UNIVERSITY OF EXETER- EGENIS ESRC CENTRE FOR GENOMICS IN SOCIETY

Genomic Sovereignty and the "Mexican Genome"

an ethnography of postcolonial biopolitics

Submitted by Ernesto Schwartz Marín to the University of Exeter as a dissertation towards the degree of Doctor of Philosophy by advanced study in Genomics in Society at the Department of Sociology and Philosophy, EGENIS-ESRC Centre for Genomics in Society (October 2011)

"I certify that all material in this dissertation which is not my own work has been identified with appropriate acknowledgement and referencing and I also certify that no material is included for which a degree has previously been conferred upon me "

…… (Signature of Candidate)

ABSTRACT

This PhD seeks to explore the development of a bio-molecular (i.e., genomic) map as a sovereign resource in Mexico. The basic analytical thread of the dissertation is related to the circulation of genomic variability through the policy/legal and scientific social worlds that compose the Mexican medical-population genomics arena. It follows the construction of the Mexican Institute of Genomic Medicine (INMEGEN), the notion of genomic sovereignty, and the Mexican Genome Diversity Project (MGDP).The key argument for the construction of the INMEGEN relied in a nationalist policy framing, which considered the Mexican genome as a sovereign resource, coupling Mexican "uniqueness" to the very nature of genomic science. Nevertheless, the notion of genomic sovereignty was nothing similar to a paradigm, and was not based on shared visions of causality, since the very "nature" of the policy object —Mexican Genome— was, and still is, a disputed reality. It was through the rhetoric upon independence, emancipation and biopiracy: i.e. experiences of dispossession "in archaeology, botany or zoology" (IFS 2001: 25) that the novelty of population genomics became amenable to be understood as a sovereign matter. Therefore, the strategic reification of Mexicanhood fuelled the whole policy and the legal agenda of the INMEGEN as well, which permitted cooperation without consensus and opened the process of policy innovation. Conversely, scientists considered genomic sovereignty an unfounded exaggeration, but anyhow they cooperated and even created a new policy and scientific enterprise. Genomic sovereignty exemplifies the process of cooperation without consensus on its most extreme version .So, as the notion circulated and gradually became a law to protect Mexican genomic patrimony, the initial coalition of scientists, lawyers and policy makers disaggregated. Many of the original members of the coalition now think of genomic sovereignty as a strategy of the INMEGEN to monopolise genomic research in the country. This dissertation additionally explores the way in which the MGDP is constructed in mass media, in INMEGEN´s communication and in the laboratory practices. These different dimensions of the MGDP depict the difficulties that emerge between the probabilistic, relative and multiple constructions of population genomics and the rhetorical strategies to continually assert the existence of the unique "Mexican Genome". I argue that the Mexican case study provides an entry point to what I and others (Benjamin 2009; Schwartz-Marin 2011) have identified as a postcolonial biopolitics in which the nation state is reasserted rather than diluted. However the relation between sovereignty, race and nation is not mediated by the biological purification of the nation (Agamben 1998; Foucault 2007), or the active participation of citizens looking to increase their vitality (Rose 2008, Rose & Rabinow 2006), but on an awareness of subalternity in the genomic arena and a collective desire to compete in the biomedical global economy.

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Acknowledgements

For Camila who likes to sing and dance...!

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Genomic Sovereignty and the "Mexican Genome": Introduction

> *Mexico is in the process of developing one of the first genomic medicine platforms of Latin America, one that is expected to serve as a regional model for other countries, in their efforts to ease health and financial burdens. Not only does Mexico view its efforts as a strategic tool for the development of the country as a whole (i.e., with respect to public health, biomedical sciences, biotechnology and economy), but also with respect to strengthening national security and preserving national sovereignty (NRC-USA 2005:8).*

This PhD seeks to explore the development of a bio-molecular (i.e., genomic) map as a sovereign resource in Mexico. The basic analytical thread of this dissertation is related to the circulation of genomic variability through the social worlds that compose the Mexican medical-population genomics arena (Clarke 2005; Clarke and Star 2008). More specifically I analyse the mechanisms, strategies and set of practices that link what has been framed as the "unique" genetic structure of Mexicans, with wider notions of national security, independence and emancipation: from international hegemony, disease and its related economic burdens.

This work expands on recent studies that explore the construction of race in the post-genomic world (M'charek 2000, 2005; Reardon 2005; Duster 2005, Fullwiley 2008, 2007; Fausto-Sterling 2005, 2008; Hinterberger 2008; Abu El-Haj 2007; Soo Jin Lee et.al 2006; Fujimura and Rajagopalan 2011). It does so by exploring the imbrications of genomics and race in the field of biomedicine in new cultural settings such as Mexico. It also complements the literature on genomics and race by presenting an emerging "postcolonial" biopolitical framework built around very specific and localised biogenetic identities. Both the construction of a Mexican biogenetic identity and the regime designed to protect it have generated intense scientific and normative disputes, many of which are analysed in this dissertation.

The primary ambition of this PhD project has been to understand the concrete scientific practices aimed at capturing a nation-state's bio-genetic diversity within the laboratory, in addition to the parallel regulatory and political efforts to protect it. The real-time and simultaneous involvement of both the regulatory and scientific spheres of Mexican genomics is one of the central theoretical/methodological innovations of this work. The "real-time" and simultaneous-comparative approach between politico-legal and scientific ordering (Jasanoff 2003, 2005) has not been explored in this way before in the field of Science and Technology Studies (STS), to the best of my knowledge[1]. The second important contribution of this work lies in its engagement with

[1] Although Jenny Reardon analyses coproduction in the Human Genome Diversity Project (HGDP), her methodology does not compare the real time practices of both the scientific and ELSI production of the HGDP. For an ethnographic account of the HGDP and its scientific practices, see: M'charek 2005. On the

a geopolitical landscape (Mexico) that has not been previously studied by STS scholars interested in genomics. Most of the literature addressing the relations between race, genomics and health/policy have focused their attention on western democratic regimes, or "advanced liberal societies" (Rose 2008; see Literature Review: Chapter 3). Rather than being another example of anthropologist's "perverse taste for the margins" (Latour in Anderson 2007), fieldwork in the Mexican genomics arena stages new possibilities of engagement and criticism. If we take seriously the idea that science is always political and local, then shifting our attention away from what has traditionally been seen as the centre to the periphery is not simply a shift in geographical emphasis.

The very few "developing countries"[2] that have been able to ride the wave of medical/population genomics face very different challenges and circumstances in comparison to their counterparts in "developed countries". Athough the idea of a threshold of development is quite problematic, the availability and magnitude of research funds drastically differ between developed and developing countries or countries belonging to the global north and global south.[3] Another basic difference lies in the medical, ethno-racial and political preoccupations that frame genomics in the global

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other hand there are many ethnographic endeavours that have established a dialogue between legal and scientific ordering, but none of them have explored the real time interactions between them. For a critique of the notion of coproduction and its theoretical-practical shortcomings see: Barnes 2010. The simultaneous research of regulatory and scientific practice could come in handy when thinking about the symmetrical and simultaneous production of natural and social orders. By paying close attention to the relations between civic and epistemic cultures (Jasanoff 2003; 2007; 2005; Knorr-Cetina 1999) we can develop new points of entry to fundamental questions related to expertise and the source of public authority. Interrogating the process of coproduction in scenarios like the Mexican one, in which democracy is a question of "transition", is of vital importance.

[2] I use the words developed and developing countries without scare quotes from here until the end of the dissertation to eliminate the constant sense of suspicion they generate. I have mostly taken these categories from my informants' discourse and in my own thesis I understood these notions to be part of a global assemblage. However I do want to make clear I don't endorse the notion of a threshold of development from which we can divide the world, since one of the ideas of this dissertation is that both south and north and all its ideas of biocolonialism and knowledge economies are coproduced.

[3] As an example, the HGDP in the USA was going to receive 2 billion dollars, while the whole National Institute of Genomic Medicine in Mexico received 120 million dollars approximately; of which 3 million dollars were spent in the creation of the Mexican Genome Diversity Project (MGDP). Another example, which draws from differences in political perceptions and activism, is that in Mexico the sampling of many indigenous communities has been possible without major political or social resistance. While the HGDP was blocked by the opposition of indigenous communities and the Erosion, Technology and Concentration Group (ETC) during the 90´s (Reardon 2005), in Mexico ETC´s influence has produced some newspaper articles, but no concerted or significant opposition from indigenous communities. Many of the critical voices I interviewed did not consider the ETC a serious interlocutor, since they were perceived as just as biased as the public figures they criticised.

north and south. In 2008 a Nature supplement (Seguin et. al. 2008 a, b; Hardy et.al 2008) introduced to an international audience the concept of a global south pursuing the protection of their national genomic resources. The interest in the protection of national genomics was framed as a question of "genomic sovereignty" a biopolitical concept, crafted during the negotiations to create the National Institute of Genomic Medicine in Mexico (INMEGEN) from 1999 to 2004.

Genomic Sovereignty was born as a boundary object (Star & Griesemer 1989; Chapter 4) that lay between the realms of political sovereignty and genomic mapping. The connection between sovereignty and genomics was made possible by the assumption that in the new "post-genomic" world, the genetic information of whole populations would become a patentable commodity (see: Taracena & Jimenez-Sanchez 2005; Jimenez-Sanchez 2002, 2005, 2008; D.O.F 2001, 2004, Frenk 2009). In this scenario Mexico had two options; develop and protect its own public health genomics initiative, or let the unique "Mestizo" genetic heritage of the nation become a tool for a new type of servitude (Frenk 2004, 2001; 2009; Soberon 2008; Canal del Congreso 2001a). In the specific case of Mexico the best way to avoid the threats of exterior plundering was to develop the internal capacity to generate a detailed genetic map of Mexican "Mestizos", and the proper legal framework to protect it[4].

The emergence of medical genomics in Mexico is relevant to those of us interested in the coupling and production of new societal arrangements and scientific knowledge such as genomics, in the developing world and beyond. The leadership of Mexico in setting the agenda of medical-population genomics for developing countries is one of the characteristics that make this case study so relevant. Such international leadership is represented by the circulation of "Genomic Sovereignty" as the flag of a political project destined to protect the genetic resources of the global south (Seguin et.al 2008; Seguin 2009; Jimenez Sanchez 2008, 2009). It also embodies a post-colonial commitment to strengthen, protect and generate public health genomic initiatives to serve the interests of the developing world (Seguin & Hardy et.al 2008; Singer & Daar 2001). The case of Mexico is considered to be a model to be followed by other developing nations. This is mainly because it is the only project completely integrated to the national health system (Daar int. 2009), and also the only one that has developed a punitive legal framework in order to defend its national genetic patrimony.

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[4]Such postcolonial awareness has been forged with images of an international biomedical scenario in which novel disputes over "the territorial sea of postgenomic medicine" are to be fought. For the moment I just want to make clear the point that competition in the realm of a global bioeconomy takes a different shape for developing countries that see in it an opportunity to exploit and re-appropriate genomic medicine, and not only a risk of dispossession or dependence.

The few academic endeavours that have examined the notion of "Genomic Sovereignty" and the developing world have done so in a very broad and romanticised way (Seguin et.al 2008; Hardy et.al. 2008 a, b, c). The aforementioned shortcomings leave aside scientific and political questions of first importance for public health genomics in the developing world. The pre-eminence of "sovereignty" goes unquestioned, erasing prickly topics surrounding the existence of a "Mexican Genome", and the possibility of claiming sovereign rights over it. Framing "genomic sovereignty" solely as a response to international expropriation of genetic resources in the poor global south comfortably excludes many problematic political assumptions and "controversial"[5] socio-scientific claims.

It is of fundamental importance to interrogate the idea of a molecular sovereignty, in order to understand what series of events and interventions make it even possible to treat the "Human Genome" as the "Mexican Genome". What would be the consequences of achieving such a transformation, even when we find that such an achievement is partial and fragmented? In Mexico the political commitment to make medical genomics into a platform for development and State independence has been related to the existence of a "unique" national genetic patrimony, and its juridical protection. In a country with more than 65 different indigenous groups, mixed with a similarly heterogeneous Spanish background, supporting the claim of biogenetic "uniqueness" is problematic to say the least[6].

From the systematic exploration of these uncomfortable issues the third major contribution of this PhD dissertation emerges, which consists of delineating a postcolonial biopolitical regime that exists in opposition to the biopolitics of advanced liberal polities: "Contemporary biopolitics in advanced liberal polities does not take the living body of the race and its vital components as resources whose fitness is to be maximized in a competitive struggle between states" (Rose 2008:58). To understand the no less contemporary biopolitics that are emerging in the developing world, specifically in Mexico, we have to engage ourselves with different analytical starting points. The basic assumptions of postcolonial biopolitics are to be found in the multiple relations between

[5] The controversial aspect of socio-scientific claims varies according to social worlds: what is completely unproblematic in the media portrayal of genomic medicine becomes scandalous and controversial for scientists outside the laboratory. In turn the media picture of the MGDP seems funny, misunderstood and ridiculous to those working in the PGL.

[6] Not to say anything about the black African ancestry, and the minority groups that are also part of the Mexican nation. This difficulty emphasizes the elusiveness of the notion of population and its boundaries; the search for the molecular basis of "Mestizaje" only makes more evident the inherent difficulties of making "racial" groupings in the postgenomic era. Another fundamental question lies in the deep economic and medical inequalities which still reign in the health scenario, making clear that ethnicity in Mexico also precludes fair health access (see: PNS 2006-2012).

race, nation and State. Such heterogeneous relations indeed look to maximise the vital component of a Mexican "race" in a cultural matrix that stages the competitive struggle between States.

The core of such a cultural matrix understands itself to be both competing in "the knowledge based economy" and defending its national biogenetic heritage and independence at the same time. The genetisation of the Mexican nation-state has allowed policy makers, scientists and epistemic entrepreneurs to make novel normative, scientific and economic claims. The strategic reification of national identity entails a series of tactics aimed at generating and protecting a specific genetic niche market (D.O.F, 27 of March 2008, Modifications to the General Law of Health on Human Genome and Genomic Sovereignty article 103 bis; ELSI response to "Genomic Sovereignty law" 22 of April 2008; INMEGEN´s on Genomic Sovereignty law [7]). In the emerging global competition of bioeconomies, individuals and families are not only constructing a new "biological citizenship", but also engendering economies searching to assert their sovereign claims[8].

On the other hand, such "sovereign" efforts highlight the contradictions and confrontations that arise between the heterogeneous mechanisms of contemporary biopower directed to increase the welfare and vitality of populations. While the rise of Genomic Sovereignty in developing countries can be read as a response to the global genome (Benjamin 2009), I think it is also a unique opportunity to find new points of entry to specific practices of control that have been understudied in current debates about biopolitics. The reconfiguration of State, Race and Nation in Mexico does not reproduce biopolitical sovereign mechanisms, based on the violent logics of the sword that controls life by taking it (Foucault 2007[1975-76]). But that does not mean that unilateral and coercive measures are not part of postcolonial biopolitics. The genetisation of Mexican identity and its protection present us with a story in which a once productive boundary object loses its flexibility, in order to become a tactic for fragmentation and imposition. On the other side this story also provides the means to understand the resistance to normative

[7] http://www.inmegen.gob.mx/index.php?option=com_content&task=view&id=816&Itemid=155

[8] I will explore more fully the concept of genomic entrepreneurs in the 4th Chapter of this dissertation. But as a quick advance, I conceptualise epistemic —in this case genomic— entrepreneurs as a specific group inside any given community that takes the leading and active role in the definition of a social world through commitment and practice. As an example in the policy innovation process, those who became the public voices, strategists and key negotiators I considered to be the epistemic entrepreneurs. But in other contexts I would consider epistemic entrepreneurs to be those who are at the core of the action and who are intimately engaged in the commitments that define different social worlds or segments therein: i.e. scientists in the laboratory, juridical and legal experts designing laws, marketing specialists and journalists.

impositions, and the creative forces of power circulating in diverse social worlds.

While the laws and principles that frame the field of medical genomics in Mexico treat medical genomics as a national public good, a neoliberal, all encompassing "free-enterprise" discourse coexists with it (see Jimenez-Sanchez 2002; 2005; Taracena & Jimenez-Sanchez 2005). The coexistence between neoliberal values, and the notion of public good is full of tensions[9]. Some of these tensions are to be found in the practices of the laboratory and the production of cost benefit strategies in order to make genomic medicine affordable, i.e. the creation of a haplotype map. Other tensions are buried in the ethical and bureaucratic negotiations that question the applicability of juridical notions, such as property and patrimonial regimes, used to regulate human genomics. By threading all these different points of concern together, I hope to flesh out an emerging socio-scientific field that could strongly contribute to our understanding of coproduction and the emancipatory role that science and technology still plays in the developing world.

In order to address the circulation of genomic sovereignty throughout the social worlds (Clarke 2005) in the Mexican genomics arena, I have undertaken extended fieldwork inside the recently created Mexican Institute of Genomic Medicine (INMEGEN). Participant observation has been done both in the ELSI centre and the Population Genomics Laboratory of the INMEGEN, for two years. I have chosen these two sites because I consider them to have a complementary and foundational role in the production and protection of the "Genomic Map of Mexicans". Even when my methods can be considered within the limits of participant observation inside somehow well-defined communities, I think of my field experience as a multi-sited endeavour.

My engagement with these two sites of knowledge production has taken me to unexpected settings and situations: inside the closed doors of the Mexican Senate, TV shows, republican ceremonies, other laboratories, NGO´s, scientific seminars, conferences, and even into the "blogs" and virtual debate forums of anonymous critical audiences. The practices of different, yet interconnected social worlds make it impossible for me to draw a line between the local practice of population genomics inside INMEGEN´s laboratory and other social settings and activities. During my stay in Mexico City, I was able to witness the rise and fall of the "Mexican HapMap", "The Map of Mexicans´ Genome", or the "Diversity Project of Mexican Mestizos" as was known

[9] Cori Hayden's work (2003) on Bioprospection and Ethno-botany could be read as an STS ethnographic predecessor of "knowledge economies" in the Mexican Human Genomics Arena. In fact, the point at which Cori Hayden's question on sovereignty and the political dimension of nature ends is where this work begins, by exploring the strategic use of sovereignty by the various social worlds constituting the Mexican Genomics Arena.

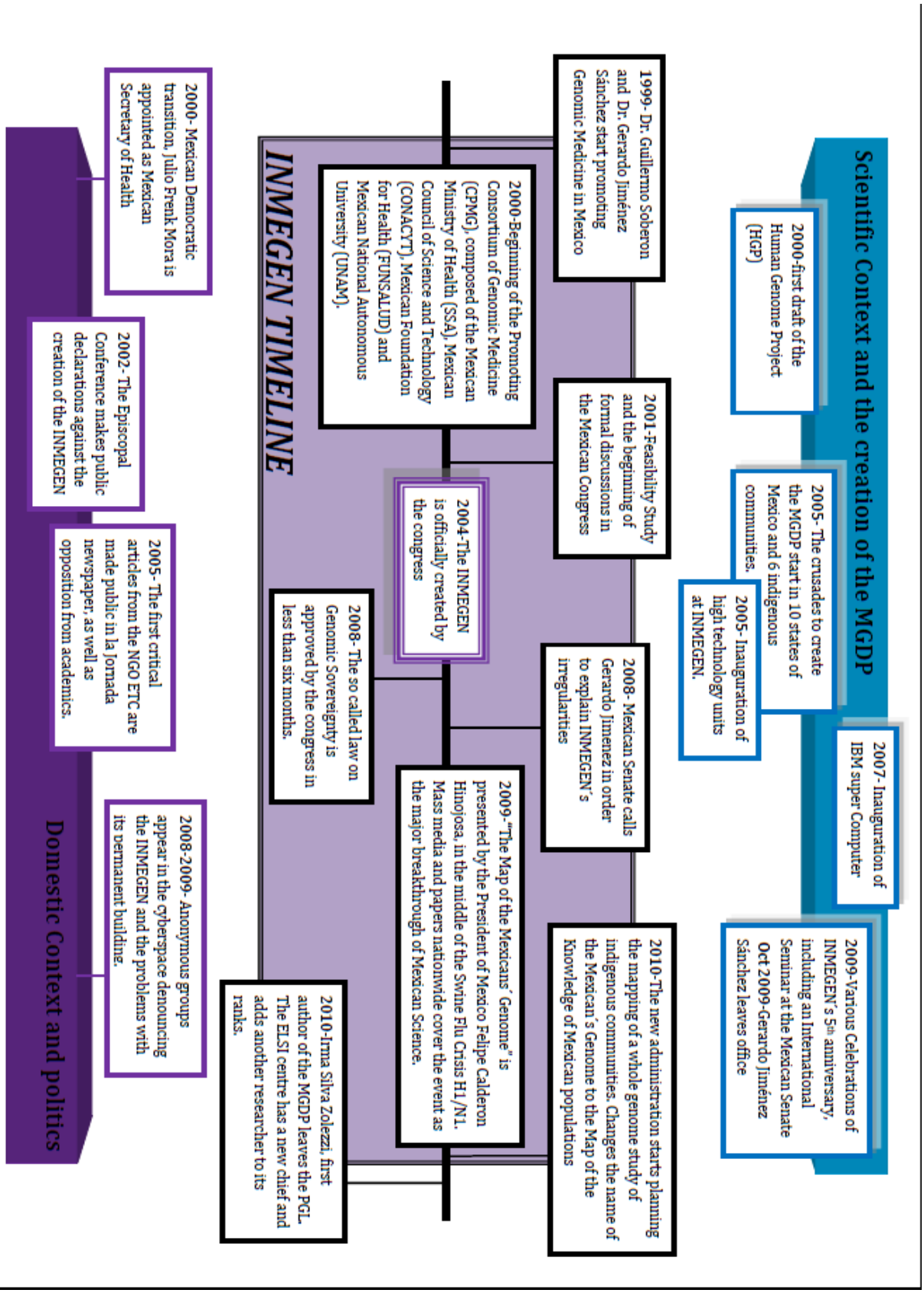
inside the laboratory. I feel the duty to warn my readers that different from the ambitions of other laboratory ethnographies in STS, the present work does not depict the construction and stabilisation of a scientific fact (see: Doing 2007; 2009). Therefore this ethnography does not present the readers with an authoritative account of how certain local and contingent practices produce or coerce an endurable scientific fact claim[10]. On the contrary, an apparently stable and well accepted arrangement between science, society and issues of political relevance becomes gradually more and more problematic, and disputed.

Looking into "the hardest of the hard places" (Doing 2007), a laboratory, in order to describe and understand the way in which contingent practices coerce and produce enduring scientific facts would be an incomplete, and potentially misleading, strategy. My case study confrontations and questioning conducted in various locales other than the laboratory have certainly interrogated the "Mexican Genome Diversity Project". As a matter of fact it would be impossible for my readers to understand such confrontations if I don't explain how marketing coproduced "The Mexican Genome". I will also fail to tell the scientific story of the "Mexican Genome" if I don't engage with the policy framing and the way in which it advanced ideas of causality and ethnicity before the laboratory work even began. The point at which my methodological weaknesses or limitations meet the theoretical/methodological virtues of this work is a question I think my readers will decide. For the moment I am aiming for a distributional and partial explanation of scientific knowledge produced in different social worlds, rather than looking solely in the "hardest of the hard places".

The PhD dissertation is divided in two sections. The first section follows the circulation of genomic sovereignty in the policy practices in the congress (Chapter 3) all the way down to the actual ELSI regulation practices of the INMEGEN (Chap 4), and the implications and policy debates surrounding the law to protect genomic sovereignty in Mexico (Chap 5). The second section is focused in the different dimensions that shaped the object of genomic sovereignty the Mexican Genome Diversity Project (MGDP) in the period between 2005- 2010 which roughly corresponds to the first administration of the INMEGEN. The data chapters cover the timeline presented below at different levels; meaning they analyse different situations.

[10] Park Doing provides a critique of STS ambitions around laboratory ethnography, emphasizing the incomplete quest of STS in demonstrating the contingent and socially constructed genesis of scientific facts (Doing 2006; 2009). My own response to such criticisms is to pursue a distributional exploration of knowledge production rather than an ethnographic exploration of the laboratory.

Figure 0-A - INMEGEN Timeline



The timeline recognizes years 2004-2005 as an important dividing line because those were the

years when the INMEGEN began functioning and most of the activities I studied in this dissertation began. It is also the time when the promises of policy making began taking shape through practices like the crusades to create the Map of the Mexican Genome. The thread connecting all these different situations is "Mextizaje" and genomic sovereignty: a proposition based on the assumption that Mexico —a nation-state possesses— a unique biogenetic composition (Schwartz and Silva-Zolezzi 2010). By following the way in which "Mextizaje" and its sovereign ethos travels amongst diverse social worlds we can uncover the diverse relations between national identity, socio-political culture and scientific practice within Mexican medical genomics. The purpose of the first section of the thesis is to show how genomic sovereignty is resisted and imposed once it ceases to be a boundary object, struggling- and finally failing- to become an overarching socio-scientific regime. The second part of the dissertation addresses three fundamental dimensions of the MGDP, its politics and disputes, the relation between sociomaterial laboratory practices and ideas on biological uniqueness, and finally the mediatic construction of the MGDP.

Chapter 1

The literature review is built on three main axes: 1) Mestizaje and national identity; 2) Literature on race and genomics; and 3) contemporary approaches to biopolitics. The way in which STS analytical tools such as coproduction and boundary objects help us to understand complex relations between genomic science and policy in the developing world and Mexico serve as a corollary to the way the research was methodologically planned and executed.

Chapter 2

Describes the methods I used to conduct research in the Mexican Genomics Arena, providing a general description of the Population Genomics Laboratory (PGL) and the (ELSI) and my position within these incipient social segments. It describes the way I negotiated access and conducted participant observation; it also explores my use of Situational Analysis as a theory methods package.

Chapter 3

This chapter explores creation of the INMEGEN and its negotiation in the Mexican Congress (1999-2004). To do so it presents the lobbying efforts of a group of scientists, legal experts and medics, to convince congressmen to fund the project. Its analytical spin shows how a whole new area of policy and scientific inquiry can be inaugurated without consensus amongst experts. The notion of genomic sovereignty was pivotal in the creation of the INMEGEN; nevertheless its fundamental assumption of "Mexican biogenetic uniqueness" was disputed since the very beginning of public negotiations.

Chapter 4

It depicts the role of the ELSI in the creation of policies, regulations and as ethical arbiters of genomics in Mexico. The role of the ELSI was a central one, even when it was a marginalised activity for much of my stay in the field; this contradictory status tells us a lot about how laws and policy were generated in Mexico and the INMEGEN. The deliberative bioethics championed by the institute are compared with the work done at the ELSI, showing the multiple features that define a Mexican civic epistemology under scaffolding, i.e. in profound crisis which has displaced the political to the sphere of fragmented expertocratic circles that hardly debate or talk with each other.

Chapter 5

This chapter addresses the larger policy and juridical world dealing with Genomic Sovereignty as a public good it also describes the restrictions that have been put in place in order to protect the genetic patrimony of Mexico. The idea of a new biopolitical regulation in which populations can be uniquely approached and controlled (Thacker 2005) is interrogated by contrasting the notions of binary regulation (prohibited/permitted) with the tactical dimension of framing something as national patrimony that by far exceeds all the surveillance capacities of the state: DNA, bioinformation. The inoperability of the law becomes evident since it is divorced from the polyvalent and elusive production of population genomics.

Chapter 6

Links the disputes around "Mextizaje" with the design and representativeness of the MGDP for critical audiences, enveloped by what I identify as scientific *caudillismo*. Moving from the larger social worlds in which the INMEGEN, the MGDP and genomic sovereignty are disputed, both in its scientific validity (genetic uniqueness?) and its political relevance promises of economic revolution, down to the very local practices of personal promotion of INMEGEN´s director general and the topics of corruption and the media scandal around INMEGEN´s finances.

Chapter 7

The probabilistic and complex production of genethnicities in the PGL are compared with socio-historical discourses about race and national identity that were mobilised in the negotiations of the Mexican Congress: making clear that the socio-material practices of population genomics constantly dispute the idea of genetic uniqueness. Population genomics inside the laboratory is constantly staging a different relationship between ethnicity, nation and genetics than the one imposed on their scientific endeavours by media, policy or the biomedical community. To show these discordances, alignments and exchanges between vernacular and biogenetic identities, I

engage with haplotypes, their interpretation in terms of "history written in our genes" and its circulation in and outside the laboratory as tokens of expertise and ethno-racial boundaries.

Chapter 8

The way in which media coproduces the MGDP, ethno-racial uniqueness and scientific avant-garde, are the topic of this chapter. The process of flattening ethnoracial diversity into the homogenising mestizo category is one of the ways in which genomics is tied to the field of nationhood. Criticism coming from experts is marked by the disapproval of the role INMEGEN and mass media have played in the creation of a "Mexican Genome," which they depict as a shameful display of cheap patriotism, unethical marketing and mass politics. All of these characteristics make media a propitious place to look for the struggle between imposition and resistance. This struggle can be followed by analysing the images produced around the "Map of the Mexican Genome" and the events celebrating it.

1- *Literature Review*

Postcolonial Biopolitics: weak sovereignty and ethno-race in Mexican medical genomics

Almost a decade after the Human Genome Project (HGP) was published, sociological and philosophical literature dealing with the reification of social categories (Duster 2005; Lewontin 2005; Koenig et.al 2008) in genomic research has boomed. The same has happened with literature exploring the role of identity politics, racial categories and the medical applications of genomics (Fullwiley 2008, 2007; Fausto-Sterling 2005, 2008; Reardon 2005; M'charek 2000, 2005; Gannet 2003; Bliss2011; Abu El-Haj 2004; Fujimura et.al 2008; Fujimura & Rajagopalan 2011). One of the most popular ways to approach the new genetics/genomics and its relation with governance, race and citizenship has been to appeal to a new biopolitical citizenship (Rose &Rabinow 2006; Rose 2008; Rose & Novas 2004). The literature on biopolitical citizenship maintains that, contrary to the practices of the twentieth century, in which race was used as a discourse by which the nation-states tried to control their population's fitness, in contemporary liberal polities autonomous individuals look to maximise their vitality by engaging with biomedical innovations and the market economy (Rose 2008: 189).

Throughout the thesis I present a scientific governance regime (Irwin 2007) which I think is different from those found in advanced liberal societies (mainly the US & Europe) and which exploits a different identity politics than those explored in the literature so far. Active individuals of liberal polities that participate in the biomedical market to increase their vitality are mostly absent in Mexico (Rose 2008, Rose and Rabinow). In their place the State and its biomedical elites occupy centre stage, claiming to make genomics a platform for national sovereignty and the advancement of new programmes of public health. As a result they have developed the concept of genomic sovereignty that this dissertation explores, which recently is being constructed as an international category for the protection of national biogenetic resources of the global south (Hardy et.al 2008 a, b, c; also see: Benjamin 2009). By exploring these different articulations of science and politics this PhD dissertation fills a theoretical and empirical gap in the literature of biopolitics, sovereignty and race that at the moment has paid little attention to the developing world (cf. Stoler 1995; Arias and Restrepo 2010).

Despite the breadth of the literature on race, genomics and biopolitics, most of it has paid attention to the techno-scientific developments in the USA and Europe, leaving aside developing countries with different racial, ethnic and socio-scientific realities. Recently ethnographic and sociological research on race genomics in the developing world, especially in Latin America, is starting to grow and become publicly accessible (Gibbon, Ventura Santos and Sans 2011; Olarte Sierra & Diaz del Castillo 2011; Kent 2011; Gibbons et.al 2010).

When I began the PhD research in 2007-2008 the INMEGEN was recently created, the MGDP was still under progress and most of literature on Latin American genomics did not exist; most of my points of comparison were ethnographic studies done in Europe or the US (cf. Reardon 2005, Fullwiley 2008, M'charek 2005). Except for the work of UNAM's philosophers of science Carlos Lopez-Beltran & Francisco Vergara (2008) and a Nature Supplement addressing the creation of public health genomics platforms in developing countries (Hardy et. al. 2008 a, b, c), the field of Mexican genomics could be thought of as an unchartered space from a sociological perspective. Nowadays the ethnographic, sociological and philosophical literature not only on Latin American but on Mexican genomics is growing (Benjamin 2009; Hartigan Forthcoming; López-Beltrán and Vergara-Silva 2008, 2011; Lopez-Beltran 2011; Schwartz-Marín and Silva-Zolezzi 2010, Schwartz-Marin 2011; Garcia-Deister 2011a, b; Wade 2011). The work of the INMEGEN and its promise to tailor genomic medicine to the nation's "unique" genetic composition product of Mestizaje (racial admixture or hybridity) has been the principal focus of attention of recent critical literature and academic commentary (cf. Wade 2011; Reardon 2011; Lopez-Beltran 2011).

The work of prominent philosophers and historians of science Carlos Lopez Beltran and Francisco Vergara (2008) analyse the relationship between ethno-race and genomic research as ready-made categories, since the idea of racial hybridity and Mestizaje have been part of Mexican collective imaginary for a long time (cf. Basave Benitez 1992; Lomnitz 2010). My own work co-authored with Irma Silva-Zolezzi, first author of the Mexican Genome Diversity Project (MGDP), has contributed an ethnographic perspective of the dynamics of dominant notions of Mexican national identity and the socio material dimensions of population genomics research (Schwartz-Marin & Silva-Zolezzi 2010). The work of Garcia Deister (2011) offers a complementary laboratory ethnography to mine which explores the way in which the Mestizo acquires substance from the sampling to the sequencing processes. Other ethnographic explorations are currently going on at the INMEGEN exploring aspects related to ethnorace in the field of Mexican genomics (Hartigan forthcoming). On a comparative dimension, Ruha Benjamin's (2009) work deals with the question of how geneticised national identities in South

Africa, India and Mexico have played a role in establishing public health genomic initiatives in the developing world. Ruha Benjamin (2009) argues against the idea of transnational decentred global genome (Thacker 2005); to back up her claim she uses the aforementioned scientific endeavours in which the nation-state still occupies centre stage.

This thesis moves in the direction of the previously mentioned literature by exploring the links between ideas of *Mestizaje*, sovereignty and genomic research in Mexico, as well as providing a historic/ethnographic analysis of the policy process by virtue of which the INMEGEN emerged and developed. One of the methodological innovations of my work is that it engages with the scientific practice at the laboratory and the policy process in a simultaneous fashion. In this way the literature review elaborates on the role of coproduction (Jasanoff 2003, 2005; Reardon 2005) and the emergence of what I have identified as a postcolonial biopolitical regime in Mexico. The Mexican case can be considered as the paradigmatic postcolonial instance of biopolitics because its proponents (Jimenez Sanchez et.al 2002a, IFS 2001:25, Hardy et.al 2008a, b, c) have framed genomics and its biomedical applications as a political/scientific space highly conscious about issues such as global inequalities, exclusion mechanisms through market oriented rules -such as patents- and a long history of biological dispossession (cf. Schwartz-Marin 2011; Chap 3, 4, 5; IFS 2001; NAS 2005)[11]. According to Ruha Benjamin (2009), the emerging Mexican policy regime can probably be mapped to other developing countries such as South Africa and India.

Although I centre my attention on the existing and forthcoming literature on the topic of Mexican genomics, I also open up my review to less specific bodies of literature that inform this work and could be potentially informed by it. The first body of literature which I am interested in is Mexican nationalism and its coextensive notion of Mestizaje. I then link it with contemporary ideas on biopolitics and literature on race and genomics (mostly centred in US and Europe). The links made between these different literatures is born from my ethnographic fieldwork; therefore each of the literature bodies situates different aspects of my empirical research. I argue that in postcolonial biopolitics the intimate relation between an (impure or admixed) race-nation and modern biotechnology re-integrates the "struggle between races" (Foucault 2003[1975-6]) in a space dominated by the expanding logic of neoliberal governmentality. This postcolonial biopolitics claims sovereignty over a national population without resorting to a murderous extermination orchestrated by the state (Esposito 2003; Agamben 2000; 1998; Bauman 1989).

[11] My use of postcolonial is reliant on the discourse of Mexican scientists who see the danger of a new biocolonialism emerging from genomic research, rather than a thorough engagement with postcolonial literature. This is something I would like my readers to keep in mind when they read this literature review.

In a more micro-social dimension, what I depict is an incipient social arena in which different social worlds are taking shape. The mark that differentiates the two evolving social worlds I analyse in this dissertation (population genomics, policy/ELSI regulation) is their contradictory ontologies, "understood as the empirical investigations of the kinds of entities, the forms of being or the structure of existence in an area..." (Knorr-Cetina, 1999: 253) The ontologies at play in the laboratory link ethnoracial categories with a loosely defined system of DNA difference based on probabilistic and relative relations, while the ontologies circulating and being worked in the policy room and the ELSI arena enfranchise the idea of national genetic uniqueness. The thesis further argues that a constant work of public strategic ordering (cf. Bell 1992; Seligman et.al 2010) brings together these two opposed ontological and socio-technical realms in a more or less coherent way.

Since one of the central aims of this PhD research was to engage with both the work of legal and policy regulators and biomedical scientists in a simultaneous fashion, the literature of boundary objects (Clarke &Star 2007; Star & Griesemer 1989; Star 2010), social worlds (Clarke 2005); Clarke &Star 2007) and coproduction (Jasanoff 2005; Reardon 2005; Barnes 2010) is very relevant. The methodological choice of using situational mapping as my main research framework, which cross-fertilises a Straussian interest in action and a Foucauldian exploration of power, resonates with a specific performative approach to biopolitics (Inda has defined this interest in action and concrete cases as an anthropological take on biopolitics see: Inda 2005). I use situational analysis, thinking in terms of points and frames of contact (Lomnitz 2002; Anderson 2007; Miller 2004; Pratt 1992), in which the global and local are negotiated; these spaces of negotiation can help us reveal how ethical and scientific models produced by "advanced liberal democracies" are part of a larger network[12].

1.1 Mestizaje: Mexican National Identity

> *"Mestizaje in the context of nation making is a 20th century post-revolutionary ideology (Gutierrez 1998: 293)".*

At the dawn of the 20th century "the Mexican elite strongly felt the political need to answer negative European racial mythologies with mythologies of their own "(Stepan 1991:145). In post-revolutionary Mexico Jose Vasconcelos became one of the most prominent intellectual characters, acknowledged for, amongst other deeds, the enhancement of the Mexican

[12] A network which is local in all its points but still deeply interconnected both by neoliberal ambitions and its use of bio-molecular technology to substantiate novel ways to achieve medical and economical goals.

Educational System and for his controversial presidential candidacy in 1929. Amongst his many achievements, the most perdurable and famous one has been his ideological contribution to a national imaginary known as Mestizaje. Almost a century has gone by, and the role of Vasconcelos in the construction of the official scripts of Mexican identity is undeniable. During his time as a public officer and Mexican Secretary of Education (1921-24), he and a group of elite intellectuals were capable of creating the foundations of a National-Mestizo Identity. This National Mestizo Identity has spread throughout the country, especially by means of the national educational system: "Por mi raza hablará el espíritu [The Spirit shall speak for my race]", Motto of The Autonomous National University of Mexico (UNAM), by Jose Vasconcelos (UNAM 2009 1920-21])[13].

Mexican patriotic symbols have been important vehicles for *Mestizaje* (Gutierrez 1998:292); this construction of National Identity was accompanied by the creation of a welfare State and the cultivation of corporativism (Tenorio Trillo 2010). The title of Vasconcelos´ seminal publication, the "Cosmic Race" (1925) has become a keyword regarding *Mestizaje*. The adjective "Cosmic" refers to the synthesis of a dialectic racial process, in which old racial stocks will fuse into one definitive race that agglomerates the best qualities of all, hence: "...the future race, will not be a fifth or a sixth race, destined to prevail over their ancestors; what is going to come out of it, is the definitive race, the synthesis race or the integral race" (Vasconcelos 1925)[14].

The boundaries of Mestizo biology in Mexico are difficult to delimit. Census data from the XIX century shows a massive growth of self-identified Mestizos in Mexico (23% of the total population in 1808, was considered mestizo, this number increased to 43% in 1885, while the indigenous population diminished from 60% in 1808, to 38% in the same time span).Such an increase could only be explained through a catastrophe of enormous dimensions —just affecting indigenous communities— combined with a disproportionate and gigantic reproduction of Mestizos (Navarrete 2005). In fact the study argues that the enormous and expedient growth of the Mestizo group is better explained by the inclusion in the Mestizo category of people formerly included under the indigenous brand.

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[13] Although Jose Vasconcelos was not the one to start branding the "Mestizo" as the new widely accepted identity of the Mexican republic (see: Basave-Benitez 1992), his ideas are a fundamental reference in the twentieth century construction of Mestizaje.

[14] (Online version in: http://www.filosofia.org/aut/001/razacos.htm; last consulted 29/July/2009).
In 1909, Alfonso Reyes, Pedro Henríquez Ureña, and Vasconcelos founded the Ateneo de la Juventud, which created a venue for scholarly activity and supported educational reforms. Early in his career, Vasconcelos was also heavily influenced by Indian philosophy, spiritualism, and the Theosophists, who listed as one of their aims, ''...To form a nucleus of universal brotherhood of humanity without distinction of race, creed, or color'' (Webster's International Dictionary, 1950 in Miller 2004:36).

Many Mexicans recognise themselves as Mestizos, a product of the clash of two cultures: the Indigenous and the Spanish. The product of this biological and cultural fusion is considered by Vasconcelos as both a future oriented national project in which racial divisions will eventually disappear (claims of universalism) and a dominant ethno-racial identity that could join in one category different ethnic and cultural backgrounds (claims of unity) [15]. The Universal and Unitary claims, are therefore fundamental characteristics of the Mexican ethnoscape (cf. Appadurai 1999), read as a Mestizo Narrative. In Mexico, *Mestizaje* has become a homogenising discourse, a response to the anxieties of diversity and fragmentation that unfolded after the Mexican Revolution; akin to the creation of a benefactor state and to a unified national project (Tenorio 2010). Regarding the role of *Mestizaje* as a National identity, I refer to a specific post-revolutionary notion of admixture, reproduced by Mexican intellectuals and politicians in the first half of the twentieth century.

The existing literature on Mexican nationalism has paid an important amount of attention to the role that Mestizaje has played in the country and the construction of a collective identity, a question that has been widely studied by social scientists (Basave-Benitez 1992; Stepan 1991; Gutierrez 1998; Navarrete 2005; Moreno Figueroa 2007; Lopez-Beltran 2007; Lomnitz 2010; Miller 2004; Alonso 2005; Martin 2009). Mestizaje as nation making can be studied and reconstructed in the intellectual work of seminal political thinkers of Mexico (for a historical approach see: Basave-Benitez 1992 also Lomnitz 2010), or through the lenses of eugenic and racial projects linked to political, national, and cultural identities in Latin America (Stepan 1991;Stern 2002). It can also be studied through historical lenses, reconstructing the socio-racial divisions produced by the Colonial "Castas system "(Lopez-Beltran 2007).

Claudio Lomnitz (2010) links the racialisation of the Mexican national subject, constructing it as the Mestizo, to three central processes; the first one is the creation of a national myth of hybridity as a way to flatten the problems of inequality in post-revolutionary Mexico. The second one is linked to the migratory displacements produced by capital investments at the end of the 19th and the beginning of the 20th centuries in the national railroad construction efforts, and areas such as mining, oil, textiles and agriculture which generated waves of internal migration in which Mestizaje took roots. The third process is the explanation he provides for the popular support given to the idea of Mestizaje as a national identity, and that is linked to the tense relation with Mexico´s northern neighbour, the US. According to Lomnitz (2010:29), since the beginning of

[15] To refer to the Mestizo as a clear identity amongst Mexicans is not easy as many Mexicans would not recognize themselves as Mestizos or Mestizas, even when directly questioned about their ethnic or racial identities (Moreno Figueroa 2007).

Mexico´s independent life the US has constructed the idea of the existence of a Mexican race. As individuals and commodities crossed the US-Mexico border new values were negotiated, as well as racial identities. Inequality and stereotypes ruled the valences in each side of the border, making Mestizaje an attractive alternative to respond to the idea of the inferiority of the Mexican race deployed in the US (ibid:30)[16] and also as a way to frame Mexico and even Latin America as a region in the US (cf. Miller 2004).

Natividad Gutierrez (1998:294) identifies *Mestizaje* as a way to romanticise the encounter between Spaniards and Indigenous, and delimit the space of national culture in Mexico. The construction of these cultural and national boundaries has had profound implications in the way ethno-racial diversity is approached inside the country: "...the imaginary of Mestizaje has obscured our eyes...no one has been preoccupied by the admixture of indigenous peoples... It has made it difficult to see ourselves as a diverse country... diversity was a problem for national integration... it was not until now, that we are starting to value diversity... that we don't see it as a problem "(Tenorio 2010).

The problematic relation between admixture as a homogeneous national identity and ethnic diversity in Mexico are synthesized by Juan Pedro Viqueira´s (2010) comments: "...the great problem of *Mestizaje* is that it has led us to a terrible dualism... postulating two homogeneous groups: Mestizos and an Indigenous minority [...] what we have to learn is to value diversity, within diversity" (Viqueira 2010). The duality between the Indigenous and the Mestizos also rests on a fundamental time partition, since Mexican history is marked by both a cultural and biological new subject, the Mestizo: "The deep roots of our nationality are in the Indigenous past, the point at which our history begins. It was a glorious past, brought to a halt by the Conquest. Since then, the real Mexican, the Mestizo, has arisen" (Bonfil Batalla in Underiner 2004: 29).

The novelty of Mestizaje depends on the millenary status of indigenous communities, in contrast with the promising future of "The Cosmic Race"; therefore for Vasconcelos the uprising of an admixed race would be the end of racial divisions. In this scheme the indigenous past of Mexico is but one step towards the final racial emancipation (Vasconcelos 1925). As a question of historical record, Mestizaje, as ethno-racial admixture or hybridisation, can be roughly traced back to 500

[16] Morris (1999) makes this point as well as much of the literature on this topic, the next phrase of Octavio Paz summarises this point: "inseparable from ourselves and...at the same time...radically and essentially extraneous or foreign... (the United States) is the image of all that the (Mexicans) are not; they are strangeness ([otherness]) itself (Paz in Morris 1999, also see: Paz 1981[1950])."

years ago, when various indigenous nations were conquered by Spaniards[17]. On the other hand, as a matter of national identity *Mestizaje* is an ongoing emancipatory process.

1.1.1-Mexican Nationalism, Mestizaje and scientific progress as a contact frame

The recognition that national identities are not an isolated achievement but a place in which the local and the global are produced is very present in the literature on Mexican nationalism: "...a nationality born from the encounter with the other, of reinvention and from the difficulty to consolidate a hybrid identity...in practice since the very beginning the project of Mestizaje and the creation of a more just society has coexisted with its antithesis" (Basave-Benitez 1992:19). Therefore taking at face value the notion of *Mestizaje* as a global brotherhood in which racial distinctions will disappear (cf. Martin Alcoff 2000) is unfounded. There is a long history of exclusion and socio-racial divisions in Latin America in which the pro-European and whitening tendencies of admixture as national identity are evident (cf. Miller 2004; Gutierrez 1998; Basave-Benitez 1992; Lowell-Banks 2006). Ana Maria Alonso (2005) shows how the discourse of hybridity can become a discourse of veiled inequalities as well as a discourse of authority that generates forms of "national-popular sovereignty, which, as in the Mexican case, are exclusionary in their very pretensions to be inclusionary" (Alonso: 59). For example *Mestizaje* and the celebrations of racially admixed national identity in Mexico have had little impact in the improvement of the quality of life of vulnerable communities who were economically and politically segregated since the Spanish colony (the 100 most impoverished municipalities are all mostly indigenous: PNS 2006-2012).

The idea that the mixture of cultures and races is the pinnacle of hybridity is far from monolithic; it changes according to different national constructions in Latin America (Miller 2004). Even within nation states Mestizaje is in flux (Morris 1999). Mexican nationalism seems to be fractal and contradictory. Recently Patricia Martin (2009) has qualitatively studied contemporary constructions of Mexican national identity showing that many of her interviewees are divided between post-revolutionary tropes of Mestizaje and anew post-national, more cosmopolitan identity. Miller (2004) also argues that in further developing the theory of hybridity (Bakhtin 1988) and *mestizaje,* the development of the notion of the 'contact zone' emerged: ''the space in which peoples geographically and historically separated come into contact with each other and establish

[17] This is a static notion of admixture in Mexico, in 500 hundred years admixture has taken many shapes and flavours. A historical example of the dynamics and mobility of racial admixture in the "Castas System" of the Colonial period can be found in Lopez-Beltran (2007).

ongoing relations, usually involving conditions of coercion, radical inequality, and intractable conflict" (Pratt in Miller 2004, originally in Pratt 1992:6-7).

In his historical study of Mexican nationalism, the prominent anthropologist Claudio Lomnitz (2002) recovers Pratt´s (1992) idea of the contact zone to present a broad map of the development of ideas of national identity in Mexico in a topographic (Appadurai 1999) rather than punctual language. The contact frame is the analytical effort to systematise the relational contexts in which national identity production occurs. "We can identify classes or types of such contexts from the dynamics of nation building and transnational interactions that can be isolated on the analytic plane. Contact frames are thus the minimal analytic units of a vast topography of national identity" (Lomnitz 2002:Chap 6). Covering topics as varied as political ceremonies, public service and collective imaginaries since the period of the New Spain all the way to the twentieth century, professor Lomnitz is able to portray some of the complex interstices of Mexicanhood. His main argument is that since Mexico never fully developed a bourgeoisie public sphere, ritual, rumour and corruption served as bridges to link local interests to the more abstract national reality (Lomnitz 2001: 163).

The scientific horizon works as one of the contact frames in which Mexican nationalism is negotiated because: "nation states are supposed to march together toward progress. Without this ideal, there would be no obsession with national history... this civilising horizon is identified in terms of technological advances, scientific achievements and the techniques used to govern the population" (Lomnitz 2010: 119). The idea of Mestizaje as dominant national identity and political project has had since its very post- revolutionary beginnings a tendency to prepare the ground for a science of admixture (Vasconcelos 1925)[18]. Literature that links ideas of Mestizaje, nation and ethnoracial projects with scientific discourse contextualises how the idea of an admixed nation has shaped eugenic discourses in the 20th century (Stern 2002, 2000; Stepan 1991; Saade 2004, 2011). For Claudio Lomnitz the work of Alexandra Stern (2002) on Mexican eugenics, Mestizofilia and biotipology provides a good example of the ways in which scientific development constitutes a contact zone. A contact frame in which a group of scientists and medics between the 20´s and 30´s developed a racialised view of the Mexican body politic and its proper eugenic

[18] The doctrine of sociological and biological formation we propose in these pages is not a simple ideological effort to raise the spirits of a depressed race by offering it a thesis that contradicts the doctrine with which its rivals wanted to condemn it. What happens is that, as we discover the falsity of the scientific premise upon which the domination of contemporary power exists, we will also foresee, in experimental science itself, orientations that point the way, no longer for the triumph of a single race, but for the redemption of all men (Vasconcelos 1925: 35 in Miller 2004).

administration, through a series of shared ideas, journal articles and conferences:

> Their work served two ends: on the one hand, it strengthened the "mestizophilic" Mexican Revolution´s antiracist arguments; on the other hand, it tended to characterize Mexico´s various poor populations (from rural Indian and to urban workers) as comparatively deficient. Eugenics´ racial relativism (each race was supposed to be adapted to a specific environment and so was in some respects superior, and in other ways inferior to the rest) and its simultaneous characterization of the Mexican majority in terms of a series of relative lacks offered hope for eventual equality between Mexico and European peoples, it also offered ample justification for a kind of "internal colonialism". Eugenics offered a way to objectify and quantify differences between poor Mexicans and ideal norms represented by the elite, this in turn permitted the state´s development mission to be defined, while the poor national majority could remain scientifically devalued, at the same time, the potential uses of race science to undercut the imagined potential of Mexico´s "halfbreed" race is well known and was always a potential liability for the nationalists (Lomnitz 2002: 120).

Many of the Latin American nations were disdainfully relegated into backwardness by the orchestra of modernity and its relentless progress (Chavez in Soberon 2009; Reyes 1929, Paz 1950) which was closely tied to ideas of racial fitness and improvement. In this context racial non-purity served as a counter model to European and US racial science, most visible throughout the 20th century; eugenic and racialised ideas found ground in Mexico and other Latin American countries (Stern 2002; Stepan 1991; Saade 2004). In Mexico a very active interest in genetics existed since the early 20th century (cf. Barahona et.al 2005). The book Genes (&) Mestizos (Lopez-Beltran ed. 2011) touches on the various aspects of the new genomics which promised to bring Mexico to modernity at last. Genomic medicine promises to bring a personalised, preventive and predictive medical practice could make Mexico able to participate in the first world countries' science made possible after the HGP (Lopez-Beltran & Vergara Silva 2011; Guerrero-McManus 2011; Schwartz-Marin 2011).

One of the purposes of the book is to understand the way in which national post-revolutionary imaginaries were historically deployed at the beginning of the 20th century (Saade 2011) in eugenics and genetics (Diaz-Suarez & Barahona 2011). The same book then explores the ways in which ideas of *Mestizaje* have been reshaped and deployed at the beginning of the 21st century with the advent of genomics and the INMEGEN in Mexico (cf. Lopez-Beltran 2011; Schwartz-Marin 2011;Garcia-Deister 2011; Guerrero-McManus 2011). My own contribution to the forthcoming (Lopez-Beltran ed. 2011) literature on Mexican genomics touches on the intimate relations between ideas of identity, and the quest for sovereignty in the field of Mexican genomics (Schwartz-Marin 2011). I think the contact frame of science (Lomnitz 2002) and the growing interest in the development of Latin American and Mexican genomics can be better portrayed under the idioms of governance, contact frames and with a focus on the coproduction of natural

and social orders.

1.1.2- Governance, coproduction and boundary objects in the Mexican human genomics context

> *...the division of technical and epistemic labour between scientists and legal professionals is no mere scratch in the ground... (Barnes 2010)*

Alan Irwin (2007) argues that a movement from the narrower language of "policy" to that of governance makes "the boundaries between science and politics become blurred, agency does not simply reside in human actors, and problems spill over between categories" (Irwin 2007: 599). In my own research I pushed the intersectional qualities of Situational Analysis (SA) (Clarke 2005; cf. Chap 2: methods) to study governance. I think one of the major strengths of SA becomes visible when phenomena such as circulation, coproduction and cooperation without consensus are studied (cf. Clarke and Star 2007). The affinities between the topographic emphasis on Mexican national identity negotiation as contact frames (Lomnitz 2002: Chap 6) and SA (Clarke 2005) can be linked to contemporary literature on STS governance (Irwin 2007; Jasanoff 2005, 2007; Gieryn 1983). An example of their affinities lies in the relevance that situated case studies, rather than grand theories, have in approaching empirically oriented research.

It is not difficult to see the immediate affinity between notions such as coproduction (Jasanoff 2007, 2005), boundary work (Gieryn 1983, Guston 2001; Kelly 2003) and situational analysis: both are strongly rooted in STS, and both seek to provide an account of complex processes that happen at the intersection of one or more social worlds. The notion of coproduction is a powerful explanatory and interpretative tool in STS, one that has become increasingly popular (cf. Jasanoff 2005, 2007; Reardon 2005; Irwin 2007). The very idea of natural and social orders coming into being in the same process lies at the core of actor-network theory (ANT), and many of the experiences of those who have engaged or are willing to engage with STS.

One of the first questions to be asked about the coproduction framework, is what do we take to be natural and social orders and what kinds of practices produce them? Sheila Jasanoff (2003; 2005; 2007) answers those interrogations by presenting a scenario in which natural and social orders are mostly culturally bounded, of which law and science are two of their privileged ordering institutions (Jasanoff 2007). The particular practices that are currently used in a society to valuate expertise and knowledge are what Sheila Jasanoff identifies as civic epistemologies:

> I suggest that modern technoscientific cultures have developed tacit claims that seek to order their lives; demonstrations or arguments that fail to meet these tests may be dismissed as illegitimate or irrational. These collective knowledge-ways constitute a

> civic epistemology; they are distinctive, systematic, often institutionalized, and articulated through practice rather than in formal rules (Jasanoff 2005:257).

Interventions in bioethical, scientific and medical scenarios and the ethico-legal stance of different nation-states towards biotechnological innovation are all involved in the process of coproduction. Moreover the notion of coproduction aims to be —even when culturally bounded— an overarching process that has as its outcome the natural and social ordering of any given collectivity. In her book *Designs on Nature* (2005) Sheila Jasanoff presents a series of compelling comparative case studies around biotechnology in which the boundaries between the social and the natural could not be understood unless we take seriously the notion of civic epistemologies and coproduction. Professor Jasanoff explores various cases of modern biotechnology in which Western democratic states (UK, Germany and USA) make very different juridical demarcations between the natural and the social[19], such differences between case studies can delimit the boundaries and differences between different civic epistemologies or tacit ordering claims that seek to differentiate between valid and invalid arguments.

After probing their obdurate character, these practices become part of a civic epistemology. Civic epistemologies can also be understood as the cultural patterns by which a given culture decides the boundaries between the natural and the social:

> ...the very faculty that allows democratic societies to exercise informed judgment in steering science and technology is shaped by longstanding cultural commitments that are built into the design of national legal and political institutions. Civic epistemology, in this sense, is the flip side of a more common concept for political theorists: public reason (Jasanoff 2003: 232).

One of the questions that this dissertation explores is how such public reason is built in non or quasi-democratic cultures and political systems in which expertocracy and hierarchies are imposed even at the expense of silencing dissident voices and the fragmentation of debate (cf. Chap 4 & 5). Professor Barry Barnes (2010) thinks about coproduction (as the joint production of knowledge between legal specialists and scientist) not as a theoretical response to new phenomena, but as a change of epistemic tastes. One of his main critiques is directed at coproduction's lack of specificity around the epistemic salience of legal specialists' contributions to the production of knowledge about the physical properties of the objects brought by the

[19] An example of this national and culturally bounded scientific and political demarcation is found in the differential judgements of genetic patenting accepted in each Western Democratic State. While in the USA almost everything under the sun could in principle be patented as a private commodity, including whole organisms, such as the Oncomouse, in other civic cultures such as the UK or Germany these practices are simply unacceptable (Jasanoff Chapter 9).

sciences: "...if one drops the assumption of epistemic salience, knowledge production becomes a contingent chain of historical links and causal connections extending to most everything" (Barnes 2010: 8).

Even though he recognises that coproduction emphasises the permeable boundaries between science and law, he is sceptical of the idea that the same set of practices produces natural and social orders in a symmetrical fashion. Instead Barnes (2010) suggests that most of the time the legal specialist works around technical consensus, ordering according to his knowledge of legal frameworks the way in which human beings should act toward the physical properties of scientific knowledge-objects. Professor Barnes's (2010) paper ends by asking for a refinement of the notion of coproduction, or simply leaving out this notion all together. I generally agree with Professor Barnes' critique about the difficulties that the notion of coproduction has in addressing the ways in which asymmetrical epistemic standings have in the production of knowledge. However the empirical fact that none of the legal experts acquainted with genomics worked on a "consensus of technical expertise", but rather on a particular (quasi-well defined) notion of genomic sovereignty (cf. Chap 3) make it necessary for us to examine the common idea that consensus is necessary for concerted action.

My own study was set up as an exploration of this kind of coproduction between legal-policy experts and scientists; the setting (INMEGEN) was specially promising to do this kind of research since it was a single institute which had the duties to both produce and protect Mexican human genomics (cf. Jimenez-Sanchez 2005; D.O.F 2004; INMEGEN 2009:167). This, I think, is one of the central contributions that my simultaneous —real time— engagement with the regulative and scientific practices around Mexican genomic medicine brings to the existing STS literature. My claim throughout the dissertation is that the ways in which natural and social orders are produced are not based on anything similar to a technical consensus of scientific experts, which the legislator or regulator then transforms into social ways to treat and work around a physical object (as Barry Barnes [2010] suggests); but rather on boundary objects. Boundary objects are ill-defined, a characteristic that allows different social worlds (or segments therein) to tailor them for their own purposes and according to their own commitments (cf. Clarke & Star 2007 & Clarke 2005).

The notion of boundary objects is an important theoretical development of STS which I adapt throughout the dissertation to my own interests and field experience. This concept was first put forward by Star and Griesemer (1989) in their seminal historic-sociological study on the origins of Berkeley´s Museum of Vertebrate Zoology. This foundational study recovered the ways in which professional and amateur ecologists, animal trappers and administrators were able to construct a

new field without consensus. Boundary objects explain how it was possible for trappers interested in exchanging money for fur, ecologists trying to develop reliable standards, and administrators keeping the accountability of the nascent institute could collaborate in the building of a credible research institution at the turn of the 20th century without the need for consensus or shared epistemic backgrounds or expertise (in fact their diverse expertise was exactly what was needed for succeeding).

Star and Griesemer (1989) developed an initial typology of boundary objects based on the ideas of STS scholars (Callon, Latour and Law) who had defined the process of translation as one in which, once an obligatory point of passage has been defined, it needs to be defended against other translations threatening to displace it (Star and Griesemer 1989: 391)[20]. The authors introduce the concept of boundary objects in order to explain a process of multiple translations in which no social world or actor is able to set the point of passage and defend it, except at the cost of losing his allies. When dealing with hybridity or Mestizaje (Miller 2004), and its constitutive ambivalence, the idea of a civic epistemology that can be roughly equated with a national civic reason might be a problematic notion. Since I did my literature review after fieldwork I am not shy to say that in Mexico the ways to sanction legitimate and illegitimate knowledge claims present relations of strife and cooperation, without collapsing into one coherent epistemic landscape. Therefore a closer look at contact frames, situational analysis and boundary objects could provide a theoretical/methodological framework to approach scenarios in which civic epistemologies are not univocal, are in open competition or simply do not look like: "the ways in which democratic societies exercise informed judgement "(Jasanoff 2003: 232).

1.2 Postcolonial biopolitics: explorations between thanatopolitics and biological citizenship

> *"one might say that the ancient right to take life or let live was replaced by a power to foster life or disallow it to the point of death" (Foucault 2007[1977-8] Chap 4)*

Foucault´s lectures at the College de France (2003[1975-76]; 2007[1977-78]; 2008[1978-79]) are the starting point of the wide academic interest in biopolitics and what he identifies as biopower: "...mechanisms by which the fundamental biological characteristics of human species are able to become part of a political strategy, a general strategy of power after the XVIII century (Foucault

[20] They talked about 4 basic categories of boundary objects: ideal type, repositories, coincident boundaries and standardised forms. For the dissertation the most important one is the ideal type which is discussed in chapter 4; which helps me in analysing how the notion of genomic sovereignty became crucial for INMEGEN´s creation and the coordination of diverse and sometimes contradictory ontologies.

2007[1977-1978]: 21; also see Rose 2008; Thacker 2005; Franklin 2000; Raman and Tutton 2009). In a very rough distinction biopower could be divided into three elements: the first one, *anatomopolitics*, is a power directed to the individual body based on discipline and individual surveillance. The second element is that of govermentality, based on security mechanisms, which are targeted to the polyvalent and multiple bodies of the population, looking to maximise the populations desired characteristics and reduce its risk and negative characteristics to the minimum; the correlation between the technique of security and population as an object and subject of these mechanisms of security. We should also add the rise not only of the notion, but of the reality of population" (Foucault 2007 [1977-78]: 27)

The third element, sovereignty, to which both anatomopolitics and govermentality were opposed, is based on the power to "make die and let live". Sovereignty according to Foucault was tied with philosophical and juridical notions born from a medieval cosmological or juridical order that ruled the relations between the prince and its kingdom. Foucault (2007; 2003; 2008) continually asserts that the three power apparatuses of sovereignty, anatomopolitics (discipline) and govermentality (security) continually exchange and adapt to each other, and that they are not confined to the historical moments in which they were born. However it seems there is an important discontinuity between sovereignty and the emergence of biopower that gave rise to anatomopolitics and govermentality. The concept of population and its search for vitality based on probabilistic calculations is opposed to a fixed or semi-fixed cosmological order protected by the right of the sovereign to kill and govern its territory according to philosophical and juridical maxims (Foucault 2003). Foucault argues that the only moment in which the murderous facets of sovereignty and govermentality work together is when racism and purity look to clean the social body and the State deploys its murderous capacities to achieve it, not surprisingly Foucault uses the Nazis to illustrate his point (cf. Foucault 2007).

Curtis (2002) historically questions the idea that population was simply a product of govermentality, since counting practices can be traced to the notion of populousness and inventory statistics in various 16th century European towns (as a matter of fact the Census started in the colonies in the 16th century, cf. Hacking 1990); therefore there is a need to explain how "governmental populations" are born from sovereign regimes. Using historical studies about statistics in France, Curtis (2002) further argues that the equivalence between individuals —which gave rise to population thought and practice— are in itself an achievement brought by sovereign political authorities:

> ...at the core of Foucault´s argument is that there was an 18th century discovery of population [...] Population cannot be "discovered" by political authorities, for its

> existence as a political abstraction depends upon the work of a particular kind of sovereign political authority itself. Population depends upon the establishment of equivalences among subjects within a particular territory (ibid: 524).

Curtis' idea supports that it was the destruction of status differences (knights fight, priest pray etc.) of the *ancien régime* which made possible the emergence of the atomistic dream and then the practice of "populations." The re-reading of Foucault´s claims on the relations between sovereignty, populations and govermentality pushes us to reconsider the relation between the old sovereign power and the modern form of biopower, in which the new governmentality could intervene. Another blank point in the development of ideas on biopower has been its postcolonial dimensions (cf. Shani 2010; Stoler 1995). I think the emerging STS literature engaging with biopolitics is moving towards a contemporary critique of how contemporary political and cultural dynamics are configuring the construction of populations, but still centred in the west. Regarding the relation between sovereignty and biopolitics, two bodies of literature —thanatopolitics and biological citizenship— can be clearly identified; however both are again centred in Europe and the US.

The literature on thanatopolitics has developed Foucault´s ideas about sovereignty and the murderous strategies deployed by the nation-state to protect its population, in order to explain the way in which power and new technologies to manage life operate (cf. Agamben 1998; Bauman 1989; Veen 2003; Esposito 2003). Giorgio Agamben is the most known author of this body of literature (2000, 1998); those who follow this particular interpretation of sovereignty in modern regimes think that modern politics is founded on the state of exception in which law is suspended in favour of the unlimited use of force. The unlimited use of force by the State can discipline or even vanquish the other. In such sovereign spaces everything is possible: no violence or harm is criminal because those that lie in the realm of zoè or bare life (*Homo Sacer*) have lost their claim to a political form of life *(bios)*.

Thanatopolitics has had a profound influence in the way in which modern global governance is thought of in relation to capitalist expansion of the market of weapons, global warfare (Veen 2003) and the war on terror (Butler 2009). However its relevance to new genomics and biomedicine is very dubious, since many of its claims about new techno-scientific advances used to dominate whole populations lack empirical support and are rather fixated with the Nazi regime (cf. Agamben 2000; Veen 2003; Duarte 2004; Singer & Weir 2008, see Barbour 2010 for a critical approach to bare life and sovereignty). In response to ideas of bare life and thanatopolitics, Nikolas Rose (2008) and other prominent Foucauldian scholars such as Paul Rabinow present a different view of contemporary biopolitics in "advanced liberal polities" in which the individual's

autonomy and responsible citizenship rule; rather than the politics of death or eugenic cleansing orchestrated by the State. The terms "ethopolitics" and "biological citizenship" designate this wider shift in contemporary biomedicine defined by the responsibilities of individuals to behave in certain ways towards themselves as living beings —in order to improve their vitality— and their biological and ethical future (Rose 2008: 23-27)[21].

The old sovereign power of "making die and letting live," which according to thanatopolitics still rule in contemporary biopolitics, in Rose´s view hardly captures the social and political features of the postgenomic era. I agree with Nikolas Rose (2008) that we should start looking at contemporary experiences and the emergence of bioeconomies (OECD 2006) of hope and vitality fuelling the new biomedicine. However Raman & Tutton (2010) observe that in the sociological and historical study of the life sciences the presence of biopolitics seems to be ubiquitous. Specifically in contemporary Foucauldian-inspired literature, the notion of biological citizenship and ethopolitics is dominant.

The molecularisation of the "politics of life" in modern liberal *polities* has left a deep mark in almost all contemporary literature relating to genomics (cf. Abu El-Haj 2007). Biological citizenship has left a mark ranging from sociological/ historical studies of molecular anthropology (Sommers 2010; Lipphardt 2009), the genetic mapping of ethnoracial groups (Bliss 2009; Hinterberger 2010) and research on the molecular basis of psychiatry and medicine (Rose 2008, Rose & Novas 2004; Gibbons et.al 2010; Koenig et.al 2008; Vrecko 2010). Therefore I centre my attention on biological citizenship and ethopolitics, since it has had more impact on empirical research on biopolitics. Then I continue to present some of the limits of biological citizenship according to existing literature (Raman & Tutton 2010, Plows & Baddington 2009; Braun 2007). I then explore those limitations when applied to postcolonial cultural scenarios different from advanced liberal *polities*; on which both Rose (2008) and Foucault (2007) centred their attention.

1.2.1- Critiques of Biological citizenship

The literature on the novel molecularisation of biopolitics is marked by individual choice and

[21] We don't have to scratch the deep seated beliefs of a growing apparatus of bioethicists, policy makers and biomedical scientists —of all sorts— to catch that human rights discourse and the respect for human life have become a standardised rhetorical and political package. Auschwitz indeed left a deep historical scar on the ethical approach to medicine, science and public health discourse, which is now completely mediated by the Human Rights discourse. In contemporary biotechnological regimes the observance and adaptation of the "value and dignity of life" to medical and scientific practice aspires to universality (UNESCO 1997; WHO 2002).

active participation in a biomarket (i.e. of drugs, genetic tests) opening new ways to improve individual health and the self (cf. Rose 2008, Rose & Novas 2005 & Rose & Rabinow 2006). Even when contemporary biopolitics is permeated by cost/benefit tropes it does not necessarily rest on individualistic and liberal values embodied by new type of citizenship (see: Braun 2007; Plows & Baddington 2006; Raman and Tutton 2010)[22]. Raman and Tutton (2010) criticise the tendency of Rose and Rabinow to consider the "molecularisation" of life and the biopolitics from below as a question of self-fashioning by active citizens. For the aforementioned authors the tendency of Rose and Rabinow (2006) to circumscribe the *bios* in biopolitical to only the biological sciences (Raman & Tutton 2010:728-730) narrows our focus; leaving aside many facets of contemporary biopolitics that still work on the basis of population control and exclusion at the level of the State.

As an example, Braun (2007) presents a biopolitical scenario in which the old sovereign powers, with their obsession with invigilating frontiers and trying to exercise control over territories and kingdoms, are not so anachronistic after all. Modern day swine flu crisis (AH1/N1) or microbes, and the birds hosting them travelling across the globe, mixes geopolitical concerns of control with an unpredictable and chaotic biological threat. The political configuration of these elements could in principle, invoke a State of exception (different from Agamben´s notion of sovereignty) to face chaos. The creation of National Biobanks fuelled with a national rhetoric sponsored by the State also provides a counter example of ethopolitics in EU and other liberal polities.

Access to genetics and active participation through market regulation seems to be more of an empty promise amongst disability patient groups in the developed world; transformed into civic questions of fair access, anti-global movements and social justice as alternatives forms of citizenship (Plows & Baddington 2006). In the face of empirical studies that point to various inconsistencies in the theoretical approach to "biological citizenship" and "ethopolitics" Raman and Tutton (2010) favour a multiple and more nuanced reading of biopolitics rather than a "molecularised" epochal change:

> ...how the biological existence of different human beings is brought into the political domain through a variety of complementary and competing discourses. These might include the discourses of disease, of medical therapies, of public health, of the environment and pollution, of migration and border controls, or of the choices at the beginning and end of life The advantage of this approach is that it might help to register that there is not a singular ''politics of life'' but a multiple politics with inequalities, opportunities, complexities, and dilemmas both individually and collectively, which require a more nuanced exploration (ibid: 729-730)"

[22] Raman and Tutton (2010) summarise the critiques of Braun 2007; Plows & Baddington (2006) and present counter examples to biological citizenship and ethopolitics with cases from STS research.

Indeed one of the aspects of these multiple biopolitics that has remained overlooked is its colonial and postcolonial dimensions (Inda 2005:12). As Ann Laura Stoler (1995) has shown, the centre and the periphery were co-constituted, and some of the biopolitical interventions of Europe were first devised in the colonies and then brought to their metropolis (ibid. 220). As an example, the first census was made in the 16th century in Peru, a technology that would be of principal importance for the modern European biopolitical projects (Hacking 1990). My own exploration of the Mexican case study is a contribution to the literature on biopolitics that looks to flesh out the relation between political projects, competing discourses and socio-scientific constructions of populations in postcolonial scenarios, complementing what until recently has been a rather narrow focus on advanced liberal polities.

1.2.2- Sovereignty, race and (postcolonial) biopolitics.

> *Racism is bound up with the workings of a State that is obliged to use race, the elimination of races and the purification of race, to exercise its sovereign power. The juxtaposition of – or the way biopower functions through – the old sovereign power of life and death implies the workings, the introduction and activation, of racism (Foucault 2003[1975-76]: 258).*

As I presented earlier, the Mexican nation-state and its nationalist narratives are founded on racial non-purity or miscegenation. Rather than the deployment of an imperial sovereignty or murderous biopower in search of domination and biosocial purity (Agamben 2000; 1989; Bauman 1989; Esposito 2003), the sovereign power that Mexico invokes stands in a position of relative weakness and a constant self-perception of national backwardness (cf. Lomnitz 2010, 2002,2003). Mexico's national self-obsession works on the idea that the nation-state needs to catch up with the great Nations of the world, rather than on the protection of a pure national biological stock[23]. Ideas of sovereignty and national identity are built in the idioms of the subaltern and "other" (La Malinche, Americans, global capitalist interests) that are not only related to external threats, but are also constitutive of Mexico´s innermost identity (cf. Morris 1999; Lomnitz 2010). Therefore talking about the coupling of murderous sovereignty, govermentality and the search for racial purity simply makes no sense.

The role that governments of developing countries (Ruha Benjamin 2009; Schwartz-Marin 2011; Hardy et. al. 2008 a, b, c), rather than individuals, have in managing "life itself" (Rose 2008) is a very important difference between biological citizenship and postcolonial biopolitics. Accounts of biological citizenship just partially (and very partially) explain what I depict throughout this

[23] Historically the Mexican Nation state has not claimed to be racially superior over other human groups or nations (cf. Lomnitz 2010), however it has produced its own types of racist thought and difference.

dissertation, and which I and others (Benjamin 2009) have identified as a postcolonial biopolitics. The postcolonial can refer to a time (after the colonial), a place (where the colonial was), or a critique of the hegemonic legacy of the colonial expansion of Europe (cf. Anderson 2002). When it comes down to the field of Science and Technology Studies (STS) the postcolonial means an inquiry into points of contact, in which the global and/or local nature of techno-science is negotiated (ibid: 644-647). Warwick Anderson (2002; 2007) hopes that the new postcolonial emphasis on STS "would not simply provide us with instances of Western science and technology in different settings – potentially it might even 'colonialize' and destabilize conventional accounts of Western technoscience at 'home' (2002:646)".

Amongst this postcolonial emphasis applied to biopolitics the work of Ann Laura Stoler (1995, also see Scott 2005; Redfield 2005) is an obliged reference. In her work she questions the scope of biopolitics' theoretical applicability to scenarios outside of the West, since Foucault (2003, 2007; 2008) systematically avoided engagement with the construction of biopolitics outside of Europe. This omission of postcolonial research obliges us to ask what does a postcolonial approach to governance (in this case genomics) looks like? And what would be a postcolonial biopolitical regime? My answer is that the postcolonial emphasis of Mexican genomics lies in the decisive role that the nation-state plays in avoiding the future dispossession of the genetic information of their own national populations. Yet different from literature that assumes that imperial sovereignty oppresses those in the developing world (cf. Veen 2003; Duarte 2004; Agamben 2000), I explore the agency of this space of "otherness".

My approach to sovereignty is one in which those that are generally portrayed as passive subjects of oppression also generate their own strategies to exploit the new techno-scientific and economic opportunities brought by genomics science. I apply Curtis' (2002) findings about the co-constitution of sovereignty and govermentality to think through the contemporary claim of Mexican elites about the existence of a unique genetic structure of a Mexican population. Therefore I treat the notion of genomic sovereignty much the same way as ethnomethodology would treat the accomplishment of a hermaphrodite in keeping, administrating and acting through a unified gender identity day after day amidst institutions and practices that constantly confront such an identity (Garfinkel 1967:116-185). Foucault had something like this in mind when he stated in the lectures entitled *The Birth of Biopolitics* (2008[1978-9]:19) that his aim was not to show governmentality as an object that had been waiting in the backstage to be discovered, or error and illusion to be dispelled in the light of reason, but a series of practices and truth claims that brought forward a new entity into being.

1.2.2.1- Literature on genomic sovereignty

The first literature to be published on Mexico, genomic sovereignty and developing countries framed the generation of public health genomic initiatives in the developing world as an international policy enterprise that will bring a fair global distribution of health benefits (cf. Nature Supplement Vol.35-2008: S5-S9: Hardy et. al. 2008 a, b, c; Seguin 2009). The idea was that developing countries needed to protect their own human biogenetic wealth by creating institutes devoted to studying the relations between genetics and disease[24]. By mixing genetic, patrimonial, institutional and medical arguments the incipient literature on genomic sovereignty (Hardy et.al 2008 a, b, c) was able to frame an emerging scientific policy agenda[25]. I think such literature is deeply naive because it takes for granted the existence of a unique Mexican genetic heritage that can be legally protected and will somehow help to reduce global health inequalities, without really questioning how such an extraordinary deed is possible (cf. Seguin et. al. 2008 a, b, c, Seguin 2009; Singer & Daar 2001).

As Ruha Benjamin (2009) summarises, the notion of Genomic Sovereignty can be read as a counter-trend to "the Global Genome (Thacker 2005)", in which the assertion of national borders and political sovereignty is overly emphasized rather than diluted. Few of us would argue against Nikolas Rose's (2008) assertion that the idea of a single society or nation behind the State has fallen into disrepute: "the idea of national culture has given way to that of "cultures", national identity to a complex array of identity politics, "community" to communities (62-64)". Nonetheless precisely in the turf dominated by a molecularised "style of thought" (medical genomics) the assertion on the existence of a "Mexican Genome" has opened a space of possibilities in which "Nation (singular)" and "molecularisation (plural and multiple)" coexist and shape each other (cf. Schwartz-Marin 2011, Lopez-Beltran 2011).

Mexican biomedical elites and governmental authorities claim to defend State sovereignty through the protection-generation of genetic knowledge pertaining to a national admixed race (cf. Jimenez-Sanchez 2002; NRC US 2005; Schwartz-Marin 2011). The fragmented, subaltern and disputed notion of sovereignty in Mexico (Lomnitz 2002) makes it hard for us to read it as an

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[24] The seminal idea brought forward in the Mexican congress to create the INMEGEN (IFS 2001), that genetic patrimony has to be legally protected and scientifically investigated in order to create local benefits instead of deeper socioeconomic and health differences between the developing and the develop world has then been reproduced extensively, in academic and political circles (Seguin 2008; Daar int. 2009; Jimenez-Sanchez 2001, 2002, 2004), but it seems that it is also an emerging global science policy trend.

[25] In a talk with Ricardo Ventura Santos as part of the workshop on race, admixture and genomics in Latin America: A comparative perspective (7-8 July 2011, Manchester) he informed me that a very similar patrimonial regime exists in Brazil: laws and anxieties are shared but the political name/frame is different.

expression of an imperial will, and also provokes us to think in which ways certain sovereign configurations are constructing the boundaries and contents of genomic populations in which new medicines, ethics and bioeconomies are being mobilised. The postcolonial biopolitics of Mexico are marked by the disjuncture between law and practice. A phenomenon that has been a creative force for the production of unrecognised spaces of negotiation, as it is oppressive for a formal (bourgeoisie) public sphere (Lomnitz 2002, 2003)[26].

It is in these disjointed terrains that the notion of genomic sovereignty has "flourished" into a law aimed at protecting a national genetic patrimony. Mexico is still a country full of events that circumvent the written order of law: whether as a peripheral cosmopolitanism when dealing with an "acute conscience of wanting to catch up, to reach "the level" of the great world powers (Lomnitz 2002:81)" or the phenomenon of an "auto-violated sovereignty (Meyer 2009)" when dealing with the disjuncture between official speech and practice; a country "in which nothing happens" when dealing with the enormous impunity of the "justice" system.[27]

When it comes down to inequalities the policy scenario is much more complicated than simply bringing an emancipatory genetic science to deal with local health priorities. The lack of transparent governance in Mexico makes the scenario of creating a science for "Mexicans by Mexicans (Jimenez Sanchez 2009)" something even more problematic. The attention centred in the Mexican nation-state by biomedical elites obscures the contradictions of a multinational country, with huge economic and medical asymmetries, which have their own history of dispossession and hegemony (cf. Delgado 2002; Schwartz-Marin 2011).

1.3- Race, reification and population genomics

> *The medical promises for genetic race talk are overblown; the genetic refashioning of race is in large measure a rhetorical move, designed to justify a research enterprise that is fascinating in its own right, but which, were it not for the claims of health relevance, might not receive the massive levels of funding currently available(Fausto Sterling 2005: 30).*

Probably one of the most problematic and problematised notions after WWII was that of Race

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[26] Mexico is a political regime that has been on the brink of crisis for a long time. This condition has become more evident after the democratic transition (2000), in which the gaps between public practice and public speech became an inhospitable and unfathomable reality; neither corruption as an economic distributive mechanism or as a ritual prelinguistic communion have been able to bridge (Lomnitz 2002: 102-110).

[27] According to recent independent researchers at UC-Berkeley, who produced and directed a documentary on Mexican juridical system, more than 98% of crimes go unpunished, accompanied by the news that in the 2% left the quality of forensic research and juridical practice is appalling (cf. presunto culpable[presumably guilty] available at: www.presuntoculpable.org)

(UNESCO1950; Gannet 2003; Reardon 2005; Griesemer & Gannet 2004; M´charek 2005; Fullwiley 2008; Müller-Wille 2010; Fausto-Sterling 2005; 2008). Regardless of all the effort put towards its reconversion, sterilisation or disappearance, the ghosts of racial biology and its consequences still linger today. Projects such as the Human Genome Project (HGP) or the Human Genome Diversity Project (HGDP) had been informed by race. In the case of the HGP, race has been portrayed as an unfounded category, while the HDGP wished to uncover and conserve the genetic structure of disappearing indigenous groups around the world (for a history of this project and the political entanglement that such declarations produced see: Reardon 2001, 2005); either way race occupies centre stage[28]. The findings of population geneticists show that genetic diversity within groups is greater than the difference between groups (Lewontin, 2006, Lewontin, 1972, Duster, 2005), and therefore the reading of a humanity that can be divided into clear cut biological groups is unfounded. Lewontin and other population geneticists' can be succinctly summarized as follow:

> (1)There is an immense variation between individuals (3,000 million distinct DNA variants), (2) by far the largest amount of variation is found among individuals (85%), and that there are no sharp boundaries between, but continuous variation over the whole world). (3) Micro-satellites tells us what we already knew about "classical" race, (having the added advantage of allowing us to make good estimates of the amount of intermixture that has occurred between populations, as a result of migrations and conquests), and (4) that these differences are in the process of breaking down, thanks to intermixing and constant human movements (Lewontin, 2007).

On the other hand, scientists such as A. Leroi and Edwards (2003) read that under the skin there are good reasons to think about races, and predispositions linked to those genomic and phenotypic demarcations. These authors refer to Lewontin´s claims as a statistical fallacy; based on their own calculations and including various loci along the genome, populations around the world can be divided into the classical five continental races, with a very low estimation of error. Nonetheless one of the intrinsic problems of research in this area is that with the 3 million SNP´s —or one nucleotide base variation— between any human being in the earth groupings would emerge by making any random comparison. To assume that these groupings can be treated in a narrow sense as populations, puts even more stress in the already ambiguous definition of race as a proxy and its validity as a geographically isolated, and semi-homogeneous biological group: "allelic frequencies vary between any selected human groups- to assume that those variations

[28] The body of literature regarding the use of race in genomic research is vast and continuously growing for a general overview of the field see: Abu el Haj 2007. After the Human Genome Project (HGP) there has been an explosion of genetic studies that search to link common complex diseases with certain chunks of DNA. The sophisticated machinery and statistics used to generate these molecular populations coincide with long standing racial classifications, has been the topic of heated debate in various fronts.

reflect racial categories is unwarranted" (Duster, 2005).

In the face of such statistical and taxonomical problems the use of haplotypes, non-random DNA blocks that are inherited from generation to generation delimited by hot spots of recombination,[29] was seen as way to navigate though that sea of genetic difference: ...it rapidly became clear that haplotypes, groupings of genes[30] containing variant SNP´s (Single Nucleotide Polymorphisms), could be used to sort through the forest and find a few trees..."

Figure 1-A - All Human genetic variation vs. genetic variation between and within populations

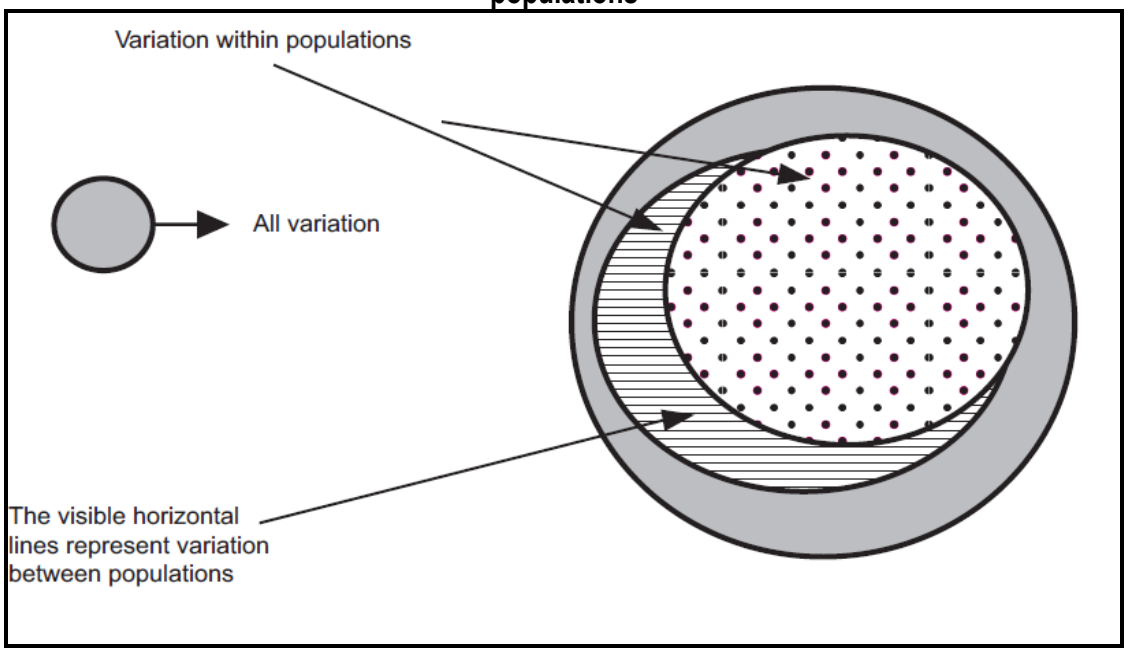

Diagram taken from Fausto-Sterling 2005:8

The International HapMap consortium (cf. Gabriel et.al. 2002) compared the samples of 275 individuals in the search for haplotypic differences and divided the people into four population groups—90 from "Nigeria (Yoruba)," 93 from "12 multigenerational pedigrees of European

[29] Because individual SNP´s can be found within the same haplotype, and because within a particular stretch of chromosome only a few haplotypes account for most of the variation among people in a particular population, scientists can assess human variation by selecting SNP´s that vary within known haplotypes. This means that instead of mapping ten to thirty million SNP´s, they can look at most of human genetic variation by selectively examining 200,000 to a million well-chosen SNP´s across the genome (The International HapMap Consortium in Fausto-Sterling 2005: 9).

[30] During my fieldwork I found that haplotypes do not necessarily need to be a group of genes, they can also be mathematically inferred from non-decoding regions of the genome (most of the time they are not related to specific genes). Of course they are more interesting when they are part of a gene; especially if it's believed to be involved in a specific disease see Chapter 7: PNPLA3 Gene.

ancestry, 42 unrelated individuals of Japanese and Chinese origin, and 50 unrelated African Americans" (Gabriel et. al. 2226). One of the highly publicised technical advantages of Haplotypes (also known as haplotype blocks), which make them central in the search of medically relevant genetic variation, is that they have a limited number of alleles, or versions of the haplotype block made from different combinations of SNP´s, making medical genomics cheaper. Another interesting characteristic is that its boundaries remain relatively stable and differentiated across the populations produced by the International HapMap project (cf. Gabriel et.al 2002; Price et.al 2007; Silva-Zolezzi et.al 2009).[31]In both the international HapMap and the Mexican Genome Diversity Project (MGDP), groups chosen to represent each region are based on convenience and accessibility. For example the term Yoruba does not represent a group with an undisputed history, and will amount to tens of millions of people, while the Japanese & Chinese samples are to represent nations and more than 1.4 billion people in the world (Dundee in Fausto-Sterling 2005). The philosophical literature that engages with the MGDP´s use of conventional categories which are assumed to correspond to natural kinds in Mexico identifies a similar set of concerns (cf. Pascacio- Montijo 2011 & Arroyo-Santos 2011; Winther 2011). Simply making the Mestizo a natural kind is giving concreteness to an ideal entity that was useful as national identity, but seems to be less useful to distinguish and search for the genetic origins of disease.

Sampling and inclusion in research is one of the core controversies of racialisation and population genomics; there is still debate on the assumptions and methods used in order to delimit the samples and construct categories. Should the grid to study human diversity emerge from a random sample or should human groups that are considered semi-isolated, atypical or native groups be sampled and regarded as parameters (Reardon, 2005; Gannet 2003). According to HGP promoters; Craig Venter, Francis Collins, and Dr. Gerardo Jimenez Sanchez in Mexico: "race is an unfounded category"; however the search for genetic differences across continental groups or populations began as soon, and even before (Reardon 2005), the HGP was finished. To understand genomic medicine, and molecular anthropology (Nadia Abu El-Haj 2004, 2007; Fausto-Sterling 2005; 2008; Sommers 2008) we need to engage with this ambivalence, this contradiction lying at the very heart of the new genomic science: "a science in which researchers simultaneously posit race as real but not real (Bliss 2011)".

The ideas of Troy Duster (2005) and Richard Lewontin (2006), and the controversies produced

[31]The paper of Gabriel et.al (2002) was a central piece of the International HapMap project. The idea was that by studying haplotypes rather than single mutations the search for the genetic causes of disease would be faster, cheaper and tailored to the specific genetic populations across the globe.

within the discipline of population genomics are representative of a longstanding dispute over the existence of race as a natural kind. Amongst those who sustain that human diversity can be objectively divided in 5 groups that largely coincide with racial categorisations (Lewontin vs. Edwards; Risch et.al 2003; Burchard 2005)[32] and those who deny the validity of mapping race and genomics, we can start to grasp the basic dilemmas of population genomics. As Jenny Reardon (2008) has pointed out, it seems that paradoxically, by promising to surpass divisive categories such as race, molecular biologists proceed to use the "very categories of race they seek to dismantle (Reardon 2008: 305)[33]. The topic that touches on the various ways in which race is reified; translated into drug marketing strategies (BiDil drug, cf. Kahn 2008), national and tribal narratives, (Sommers 2010; Parfitt & Egorova 2006; Abu-El Haj 2004, 2007; Schwartz-Marin & Silva-Zolezzi 2010) and in the search for the origins of disease, has been a constant topic in the literature on genomics, race and medicine (cf. Koning et.al 2008).

1.3.1-Race and genomics: coproduction, re-articulation or multiple enactments

Amongst the growing literature in the area of race and genomics, three main approaches can be distinguished. The first one is the coproduction framework (cf. Jasanoff 2003, 2005), which has its most known proponent in the field of race and genomics in Jenny Reardon and her study of the HGDP (2005); her argument is basically that both social and natural knowledge and institutions come into being together. So, in the HGDP when the idea of sampling isolated indigenous populations was endorsed as the most viable way to study human variation, new social arrangements such as community informed consent had to be devised in order to address the political traditions of many indigenous communities.

Her argument continues to develop the idea that the lack of awareness of HGDP organisers about these coproduction issues made them think that sampling was simply a technical question "in order to keep a record of vanishing populations in the world", while for indigenous communities sampling and donating biological material undergird historical struggles for sovereignty. The failure of the HGDP to recognise these issues finally generated an intense opposition from indigenous communities and NGO's (mainly the ETC, called RAFI in those days), who thought

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[32] Also see the debates of philosophers of biology on the conceptual underpinnings of the use of race (cf. So Jin-Lee et.al. 2008; Lewontin 2007)

[33] Francis Collins Recognises that Gerardo Jimenez is using racial categories , but trusts he is aware of the perils of such decisions (Guerrero-Mothelet & Se... 2006); Francis Collins has been recently been more ambivalent about the total rejection of race as a category in genomic research.

they should not be viewed as extinguishing museum pieces, but as living communities facing medical and economic challenges. Finally the 1.2 billion dollar project was dropped in the face of growing political opposition and discontent.

In the turf or re-articulation between race and genomics, Fullwiley's ethnography(2008) of admixture mapping in Esteban Gonzalez-Burchard's Laboratory —a famous geneticist who defends that race is a biological reality and needs to be addressed as such (Gonzalez-Burchard 2005)— presents us with a circular relation between race and genomics. In re-articulation, pre-existing racial categories serve as first principles to construct genomic difference, which then serve as proofs to support the existence of race as a biological reality. The belief amongst scientists in this laboratory about the existence of three well defined racial groups (Native Americans, Europeans, and Africans), are fundamental to support the idea that the differential contribution of genomic race can explain disease risk in admixed populations of Mexican and Puerto Rican origin. Duana Fullwiley (2008) argues that the relation between race and biogenetic identities runs contrary to the notion of coproduction "understood as the simultaneous coming into being of societal arrangements and scientific ideas and practices (Reardon in Fullwiley 2008: 698)". The work of Pascacio-Montijo (2011) and Arroyo-Santos (2011) on Mexican genomics supports the idea that there is a tautological relation between genetic information that substantiates the genomic mestizo, and census, anthropology, history and geography that have construed the Mestizo in their own disciplines.

The third approach, the one that emphasises the multiple enactments between race and genomics, has as one of its main proponents Amade M'charek (2005:73), who argues that genetic markers are not entirely local or global in nature but occupy a middle ground between the two, and are tied to the standards and flexibility permitted by certain socio-technical settings in the laboratory. She also argues that race "gives the illusion of a thing" while in practice it is something enacted every time partially anew (M´charek 2011). This means that the contents that compose the notion change according to the social worlds in which they are deployed.

Amade M'charek (2000) works on forensic DNA, showing the transformation of populations in its trips between the laboratory and the courtroom, as an example of the malleable and probabilistic qualities of biogenetic identities (I highly recommend this paper to anyone interested in the malleable qualities of population genomics). These characteristics allow different identities to coexist, depending on which parcel —as well as how many markers— of the genome you are studying. The work of Fujimora and Rajagopalan (2010, also see: Fujimora et.al 2008) also elaborates on the ambivalent relation of race and genomic research and the socio-material practices, and non-human agents (Structure, Eigenstrat, AIMS), that are enrolled in population

genomics laboratories.

I think that what I have depicted as the multiple enactments approach (M´charek 2005, 200; Fujimura & Rajagopalan 2011, Fujimura et.al 2008) elaborates on the changing meanings and practices of scientists and producers of genomic science, revealing that the relation between race and genomics is much more complicated than the coproduction or re-articulation frameworks. I locate my own work on the construction of the MGDP and its relation with national identity in Mexico (Schwartz-Marin & Silva-Zolezzi 2010) as a mix between co-production and re-articulation. Since in this PhD dissertation I pay attention to the ways in which genomics is enrolled differently in the laboratory setting, in public rhetoric and even amongst policymakers/scientists, I think my ethnographic exploration is an expansion on the literature that thinks about race and genomics as multiple enactments.

1.4-Conclusions and summary

> *"Biopower might have been a uniquely bourgeois form of modern power, but it was also an inherently imperial one (Stoler 1995:207)"*

I hope that by briefly reviewing what I consider to be the most pertinent academic work on the field of biopolitics, *Mestizaje*-nationalism and population genomics related to Mexican genomics (Lopez-Beltran 2011) and genomic sovereignty (Benjamin 2009; Schwartz-Marin 2011; Hardy et.al 2008 a, b, c), it has become clear that a perspective from developing nations will contribute to the existing literature in these three fields.

Already the literature on Mestizaje and Latin America shows that ideas of admixture — Mestizaje— have been calibrated throughout history to face European ideas and programmes of racial purification. The cult of non-purity or Mestizofilia, understood as the idea that the phenomena of Mestizaje is a desirable event (Basave Benitez 1992:13)," has not been adamant about eugenic or racist thought, but its adaptation of eugenic ideas and practices followed a dissimilar path to that of anti-miscegenation policies, and strict migratory rules in Europe or the USA (Stepan 1991; Stern 2002; Saade 2004, 2011; Wade 2011; Lomnitz 2002, 2010). Afterwards I presented what could be considered to be affinities between the postcolonial approaches to national identity construction (Lomnitz 2002) and STS literature on boundary objects and social worlds (Clarke & Star 2007 also see: Anderson 2002, 2007). This pointed to specific negotiations around knowledge claims rather than to coherent civic epistemologies that could be equated to "the tacit ways in which democratic societies steer science and politics." My simultaneous ethnographic engagement with the ELSI and the PGL (cf. Chap 2) offers a window to theoretical frameworks such as coproduction and boundary objects applied to a non-western case study.

The field of biopower is of primary interest to interrogate biological interventions directed to govern a population (see: Foucault 2007[1977-78], 2003[1975-76]), as well as the knowledge practices on which populations are modelled and constituted in the first place. The work of Curtis (2002) has already problematised the relationship between Foucault's account of the emergence of populations as the trumpet of biopower and governmentality. If as Foucault (2007 [1977-78]) stated, the birth of governmentality is linked to the emergence of population thought and a series of mechanisms to increase its vitality around the 18th century, then it is of primary importance to examine the assumptions and conditions that give birth to a "population" in contemporary settings, especially in our context of population genomics.

However one of the omissions of the existing literature on biopolitics and population genomics and its relation with race (cf. Fulwilley 2008; Reardon2005; Fujimura & Ragagopolan 2011, amongst many others) and its relation to the postcolonial world (cf. Shani 2010, Inda 2005; Scott 2005; Stoler 1995). At the moment new literature on Latin America, race and genomics is filling this gap (Wade 2011; Lopez-Beltran 2011; Gibbons, Ventura-Santos and Sans 2011). However the relation between sovereignty, race and genomics is something that is still in need of further exploration.

While the literature on imperial/murderous sovereignty uses Nazism as its paradigmatic example, in the literature of biological citizenship attention is centred on the autonomous individual; yet both forget almost completely about developing countries (cf. Rose 2008; Agamben 2000, 1998— Gibbons et.al 2010 is an exception). Although I agree with Nikolas Rose that the field of biomedicine and genomics does not follow a biopolitics of State racism in which the sovereign power of death is reactivated in order to eliminate those that threaten the populations' quality (Rose 2008: 167), I think the literature on biological citizenship lacks the tools to engage with non-western biopolitics. Already, works that recover STS to interrogate notions of biological citizenship are starting to develop a critique towards the idea of an individualised and autonomous biological citizenship (Raman & Tutton 2010; Plows & Baddington 2008; Braun 2007).

The shift of emphasis from Western to postcolonial articulations of biopower will inform academic work dealing with sovereignty either as a problem of democratic theory (Singer & Weir 2008), population construction (Curtis 2002), or violence and knowledge (Stone & King 2008). I hope that by exploring in detail the Mexican case study we could bring forth a different biopolitical regime that is emerging amongst rising powers in the developing world and obeys different logics than those of biological citizenship or thanatopolitics.

2- *Theory/Methods Package: Doing Participant Observation and Situational Analysis in the Mexican Human Genomics Arena*

This chapter presents the methods I used to analyse and conduct fieldwork in the emerging arena of Mexican human-medical genomics. I depict how I developed my methods through an extended ethnographic engagement with the Mexican Human Genomics Arena. My voice is very present in this chapter in order to make clear my positionality in the research process. After briefly delineating the processes I used to gather information, do interviews and archive research, as well as conduct participant observation, I comment on my take on Situational Analysis (Clarke 2005).During the two years of fieldwork in Mexico City I mostly mixed documentary-archive research, in depth semi-structured interviews, focus groups/peer groups and participant observation. All of these activities together —which constitute a family of methods— (cf. Wills & Trondman 2002) are what I consider to be my ethnographic engagement with the field.

As part of this ethnography I did dozens of informal interviews, which because of the volatile political atmosphere and the vulnerability of some of my informants I did not record. Nevertheless I tape recorded more than 27 in depth interviews with visible policy actors, scientists and legal experts who were, or had been, actively engaged in the escalation of genomic medicine to the national arena. I also interviewed anonymous critics of Mexican Genomics (especially those who made blogs or internet campaigns), representatives of NGOs and critical academics. These interviews lasted around 1 ½ hours, and were structured around basic themes upon which interviewees were free to elaborate or not[34].The small biomedical community in Mexico has overlapped through the years with the Elite Policy makers in the field of science and education, so choosing who to interview was not really difficult. I followed those that publicly endorsed the creation of the INMEGEN from 1999-2004. Difficulties became visible when I had to move from INMEGEN´s facilities into the grounds of another M-NIH, or to bureaucratic offices around Mexico City. In such a community everybody knows everybody else; it is amazing that in a country with more than 107 million inhabitants, academic elites scale down to a very small and divided group of experts (who can be counted by the dozens, rather than the millions).

[34] When I interviewed a key actor more than once the interview was specifically targeted to fill information gaps, or new theoretical sensitivities born out of ethnographic engagement: i.e. documentary-archive research, informal interviews or participant observation

I also investigated the framing of population genomics as a question of sovereignty, through public archive research and documentary analysis, mostly of existing or proposed laws and legal commentary around genomic science (I gathered documents from INMEGEN´S web page: www.inmegen.gob.mx and its institutional library). Nevertheless, through my long ethnographic engagement with the field I was able to gather some important private documents from meetings, memos on legal initiatives and political events. The most important document I recovered from this research was the Feasibility Study circulated in the congress in order to propel medical genomics in Mexico: a seminal public document that was strangely not part of any public archive. Most of my attention was directed towards pieces related to the negotiations that took place in the Mexican congress in order to create the Mexican Institute of Genomic Medicine (INMEGEN), and the legal and scientific commentary related to the "Map of the Mexican Genome" or the notion of "Genomic Sovereignty".

Throughout those two years I also generated a personal archive, which included a long section of media portrayals dealing with medical-population genomics in Mexico (cf. The Map of the Mexicans Genome CD-ROM). This archive was complemented with institutional communications directed to the general public, in which the benefits of medical genomics are presented to lay audiences. I closed this archive with a focus group which included the creators of comic books and members of INMEGEN´s science communication department. As part of my ethnographic engagement with Mexican Genomics I went to scientific meetings, international and national congresses in Mexico City, and public speeches in which the key scientists and policy makers intervened.

To keep record of my ethnography I had two field diaries: one in which I described important events and situations in the field and another one in which I recorded insights, elaborating on the thick descriptions (Geertz 1973) written in the other diary. Both diaries are numerated and dated. I also had a third notebook with quick notes on telephonic or casual interviews that I was either not able to, or not given permission to, tape. Even though I just entered the dates and made notes about observations/interactions that I considered important for my research interests[35], the bulk of these two diaries and the notebook amount to more than 300 pages of information. I spent

[35] I was selective in making notes in order to keep my field dairy manageable and focused on my research questions, but still open to novel situations or dimensions of the field I had never thought about, which were plenty. But sometimes, especially when something big happened in the field or in Mexico as the swine flu H1/N1, the same topic would be repeated again and again. On the other hand during some weeks my informants would be at an international conference or meetings at other institutes in which I had not negotiated access to do participant observation.

approximately 70% of my "in site" research time at the Mexican Institute of Genomic Medicine (INMEGEN) located in the south of Mexico City. I spent roughly another 25 % of my time making interviews with dissident voices or talking with people that had been, or were still (marginally) involved with INMEGEN. The other 5% I spent travelling in the south of Mexico City trying to avoid traffic jams.

2.1- INMEGEN: research questions, and where to look...

The INMEGEN is an institution of recent creation (2004), which seeks to apply the knowledge of medical genomics to improve the health outcomes of Mexico. It is one of the 13th Mexican National Health Institutes (M-NHI) which together make the specialised and elite network of Mexican healthcare. Composed of several government offices and laboratories devoted to genomic research, INMEGEN and the Mexican Institute of Public Health are the only two M-NHI that are completely devoted to research. INMEGEN, the 11th M-NHI, is also home to various high technology units in which massive automatic sequencers are used to read hundreds of thousands or even millions of genetic variants (T, C, G, A) in the genomes of patients and volunteers. This raw data is organised in the supercomputing department (that claims to be the fastest in Latin America, cf. Villar 2009), and later redistributed to a small teams of experts in informatics. These teams of experts would then re-arrange this data in conjunction with a molecular biologist in order to find links between genotypes and a particular disease or a phenotype.

INMEGEN is divided into 5 main departments, with an internal organ of control. The institute has a board of directors constituted of public figures and Federal authorities, including the Mexican Secretary of Health. The board of directors meets approximately 3 to 4 times a year, and evaluates the progress of institutional work plans. The INMEGEN also has a patronage composed of outstanding figures in Mexican mass media, the public sector, and notable businessmen and pharmaceutical enterprises. Since it is an M-NHI it has also to cope with all the administrative and political duties of Mexican bureaucracy. According to the law that announced its creation, the institution is in charge of promoting, fostering and regulating the development of genomic medicine in México (D.O.F April 2004). INMEGEN´s role as a regulator and producer of medical genomics made it the perfect candidate to address the question of Genomic Sovereignty at the level of everyday practice (apart from the fact that those who circulated the idea of Genomic Sovereignty were also the founders of the INMEGEN). I knew that the practices I was looking for were localised at the INMEGEN, but I did not assume that they were linked to clearly defined departments or research units until I had conducted many formal and informal interviews.

The first time I came into the institute, there were only 3 directors taking charge of the 5 departments, with approximately 150 employees unevenly distributed among the various departments and its sub directions (cf. Villar 2009). Even though the INMEGEN's organisational structure had been carefully planned, the institution is much less organised than what the organigram represents (Annex A.2). INMEGEN is also home to various offices for administrators, government officials who deal with the bureaucratic responsibilities of the institute, and a few social (ELSI) researchers. Following the discourse of the HGP, ELSI research constitutes to be one of INMEGEN´s central compromises (priority no.8 of their strategic plan cf. Jimenez Sanchez 2005). The role of the ELSI research centre is to make sure that the development of Medical genomics follows "universal ethical principles (see: INMEGEN´s vision and mission: www.inmegen.gob.mx).

Even though I spent much of my time inside the INMEGEN, I have not conducted ethnography of the institute as a whole. During the 2 years of fieldwork I did not engage with the activities of the IP department, the administrative wing, the laboratories of functional genomics, proteomics or the supercomputing engineers; all of which are important components of the institute (for more information on INMEGEN's organisational structure and objectives see: Jimenez Sanchez 2002 a, 2005; Jimenez Sanchez et.al 2008; Villar 2009). I had many good chats with members of the aforementioned departments, but my ethnographic attentiveness was truly centred on two activities:

1) The production of Mexican population genomics, basically the "Mexican Genome Diversity Project (MGDP)"; and

2) Its juridical and political protection and the relation that such practices hold with the possible alleviation of health problems and disparities inside the country.

I was hugely focused on the processes relating to population genomics, since they are what the law on Genomic Sovereignty claims to protect (Gaceta Parlamentaria 2008, art 103 bis; Chapter 4 & 6). It was also what congressmen thought they were defending by promoting and creating an institution endowed with the duties of knowing the genetic structure of Mexicans (Canal del Congreso 2001 a, b; Chapter 4). I have threaded these different dimensions of population genomics in Mexico by examining the way "Mextizaje," or the public claims about the existence of a "Mexican Biogenetic Uniqueness," transforms as it circulates across them. Very early in my research endeavour, I decided to use a social world's perspective —Situational Analysis— to deal with the multisitedness of my research ambitions, and my own tendency to spatially interrogate my research endeavours (Annex A & A.2). The meso level analysis opened by Situational

mapping naturally fitted my approach to the field and provided me with a flexible, yet consistent, methodological approach. The main advantage for me was that diverse arrays of documents, field notes and in-depth semi-structured interviews could be organised around the situations of interest for my informants and me. Thinking of my ethnography in terms of situations of interest in which various actors intervened helped me to refine and focus my analysis. These characteristics, and my own experience with Situational Mapping/analysis, are explained more fully in the next section.

After my initial round of interviews with experts, I found that the two places committed to the protection and production of the "Mexican Genome" were the Ethical, Legal and Social Issues (ELSI) department and the Population Genomics Laboratory (PGL) at INMEGEN. The two segments I studied belonged to the research department and they were also closely linked to the department of education and outreach. Identifying the ELSI centre as the place to conduct participant observation was relatively easy, since it's the only centre of its type in Mexico. I was reassured of my decision when I went to interview the National commissioner of bioethics, Dr. Guillermo Soberon (August 2008), and he advised me to talk with the Director General of the INMEGEN and its ELSI people "to know more about those bioethical details". Later on in my fieldwork I found out that the Mexican Commission of Bioethics had almost no input in the regulation and ethical sanctioning of genomics. Apart from the ELSI and the Mexican Commission of Bioethics there are no other governmental bodies in charge of regulating biomedicine and more specifically genomics at the federal level. The way I chose to study the PGL will become clear as the chapter evolves, but that was a much more difficult decision.

By analysing the video material of legislative discussions, carefully reading existing laws, and codifying expert interviews in the light of a long ethnographic immersion in the field, I have the added advantage of capturing political change and discursive accommodation in a dynamic way. Some of the actors who actively endorsed the policy framing of human genomics have become vehement critics, or have lost terrain (including non-human actants (cf.Latour 2004), as with genetic therapy). Others, who were low in the ranks of the epistemic production at the time, became fundamental actors in the coming years. It's through the mixing of ethnography, informant's memories, visual records and written documents —products of the interaction of public figures and a small unit of experts— that the coming chapters are possible. To analyse the ethnographic data I alternatively or concurrently used the insights of STS scholars and Foucault's biopolitical mechanisms. I used them as analytical tools to make sense of the complex scenery involved in the production and regulation of population genomics, rather than coherent research agendas.

2.2- Mapping, Situational Analysis and Social Worlds

> *The tremendous strength of grounded theorizing after the postmodern turn lies in its meso level analytic frameworks…Here the meso level is the level of social action —not an aggregate level of individuals—, but where individuals become social beings again and again through their actions of commitment to the social worlds and their participation in those world activities (Clarke 2005:110)*

In her book, *Situational Maps: Grounded theory after the postmodern turn* (2005) Adele Clarke defines situational mapping as a theory/methods package focused on meaning making/social groups and people doing things together. Her approach to situational analysis has a strong emphasis on action, and expands on the methods of grounded theorising and symbolic interactionism. Situational Mapping helps with the task of following the circulation and articulation of ideas, objects, practices and people through different Social Worlds, or segments therein. The Social Worlds framework is embedded in an ecological perspective "seeking to understand representation (narrative, visual, historical, rhetorical) processes of work (including cooperation without consensus, career paths, and routines/anomalies) and many sorts of interwoven discourses (Clarke and Star 2007:113)".

Situational analysis is heir to the Chicago School of Sociology, and what was originally conceived as a research tradition on Social Wholes, which studied distinctive communities, locales or events that could range from ethnic enclaves to strikes (Clarke and Star 2008; Clarke 2005). The ecological Social World's perspective and Situational Mapping are organised around "universes of discourse" and/or commitments; this last part being understood as predispositions to act as well as parts of identity construction (Becker 1960 in Clarke and Star 2007). Clarke (2005) proposes to push Social Worlds and Grounded Theory (GT) analysis into the post-modern turn, by avoiding GT "positivist underpinnings to form a revised, more open-ended practice of grounded theory that stresses its emergent, constructivist elements (p.510)". She conceives of both Postmodernism and Symbolic Interactionism not as theories but as perspectives. Adele Clarke´s postmodern push has 6 contributions[36] in mind in order to decentralise the Western

[36] These 6 contributions should be paired with the 6 "always already" postmodern properties of grounded theory grounded in interactionism: 1) The Meadian notion of perspective through which both partiality and situatedness are assumed; 2) Its material social constructionism; 3) Its foregrounding of deconstructive analytic interpretation via open coding and the legitimacy of multiple simultaneous readings/interpretations; 4) the orientation toward action, processual analyses, and negotiations and anticipating instabilities; 5) range of variation as an always significant but underdeveloped and underemphasised featuring of differences; and 6) The long-standing ecological and social worlds arenas bent of both interactionism and grounded theory as presaging relational forms of analysis such as situational analysis and positional maps (Clarke 2005: 6)

master narrative that "explains variation" —enfranchising a bipolar model of normal and deviant— for a model that assumes variation and difference and seeks to explicitly map and represent it:

> **1)** Assuming and acknowledging the embodiment and situatedness of all knowledge producers, and assuming the simultaneous "truths" of multiple knowledges;
>
> **2)** Using the situation of the research phenomenon as the site of analytic grounding;
>
> **3)** Shifting from assumptions and representational strategies of simplifying normativities and homogeneity to complexities, differences and heterogeneities;
>
> **4)** Asserting the analytic sufficiency of sensitizing concepts and theoretically integrated analytics rather than pursuit of formal theory;
>
> **5)** Doing situational analysis throughout the research process, including making situational maps, social worlds/arenas maps, and positional maps; and
>
> **6)** Turning to discourses-narrative, visual and historical- to expand the domains of social life included in grounded theory research (Clarke 2005: 6).

The relativistic qualities of Situational mapping are one of its fundamental strengths, and if taken seriously provide also one of its greater methodological and practical challenges. One of the fundamental innovations of Situational Analysis (SA) consists in leaving behind the ambitions or claims of being an objective observer. SA moves away from GT positivistic claims in which categories should always emerge from data, and instead urges us to find the silent voices and account for them. Voicing possibilities and positions that are latent or simply silent in the research experience is a time consuming and very hard job. The other practical challenge arises when letting "complexities, differences and heterogeneities" come through while producing a coherent story (Clarke 2005). The way in which I managed these difficulties was by following genomic variability and population genomics through different social worlds. This strategy allowed me to go deeper into the realms of knowledge production, while maintaining true to the complexities of the field. On the other hand this strategy still gave me enough room to compare the multiple translations and/or contradictions of genomic variability in the Mexican Human Genomics Arena.

In many ways my decision to make INMEGEN my research base can be seen as a return to the Social Wholes/Social Worlds analysis of locales or communities. In my case it was rather a sensitising strategy. In a Social Worlds perspective INMEGEN´s PGL and ELSI centres are very important segments of larger social worlds; for me they were the cores of more than one social

world. I conceived of them largely as places of "everyday doingness" in which I could consistently engage with the activities of people, genes, laws, policy and machines. The ELSI and the PGL were officially and professionally devoted to protecting and producing the "Mexican Genome" characteristics, which made them ideal sites for ethnographic engagement. Even though I did not study any other sites of knowledge production as closely as I did with the previously mentioned ones, I did aim for plurality in my analysis. The relation of the PGL and ELSI with the larger Social Worlds in which they unfolded and to which they largely contributed is made explicit through in-depth interviews and analysis of archived documentation. I complemented this strategy by including the disputes on blogs, newspapers and visual media that confronted the scientific and political statements of the INMEGEN (also see Hammersley and Atkinson 2003, on looking for divergent views and written records, and the role of artefacts in social life).

During fieldwork I indeed engaged with multiple actors involved in different social worlds of the Mexican Genomics Arena[37]. As a consequence I consistently included marginal voices in the research endeavour. Nevertheless I found it to be empirically exhausting to chase all the silences, which I knew were many, so I opted for more vicarious forms of inquiry to tackle marginalised and/or minority perspectives. One of the very important silences that I could not chase was related to indigenous communities in Mexico, which have historically being amongst the most marginalised in Mexico (see: PNS 2006-2012; Zolla 2003). I always felt that one of my greatest research shortcomings was the inclusion of indigenous communities, maybe one of the most important silent or silenced agents (see: Clarke and Star 2008: 119).

In my original research design I included short ethnographic immersions into indigenous communities that participated in the Mexican Genome Diversity Project (MGDP). After the first couple of months at INMEGEN in Mexico City I had my research agenda suddenly full. In a very short period I was dealing with NGO´s, scientists in other Mexican National Health Institutes (M-NHI), automatic sequencers, policy makers, academics, middle ranked officers, GWAS, ELSI researchers as well as informants of various kinds. In those first months of continuous discovery, I was still coping with the messiness of fieldwork: diverse voices, institutional allegiances and epistemological stances were literally popping up all over the "field". Many of them spoke for, or

[37] A social world is not the same as a community or group united by a discipline or paradigm. It is a universe of discourse and/or commitments that unite a Social World; as a consequence different social worlds could, and in the Mexican case did, include members that were also central in others. The centralised and expertocratic membership in the field of Mexican Genomics made me continually stumble into the same people who occupied positions of power at one or more M-NHI (since prestigious scientists also become members of directive boards of others M-NHI or associated fellows).

implicated, indigenous communities in their knowledge claims; either because they negotiated informed consent with them (scientists and ELSI researchers), or because they thought to be representing their best interests (NGO´s). I did not have the opportunity to speak with indigenous representatives or communities, and for all the vicarious forms of research in Situational analysis I still feel that no historical, narrative or visual research really does justice to this issue[38].

On the other hand there was also the question of National Security and the "War on Drugs" continuously pushing the boundaries of what was safe or what was not safe anymore. In order to briefly point to those security challenges I would ask my readers to be aware that the number of deaths related to the war against "*El Narco*" (Drug Cartels) has steadily increased ever since 2006, when there were just 62 deaths related to drugs in the country. 5 years afterwards the summative death toll is more than 34,000 (almost 40,000 if we count the disappeared persons) of which just in the last year (2010) 15,000 were killed. Approximately 70% of those deaths are localised in 85 of the 2,500 municipalities in the country making some spaces, especially in the north of Mexico, inaccessible (Miglierini 2011). At interviews with key informants I also learnt that the planned journeys of INMEGEN back to the regions and states in which they collected blood was being cancelled. This news basically meant that I would not be able to make contact with indigenous communities that participated in the sampling of the MGDP. The inclusion and interaction of population genomics with indigenous communities is an important space in need of much more exploration.

2.2.1- Mapping positionality and partialities

> *"Maps are tools of control, appropriation and ideological expression... (Clarke 2005:30)"*

The irony of using situational maps to study genomic maps could be extrapolated *ad infinitum,* making my own maps "tools of control, appropriation and ideological expression..." Indebted as I am to the generosity and trust of many of my informants, some of whom were preoccupied by the possible use of my research to attack their ongoing (but mostly now past) efforts, I want to stress the plastic qualities of situational maps. None of my arguments or chapters are beyond discussion, on the contrary, they explore those conflicting points in which the multiplicity, uncertainty and ambivalence of population genomics becomes all the more visible. My research

[38] Genome Wide Association Studies (GWAS) were at the time I entered the laboratory the kind of studies being done in order to relate single nucleotide polymorphisms (SNP´s) with disease control and cases. The Automatic Sequencer is a basic piece of machinery used to read genetic variance from chips designed to include certain regions of the genome, and compare this genetic information between large pools of individuals.

vision has been directed towards the range of variation of genomic variability in the ideoscape of Mexican genomics (Appadurai 1999). As such it is not only a presentation and representation of interests, but an exercise in plurality, even if just at the modest level of a PhD dissertation.

My use of theoretical frameworks or perspectives was indeed opportunistic. Depending on the type of data and the "world of discourse," I found different perspectives more or less useful. My research was not a tabula rasa, and letting the data speak meant an accomplishment different from what a strongly deductive GT would prescribe. Hence, the double interest of Situational Mapping in Foucault´s approach to power and a Straussian focus on action (Clarke 2005) served as an excellent catalyst to my research endeavour and its plastic qualities. Biopolitics was one of the very first perspectives to become unavoidable, useful and illuminating altogether. I had already read that the field of population genomics was a place to explore contemporary biopolitics (Rose 2008; Thacker 2005; Reardon 2005; Rabinow 1998) but it was not until I was fully immersed in my fieldwork that such previous readings became truly meaningful (or not).

During my days at the INMEGEN, I constantly kept hearing statements on how genetic diversity could help find the real causes of disease, and as a consequence rationalise healthcare based on the genetic structure of patients/users. I also constantly heard the idea that the interest of multinationals and governments were converging in what is known as bioeconomies (OECD 2006), potentially producing a new world order with a series of ethical and political challenges until then unknown to mankind. I kept track of these thoughts and field experiences by writing analytical memos, field notes and doing coding. I can without much trouble claim I complied with the "Trinity" of GT: "(a) theoretical sampling, (b) constant comparison of data to theoretical categories, and (c) focus on the development of theory via theoretical saturation of categories (Hood 2007:164)". I did all of the previous analytical exercises in order to produce situational and positional mapping, rather than a tight web of codes to represent basic social process (for examples of these mapping exercises see annex A & A2).

My engagement with theoretical frameworks such as boundary objects, boundary work or re-articulation (see: Chapter 3; Clarke and Star 2008; Star 2010, Star and Griesemer 1989; Jasanoff 2005; Fullwiley 2008) did not become meaningful until I had spent quite a lot of time in the field. Both biopolitics and the Social Worlds conceptual toolbox for Science Studies (see: Clarke and Star 2008: 118) were sensitising concepts: "...Whereas definitive concepts provide prescriptions of what to see, sensitizing concepts merely suggest directions along which to look (Blumer 1954:7; also see Clarke´s 2005 use of the concept)". Specific tools, such as the concept of security mechanisms (see Chapter 3), became relevant after various analytical engagements with my data, but had been in the back of my head for a long time (see: Clarke 2005).

Some dialogues are being held here which have not yet happened between my implicated informants; connections are being made in spaces where hostility or silence reigns. As an example, the ETC group (NGO, see: Reardon 2005) has never dialogued with INMEGEN officials, or for that matter with any other organisation of scientists involved in medical/population genomics. On the other hand, none of my Scientist informants have publicly voiced their discontent the way they have done with me at interviews.

The polyphonic qualities of situational mapping stress the fact that representing is always intervening in some way or another, and that there is no observation situated out of the world: "Who is authorized and not authorized to make what kinds of knowledge claims about whom/what, and under what conditions?" (Clarke 2005: xxv) is a question that resonates both for researcher and informants. Therefore making explicit my own position in the field is the preamble to any further methodological explanation. This chapter guides my readers through the various positions I took in the field while I explored some of the social worlds that compose it. It also presents the readers with some of the most important choices that coproduced the final form of this PhD project.

For me PO was a process of trust building and cohabitation in various Social Worlds that indeed transformed who I was. Much more than an "ethnographic self" crafted for the field, I experienced participant observation as a central part of my identity. An identity that I would find to be, as many others doing PO have (see: Hume and Mulcock 2004), fragmented, anxious and homeless; full of uncertainties and still deeply rewarding. In my own personal experience, extended PO was indeed a baptism of fire (also see: Kelly 2003). Observing and trying to engage in other people's lives and every day chores was a bit strange, especially when you have to make your way through highly politicised groups and settings. Many of the communities and social segments I researched have been endowed with important social responsibilities and are likely to be subject to strong criticism; in such ethnographic context the role of trust is hardly overstated.

2.2.2- Positionality and my Interest in the field.

I was first intrigued by the creation of a Mexican Institute of Genomic Medicine (INMEGEN), after reading a published discussion on deCODE genetics©; the first public-private initiative that was constituted as a national Biobank. deCODE genetics© was designed to link population genomics, genealogical and medical records with complex diseases. The rationale for the creation of this Biobank was that Icelanders are genetically very homogeneous and also that they hold an

extensive genealogical archive, which in principle would make it easier to find genetic variants related to disease. The public-private partnership between the Icelandic government and giants of the pharmaceutical industry was highly controversial; in one of those disputes Paul Rabinow and Gissli Palsson commented on Professor Lewontin's critiques. He portrayed deCODE genetics© as a capitalist plot in which a State sell its citizens DNA, and then continued to say that Iceland begins to sound like Mexico or Thailand (Palsson & Rabinow 1999).

I rapidly began to look for this type of project in Mexico, just to compare and contrast the orientalist enunciations of Professor Lewontin (Palsson and Rabinow 1999:17) with what was happening in my home country.[39] To my surprise in Mexico, just 10 minutes away from the house of my father and mother-in-law (in which I used to live), a gigantic building was being constructed in order to develop Genomic Medicine. That meant that I had been driving by this building for more than a year without noticing it. Even worse, it was not until I lived in the United Kingdom that I even began to consider that such a project could exist in Mexico. I was certainly ashamed of my "Malinchismo"[40], and was fascinated by INMEGEN´s web page [41] and the available online information. Throughout my fieldwork I found that Mexico was not the only one being orientalised. On the other side of the world, deCODE Genetics in Iceland served as an example for Mexican policy makers of exactly what to avoid terms of the types of arrangements between business, science and the State (Frenk int. 2009, also see chapter 6).

The remarkable difference between INMEGEN´s constitution as a publicly funded body destined to protect the "unique" genetic patrimony of Mexico (see: Jimenez Sanchez 2005, 2001a, b; chapter 4) [42], and Lewontin's depiction of Mexico as a State willing to sell the DNA of its citizens

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[39] My own research interests have been widely influenced by certain readings, and not only grounded experiences and research. The first of those important readings was Peter Sloterdijk´s "Rules of the Human Park ([1999]2009)" which immediately ignited my interest in the new genetics. The second influential reading was Andrew Pickering´s "After Dualism (2006)"which centred my attention on the field of STS, and the idea of becoming and performance; and anything that staged a non-dual, non-modern ontological stance or engagement with the world. My preference of SA as the method for my research is related to these previous influences.

[40] "Malinchismo" refers to an attitude amongst Mexicans which highly values foreign virtues, systematically diminishing the native or domestic ones. It is a word applied in all sorts of situations, mostly with a negative connotation. It has its roots in the story of Hernan Cortes and Doña Marina "La Malinche" who was the interpreter and concubine of the famous Spanish conqueror. "La Malinche" is also a fundamental figure in vernacular and folk stories of Mestizaje (see: Navarrete 1997).

[41] Also to my surprise Kari Stefansson, the criticised charismatic leader of deCODE Genetics, had been in this new research centre giving talks, I could even see his presentation in the institute web page (www.inmegen.gob.mx).

[42] This was not completely a surprise for me since I knew about the importance that Mexican heritage has in discussions of sovereignty and political independence and the impact of deCODE genetics worldwide.

to the best buyer, was indeed worthy of much more examination. I immediately thought that Professor Lewontin would have been very intrigued to know about the INMEGEN's existence and its political compromise (even though I guess he could have still said that Mexican political compromise was nothing but void rhetoric). The way in which Mexico was being used as a moral yardstick to exemplify the lowest of ethical attitudes toward the commoditisation of DNA, and the surprising fact that the creation of INMEGEN was indeed destined to avoid such commoditisation immediately grasped my full attention.

Almost 4 years after my initial (virtual) encounter with the INMEGEN (www.inmegen.gob.mx), and after spending two years doing PO inside the aforementioned institute, the possible appropriation of genetic information in order to emancipate or dominate whole populations is still an open debate[43]. Conceptions and practices by which population genomics becomes a tool for national-political emancipation, public health and economic growth could not be a more encompassing and exciting research project for someone with my background. I had a B.A in International Relations and at the time I was studying an MSc in Genomics in Society.

I was also convinced of the added advantages I gained by exploring this sociotechnical phenomenon in Mexico. The first advantage was that I did not need any language interpreter or extra living and travelling expenses, since I could just live with my political family again. This also gave me the opportunity to save some money for the face-to-face PhD supervision meetings back in the UK. I am also Mexican, so I assumed that relating to the everyday experiences and situations of my informants would be easier: in this respect I was only partially right. Some anthropologists reflecting on fieldwork in which they were members of the group they were studying clearly point to the constant need of some auto-ethnography and self-reflection when engaging with those familiar others (see: Colic-Peisker 2004; Kurotany 2004).

Being Mexican was an identity that I tried to separate myself from many times, especially when I heard phrases like "... you know, you know... you are Mexican and you know the System". With time and many experiential lessons I understood that the "System" was a ubiquitous phenomenon that explained the hierarchical decision making practices, nepotism, lack of trust and in general, social transactions with others; it was even closely related to cultural Mexicanhood. I was especially keen to sever those ties when my informants implied that I knew this or the other,

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What I did not expect was that deCODE became the model that Mexico was trying to avoid.

[43] My MSc courses mixed STS—mostly focused on genomic technologies—, philosophy of biology and qualitative/quantitave methods, providing a truly transdisciplinary experience. Mexican Genomic Medicine seemed to be a natural site for research.

which in fact I did not. Distancing myself from our shared national adscription was helpful when I wanted to know my informants perspectives in more detail.

On the other hand, Mexicanhood was also a common backdrop of mutual understanding and dialogue[44]. My own distance from the formal academic circle in Mexico, and my identity as a "fresita"[45] that was not part of any group at the Mexican National University (UNAM) made my presence in the field less compromising or explosive. In my first interview with Gerardo Jimenez, Director General of the INMEGEN, he immediately asked me "are you Mexican..." I answered affirmatively, he then continued to ask, "... so where did you study"; he was pleased to hear I came from one of the big private universities in Mexico City.

It was comforting for my sponsors in the field to know I did not have any alliance with the ones with power; a situation which helped me to rapidly gain their trust. In my first months of fieldwork a constant topic of inquiry was to ask me how I gained access to the field without being the relative or close friend of someone. This anxiousness, as with many other things, became a joke: "...well maybe the bosses like you because you have a foreign last name, and they might think you come from an important family..." This helped us to talk about certain topics without having to confront each other constantly. My second advantage was confidence. I felt relatively well prepared to engage with population genomics in the laboratory after Steve Hughes'[46] biweekly technical seminars and my readings on philosophy of biology with Lenny Moss. I rapidly learned that nothing, not even superb learning experiences, prepare you for participant observation with all its exigencies and surprises. While doing PO a third very important advantage emerged: the two sites I was willing to study were situated in the same building, and very close to each other.

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[44] This was such a common strategy of my research that one of my key informants made a joke out of it. The joke was an iteration of one of my answers when he talked about Mexicanhood and the "System" (see chapter 4, and subsection 2.3.2), implying that I must already really know about it, I, moderately annoyed, said "...I don't know... I have not seen the system walking on the street or knocking at my door..." Afterwards my informant would make it a personal enterprise to show me all the instances of the "System," adding at the end "...I have never seen it walking or knocking at my door..."

[45] "Fresita" is a common way to say that you come from a privileged background or that you are naïve, or both. It can refer to the tone of voice or intonation of certain words. It can also make reference to the place in which you live or study, or the dress code. In my very partial competence as a member of this culture I would say all these different versions are somehow loosely related to the idea of class difference, but are not exhausted, or in any way limited to the different versions I have just mentioned.

[46] Steve Hughes is Egenis Co-Director and his short and superb seminars on biology and genetics were a great preparation for someone trained in Humanities and Social Sciences. When I took these seminars my biology came from my high school education. In such classes I was still studying the phenotype as an expression of the genotype: the biology I learned in high school was incredibly mechanistic.

Such geographical proximity made it much easier for a lone ethnographer with a tight budget to chase a study of coproduction in "real" time.

2.3-Ethnography at the INMEGEN: Subjective adequacy and authenticity

> *If existence in one´s own home lifeworld is not a challenge enough to endure, doing ethnographic fieldwork serves to heighten the vagaries, contradictions, and pleasures of "normal" life as we attempt to absorb others´ experiential worlds and deepest meanings... (Birckhead 2004)*

As I remember it[47], fieldwork really started through my first informal encounters with people "doing things" rather than saying something. It is not that interviews were not a central part of my research (they were), or that I am drawing a clear frontier between speech and practice. I completely agree with the idea that ethnography is a family of methods (Will & Trondman 2002). It is just that Participant Observation (PO) was a very different creature. It is a lot more intimate and, as with any long term relationship, it requires commitment and patience to flourish. Armed with my copy of Ethnography in Practice (Hammersley and Atkinson 2003), I launched myself into the "field" not knowing what exactly to expect; yet I was enthusiastic and decided to become an "ethnographer of science and politics".

Hammersley and Atkinson (2003) describe the engagement with the field and the familiarisation with what was once a strange cultural environment, as "subjective adequacy". In my own experience subjective adequacy was a two way street; my informants had to adapt to me as much as I had to adapt to them. It was a personal becoming and an encounter with otherness, which I had not experienced while interviewing Mexican science and policy elites. Interviews are challenging, and sometimes can even be considered a high wire act (White 2002). It is a research technique that puts pressure on your conversational capabilities and constantly tests your ability as a researcher to guide, and let the informant guide, the direction of the interview (with some very enfranchised groups this can prove to be an incredibly difficult task). Even when frequent interviews can develop a sense of complicity with some interviewees[48] it is very different from PO,

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[47]My first engagement with the field started in the last months of 2007, when I read the documents on Mexican genomic medicine available on the World Wide Web. A couple of months afterwards I interviewed the two principal lobbyist/promoters of Genomic Medicine in Mexico: INMEGEN´s Director General, Gerardo Jimenez and his political mentor Dr. Guillermo Soberon (Ex-Secretary of Health and Ex-Rector of UNAM). Mixed with these Elite interviews with prominent scientist/politicians, I also had other interviews with top officials inside the INMEGEN, The Mexican Commission of Bioethics (CNB), and many other federal (mostly health related) institutions based in Mexico City.

[48] I frequently talked, informally chatted and sometimes (less than) formally interviewed many of the middle ranked bioethicists, researchers and biomedical scientists in the Mexican Genomics Arena. After various

which continually touches the boundary of your identity; you and your informants become exposed to each other.

2.3.1- Negotiating access and the "Field"

I negotiated my way into the INMEGEN with Gerardo Jimenez Sanchez (Director General), and the department heads of both ELSI and Genomic research. They all asked me to send them some of my written research, with a promise of a quick response afterwards. Nevertheless my engagement with the field had already started and I could not (and did not want to) do anything to stop it. Institutional responses came in partial and gradual slots; they would say yes to longer interviews, to archive research or to participant observation, but only after getting to know me better. So I was doing fieldwork in order to gain access to my "field".

The field itself emerged as I stayed longer around people whom I knew were dealing with the objects of interest for my own research. The first natural site to do fieldwork was the Ethical, Legal and Social Issues Centre (ELSI), since it was the only place in the country in which everyday research on medical genomics, policy and its public objectives was done. There are important academic institutes, such as UNAM´s Instituto de Investigaciones Jurídicas (IIJ), that have a strong input in national politics and bioethics but are not entirely committed to genomics; their input in policy follows the lines of occasional "*amicus curies* (expert friends)".

When I started my fieldwork I was not very familiar with anthropology or PO, and I was doing my first serious ethnography on the grounds of a M-NHI. I also have to confess to my readers that after all, ethnography was a really simple task; I was basically talking with others about topics that I found fascinating and intriguing. I spent most of my days at the laboratory observing laboratory gadgets or trying to understand the meaning of a graphic representation of a populations' genetic structure. But I would really look forward to the discussion time, a dialogical window that normally occurred right before lunch, in which the results and experiences of the day were discussed and shared. I spent copious hours chatting over a new law, or over a computer graph representing genetic variability, without even realising it. During my time in the field I would deeply enjoy such activities. Even today (or even more now) I am still astonished by the ease with which many of my

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months of being involved in the political atmosphere surrounding the INMEGEN, I became very empathetic with the everyday troubles and challenges that many of my informants faced. The same thing happened to me with some high ranked policy makers, whom I frequently interviewed or talked with. A counterbalance to this empathy was brought by movement into new social and political spheres, which immediately generated a distance between my membership as an ethnographer, and as a friend in the social worlds in which I conducted participant observation.

informants would engage in critical reflection and debate over their own work practice. I am also aware that those moments of discussion were heavily invested with interpersonal rapport and trust.

While becoming acquainted with the new intellectual and emotional demands of fields like Genetics or Law, I had also to face my own methodological anxieties. Even though I considered myself to be an informed ethnographer rather than just a naive observer (cf. Lauder & Glaser 2007), sometimes my ignorance of molecular biology or the ways of constitutional rights would make me realise I was not entirely part of the PGL or ELSI team. Just when I was feeling at home in the PGL, social, bureaucratic or political turmoil changed the organisational configuration, the role of "my people"[49], or the distribution of work and responsibilities. Through those two years, the "field " kept changing and my role as an ethnographer had to change as well.

My first and most active sponsor in the field became Volkovak (Pseudonym), a passionate lawyer who had been involved as an assistant researcher in the ranks of Mexican academia for many years in the UNAM´s-IIJ; now in charge of ELSI research at INMEGEN. With time he would become an important facilitator of my research, and I personally owe to him much of my subtle understanding of tacit protocols and unspoken policy practices. I started collaborating as another (unpaid) ELSI researcher; the tacit agreement was that they would not need to spend any of their financial resources and that they would have another person working in the department. In exchange I would be able to know about the backstage practices of ELSI research and everyday policy making. Once he (Volkovak) accepted me as a peer and colleague he would help me navigate bureaucratic archives and the tacit codes of practice in Mexican policy circles.

One of the first memories I need to relate in order to let readers share some of my fieldwork experiences is connected with INMEGEN´s permanent building and the corruption scandal surrounding it. For the purpose of this chapter you just need to know that the INMEGEN is the M-NHI with one of the highest findings, and that during the first 5 years of its institutional life approximately 2.5% of its budget or an amount near to 3 million dollars seems to be lost either by making poor constructions decisions, buying unnecessary material, paying before the work was finished and various other irregularities in its final construction site according to a preliminary report by the Federal Audit Bureau of Mexico (cf. ASF 2008, T5; Cruz-Martinez 2009; Gomez 2009).The report cites structural failures, flooding and many other irregularities in the construction

[49] I refer to "my people" as the community that embraced me as one of their members; basically the PGL and the ELSI centre. As months and then years passed I felt a very strong sense of identification with my informants, who had become my friends, allies and in many ways my teachers and shamans in regards to the ways of their disciplines, discoveries, interests and their production of knowledge.

site. But what was most important for my own research is that media and many of my informants read this event as one of the usual practices of corruption that characterise Mexico and the "System (popular way to refer to these practices of nepotism and corruption)".

It was amid this ambience that I entered the field. While working in the ELSI Volkovak would be wary of providing me access to the archive without the written approval of his immediate boss, Marco Aldebaran (pseudonym), Director of institutional outreach and INMEGEN´s legal office. In this scenario he would ask me to get the documents through the long and time consuming transparency apparatus of the Mexican State (IFAI).

Volkovak's boss would orally accept my research, but would forget to send the specific letter to back up his oral order. At some points we went to his boss' office together to request the letter, and Marco in a very friendly manner assured Volkovak that my research was ok, but would again not send the letter. After all, my "soft" type of research did not need informed consent according to the laws governing the M-NIH. I rapidly became aware that the environment, a product of political instability and information "leaks," made it very difficult for any top official at the INMEGEN to provide any written document granting access to non-public archives. On the other hand, they wanted to be viewed as a transparent and progressive institute and my presence as an outsider endorsed that commitment; this allowed me to work and participate at the ELSI and afterwards in the PGL[50].

Occasions of political and scientific dispute would make my engagement with various social worlds (Clarke 2005) raise suspicions inside the INMEGEN. As an example, I was part of the Critical Genomics seminars at UNAM´s Institute of Philosophical Research (UNAM-IIF) when a note criticising the production and communication of the Mexican Genome Diversity Project was published in the newspapers by one of its members (Guerrero-McManus 2009). This immediately heightened my informants´ suspicions that I might be some kind of reporter or critical academic with a hidden agenda. Fortunately (and sometimes unfortunately) I am very bad at telling lies or hiding information, so my sponsors/informants knew from the beginning of my research that I was engaged in a multisited endeavour. I made it explicitly clear that the days I was not around I was probably talking with other scientists or even antagonistic voices. I think this open way of talking about my research and letting them know what I was doing outside the INMEGEN was, generally

[50] All this turmoil frustrated my efforts to study the practical way in which the law of genomic sovereignty was going to be implemented, since the ELSI centre shifted its agenda towards containing the scandal damage. On the other hand it became an excellent opportunity to study ELSI operations in order to define debate, engage their strategic audiences and control political struggle and what could become internal "dissidence".

speaking, a success. As a result I was able to move around in a very tense and antagonistic politico-scientific environment with relative freedom, allowing relations of trust and mutual respect to be built between myself and my main informants/sponsors.

2.4-Becoming a Gatekeeper: The unexpected ethical responsibilities of fieldwork

At some point, once the researcher has paid the cost of sticking to his fieldwork (Birckhead 2003), his/her presence in the field becomes acknowledged, especially when ethnographic engagement is long and clearly identifiable within a community of practitioners. In my particular case, I became aware of such a status change when I was treated as an emissary of medical-population genomics during in-depth interviews or informal chats with scientists or policy makers. People working at the INMEGEN would identify me as the social researcher interested in the "MGDP". After the initial weeks of rapport those who became my close informants would constantly introduce me to their friends and colleagues as their ethnographer. I immediately enjoyed the benefits of becoming identifiable and trusted by many more persons than those with whom I had established initial contact with.

The reputation of my Gatekeepers (who later became my friends) opened the door for steady flows of valuable ethnographic information, and access to spheres that would be otherwise totally beyond my grasp, i.e. the Mexican Senate. In such scenarios it was even possible for me to meet with antagonistic groups and critical audiences; this engagement gave me a way to loosely measure the influence of gatekeepers in the scope and depth of my own research. Again at some point everything appeared to be simply harmonious, moving in a politically fraught arena was difficult yet possible; I had the trust of my key informants and I felt really good about my fieldwork. Unfortunately my epiphany rapidly became a question of ethical responsibility. How much should I disclose of my research to interviewees (especially critical ones) interested in knowing what I thought and had learned while living inside the INMEGEN? Should I serve as a Gatekeeper to other researchers interested in doing ethnographic work in what I considered to be "my field"?

I suddenly recognised that becoming known meant I was also becoming a gatekeeper. After embracing the political intricacies of my new status, I opted to open the way for another ethnographer in "my laboratory", a decision that turned out to be more difficult than I ever thought (both emotionally and academically). After my status change none of the new avenues of research were simply opportunities for exploration anymore; every decision I made inevitably brought with it bitter-sweet consequences. Showing respect for my informants' wellbeing and their

own career preoccupations was a difficult and also emotionally challenging situation. To tell my readers that I was a detached and critical observer would be a complete lie, but it would also be a lie to tell them I became completely "native" (cf. Tresch 2001).

Throughout the two years I spent at INMEGEN, there were many occasions for awkwardness, complicity and confrontation between my informants and me (cf. Annex C& D). Such moments stressed my double membership as an outsider/insider, and made me realise that gaining critical distance or ethnographic intimacy had ineluctable costs attached to it. Throughout the coming subsections I will highlight the most important issues related to my experience conducting PO in the social segments of the Mexican Human Genomics Arena I studied, as well as SA of larger Social Worlds.

2.5- Representing "The field": making clear the contours of the Situation

Hanna Arendt (1958) thought that the only time when a Human Being can be told as a story is when he/she "dies". Before such a moment (death) human subjects are in a constant flux. Death means stability and fixity, and now that my fieldwork has "died" it is indeed easier to sit down and write about it. Yet I know that the field is not "dead", it's still moving and changing, in what appears to be a perpetual flux. Nevertheless I also know that such a social setting had a beginning, in fact a very precise one when the Mexican Congress approved the creation of the INMEGEN (April 2004). It is just that for me as a research endeavour, it has finally ended. But rather than fieldwork "dying" in order to occupy a peaceful place in the "*panteon*," it became a zombie-like entity[51]. Now I mostly remember fieldwork as a success. To write these lines I had to refresh my memory by digging into the first entries of my field diary (Field notes 9/12/2008). Now that I have left the field after two years of ethnographic research, those first moments of uncertainty in which being "there" and doing "that" was simply off limits are a somehow distant memory.

[51] It is also now that my fieldwork appears to be "dead" that it has acquired its´ most public and lively shape. Now that it has transformed from a partially private matter that existed as the intersubjective fabric of scientists, policymakers and an ethnographer, into a public object that will be judged in the light of the common realm in which only that which is "worthy of being seen or heard, can be tolerated (Arendt 1958:51), that fieldwork acquires a whole new reality.

2.6- The Field: descriptions and comments on the Population Genomics Laboratory (PGL), and The Ethical, Legal and Social Issues Centre of the INMEGEN.

In this section I generally describe the field and the social segments in which I conducted Participant Observation (PO).It is difficult to think of any other authentic way for me to make explicit the deeply emotional and transformative effect which this fieldwork has had on my academic and personal identity

2.6.1 - Identity and Relations in the field

While I write these lines some of my key informants and other central public actors in Mexican genomics are developing novel ways to deal with ELSI implications for human genomics in Mexico. I am partially active in such endeavours, since some of those ideas are the product of long ethnographic dialogue and political interaction between my informants and me (see: Siqueiros et.al 2011: Schwartz and Silva-Zolezzi 2010). I see them not only as subjects of study, but as collaborators; friends that showed me the way into their own social worlds. I also think of them as civic entrepreneurs who took the risk of letting me in when times were difficult. Despite operating in such a delicate environment they were honest and willing to establish polemic dialogues.

Relations in the field problematized the observer/observed distinction in many ways. Again a joke was the way to canalise these tensions. Once while I was closely observing and making notes on how Volkovak answered to new legislation, Altair —laughing— said out loud "... well, well here we are... being examined by Mr. Schwartz... just so you know, we are his pigmies and he is our anthropologist".[52]This became our local joke, and we would tackle our strange relations, both as research partners in the ELSI endeavours, and as research subjects, through the pigmies joke. Volkovak was much more into the idea of being my Shaman or spiritual guide through the "System"; he probably developed this idea while conducting informed consent with the Tepehuanes, an indigenous community in the North of Mexico.

[52] Altair is also nominally an ELSI researcher, yet his interests are centred in epidemiology and genomic research, looking for the relation between genes and teenagers with addictions and violence problems. Many hours were spent in the ELSI dedicated to discussing the sociobiological tones of his research by Volkovak and myself, and the Ethical implications of his interests. To which he always replied "well, well... that is why I am asking you, you are the ones who deal with the ethical and social issues, right!!!"

On the other hand my relations in the field were heavily invested in debate and confrontation. I had constant discussions with doctor Soma, a physical anthropologist, since she thought that we "socials" (making reference to social anthropologists), were constantly mixing the natural with the artificial, the socially constructed with the biological and so on. She always stated that I was a social anthropologist fighting in my own disciplinary space, while she was a molecular/physical anthropologist defending her own discipline. The relationship with Dr. Soma was a constant negotiation and whenever she was around the laboratory great discussions and very lively debates occurred.

At the same time she would be very nervous around a tape recorder, and would ask me not to use one, since from her own ethnographic research in indigenous communities she knew that when people get excited they say things that they might not want everyone else to know. Identity politics around Mexican Genomics made the question of Mexicanhood all the more relevant for my informants and me. As an example, the preoccupations of Dr. Soma revolved around my representation of Mexico in the international sphere. Once in a heated discussion she said "you should rather do a longitudinal study, to let things settle down... and don´t damage the image of Mexico and the new genomic initiatives".

After a long stay in the field friendships, acquaintances and sometimes "unwelcoming" members of different social worlds would show me the way to new research possibilities. As I followed the novel avenues of research I would find myself in close interaction with new situations and actors (some of them non-human) which required my commitment, participation and critical engagement. In such a dynamic environment it is really hard to draw a line between ethnographic failure and success. Depending on the circumstances and the research scope we can develop different ideas of what we consider to be an ethnographic achievement. While immersed in fieldwork new avenues of research constantly emerge or disappear. Some very carefully planned fieldtrips or events are indefinitely cancelled, on the other hand extremely exciting and totally unplanned opportunities for research suddenly appear.

The connections or dialogues established in this PhD dissertation do not attempt to make any naturalistic claims, but I still find the "compare, contrast and judge for yourself" process to be a vital part of what we "socials"[53] do.

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[53] Although I told Dr. Soma I was not totally what she would call a social anthropologist, she was not fooled by my explanation; for her someone doing such a long observation in the field was a social anthropologist. I guess Dr. Soma was right at the end. After two years of participant observation at the INMEGEN I feel a lot closer to the field of social anthropology than I ever did before (see Fischer 2006 for

The ELSI had a unique organisational structure. It was also one of the places in which the bioethical and normative work I have been interested in studying was occurring on an almost daily basis. Most of the time the ELSI was about engaging with Human Genomics and its socio-political implications, but days or even complete weeks could pass just doing clerical work. The clerical work included sorting visas for international speakers, preparing and checking presentations for public figures, or selecting the right venues, orators or experts for conferences. Then we had to think about the kind of audience we would face in political events, and adapt the information to what we imagined were their needs. This organisational flexibility or laxity also allowed the ELSI to be part of the production of comic books destined for public consumption, as well as to take part in various types of internal bioethical evaluations of research projects. Even though the ELSI activities were fugitive, this department being basically composed of one person, it provided a great place to get the feel of what was going on in the INMEGEN, and in the wider policy arena.

Choosing what laboratory to study was pretty complicated in comparison to the ELSI. The field of population genomics was much more difficult to navigate for an outsider. Nominally the HapMap laboratory was located in the 5th floor of the INMEGEN, but the head scientist in the laboratory, Gerardo Jimenez (INMEGEN´s Director), had devoted most of his time to deal with public affairs. The main author of the Mexican HapMap at the time, Dr. Y, was presenting about the process of informed consent in the "Collection Crusades to create the Mexican Genomic Map". Finally there was Irma Silva-Zolezzi who was talking about population genomics, admixture mapping and GWAS studies, but who was not the main author of the still unpublished paper. At the beginning I was pretty confused: I did not understand why Dr. Y was not presenting or talking about population genomics. In such a confusing scenario I asked Volkovak with whom I should talk if I wanted to know about medical genomics, and he immediately answered "...ohh you should go with Irma, she is *la Jefa* (chief) the one who really knows about this, and she is great explaining".

The next day Volkovak took me to Illumina Laboratory, I was hoping to have my first interview with Irma, but that day she was in a meeting with the representatives of Illumina®. The next week we had our first meeting; it turned out that even though Irma was not the first author of the paper she had an understanding and a style of communication that indeed made her expertise evident. After that first encounter I did everything in my power to hang around her in order to be initiated into the mysteries of population genomics and its medical applications. A couple of months afterwards the authorship of the MGDP had changed. Luckily my half intuitive-half informed

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a review of STS and Anthropology).

decision of hanging around this laboratory was endorsed when Irma became the first author of INMEGEN´s flagship project, the MGDP.[54]

2.6.2-"The Caterpillar" INMEGEN´s Population Genomics Laboratory (Formerly known as Illumina Lab)

Illumina© is one of the leading transnational corporations that produces and commercialises automatic sequencers across the globe. The original name of the technology units at INMEGEN was derived from the technology used in the laboratory. The logic of branding laboratories with the name of the technological platform they use has been questioned by the public officials; they were asked to remove the flags displaying the logo of Affymetrix©, Illumina ©and Applied Bio Systems©. This is due to the fact that the INMEGEN is a public institution with no commercial partnership with any of these companies. Yet many informants have told me that they receive excellent prices and discounts. One of my early informants even told me that this was the product of a collaborative agreement (Marco Aldebaran 2008- Director of Institutional links, and ELSI). After institutional revision and re-arrangement the laboratory officially became "The population Genomics laboratory," and the flags of Illumina were taken away as markers of a forgotten era.

Figure 2-A- Institutional picture of PGL displayed at INMEGEN´s

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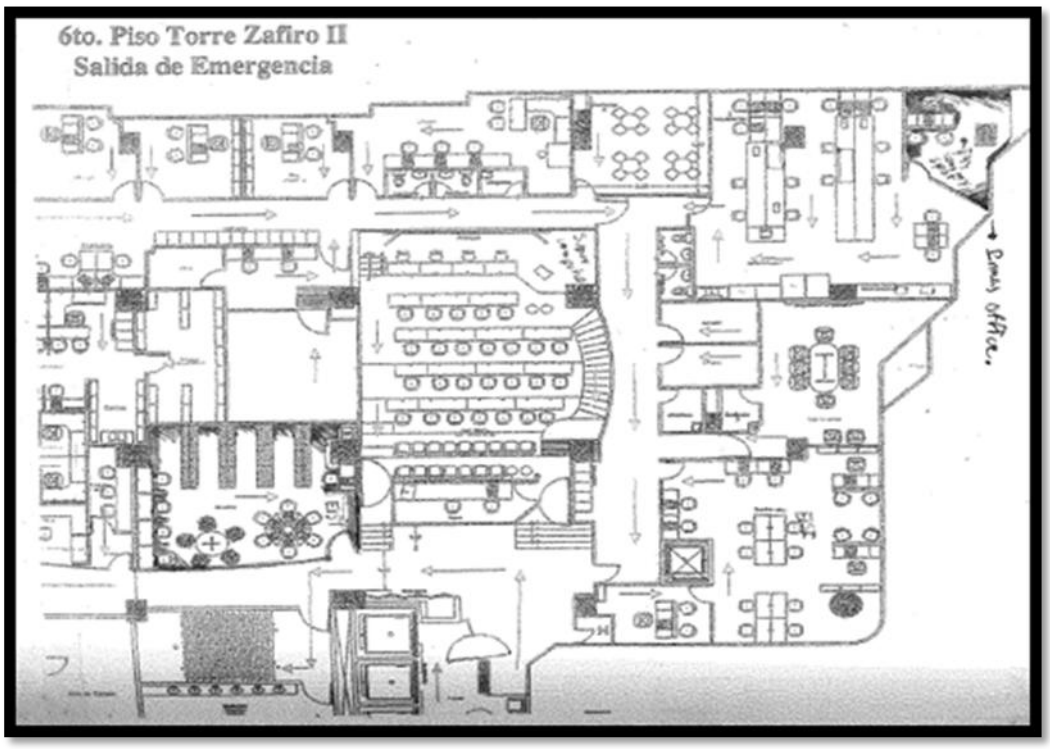
[54] The change of authorship is addressed briefly in chapter 5. In my first days of fieldwork it was reassuring to know that my choice of scientist and laboratory was recognised inside the institute, after being previously marginalised. My interest in the PGL before it was institutionally recognised delivered an important message about my academic independence; which in turn provided me with a trust premium inside the laboratory. Following action regardless of institutional boundaries had paid off.

[55] This picture was taken before Illumina officially became the PGL. The picture appeared in the INMEGEN´s web page until the beginning of 2010. Certainly this picture was one of the factors that clearly identified me with the PGL, its members and particularly with Irma Silva Zolezzi, the head of the laboratory. I am the only guy without a laboratory robe.

The transparent glasses of the Population Genomics Laboratory (PGL) made it difficult to build a frontier between the inside and the outside. In the intermittent two years that I spent inside its walls I saw it transform into: a TV set, a class room, a debate forum and most usually a place to think about genetics and its wider implications. Its institutional localisation placed this laboratory apart from the others; instead of occupying a space in the 5th floor where the rest of high technology units coexist, PGL occupied the corner of the 6th floor, comprised of administrative and government offices. On a clear day when gentle winds dragged away the pollution that commonly covers Mexico City, being inside the population genomics laboratory made one feel as if they were floating. The transparency of the laboratory walls allowed us to enjoy idyllic pictures of the post-genomic era: The automatic sequencer and the PCR machines framed by the Popocatepetl and the Iztlacíhuatl. Two symbols of the Mexican national landscape and its indigenous roots, accompanied by other two seminal symbols of genomic research. For the ones involved in population genomics research in Mexico it was not uncommon to find national symbols blended with their work and representations of genetic variability.

Figure 2-B- Map of INMEGEN´s 6th Floor



[56]Map annotated by the author

[56] Map of the INMEGEN´s Government and Administration floor (temporary site) located in the sixth floor of a nine story building in the south of Mexico City. The two principal sites in which I conducted participant observation (ELSI centre and the Population Genomic Laboratory) were approximately 25 footsteps away, undoubtedly one of the material characteristics that allowed my simultaneous involvement with the

Since the very beginning of the lobbying efforts to create the INMEGEN's national symbols and genetic science have been a symbiotic entity. This symbiotic entity existed as "genomic sovereignty and Mexican uniqueness (Chap.3)" some time before the MGDP took place or was even designed. Such symbiosis proved to be extremely successful, capturing the imagination of policy makers and media alike (Chapter 8). On the other hand the blurring between inside and outside could become quite annoying. Sometimes while we were comparing the genetic diversity of Zapotecs and Mestizos, we had to bear the screams of TV Fans, or the protests and chants of the extinct Electricity Labor Union. The inside and the outside were blurred; both as an objective of INMEGEN´s institutional design and as an aesthetic turn towards a panoptical laboratory. The institutional desire to grow through horizontal collaboration somehow obliged the PGL to keep close contact with other institutes that had medical patients. Nevertheless the growing surveillance and unrest produced by the financial turmoil in the construction of their permanent site, and the controversial personality of Gerardo Jimenez-Sanchez (Former Director General), made the frontiers between the inside and the outside rigid, and at many times hostile.

The PGL (Illumina Lab) was a very lively place to do ethnographic research; more than 4 projects concerning population genomics were under way while I was conducting participant observation. Irma Silva Zolezzi (first author-Mexican HapMap) was generous with her time and knowledge. In fact the entrance into her office was indeed my point of access to the core of the laboratory. Most of the fascinating discussions happened inside her office, and much of the esoteric interpretations and in depth interrogations about genetic data were to be found in her computer or over her desk. Participation in Illumina, and some interviews with key scientists in the field, has given me a rather contradictory story concerning "Mexican" population genomics. Such a story has been born from the realms of scientific intrigue and political dispute, and also from the visions of emancipation and social justice. But most of the fine-grained analysis this PhD is able to bring forth could not been done without the patience and trust that Irma gave to me; inviting me to all those moments in which she was not completely sure about something, exposing the soft spots of genomics as she had experienced it as an autodidact population genomicist.

When I jumped into the lab (2008-2009), two new post grad students started collaborating with Dr. Irma Silva-Zollezi. One of them was a molecular anthropologist ,Alma (pseudonym), working on a project with the ambition of mapping indigenous communities based on ethnicity, language and haplogroups, specifically a community of Afro-Mestizos on the pacific coast of Mexico. The

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production of regulatory/politico-juridical and scientific knowledge. The circle with the letter (Z) shows the location of Dr. Irma Silva Zolezzi's office.

second post grad researcher —Crown (pseudonym)— was working on a specific gene related to hepatic diseases with significant differentials in allele frequencies between Mexican Mestizos/indigenous, and the so called ancestral populations (i.e. Africans, Europeans and Asians, as represented in the International Hap Map). Both of these two new projects almost coincided with my entry into the lab, as well as the final preparations for the publication of the MGDP. I was particularly lucky to benefit from the introduction of the technologies and assumptions of population genomics to the new students (including me). I should also recognize the patience that Elisa (pseudonym) and Rita (pseudonym), both laboratory technicians, showed with my interminable ignorance about protocols and concepts inside the laboratory.

After leaving the laboratory I thought the PGL was kind of "a caterpillar," waiting and transforming inside a bureaucratic shell (the 6th floor). By the time I left the laboratory almost everybody was gone and just 2 of the 3 original members (Rita and Elisa) I first interviewed remained. The number of people in the laboratory had miraculously increased in number, making it difficult to move inside the laboratory. All the new faces I saw in my last days in the PGL, and those that I knew were not around anymore (Irma Silva-Zolezzi), made me wish I could still spend some minutes in the lost tranquillity of the first days. When those thoughts crossed my mind I knew my fieldwork was over. The time to contemplate the imposing landscape or ignite debate was gone as well. The emotional place originally occupied by excitement was now full of nostalgia. At that time the laboratory was recognised as the institutional site to find population genomics; nevertheless the action that captured my interest in the first place was not found there anymore.

2.6.3-"The Ghost" INMEGEN´s Ethical, Legal, and Social Issues (ELSI) Centre

Participant observation done in the ELSI centre of the INMEGEN gave me the opportunity to take part in the grounded role of bioethics and its substantiation of "sovereignty". The explicit/implicit categories and norms dealing with the production and use of human genomic research were definitely located in the ELSI centre. Nevertheless the ELSI centre itself was a fugitive entity. At the very beginning of field work in the INMEGEN one of my first surprises was to find that what I thought would be a research centre populated by different disciplines was mainly the domain of one junior legal researcher and his immediate boss[57]. In the case of the ELSI department, their localisation in the organisation was a question of political control; they had to evaluate the work of their immediate authorities and other important scientists, an activity that in principle could block or propel the credibility and policy impact of the INMEGEN. This was also a difficult task since the

[57] There is also another ELSI researcher, Altair, see page 16.

careers of ELSI researchers were subject to the continuous approval of those they had to evaluate (biomedical scientists and policy makers), or their close friends (who also happened to be scientists or academic elites).

The existence of the ELSI was severely threatened if the two researchers were sick, or in a conference. This meant that in practice there was no ELSI centre. On the other hand the ELSI would become incredibly important at some periods in time. The importance of the "centre" would dramatically increase when political or public events were close or when domestic politicians and/or international visitors arrived from developed countries. The chores of the ELSI researcher ranged from answering memos and filling bureaucratic forms, to strategic/tactical ones such as designing legislation/laws, commenting on legislative projects and setting the political agenda. In a way the ELSI transformed to become incredibly important, literally becoming the site in which national interests were crafted. On the other hand it could become politically insignificant, becoming a place in which readymade knowledge and repetition of the same ideas was systematically done.

Volkovak thought, and I share this view, that the lack of a formal place to work was nothing more than "proof" of the "pariah status" of the ELSI[58]. This lack of a proper work space obliged us to work wherever and whenever we could (mostly inside the library), trying to leave debate and discussion for moments of relaxation or over coffees somewhere in the south of Mexico City. ELSI research was inscribed in the "System", therefore we had to simulate "as if" we were really doing independent ELSI research, while in practice most of it was censored and lacked any deliberative process (which was the type of bioethical discourse championed by the institute). We also had to simulate as if we agreed with what the public figures said: basically we had to simulate in order to please.

Although the responses of the ELSI were a product of Volkovak´s independent judgement, they would be censored and shaped according to what was perceived at the time as being in the institutions best interests (cf. Chapter 6). Volkovak would never get tired of explaining to me the

[58] The overall atmosphere in the institution was evidently tense; people working in the institutional library (which physically contained the fugitive ELSI) did not talk with each other a lot. My presence in their very small community was not a cause for celebration. As time went by, the working place of Volkovak changed many times. Volkovak explained these frictions, and sometimes showed me the memos describing them. Basically much of these frictions occurred when the librarians tried to impose their rules. Many times we were told to do x or y, when we needed to debate or read something out loud. Volkovak would openly confront them, asking to respect our ELSI work. This problem was a never ending story, with no solution. After many confrontations moving to a new place was the only option, and Volkovak, and later his new boss, would move into a small room across the aisle from the PGL.

many faces and workings of the "System": in such an overarching and nondemocratic scenario the work of the ELSI-he thought- would hardly make any difference. On the other hand the products of such simulations of autonomy and ethical engagement could in a matter of weeks become a local law "protecting genomic sovereignty at a regional level" (cf. Chapter 4), or an international seminar that would establish the regulatory principles of genomic science at the Mexican Congress. This peculiarity made the ELSI the *de facto* regulator of Mexican genomics. Such status made Volkovak feel proud and ashamed at the same time; proud since his work would become the basis for new laws in the country, and ashamed of the supposed deliberative bioethics championed by the institute, which was a crude remainder of the ELSI´s lack of critical autonomy.

Volkovak was also constantly bothered with the administrative chores and bureaucratic form-filling which interfered with his daily work; in this respect I was completely unable to help since much of that job had to be done by an employee. When I was around he would try to save the time to comment and discuss a new law or paper; doing this kind of work would become a day for celebration and excitement. Basically I became the only other ELSI researcher apart from Volkovak. Altair was much more interested in medicine and epidemiology than in the ELSI dimensions of such practices. Most of the time Altair would ask us about the ethical or legal implications of the epidemiological studies he was trying to conduct: such studies tried to link violence to certain genetic characteristics of juvenile offenders through GWAS[59].

Even though I was only a secondary voice at the ELSI, when discussing laws or when thinking about the best way to regulate or promote the use of genomics Volkovak treated me as a peer and included my perspective in some of the institutional responses. Our main vehicle within ELSI was debate, but such debate had to become consensus in order to produce a coherent communication or give a recommendation on a new legislation. That is why I represent the ELSI as a "We" rather than an "I" or a "He". I refer to "We" not because we don´t have divergent points of view, but because we had to produce a unified voice in order to represent ELSI normative stands. If I ever did get close to becoming native, the ELSI would have been the place. My involvement was political through and through. It is really hard, if not impossible, to engage with policy without taking a normative stand. In my own experience I considered it unethical not to voice my thoughts: how could I ask my informants to trust me if I did not trust them? I could either

[59] Volkovak and I found such studies troubling for various reasons; the first and most evident one was the difficulty of defining violence. Although we were both preoccupied with the implications of this research, Volkovak was much more vocal about the discriminatory and reifying features of such explorations.

honestly engage with them (all of my informants) as equals in a civic enterprise, or I would be better off not getting involved with the ELSI dimensions of genomic medicine at all.

During almost all of my fieldwork the ELSI researchers did not increase in number; it was not until the last couple of months that a new head of research, Gabrielle (Pseudonym), would be appointed to the centre. By the time I left the laboratory my involvement with the field was very sporadic, and I was making appointments with people rather than popping in and hanging around for long periods. We spent these last months with friends and colleagues from the National Commission of Bioethics (CNB) who were like-minded and open to discussion; and who, like Volkovak, were eager to meet their peers for bioethical discussion. Our overall goal was to start autonomous research and independent policy projects, even when such initiatives were not part of the "System", or could even be seen as rebellious. I also thought about these meetings as a group of young researchers (including me) who were looking for their own place in the growing bioethical machinery.

Today we still collaborate, and from time to time even talk to each other by phone. Some of them are not occupying their bureaucratic positions anymore, since they stood up to the "System". Others have learned to navigate through the "System" and are waiting to find the right mood or institutional wave to try to change something. After all the existence of the ELSI is still fragile[60], like a "ghost" that needs to put a lot of effort to make itself felt or to communicate with the world of the living (the biomedical scientists/top officials that control them).The ELSI is still chasing institutional autonomy in order to pursue its own independent research and opinion. I sincerely hope they (The ELSI researchers) can find their sorely needed institutional autonomy and independent voice soon.

Many more significant events and discussions occurred than I can present in this PhD dissertation. During the two years of my stay at INMEGEN I suffered a transformation, along with my informants and the "field" itself. As a matter of fact the institution, its scientific-political objects, and the situations I studied during my fieldwork have mostly vanished. The events and confrontations that deeply transformed, and finally completely changed, the political and scientific scenery at INMEGEN will be depicted and analysed more thoroughly throughout this work. The policy makers I interviewed and followed left their top bureaucratic posts. Dr. Gerardo Jimenez Sanchez—Founder and Director of the INMEGEN— is now in the private sector, but remains as

[60] Recently the name of the ELSI has changed to EJES (Estudios Jurídicos, Éticos y Sociales: the Spanish translation) in response to criticism of Jiménez Sánchez, and it seems the new administration agrees with the thought that keeping the English acronym (ELSI) of the centre was unfounded and confusing- and possibly too American.

the OCDE Chair of Biotechnology and part of the board of directors of the P3G[61]. Dr. Irma Silva Zollezi, former head of INMEGEN´s population genomics laboratory, is now working at Nestle in Switzerland. Alma and Crown, the two postgraduate students who started their research while I was in the laboratory, have both left to foreign countries because of professional and personal reasons. From the original laboratory team just Marmota and Rita, laboratory technicians, remain. Volkovak still works in the ELSI, and is now surrounded by two new bioethicists with whom he can now (from time to time) openly discuss and share ideas.

The "Map of the Mexican´s Genome" I so eagerly followed suffered a nominal and institutional transmutation, becoming in 2009 "The Map of the Genomic Knowledge of Mexican Populations". It was as if by nominally diluting the ties between Mexicanhood and genomics the scientificity of the MGDP would be reinstalled. Behind all the goodwill and scientific clarity that this new name was supposed to bring (Soberon-Mainero int.2009), I still find that the notions of Mexican uniqueness, on which the much publicised "Map of the Mexicans´ Genome" was built, have been sidestepped and remain unexamined. This dissertation has the ambition of contributing to such an examination, bringing forth the relations between science, race, power and culture in Mexico.

[61] The Public Population Genomics Project (P3G) is an international Consortium dedicated to the discussion of policies toward policy harmonisation and Data Sharing of population genomics Biobanks and medical genomic initiatives around the world. INMEGEN is the only genomic institute in the developing world that participates in this global governance genomics enterprise, and Gerardo Jimenez is still its representative.

Genomic Sovereignty:

The creation of the INMEGEN, the ELSI practice and the protection of "Mexican uniqueness"

3- *Genomic Sovereignty & the creation of the INMEGEN*

> *With the creation of the National Institute of Genomic Medicine, Mexico will fully enter the 21st century, participating with a vigorous and sovereign voice in science, and never with a weak and dependent echo. I am sure that in the new era that is unfolding today before us; we will know how to combine the innovation of scientific knowledge with the sturdiness of ethical principles. In this way the voice of Mexico will be heard, clear and strong, for the good of humanity (Opening speech, inauguration of the Mexican Institute of Genomic Medicine, Frenk-Mora, July 2004)*

One of the principal characteristics of boundary objects is that they are ill defined; therefore they are fertile ground for different actors and social worlds to tailor them for specific purposes, without reaching consensus (Star & Griesemer 1989; Star 2010: Clarke and Star 2007). The initial commitment put forward by the CPMG was to create a molecular roadmap of the "Mestizo" difference, to make sense of biogenetic variation and correlate it with clinical phenotypes in order to produce a more "predictive, preventive and personalised medicine". Such political and scientific compromise is based on the assumption that the rich history of Mestizaje provides the Mexican nation with a unique genetic structure. A new, fairer and more cost effective sanitary regime could be built around this genetic knowledge. Nevertheless there are risks that should be avoided; if not done successfully this new techno-science could become a device for domination (Jimenez-Sanchez 2005, 2008; Frenk-Mora 2009; Soberon 2008; Muñoz de Alba 2002). Such were the statements mobilised by a limited group of people lobbying the creation of the INMEGEN.

The gradual shaping of a new policy object and the projection of regulatory practices around it is what I will refer to as policy innovation. Such processes constantly define and redefine the discursive grounds of the field. In the case of medical/population genomics, it opens up the initial conditions for its further development. Not only does scientific inquiry into medical genomics is novel, but also the imagined practices that policy makers and lobbyists build around this emerging scientific field. Another outcome of the policy innovation process is that it served as a template for other developing nations interested in pursuing their own medical genomics initiatives (Seguin et.al 2008, 2009; Billie Jo-Hardy et.al 2008 b; Daar int. 2009).

I will describe how the policy innovation processes that lead to the creation of the INMEGEN took place; pointing to some analytical insights that can help us relate the policy framing process to the contexture of a Mexican civic epistemology (Jasanoff 2005; 2003). The main thread of such a relationship lies in the recreation and conflation of history, a quasi-unknown "yet unique" genomic structure, and the production of a new economical and more equitable social order (inside Mexican borders, as well as in the international scenario). The introduction of novel conceptions

and practices as if they were part of a long historical process, by which not only the new object but also its history is recreated (cf. Barbour 2010) is a well suited analytical tool to understand Mexican medical/population genomics.

The postcolonial awareness of Mexican scientists and congressmen alike, and its recourse to "Genomic Sovereignty", relies on pre-existing ethno-racial and political identities linked to a dominant history of racial admixture. The recreation of a romanticised national history through population genomics and its projection as a part of longstanding national anxieties is what has permitted "Genomic Sovereignty" to become both a boundary object and a biopolitical regime. I will expand on these mechanism more fully when I allude to the topic of "Mextizaje" (Schwartz and Silva-Zolezzi 2010), and its implications for genomic governance.

Regarding the overall argument of the dissertation, the importance of epistemic communities and policy innovation lies in setting the discursive limits of what I recognise to be a particular type of postcolonial biopolitics. I conceptualised this epistemic endeavour in the specific contexture of Mexican governance/policy making. I will explicate the salient features of such a biopolitical regime in the closing sections of this chapter. The limitations of this analysis derive from its close focus on lobbying and issue framing as the principal activities constituting policy innovation. That focus leaves us with little room to explore the historical and cultural roots of postcolonial science discourse in Mexico

3.1- Mexican Genomics: on the brink of modernity

"...Mexico arrived late to the banquet of Western civilisations..." (Reyes in Monsiváis 2000)This is a common aphorism amongst Mexican Elites, made famous by the Nobel laureate Octavio Paz, in his book: *The Labyrinth of Loneliness* (1981[1950]), and originally coined by the notorious intellectual Alfonso Reyes. It does not matter if it is in everyday or in grandiloquent public speech; a constant tension arises whenever Mexicanhood meets Modernity, understood as a state of progress and civilisation, having science at its core (see: Shapin 2007; Patiño in DOF 2001a). Considered to endorse all kinds of political agendas, Modernity, together with its supposedly[62]

[62] Here I am referring to Bruno Latour and STS scholars' rejection of a linear modern time or progress. In Bruno Latour's Latour "We have never been modern (2003)" Modernity and moderns, basically believe there exists a fundamental difference between a primitive and warm cultural matrix, in which no distinction between subject/object exists. This is in contrast with enlightment thought and the discovery of first principles in which object and subject are clearly separated; and reason guides our actions. In Mexico modernity is also a way to elicit the hopes of constructing a better, more efficient and just society in the near future with the help of science and prudent and rational government. Therefore Modernity is a hope

univocal and linear progress, has served many masters. The conception that Mexico is always at the brink of Modernity —a transformation always yet to come— has been a common and widely spread idea for more than a century now (Lomnitz 2003). When Julio Frenk Mora, former Secretary of Health and prominent medic-politician, framed the creation of a Mexican Institute of Genomic Medicine (INMEGEN) as an opportunity for Mexico to arrive on time to the banquet of Modernity"[63], the contra rephrasing of the Octavio Paz dictum (Frenk Mora 2004) was alluding to something much more complex than science itself as an ever moving frontier.

The initial framing of genomics as the latest threshold of Modernity[64] was indeed a rhetorical device to present congressmen —that had to be convinced to make heavy investments in molecular biology— with nothing "but future projections...and still pull out the project... (Dr. Elias 2008)". Modernity is also a cultural framework that elicits Mexico's unsettled contradictions as part and parcel of its national identity and its post-revolutionary socio-economic project, directed to produce public goods and social justice (Paz 1981(1950); Reyes 1927, Monsiváis 2000; Basave-Benitez 1992; Bartra 2001; Tenorio Trillo 2010). Such a frame helped scientists, congressmen, and even sceptical audiences, to relate historical frustrations, foreign exploitation and emerging risks to a novel scientific field; and most importantly to the very core of Mexican identity. It was an emotional call to change the role of Mexico in the international scientific concert of ideas (Soberon 2009): "If Mexico would someday become an important player in the world of ideas, it will not be done by the science it imports or the amount of culture it is able to assimilate; if such a deed will ever be accomplished it will be done by Mexico´s ability to produce and create, it will be done by Mexico´s original contribution to the concert of ideas "[65]. It was a time to re-build the nation-state.

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for justice, a hope of arrival to a better social and economical status.

[63] "Rephrasing in a contrary sense the famous dictum of Octavio Paz, we can say that today we have the great opportunity, to start writing on time, the new page in the book of the Mexican medical medicine of excellence (Opening speech, framing the creation of the National Institute of Genomic Medicine, Frenk-Mora July 2004)".

[64] "The heterogeneous temporality of America (Garcia Canclini, 2004), the name that has been given to the phenomenon of modernism without modernisation in this part of the world, only reinforces the thesis of Octavio Paz, which says that: "Mexico arrived late to the banquet of Modernity...(Ocampo, 2005)". We could also think in a different way about modernity as multiple or not univocal. Nevertheless what is important for the policy innovation process is that the vision of a revolutionary modernity, "...from which Mexico has not been able to really profit, or from to which it has just profited in a marginal way..." remains dominant in domestic policy circuits.

[65] This is another aphorism coined by Ignacio Chavez, (founder of the Mexican Institute of Cardiology, Rector of UNAM in the 1960´s). "

Mexico is not known for contributing to the big waves of scientific knowledge. Even though it is the 14th largest economy in the globe, and the eleventh most populated nation on the face of the earth, investment in Research and Development (R&D) does not reach half a percentage point of Gross Domestic Product each year[66]. Overwhelmed with the ongoing "war on drugs" that has taken the life of many Mexicans, or the discussions over the best way to administer and exploit petroleum, spending precious resources on "Big Science"[67] such as human genomics, might be perceived as superfluous. Nevertheless almost seven years ago, Mexican legislators and an influential group of scientists, professional politicians and medics, were capable of opening a new realm of governance in cutting-edge molecular biology.

A year before the so called Mexican democratic transition in 2000, a very small group of epistemic entrepreneurs[68] started mobilising the idea of creating an institution devoted to the investigation of human genetic variation, and its relation to disease. It took approximately 4 years, including 18 months of discussions in the Mexican congress, for their lobbying process to succeed. On July 20, 2004, the National Institute of Genomic Medicine (INMEGEN) was officially created by a presidential decree, mandating this new organization with the official duties to: "promote, regulate, foster and practice the research and medical applications derived from the knowledge of the human genome (D.O.F, Article V-bis, 2004)". With INMEGEN´s creation, Mexico was opening a door to the development of a whole new scientific field, as well as creating a new policy-scientific object (Mexican Genome) [69].

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[66] In the period between 1998- 2005 the investment in R&D reached a level of 0.43% of the GDP according to: (Triunfol in Jimenez-Sanchez et. al. 2008).

[67] Karin Knorr Cetina (1999) argues that comparing the Human Genome Project (HGP) with High Energy Physics (HEP), is not really comparing the same sort of "Big Science" project. In fact the HGP functioned more as a coordinated and pluralistic effort, than as a big centralised transnational project. Another factor is that the technology used for genomics becomes accessible after some time, and can be adapted to local settings, and to a small group of researchers and standard laboratories; while in HEP that is not possible. The decreasing cost of sequencing technology for molecular biology, is one of the variables that should be kept in mind as the chapter continues since is one of the promises used to endorse the investment in genomic medicine for emerging economies.

[68] I make a strong difference between genomic entrepreneurs and the rest of the CPMG, since I consider that the actors that lobbied and generated the strategies to develop genomic medicine are more influential in the policy innovation process, than the rest of the members (I will expand on these distinctions as the chapter evolves), and therefore deserve a different treatment.

[69] Such a goal was no minor deed in Mexico, obtaining more than 120 million dollars of public funding was a titanic endeavour; it amounts to almost 82 % of Mexico´s annual health budget. The eleventh decentralised institute of health was born through an open discussion inside the Mexican congress. For the first time in the history of the country, a major bet in science and technology was a question of debate.

3.1.1 Genomic entrepreneurship: searching for political will

It was clear for Mexican scientists why Mexico did not participate in the Human Genome Project: lack of political will. Scientists and science-oriented policy makers believed that the country had the technological capacity and the specialised human resources to take part in this historical project since the 1980´s. A good example was Brazil´s and China´s involvement in the HGP (Feasibility Study 2001; Canal del Congreso 2002 a, b. Soberon 2009). Mexico had a tradition in population genetics, biomedical research and enough trained scientists and research centres to do it, but still something was missing:

> In the decade of the eighties the Project of the Human Genome was developed, and Mexico was not able to participate in the process for circumstances which are not easy to determine; even though we had groups of molecular biologists, biotechnology in the Mexican National university UNAM, the University of Nuevo Leon and in the IMSS Guadalajara; apparently what was missing was the explicit support of the government (piece of an interview in Mendoza, 2007:262).

Political will meant getting the necessary funds from the federal government to develop internal expertise on the new genomics, buy state of the art equipment (gene sequencers, supercomputers), and bring back the scientific talents living abroad. In 1999 when INMEGEN was first conceived, it was almost immediately followed by an intense lobbying and promoting process; nevertheless the root of the project lay in a previous failed attempt to create a small genomic research unit[70]. According to various informants who were closely related to the project, the seed of the new institute began in the Mexican Paediatric Institute (INP). In the years between1997-1999 the need to create facilities for research into the genomic component of paediatric disease was clear to the director of the INP, Dr. Alexandra Carnevale.

She recalls a Gerardo Jimenez Sanchez —who had been away researching human genetics in the USA (Johns Hopkins)— as one of the scientists who would be in charge of the new genomic wing. Nevertheless she was unable to gather the needed governmental funds to move the bioterium to a new floor of the building, and make space for the genomic project (Field notes, paraphrasis 2010). Facing such deflating circumstances Dr. Antonio Velazquez Arellano[71],

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[70] In those days the INMEGEN was called CEMEGEN; it was initially conceived as a national centre for genomic research that would be part of UNAM. For an organizational approach to the early development of genomic medicine, see: Mendoza 2007.

[71] Dr. Antonio Velazquez Arellano was continuously referred to me as one of the founders of genomic medicine, by many geneticists in Mexico City. It was particularly interesting that one of the personal assistants of a highly ranked official in Mexico mentioned that: "... he was the one that really started all of this, if you really want to know about genomic medicine... you should ask him..." I took the advice and tried

Geneticist and paediatrician of the INP, former teacher and mentor of young Gerardo Jimenez, accompanied the latter to talk with Guillermo Soberon Acevedo. The political career of Dr. Soberon placed him as one of the most prominent figures in Mexican public health. Amongst his many public positions, the most important ones have been: Mexican Secretary of Health, from 1982-1988, Rector of Mexico´s National University (UNAM) and president of FUNSALUD; his support would be decisive in order to achieve the creation of a medical genomic centre in Mexico.

In the words of Dr. Soberon himself, the enterprise of creating a centre for genomic medicine in Mexico, really began in the first meeting with Dr. Jimenez and Dr. Velazquez, who delivered to him a very clear message "... Mexico cannot afford to maintain itself out of the genomic revolution, in order appropriate the benefits of the Human Genome Project (HGP) we need to create an institution devoted to its research... (Soberon 2009)" Mexican Health Foundation (FUNSALUD) is the most influential health related think tank in Mexico. Funded by private organisations it is also an institution strongly connected to the "neo-sanitarian" regime, and the technocratic turn of health services in the country (Abrantes & Almeida 2002).It was FUNSALUD and its president Guillermo Soberon who took the risk to promote genomic medicine in the first place. Guillermo Soberon provided Gerardo Jimenez with the necessary resources to divide his time between Johns Hopkins and Mexico City, as well as invaluable political advice and contacts to start the lobbying endeavour.

The notion of epistemic entrepreneurs is derived from the early activities of these two public actors who gathered the initial support from their closest academic and policy community. A key feature of entrepreneurs, "deeply committed and active individuals (Becker in Clarke and Star 2007)", is that they designed the basic premises on which genomic medicine would work, and assumed the associated financial and political risks in order to push the project forward. Artemio Cruz (Pseudonym), a political scientists/lobbyist who was involved since the very beginning of the negotiation process recalled a time when it was just "...him, Gerardo and a personal assistant in a little office at FUNSALUD... (Cruz 2010)". Dr. Gerardo Jimenez quickly became the public figure representing the epistemic entrepreneurs' team. His curriculum in human genomics, paediatrics and basic research at Johns Hopkins gave him the necessary credentials to speak on behalf of the genetic/genomic community in public events. One of the most publicised deeds of Dr. Gerardo Jimenez-Sanchez was his article surveying existing genes related to disease with Barton

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to interview him; in a short response by email, he said that he might be the one who started all the fuzz with genomic medicine... but that was not his field anymore and he was interested in new projects and horizons; therefore he did not find an interview suitable.

Childs and David Valle; which appeared in the same Nature issue as did the first draft of the HGP (see: Jimenez-Sanchez, Childs, B &Valle D., 2001).

3.1.2- Enrolling allies (possible enemies) and INMEGEN´s Feasibility Report

In 1999 when both Dr. Jimenez and Dr. Soberon projected an initial meeting with influential figures from various Mexican Institutes of Health, it became clear that the necessary funding had to come from several sources. Initially three institutions were selected because of their "natural"[72] history of cooperation: The Mexican Ministry of Health (SSA), FUNSALUD and Mexican National University (UNAM). Further on a fourth one was invited to participate since it was "obviously an important federal agency for the project (Soberon 2008)", The Mexican Council of Science and Technology (CONACYT). Epistemic entrepreneurs remember the initial contact with the sponsoring institutions as one of enthusiasm.

The first lobbying efforts were frustrated by the imminent change of government: Mexican regime transition occurred in 2000. So the recently public/private coalition willingly agreed to fund, with 2 million Mexican pesos each, a research program which later produced the INMEGEN´s Feasibility Study (IFS 2001), and promoted the formalisation of the public/private coalition. The feasibility report itself would become a platform for discussion in the Mexican Congress, and the formal consolidation of the epistemic community:

> We did the feasibility study...and many people participated... the feasibility study came to well-founded conclusions: it is necessary to develop genomic medicine, it is desirable to do this through a consortium of institutions, we needed to establish an Organization that could deal with these issues and develop them in concrete ways... (Soberon 2008)

Three months after INMEGEN´s Feasibility Study (IFS) was completed, in November 2001, a new organisation was created. It was exclusively oriented to publicise the project, and conduct the necessary tasks to verify that its completion took place (Soberon 2009; Jimenez Sanchez et. al 2002). The name of this organisation was the Promoting Consortium of Genomic Medicine (CPMG)[73]. Their main goal was to present a detailed strategy to communicate the benefits of the new field of human genomics to two key audiences: congressmen and businessmen.

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[72] It was not uncommon for UNAM Rectors to become Heads of SSA (Julio Frenk Mora, in De la Piedra Matute 2010). In this case Juan Ramon De la Fuente was head of SSA, when he supported the project the first time in 1999, and then he was also a political supporter as UNAM´s Rector after 2000.

[73] "...On November 22nd 2001, the heads of the four participating institutions signed a new agreement to establish a Promoting Consortium for the Genomic Medicine Institute. Its objective was to promote and

The IFS served many important purposes: it helped epistemic entrepreneurs to concentrate and organise informal sympathy for the development of the INMEGEN. The IFS itself became the platform to circulate the promises of genomic medicine to strategic audiences. We have to keep in mind that the Feasibility Study (IFS) was the document given to congressmen in order to evaluate the creation of the INMEGEN; as such it became a self-referential piece during the whole negotiation process. By April 2001, between the "knocking at doors" of bureaucratic allies and formal negotiations in the congress, Guillermo Soberon and Gerardo Jimenez had already been involved in more than 40 conferences and promoting events all around the country (IFS 2001). Dr. Soberon estimates that throughout the whole negotiation process (1999-2004) they visited approximately 80% of the country (2008).

The purpose of those visits was to attain the imperative support of wider audiences, including private investors, local ministries of health and even possible enemies. According to the perspective of Artemio Cruz, one of INMEGEN's main lobbyists, their priority in those days was to invite and convince those that could somehow oppose the project: "... you know, critical people from UNAM, or the other institutes of Health... people we know could just say no....for whatever reasons". After the first two years the initial team had already enrolled more than 42 contributing participants, who signed as collaborators of the IFS (2001), and more than 50 prominent figures by 2002 (Jimenez Sanchez 2002 d). The signing members of the IFS (2001) included scientists, businessmen, consultants, policymakers and top bureaucratic officials. Also amongst them were the fiercest and most openly critical voices, in science and policy. These dissident voices would distance themselves from the original network and epistemic propositions after the first years of INMEGEN´s existence (more specifically while the Mexican Genome Map was under construction). In 2008, Artemio Cruz would become one of those dissidents that he so vehemently worked to enrol in the initial project (Cruz 2010).

There are various reasons for their dissidence; the important matter (for the moment) is to make visible the fact that there was no consensus from the very beginning of the project. Later in the chapter I will explain, using the accounts of the actors themselves and the documents left behind, their reasons to disagree and still cooperate (or not). After enrolling the first possible enemies in the network and convincing bureaucratic bodies to support the creation of the INMEGEN, the core of the social world, who at that moment had transformed from Dr. Jimenez and Dr. Soberon

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carry out executive and detailed studies to establish and develop the Genomic Medicine Institute as well as to promote horizontal connections with any national and international institutions willing to cooperate ...On that occasion, it was also decided that the future organization should be part of the health sector and should fit the profile of a National Health Institute" (CPMG Report of activities 2002).

to more than 20 scientists and lobbyists, was ready to mobilise its promises and vision in the congress.

At the core of the network were also strategic entrepreneurs who would help them to move into the emerging democratisation —meaning less presidentialism and more parliamentarinism— of the Mexican system that was configuring itself in 2000. The most important of those entrepreneurs would be the then recently appointed Mexican Secretary of Health (2000-2006), Julio Frenk Mora. His reputation as a brilliant public academic, health related policy maker, science communicator and founder of the Mexican Institute of Public Health (INSP) preceded him. His relation with former Secretary of Health, Guillermo Soberon (1982-88), was close since the days when Dr. Frenk Mora founded the INSP and became its first Director in 1987 (Frenk in De la Piedra Matute 2010; Soberon 2008). Throughout his career he had the opportunity to work at the highest levels of global health policy (WHO Information and Research Executive Director 1988); in 2000 he was well aware of the medical promises of the HGP.

Even though Dr. Frenk Mora only intervened on special occasions and during moments of political tension, his take on genomic medicine was timely and strategic for the policy innovation process. The way in which the complicated lobbying unfolded, and his support in harnessing and expanding the notion of "Genomic Sovereignty" and INMEGEN itself, added to the reputation of the project. Not to say anything about the already well established reputation of Dr. Soberon, and Dr. Gerardo Jimenez in Mexican and international policy circuits (see: Genoma y Dignidad Humana, 2002). Julio Frenk´s standing as Secretary of Health was of strategic importance to accelerate congressional hearings, and make visible the CPMG work to congressmen who might not be paying sufficient attention.

The triad formed by these public figures produced most of the available public documents on genomic medicine in Mexico. Their communicative action shaped the organic development of an institute (Mendoza 2007) and a whole policy realm. They were able to circulate the ideas amongst international academic circuits, as well as through international organisations such as the WHO and the OCDE. Such was their success that most of their policy oriented scientific statements (Feasibility Study 2001) became widely referenced in the existing literature on developing countries and genomics in the years to come (Seguin et.al 2008; 2009; Billie Jo-Hardy et.al 2008 a, b, c; WHO 2004; NRC-USA 2005).

In Mexico the consolidated network gained the support of the Juridical Research Institute (IIJ) of UNAM and was able to interest them in shaping their incipient bioethical academic work for policy engagement. Marcia Muñoz de Alba, who worked on bioethics, and was a collaborator with Julio

Frenk in the INSP[74], became the individual in charge of legally framing the propositions of the epistemic community. Her support and academic interest helped the CPGM to set the ELSI agenda during the negotiations in the Congress. Most of the social researchers involved in medical genomics came from the IIJ-UNAM centre. Their connections with wider circles of policy, law and academia helped them to link the question of medical genomics, with national health policy and the right of individuals to health care, regardless of their labourel or socio-economic status. This new field of academic and juridical interest became known as Genomic Right (Mendoza 2007; Volkovak 2010, field notes).

In 2002 when the heavy lobbying and negotiation to create the INMEGEN began inside the congress, they had already developed specialised committees to address different areas such as: Administration, Ethical, Legal and Social Issues (ELSI), scientific research, Communication, International promotion, and the Director´s team (National Commission on the Human Genome 2002 in CPMG 2003). Prominent human geneticists became the heads of the different committees. As an example Dr. Elias (Pseudonym), human geneticist, genetic anthropologist and biomedical researcher, became the head of the ELSI; other committees such as the one of scientific research, finance and administration were headed by the CPMG Director, Gerardo Jimenez Sanchez. The Scientific committee was composed of 7 international and national figures of genetics and medicine coordinated by David Valle[75].

For other (sometimes) less visible actors, who nevertheless also invested their time, reputation and hopes in genomic medicine since the very beginning of the project, I will use pseudonyms for reasons of anonymity and/or confidentiality[76]. One thing was clear for all the members of the

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[74] I thank Maria de Jesus Medina, for pointing to me the laboral relation between Julio Frenk and Marcia Muñoz, who were important actors in the negotiation of the INMEGEN. Marcia Muñoz unfortunately could not witness the creation of the INMEGEN, since she died from a congenital lung disease.

[75] The international team of scientific research was composed of world known geneticists and key figures in Medical and genomic research in Mexico: Arthur L. Beaudet, Aravinda Chakravarty, Francisco Bolivar - Zapata, Maria Teresa Tussie Luna, Alejandro Cravioto and Xavier Estivill. For a profile of their activities in the field see: Jimenez Sanchez, Reporte de Actividades CPMG, 2002.

[76] Some of them provided public accounts of science and its social role in Mexican political venues, but would like to remain anonymous: that category mostly belongs to Dr. Elias, a biomedical research-geneticist, who was an authority in the field and a public scientist/lobbyist. Dr. Sofia, a -geneticist, took part in some meetings and was included in the documents that the PCGM produced. Dr. Lopez, another geneticist, was part of the scientific team since the early lobbying process. Artemio Cruz was in charge of lobbying and occupied top positions for almost 8 years within the epistemic community but has now broken his ties with the network. He still works in the political realm, and he would not mind using his name in the research. Nevertheless because of the complicated nature of his involvement in the field, and the nature of his declarations, I prefer to maintain his confidentiality.

epistemic community: the creation of a Mexican Institute of Genomic Medicine (INMEGEN) had to be defended on the grounds of the rational use of scientific knowledge in order to improve the quality of life of the population (CPMG, 2003). That said, it does not mean that all the statements presented in public forums, the associated risk and promises, or the economical and social projections of genomic science, were accepted by all of its members. As a matter of fact some structured interviews with scientists at the time show a reluctant embrace of genomic medicine and the promises of Mexican scientists and medics (Oliva & Schwartz 2009).

3.2 INMEGEN: cultivating political will at the crossroads of the democratic transition

Situated in the biotechnological and medical heart of Mexico City, The Mexican Institute of Genomic Medicine (INMEGEN) occupies a controversial and unique position amongst the other National Institutes of Health. As the first institute to be negotiated inside the Mexican congress[77], it was perceived as a product of the democratic transition; one of the first examples of modern government and modern medicine dancing together. The newborn institute was undoubtedly a child of budding Mexican democracy, and the first open and public exercise of Mexican legislators dealing with human genomics.

In 2000 Mexico was experiencing the so called democratic transition: after more than 70 years of one party rule a candidate of the opposition won the presidential elections. Since the aftermath of the Mexican revolution, the Partido Revolucionario Institucional (PRI) had not lost an election until the 2nd of July of 2000 when Vicente Fox Quezada, candidate of the Partido Acción Nacional (PAN) won the elections. Nevertheless, ideas and policy are not created in a political or cultural *tabula rasa*. Rather they are built on previous notions of a national common identity, in order to be comprehensible and resonate in even the most seemingly new contexts. Ideas, such as the defence of a unique Mexican heritage against a scenario of foreign colonisation, have been around for a very long time. Examples can be found in science projects, such as those related with biodiversity and bioprospection (Hayden 2003), and also in historical debates on the racial and political identity of Mexico (Basave Benitez 1992).

[77] The previous institutes of health were directly created by a presidential decree, and no parliamentary discussion was necessary, since it was a one party rule. Nevertheless, the need to convince political audiences in order to support the creation of institutes has always been part of the process.

The defence of a Mexican Genome reverberates with the commitment of Mexican post-revolutionary governments to defend Mexican independence and sovereignty. If we contrast the (seemingly) open debate with the lack of transparency associated with the financial scandal around the construction of INMEGEN´s building, we have a scenario that many of my informants refer to as "old regime practices", or the "System". Even though the INMEGEN has been the child of new and old political practices, its addition to the constellation of Mexican National Institutes of Health (M-NIH) definitely opened a new field of governance and scientific practice. Trapped in between Mexico´s tough democratic transition, the INMEGEN stands alone as the spearhead of a new type of public health institution; an institution that mixes science, medical care, business, and socio-political responsibility[78]. The shift from a notion of health solely related to medical expertise and patient care to a wider sphere in which the political and social implications of new scientific knowledge is addressed as well.

Such an unusual mixture is made evident by its organisational design and the strategic areas it wants to influence. It is the only National Institute of Health in Mexico, which has a Business Incubator, a Science Communication Department, and an Ethical, Legal and Social Issues (ELSI) centre in the whole country (apart from its various genomic laboratories; see: Jimenez-Sanchez et.al 2002 a, b, c; 2005;2008). The idea to concentrate the social, medical and scientific expertise in Genomics in one M-NIH, also serving as a horizontal link between different M-NIH research projects, was the product of mixing Brazil´s (networked) and China´s (centralised) models of genomic research (IFS 2001).

INMEGEN´s novel organisational structure (especially its ELSI department and Science communication area) pay homage to its institutional commitment to become an open and public centre of reference in topics related to human genomics. INMEGEN promised to nurture

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[78] "Corruption has long been considered a characteristic feature of the Mexican political system. From the payment of the *mordida* (literally 'bite', used to refer to lower-level bribes or extortions) to police or bureaucrats, or the purchase of an *amparo* (a type of injunction) from judges, to the pocketing of millions by high-ranking government officials, contemporary Mexican history is full of scandals and anecdotes, high-level purges and scapegoatings, and nicely orchestrated anti-corruption crusades. Scores of surveys, press reports, official investigations and politicians' sound bites reveal the scope of the practice; other studies unveil corruption's ability to foster distrust and nurture public cynicism. As one observer noted, 'Corruption is not a characteristic of the system in Mexico . . . it is the system' (Morris 1999)".
For my informants the "System" is ubiquitous and is mostly related to cultural patterns of transaction and tacit norms, which constitute the type of social reality and political system, lived in Mexico. Not only related to corruption, but also with intrigues at the micro level, disputes between scientists and even deep seated beliefs on racial identity, discrimination and why "the country has not been able to grow or prosper". I will elaborate more on this when I touch on the topic of Mexican civic epistemology (this chapter, and more thoroughly in chapter 6).

genomics not only in medical terrains but also around its socio-political implications. INMEGEN and the INSP are the only two Mexican Institutes of Health, (M-NIH) which do not have a hospital wing[79], but the INMEGEN is the only M-NIH which has made its commitment to public understanding of science and ethical regulation part of its core institutional values and organisational structure.

3.2.1- Engaging with possible objections: a new policy object takes shape

INMEGEN´s creation was accompanied by the promise of producing an economy of knowledge, which would exploit a national genomic patrimony. Epistemic entrepreneurs presented a future ruled by a more rationalised medicine, which in turn would assure Mexico´s leadership in human genomics. Mexican congressmen gave 120 million USD to create a national centre of excellence devoted to research in the medical applications derived from the sequencing of the Human Genome. Compared with the Indian Genome Variation (IGV) project (20 million USD), and the Thailand Centre of Excellence in Life Sciences (TCELS) Pharmacogenomics Project, (3 million USD), INMEGEN is one of the best funded in the developing world (Seguin et.al. 2008).

Getting to negotiate inside the Mexican congress was the product of a long informal process of lobbying with academics and policy making peers, bureaucratic bodies, health authorities and all kinds of groups interested in genomic science. Documents available from this initial period are scarce and remain scattered around many desks; except for the published articles, which are a synthesis of the most relevant premises of the IFS (2001)[80]. In the previous section the networking of the public figures that negotiated genomic medicine was briefly described, their bureaucratic ties and their organisational efforts contextualised. Nevertheless we are still missing

[79] Nevertheless it was projected to work with hundreds or even thousands of patients each year or at least their blood, saliva or any other biological sample. The horizontal design of the INMEGEN was thought to become a central aid in the development of the genomic research agendas of the other national institutes of health.

[80] See the published articles of Jimenez Sanchez, from 2002 to 2005; the extremely redundant statements in the articles make it simple to follow the basic rhetoric of genomic medicine in Mexico. The epistemic entrepreneurs made 3 articles for the specific purpose of communication and lobbying, see Jimenez Sanchez, Valdes Olmedo & Soberon 2002a, b, c. To get hold of the Feasibility Study was a deed, it was not available in the institutional library, which was still organising its material and did not have a copy of the study. Such secrecy for a document of public relevance is strange. I finally got a copy of the study from one of my informants who casually held the version used in the congressional negotiations in his personal archive, and was kind enough to make a copy for me.

the "epistemic" substrate of this policy network. Such substrate lies in the promises advanced, and the assumptions of causality circulated in the public realm: basically the Mexican Congress.

Through their continuous engagement with policymakers and strategic audiences epistemic entrepreneurs had the opportunity to survey opinions on their project, and the possible objections that could be raised against them (CPMG 2003). After the first couple of years of promotion (1999-2001), epistemic entrepreneurs identified that they had to face two challenges: the first one was to show that genomic medicine was not a high-end enterprise, meaning that it could be directed to address the country´s most pressing health needs regardless of socioeconomic status. On the other hand they had to convince decision-makers not to free-ride (to use rational choice language) on the emerging scientific field that was globally framed as an international public good (Frenk Mora 2001; UNESCO 1997).

They confronted these two problems by designing and implementing a communication strategy directed to show their audience (congressmen) that those objections were not strong enough to stop the construction of a national centre on medical genomics. The way to link these two issues of debate was by postulating the existence of a "National Biological Uniqueness" or "Mexican Genome". For those daring enough to take these ideas further —epistemic entrepreneurs— there was an evident relation between a Nations´ ethno-racial[81] identity and its genetic structure, which could become a national resource or another opportunity that simply goes by. Even worse if nothing was done to create the INMEGEN, the Mexican Genome that could become a national resource and public good, would now endanger national security, increase the economic and sanitary dependence of Mexico, and open the class/health access breach inside the country (see: Canal del Congreso 2002 b; NRC 2005; Jimenez Sanchez 2002 a, b, c).

Even though this was a bold argument to throw at public debates, especially because of its racial claims, during the negotiations to create the National Institute of Genomic Medicine in Mexico (INMEGEN) there was simply no discussion about the biological reality of race or ethnicity (1999-2004). This lack of debate does not indicate an explicit public agreement amongst Mexican scientists on the biological truth or falsity of race. It is better explained by the conjunction of two decisive factors: The first is that during the negotiation to create this institution, the main political concern was cloning (ACI, 2002; see section 3.4 this chapter), and not racism or biological reification. The second one is that the political framing of population genomics in Mexico took

[81] Following Brubacker (2009) I find it difficult to draw clear boundaries between race and ethnicity, so I prefer to use ethno-racial in general and vernacular grounds.

advantage of an already accepted and popular notion of biological and cultural Mexicanhood: Mestizaje (Lopez-Beltran & Vergara 2008; Schwartz and Silva Zolezzi 2010; Chap 1:1.1).

3.2.2 A new policy object: epistemic entrepreneurs and public speech

The initial statements of a public speech about Mexican genomics began almost always the very same way. Dr. Gerardo Jimenez would inform his audience about human genomics and its medical applications by slightly changing a scientific script that was repeated in all and every one of his seminars directed to congressmen, general public or businessmen (see: Jimenez Sanchez in Canal del Congreso 2002 a, b, c; 2001; 2003 a, b; 2004; Academy of Sciences 2009; Mexican Senate 2009). Repetition became the name of the game:

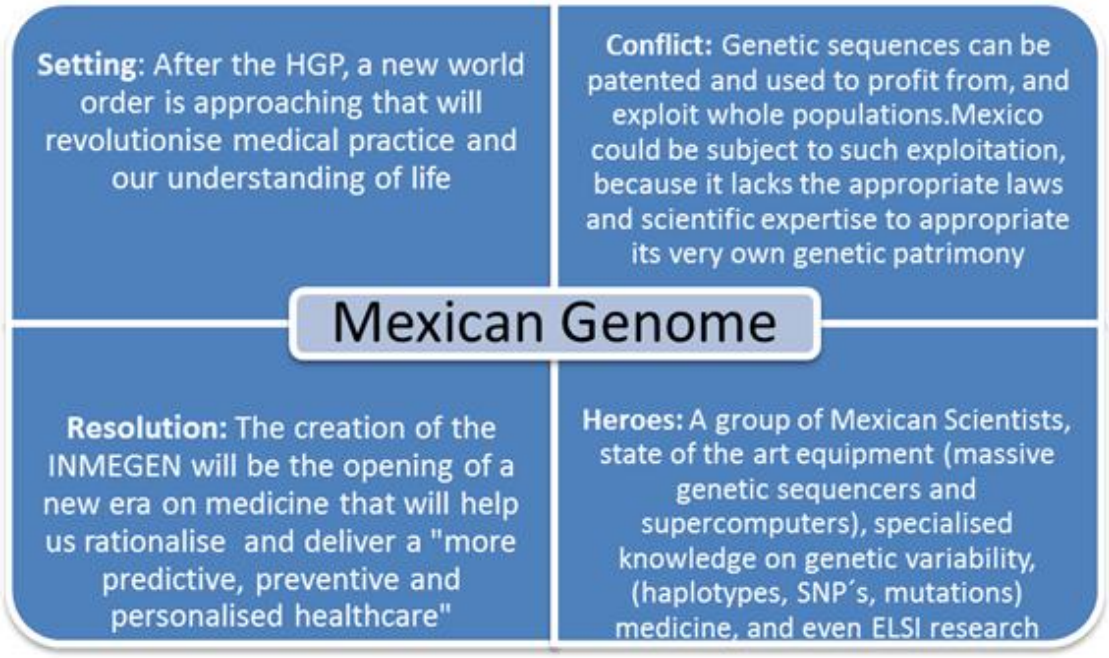
> The human genome is to humans the equivalent of a computer operating system. It consists of 3.200 million nucleotides that are known by their initials: adenine (A), guanine (G) Thymine (T) and cytosine (C). It is estimated that the chain is close to one and half meters long. It lies compacted at the nucleus of each of the trillion cells that make up the human body. With the Human Genome Project (HGP), man managed to decipher the precise order of all the letters of the human genome and produced a map that locates the near to 26.000 genes housed in the genome of its own species (Jimenez and Taracena 2005).

Afterwards Dr. Jimenez would state that human beings share about 99.9% of their genome, and that differences between individuals are due to changes in the sequence of letters in this string. He emphasized that the 10 million Single Nucleotide Polymorphisms (SNP´s), that he commonly compared to spelling errors splattered throughout the human genome, and its possible combinations by far exceed the living humans on earth. Then he would immediately present the congressmen with the importance of SNP´s in the development of biological individuality, and the strong relation between genomic variations and a predisposition to develop diseases such as obesity, diabetes, hypertension, and cancer, among many others (Canal del Congreso 2001 a, b; 2002 a, b c, d).

"The interesting part for the legislators..." as Dr. Jimenez himself would announce (Canal del Congreso 2002 b), came after they all spoke the same language, the concept of SNP´s and genetic variability was known by all those present in the conference, and now it was time to explore population genomics. The next step was to apply the recently received knowledge from heredity in families and their genetic/phenotypic similarities, and move it to the realm of populations (in this case meaning nations): "...the same way the human genome is inherited from parents to offspring, inheriting physical traits that make our children look like us, the same

happens at a global scale, creating the likeness between a population, reflected in races (Jimenez-Sanchez in Comisión de Relaciones Exteriores 2003)". Epistemic entrepreneurs mobilised the idea that in Mexico such likeness was a product of a history of ethno-racial hybridisation mostly framed as the encounter of Spaniards and indigenous groups, approximately 500 years ago (Jimenez-Sanchez 2002 a, b, c; Jimenez in Guerrero Mothelet and Herrera 2005). As a consequence they postulated the existence of a unique genetic structure shared by Mexicans —i.e. the Mexican Genome—. Around this new object of interest, they built a narrative that underlies many of their communication endeavours.

Figure 3-A- Mexican Genome: a new policy object



The redundancy of many of these statements (Figure A) in different venues made the rhetoric of Mexican genomics consistent, and addressed the two arguments raised against genomic medicine with one apparently simple and straightforward proposition: Mexicans possess a unique genetic heritage, which could become the platform for a new conception and practice of health tailored to the country´s ethno-racial composition. The postulation of the Mexican Genome was then a good argument against free riding; or thinking the Human Genome is simply a global public good, from which all countries and individuals could benefit (also see: Frenk Mora 2005). The next piece of the discussion summary of the International Relations Commission of Mexican Congress (2003) illustrates the argument more fully:

> This means that we will not be able to import the findings and genetic knowledge produced for other populations, since the variations of the human genome in other regions of the world are different. For this reason, the genes that make us susceptible to diseases such as diabetes, hypertension or stroke, including infections such as HIV or hepatitis, are not compatible with SNP´s in other regions, hence the importance of detecting through research studies, what are the characteristics of

> different loads of SNP´s in people; in order to ground this information in good projects for the preservation of Mexican´s Health (Jimenez Sanchez in Comisión de Relaciones Exteriores 2003: 3).

Through INMEGEN´s creation Mexico would now be able to compete in the international bioeconomical regime, protecting its genetic heritage and National sovereignty. In a similar fashion it would help close the sanitary gaps inside the country. The economical projections on the impact of genomic medicine in health care, helped genomic entrepreneurs to exemplify the reach and benefits of researching the Mexican Genome. Epistemic entrepreneurs calculated that the implementation of genomics in public health care could reduce by "... 36 % of the cost of diabetes and hypertension in the country in the coming 25 years (Feasibility Study 2001; Reporte CPMG 2002: 65; also see Chapter 6)". In numbers this was 237 million (USD), compared to the proposed cost of the INMEGEN at the time 172 million USD, it seemed to be a good investment.

Already the idea of bringing into being a new science based on the knowledge of populations, their demographic history and their uniqueness, resonates with the founding idea of a Mestizo nation; which is the product of the cultural/reproductive encounter of the Spaniards and the indigenous communities (needless to say this is the most simplistic approach to Mexican origins). The universal and unitary features of Mestizaje, and the claim that more than 80-90% of the country is of admixed ancestry automatically addressed the second possible anxiety, the one about the epidemiological applicability of genomic knowledge in national public health care: "...a medicine for Mexicans, by Mexicans (Jimenez Sanchez 2009a)".

By creating the INMEGEN, congressmen would assure that this techno-science would be used for public service, instead of being appropriated by "unscrupulous" private corporations that would tamper with what is most sacred for human beings: "...the idea is to protect , with this, nothing more, than what is more intimate, which is the genetic heredity, from the aggression of the exterior; by racist groups and mad personalities, or multinational entrepreneurs without scruples, ready to savagely speculate with the most sacred of the human being: its genetic heredity (Patiño in DOF 2001a)". The partial connections between a population and its biogenetic uniqueness reveal the impossibility to import this knowledge from any other country, as well as the moderated feasibility of using the same technical knowledge in order to map other Latin American countries having a similar demographic history (Jimenez-Sanchez et.al 2002; 2005; IFS 2001). This strategic uniqueness dwelt in a fundamental ambivalence which was able to reinforce a nationalistic and an internationally expanding discourse at the same time. In this way a large scale genotyping project becomes not only the platform for a new medicine, but strategies to protect national security, and even become an export product (millions of Mexicans and Hispanics living in USA, apart from the huge Latin American Market).

3.3 Genomic Sovereignty: Boundary Object

> *We have even coined the term genomic sovereignty, the countries that are being left behind will lose their genomic sovereignty, others would come to study their populations and later they will come to sell them this knowledge, because the medicine of the future is going to be a medicine based on the knowledge of the human genome... (Frenk-Mora, 2004)*

The origin of "Genomic Sovereignty" remains somehow veiled in mystery and vagueness. Some of those that worked in the CPGM, such as Dr. Irma Silva Zolezzi (Human Genomicist), think that it was an adaptation of the arguments put forward to defend indigenous genetic heritage and tribal knowledge in meetings at UNESCO or the OCDE (field notes 2008)[82]. Dr. Soberon and Dr. Jimenez both agreed that it was a response to changing international circumstances, and what could become new pathways of inequality: "Well this concept came... in fact from the international debates, because there was the preoccupation that this knowledge could be occupied by those that had the opportunity to use it, the owners of the money; and that they could use this information for their particular interests (Soberon int. 2008)."

Even some of those amongst the ranks of epistemic entrepreneurs, like Dr. Martucelli (Pseudonym) who was coordinator of one of the CPMG´s committees, was not aware that such a concept was crafted in Mexico: " ...That is the way we are going to have an impact on the world, by producing culture, like this concept of Genomic Sovereignty... you know, I did not know we were the first to talk about it, until Dr. Seguin´s talk (part of an informal chat, Mexican Senate, 9th of March 2009)." Others, like Artemio Cruz, pronounce for themselves a more cynical perspective: for them Genomic Sovereignty was a selling strategy that happened to work really well inside Mexican Congress: "... nobody knows what the hell sovereignty is, but everyone loves the term in the Congress... but they know even less about genomics, except that it will cure all diseases... when you put them together you have a concept that sells massively (Cruz 2010)". The vagueness and mysterious qualities of "Genomic Sovereignty" were precisely the characteristics that granted the concept its practical import in the policy innovation process. It worked both as a vehicle to shape diverse interests, and as a way to map the terrain being covered by genomic medicine in Mexico, without necessarily implying consensus between different actors. In Social worlds and STS literature, vagueness is a constitutive characteristic of boundary objects (Star & Griesemer 1989: Clarke and Star 2007; Star 2010) An example of a boundary object in biology could be the concept of the species "This is a concept which in fact

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[82] On the topic of bioprospection or biopiracy see Cori Hayden´s (2003) When Nature Goes Public: The Making and Unmaking of Bioprospecting in Mexico, Princeton University Press.

described no specimen, which incorporated both concrete and theoretical data and which served as a means of communicating across both worlds (Griesemer and Star 1989:410)"

Rather we should explore the possibility that interests, ideas of causality and principled beliefs are crafted at the same level, and in the same set of practices (negotiations) as any other knowledge, including parochial (local) interests. If we give scientific knowledge a different epistemological status than vernacular or "parochial" knowledge, we will miss the fine grained tools that STS scholarship can bring to the analysis of policy and governance. So the fundamental question to ask is not how to include parochial knowledge into a universal framework, but what counts as parochial or expert/universal knowledge in the first place (Jasanoff 2003; 2005).

In the Mexican case, no one —and especially not scientists— could bring to the table any scientific paper, graph or any kind of genomic study, to support their claim of the existence of a Mexican Genome; first and foremost because a genomic study of admixed populations was exactly what they were trying to launch. In 2001 when the first statement on Mexican Genetic Uniqueness appeared on a written document (IFS 2001), the HGP was not even finished; by 2002 when the "Mexican Genome" appeared in a public document (the IFS has remained out of public scrutiny), the HGP data was still not available to produce any genetic comparison, not even a very general one. Nevertheless epistemic entrepreneurs could publish the next phrase without generating a scientific or political controversy:

> Mexico has a population of *unique* genomic makeup as a result of its history. As of February 14, 2000, Mexico had a total of 97,483,412 inhabitants, occupying the 11th place among the most populated nations on earth, with an annual population growth rate of nearly 1.58%. The vast majority of the Mexican population emerged from a mixture between Meso-American native groups and Spaniards (Jimenez-Sanchez 2002a: 32, emphasis added)

The conflation between Mexican national identity, racial admixture and population genomics research; a reification which Dr. Silva Zolezzi[83] and I have previously denominated as "Mextizaje" (Schwartz and Silva-Zolezzi 2010) reads history and genetics as if they were exact mirrors of each other. Racial and cultural admixture —Mexico´s foundational narrative— is supposed to provide the country with unique genetic variability: The Mexican Genome. The novelty of population genomics is then enrolled as part of a long chain of historical events that sprung from the very foundation of the Mexican nation as a new biological and cultural entity. In the words of Bruno Latour (1987), the dissident reader, scientist, or congressman would now have not only to

[83] Dr. Irma Silva Zolezzi is the first author of the Mexican Genome Diversity Project, and was one of my key Informants and sponsors during the 2 years of fieldwork in the INMEGEN, and the approximately the 20 months I spent in and out the Population Genomics Laboratory.

fight against the weak statement of an isolated actor claiming the existence of a Mexican Genome, but against the armies of historical records that give account of the intermarriage of different Castas in the New Spain, and the national project of *Mestizaje*.

Before getting too excited with military metaphors and trials of strength (Latour 1987) we have to remind ourselves that this is not the story of one fact claim that becomes gradually strengthened as it enrols different human and non-human allies in its network. This is the story of a network (CPMG) that wants to work out how to avoid trials of strength and confrontations in order to generate a space, a propitious political and scientific environment, for medical genomics and the projection of a particular vision of the future. The power of genomic sovereignty, as of many objects, lies in its ability to pass unnoticed (Miller 2009); in the case of the policy innovation process, that is exactly what happened with the notion of genomic sovereignty.

In the 18 months of lobbying in the Congress, one of the few cautious legislators that questioned the existence of a Mexican Genome was Senator Miguel Herrera[84]. His cautious and respectful interrogation was dismissed when he questioned "Genomic Sovereignty", and "if the scientific community dedicated to genomic medicine contemplated the migratory phenomena in all continents, that have augmented the size and number of admixed populations in the world (Comision de Relaciones Exteriores 2003)". Dr. Cano Valle, a public bioethicist and prominent neumologist, dismissed the Senators' questioning, not based on the authority of genetic research demonstrating the unique patterns of molecular variation in Mexicans. On the contrary, Dr. Cano Valle thought that "State policies with a demographic perspective, were outdated and surpassed (Anon (2003) in Comision Relaciones Exteriores: 7)". So then why did Dr. Cano Valle not fuelled the interrogations against Genomic Sovereignty assumptions "...if they were updated and surpassed"? Mainly because the topic of the meeting was to ratify international instruments on important bioethical matters (Oviedo´s Convention and Paris Protocol), and secondly because Genomic Sovereignty included "different elements and propositions" from those questioned by Senator Herrera "...that needed careful thought and evaluation (Cano Valle in CRE 2003)".

Critiques made by various genetic scientists, who were amongst the supporters of the CPMG, interrogate the existence of a "Mexican Genome" and its sovereign protection in a much more straightforward way. Dr. Sofia, geneticist and top scientific official, said that Genomic Sovereignty was a complete fallacy "I don´t have a single Mexican gene, they are all Portuguese, but I am still

[84] Probably this was the only public questioning of Genomic Sovereignty and its assumptions (that left a written trace); such as the existence of the Mexican Genome and the uniqueness of the admixed Mexican population.

Mexican (Interview 2010)"[85] Dr. Elias, former head of the CPMG ELSI committee, and now open critic of INMEGEN´s discourse, elaborates on his critique more thoroughly:

> Genomic Sovereignty is an oversized exaggeration... of, of ... that a country... geographically, politically represents a different genome... from the rest of the world, like if we were a different species, and no, we are of the same species!! Politics, that is the one that made countries... is casual, aleatory... it has nothing to do with the structure of genes, genomic sovereignty, is a much exaggerated concept [...] it is too nationalist without any real backup (Elias 2008).

Nevertheless, Dr. Elias had nothing to say when Marcia Muñoz, Bioethicist and Legal Scholar in charge of INMEGEN´s ethical and juridical framing (sharing the podium with him), argued in favour of protecting the Mexican Genome. She was committed to explaining to the policy making audience the importance of appropriate legislation on human genomics, and the relevance of creating the INMEGEN:

> ...you saw the potentiality that lies in the Mexican population, because of its indigenous origins... as genomes are more concentrated, they possess more research value... Mexico has to define the profile of its populations and also of its values... if there is not an appropriate legislation imagine what would happen if a laboratory came to patent that knowledge and take it to other places, getting away also with indigenous genes... when science advances legislation is needed (Muñoz in Canal del Congreso 2002 a)

Dr. Elias and Marcia Muñoz were amongst the public academics promoting INMEGEN´s creation; one of them promoting the uniqueness of Mexican´s genetic structure and its potential value, and the other deeply critical of the statements mobilised in order to claim the existence of a Mexican Genome; yet both of them cooperating in order to create a new M-NIH. We would have to say that Dr. Elias and for that case Dr. Sofia—since she was amongst the scientists that signed the IFS— are cynics and have failed to stick to basic scientific ethical principles of public truth telling. Such a statement would portray them as calculating rational actors and interests dopes at the same time. When I interviewed Dr. Elias I showed him some of the documents in which he was personally backing the idea that the creation of the INMEGEN[86] was a question of national sovereignty:

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[85] I will like to point out to my readers that even when the reification of Mexicanhood, is the object of critique, Dr. Sofia happily reifies Portuguese national genetic identity.

[86] I would not like my readers to think that I bullied my interviewees with their own quotations, in order to prove them wrong or make evident they were lying or something like that; I just happened to have those documents in my bag as part of my interview preparation. So when Dr. Elias heavily criticised the notion of Genomic Sovereignty, I thought it would be very interesting to know in what ways he was supporting the concept before. My interviewee did not remember (or did not want to admit) his previous involvement with such conception, it was in that moment when I showed him some of his previous interviews with Mexican mass media.

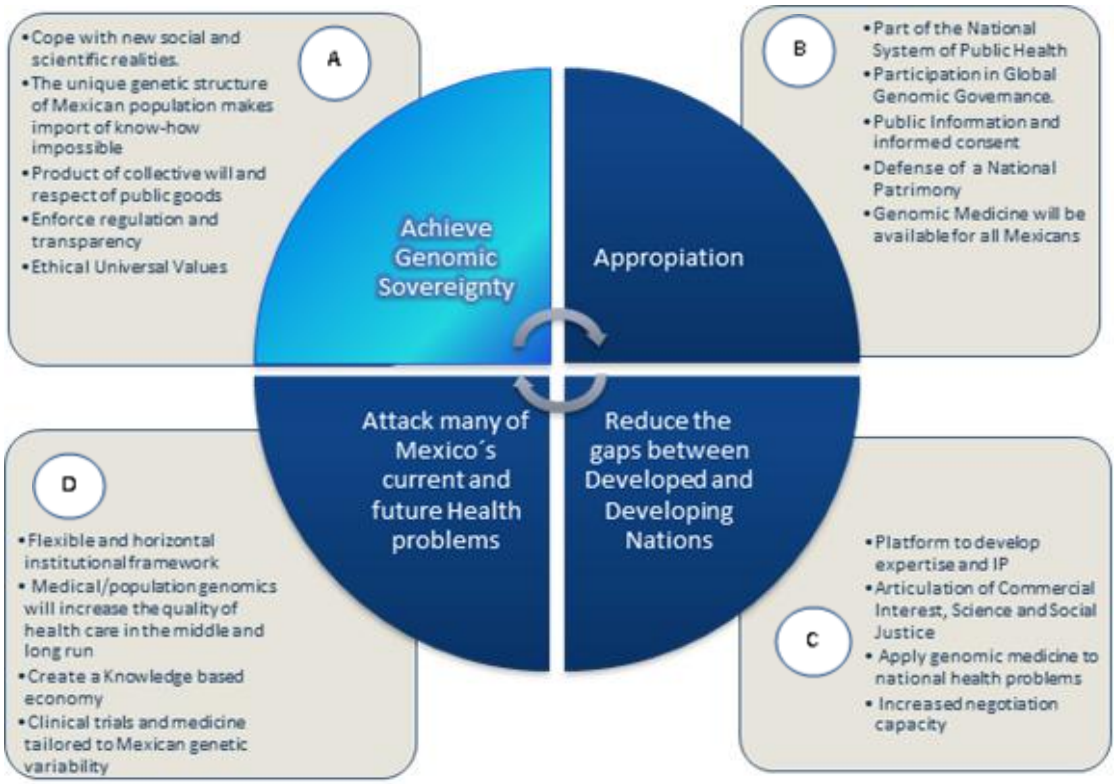
> E.S. here you say that: if we don´t get involved, and start producing medicines and vaccines they are going to come and sell it to us at the price and with the conditions they like [referring to the creation of the INMEGEN and the risks for national sovereignty]
>
> **Dr. Elias**: Oh well that is another thing... that is not sovereignty of the genes, that is sovereignty of economics and production... if we buy everything they will sell it at a very high prices, if we are not working in the cutting edge... if some product is derived from genomic medicine, and we don´t work in the area, we won´t be able to take advantage of it...medicines are not invented here, they are all imported... local medicines are very few... amongst the very few that were developed here [Mexico] were the steroids by Syntex... but the only ones who benefited from that were Syntex (who shortly after discovering steroids moved to USA), and not Mexico... not the farmer cultivating...not the Mexican people...

This example is telling in many ways more interesting than just reading him as a selfish rational actor: of course incentives and material gains play a part in policy making; scientists and many types of experts need money to make a living and keep alive many of their knowledge/profit endeavours. Social worlds are also subject to their own local stories and aspirations. One of the most persistent, especially for the medical and scientific elites in Mexico, resides in the awareness that most of the very little innovation happening in the field of biotechnology in Mexico has not become a public good. It is no coincidence that medics and scientists have historically being amongst the most politically active professional communities in the country, the curriculums and current activities of genomic entrepreneurs are a living testimony of such a policy oriented vein (see: CPMG 2002; Frenk 2009).

3.3.1- Ideal types, Policy Innovation and the coordination of interests

Once boundary objects are appropriated by different social worlds, new properties or policy strands might emerge that allow them to multiply the processes of translation, helping to define clear interests in highly uncertain scenarios. In the Mexican case entrepreneurs were able to interest critical geneticists and sceptical groups not because of the "factness" of the Mexican Genome, on the contrary the reality of the new policy object was fragile; it was the vision of a more sovereign (meaning independent) science and bioethics that inspired many of the members of the epistemic community. The terrain mapped by Genomic Sovereignty and the creation of the INMEGEN had something to offer to scientists, bioethicists, lawyers and legislators, who for the time being would cooperate in order to create a new M-NIH (see Figure 3-B).

Figure 3-B-Genomic Sovereignty an Ideal Type



[87](Graph made by the author)

Genomic sovereignty is vague, its work was not to start disputes with any of the interested audiences, or show its veridical properties. Its function was to make possible a particular political landscape, in which past (National history) and future (Knowledge economies) could meet, and as a consequence a new patrimony that lies in the genetic makeup of the Mexican population could be appropriated. It belongs to the type of boundary objects described by Star and Griesemer (1989:410) as ideal types:

> This is an object such as a diagram, atlas or other description which in fact does not accurately describe the details of any one locality or thing. It is abstracted from all domains, and may be fairly vague. However, it is adaptable to a local site precisely because it is fairly vague; it serves as a means of communicating and cooperating symbolically—a 'good enough' road map for all parties

But even in the cases of a "good enough" or "fairly vague" map for scientists, policymakers and congressmen, who can tailor the boundary object to fulfil local needs and interests, certain parameters and fixed points of departure exist in order for it to be readable. To read this map we have to locate two fixed points that would guide the user: 1) The existence of a Mexican Genome, and 2) the belief that in the new economies of knowledge, genetic knowledge would be

[87] This is a visual summary and representation of the different propositions and promises circulated by the epistemic community in their lobbying efforts from 1999-2004. I have produced this graph based on the public documents of the CPMG, and the Feasibility study.

commoditised and appropriated by whoever is able to uncover the molecular patterns of populations. Genomic Sovereignty enacted a vision which was able to integrate multiple objects, some of them deeply controversial, like the Mexican Genome, and arrange them in such a way that instead of a total contingent future, it presented us with possible scenarios amenable to be regulated and discussed: "...boundary objects are a sort of arrangement that allow different groups to work together without consensus (Star 2010)".

3.3.1.1-Biomedical world

This ideal type worked as a bridge between different social worlds and even inside social worlds. For the medical/scientific community the creation of the new M-NIH could open the possibility to compete in a new economical and scientific field: Medical Population Genomics. It was also a link between the work of geneticists and medics interested in population genetics since the 1950´s (mainly Clara Godorezky and Ruben Lisker), and the novelty of Medical-Population Genomics after the HGP; represented by a new generation of Human Geneticists like Dr. Irma Silva Zolezzi and Dr. Gerardo Jimenez. For geneticists and medical doctors who did not share the enthusiasm about the Mexican Genome, the promise of emancipation from what they thought could become a new technological servitude (Figure B: quadrant C & D), was good enough to let some nationalistic rhetoric circulate in the Congress. In order to communicate with strategic lay audiences as Legislators "... Gerardo Jimenez said what he had to say (Dr. Elias 2008)"[88].

3.3.1.2- Bioethicists and Legal Scholars- Genomic Right

For the much reduced group of bioethicists and legal scholars involved in Genomic medicine, the new boundary object meant addressing problems derived from the 3rd generation of Human Rights that were poorly debated at the moment. On the other hand, Sovereignty also provided a bridge to old theoretical problems of jurisprudence and political philosophy. As an example, the first time I interviewed Volkovak, INMEGEN´s main ELSI researcher (who would later become one of my main Sponsors in the field), he stated that genomic sovereignty was a social contract in which genomic medicine becomes part of the public goods available to the Mexican Population (Volkovak Interview paraphrasis 2008). The new policy object would also become a domain in which legal scholars could address international academic trends and objects such as: Population Genomics Biobanks (P3G), Informed Consent, Patrimonial Doctrines and Science and

[88] At the moment I have not interviewed any dissident of the CPMG or critical voice that does not recognize the rhetorical skill of Gerardo Jimenez many of them imply or overtly say, that the best way to communicate with Legislators (mostly ignorant of science) is by making the science accessible or even by inflating promises.

Technology policy. In Mexico this realm is looking for professionalization; as such the creation of the INMEGEN and with it a whole new area of debate and regulation (Figure B: quadrant A & B) was a goal worth pursuing. The work of this social world has been of strategic importance to the new policy field.

3.3.1.3- Policy Making Specialists

In an interview with Dr. Frenk Mora (2009), former Mexican Secretary of Health, he talked of Genomic Sovereignty as a way to counter the international biological appropriation and the indiscriminate patenting of nature: "...I am personally against the patenting of genetic sequences". The way in which he personally and as a Secretary of Health understood genomic sovereignty "...had nothing to do with trying to control the biological material of Mexicans" it was in his words a strategy to provide nation-states (particularly Mexico) with "more degrees of freedom to foster and protect its populations health".

When Dr. Gerardo Jimenez Sanchez, the principal negotiator of INMEGEN, introduced the concept of Genomic Sovereignty to congressmen he thought that it would be difficult for them to grasp the idea: "...in those days [2001-2002] the topic of genomic sovereignty was very abstract...to come to Mexico to talk about it, or about genomic dispossession, you had to be a connoisseur of the law, of sovereignty, of all these things, to catch that there was something there of substance., and they [legislators] recovered it..(Jimenez-Sanchez Interview 2008)" To Dr. Gerardo Jimenez' surprise a few months after his first meetings in the Mexican Congress legislators from the Committees of Health and Science and Technology had completely endorsed and translated the notion of Genomic Sovereignty.

Legislators emphasised the risk dimensions inherent to the notion, assuming their role as regulators in order to avoid these risks: "...what is most preoccupying is that such knowledge could be manipulated, concentrated and monopolized by a few enterprises or governments. And that is why research in this area is a question of national security (Patiño in D.O.F 2001)". Even the openly cynical Artemio Cruz had mapped his relations with the field of genomic medicine through the 2 fixed cartographic points of Genomic Sovereignty. He would question the reach and applicability of the protection of the Mexican Genome, on the grounds of its lack of enforceability (since there were plenty of indigenous samples in foreign countries), or the minuscule budget of the INMEGEN when compared to American projects (120 million USD against Billions of Dollars), but not the 2 basic premises of Genomic Sovereignty. When I questioned the existence of a Mexican Genome, he was visibly uncomfortable and replied: "No, no, no you are wrong there are unique genetic variations in Mexicans.... (Cruz 2010)"

3.3.2- Mextizaje and its International circulation

The conflation between the Mexican national identity and the Mestizo ethnicity, grounded in genomics (Mextizaje), has travelled with relative ease among the mass media (see: Chapter 7), Mexican Congress, and through international genomics and policy health related networks. One example of such international circulation can be found in a declaration of Dr. Edison T. Liu, President of the Human Genome Organization (HUGO), the day after the massive media announcement of the Mexican Hap Map in 2009: "This work by the INMEGEN group is important both for the scientific content which can be used to direct personalized medicine in Mexico, but also for its sociologic impact in defining the uniqueness of Mexico's genetic heritage (Press release may 12, 2009)".

Undoubtedly the peak of Genomic Sovereignty as an ideal type in the international scenario was achieved when it was made a category to cluster medical genomic initiatives in the developing world (Seguin et.al 2008). A group of policy oriented academics in the McLaughlin-Rothman centre in Canada making a comparative study between Thailand, India and Mexico immediately identified Genomic sovereignty as a transnational category. This category could be helpful in explaining the forces behind medical genomics research in developing countries:

> Three of the case studies, Mexico, India and Thailand, focus on six major cross-cutting themes: political will, institutional leadership, local health benefits, genomic sovereignty, knowledge-based economy and challenges. Together, these themes represent a 'taxonomy' of driving forces towards the adoption of genomic medicine in emerging economies... (Seguin et.al. 2008)

Not only did the authors of The Nature Review Supplement made the notion of Genomic sovereignty an international "taxonomy", they were also happy to leave the question of Mexican genetic uniqueness unexamined (Seguin et.al:S5-S6). Another example of the lack of questioning around the concept can be found in Francis Collins, who was amongst the international supporters of INMEGEN. His declaration, when questioned about the racial propositions of the Institute, was: "Gerardo knows the challenges of using race as a research variable…which is why they are working hard to identify the ethical, political, legislative framework that needs to be put in place before the project even begins" (Francis Collins in Guerrero-Mothelet & Herrera 2005). The branding of a Mexican Genome existed, until the fall of 2009,[89] without having any problems with the rejection of the scientific basis for racial categories proposed by HGP public scientists. This is mainly because one of the premises of Mestizaje is the disappearance of races, and many of those who embrace Mestizaje as a national and biological reality in Mexico think of it as rejection

[89]See chapter 5, 6 and 7.

of racial science (cf. Stepan 1991; and Altair in Chapter 4). Dr. Gerardo Jimenez himself would continuously state that one of the greatest findings of the HGP was the rejection of the reality of race, as such a concept is untenable because of the incredible genetic similarity that exists between any one human on planet earth (Jimenez Sanchez 2005, 2002 a, b, c, d; 2008, 2009).

3.4 The rupture of the CPMG

> *Precisely the creation of the institute has an enormous importance and that is the central topic, not the one about cloning!! Cloning has only been a distracter from the central debate; the central debate is that if we do not act right now, we are going to be left behind from the knowledge of the genome of the Mexican population, if we don't do it we are going to pay an incredible high cost (Frenk-Mora, 2004).*

The previous section intended to show the readers that consensus was not necessary for policy innovation. The aim of these closing sections is to delineate the ways in which boundary objects lose flexibility, and instead of becoming epistemological bridges they become arenas of dispute. This part of the story describes the practical limits to cooperation while negotiating the INMEGEN, but at the same time it addresses another question: What constitutes and epistemic community if not an epistemological consensus? Many boundary objects appear to be malleable and vague enough to be appropriated by almost anyone; nevertheless their limits are tested every time they find a new social world, or enter into a bargain or social transaction. In the Mexican case the limits of Genomic Sovereignty as a bargaining ideal type were found (1) when the Church entered into the public debate, and (2) when Genomic Sovereignty materialised itself as a punitive Code of Law. For the moment I am just going to talk about the first cause of rupture, since chapter 4 is devoted to the exploration of the so called "Law to protect Genomic Sovereignty (see: www.inmegen.gob.mx)" and its relation with the disbanding of the former epistemic community formed by the CPMG.

3.4.1- The opposition from the Catholic Church

The Mexican Prime Cardinal Norberto Rivera, as the head of a group of priests and the Catholic medical group, pronounced the Catholic Church against the creation of the INMEGEN. In a public note that appeared on the 10th of September of 2002 priest Jorge Palencia, in charge of the Catholic Commission of Health, said that the real intentions of the INMEGEN were to make legislation to promote genetic manipulation and the cloning of human beings. In the same public demonstration he added: "in order to create such projects in Mexico, great quantities of economical resources are required, which we well know are not abundant in our country nowadays, and even less in the health sector, that is why in order to achieve the objectives that

this project pretends, we would have to depend completely of the resources and policies of other countries" (ACI 2002).

The closing arguments of this informative note stated that since Mexico had no legislation on this matter, other developed countries that had already banned cloning wanted to exploit through this project the life of Mexican citizens; giving way to a new form of slavery and extermination in which developing human beings (embryos) were going to be sold to the States or private investors which had more economical resources:

> Selling the life of many Mexicans in their first stages of development, to those with more resources, their lives would be in the hands of scientists and technicians. "Mexico tries to build solid foundations for the interaction of citizens in the light of human rights, we oppose violence and the privation of freedom; but through this research project, human beings are considered as a product, which will be violently captive in laboratories, transformed into concentration camps for extermination"said the priest (ACI, 2002).

In a country where more than 80% of the citizens are Catholics (and the ruling party PAN is very close to the Church), the declaration produced by the Episcopal Mexican Conference had immediate repercussions in the House of Commons. The legislators promoted a prohibition against nuclear transfer and stem cell research, which was included in the law that created the INMEGEN:

> **Article 7 bis. -** The Institute of Genomic Medicine will have the next attributions: I. Develop studies of epidemiological, experimental and clinical investigations, including technological development and basic research in its specialty areas, for the comprehension, prevention, diagnosis and treatment of illnesses, rehabilitation of the affected ones, as well as to promote health measures; *those obtained by research on stem cells of living human embryos, or by nuclear transfer are strictly prohibited.*(CPMG 2003; D:OF 2004-Contains the final draft of the article)

These prohibitions on stem cell research and nuclear transfer mobilised a group of scientists interested in this research field which started their own lobbying process in a parallel way to the geneticists and politicians supporting the creation of the INMEGEN. For these actors the cloning debates were nothing but a distracter: "we said it was not in the agenda of the institute to do this type of research, which is true... but the scientific community did not accept this prohibition, what they did not like was the precedent...in this discussion we had the position that well... in our point of view... we did not care, what we cared about, was the creation of the institute (Soberon 2008).

Dr. Elias and many of the geneticists that publicly supported the creation of the INMEGEN inside the Congress were amongst the scientists that opposed the prohibition. Many felt really disappointed when Dr. Jimenez and Guillermo Soberon accepted the prohibitions of the Church; as a result they distanced themselves from the CPMG. The unilateral negotiation strategy of epistemic entrepreneurs mined the links between the creation of the INMEGEN and the emergent interests of the biomedical community. A by-product of this decision was to make Genomic

Sovereignty less of a communal map and more of a tool in the service of the "self-interested politicians" instead of the "astute scientists representing them —the biomedical world—". Medics, geneticists and bioethicists who thought that pursuing research on stem cells or therapeutic cloning could be in principle interesting, and in the future might even be of strategic importance for Mexico "... felt disillusioned (Dr. Sofia Interview 2010)" or even betrayed: "In my point of view I did not like that Gerardo gave power to the prohibiting article against cloning, proposed by the church!

For the three high ranking policy oriented actors and public voices of the CPMG (Dr. Jimenez-Sanchez, Dr. Soberon and Dr. Julio Frenk Mora) the prohibition did not matter a bit: "... we accepted the prohibition because, we were not planning on doing any cloning, so if that would make them happy then why not...in political negotiations you need to be prepared to be flexible... *quid pro quo*" (Frenk-Mora, int. 2009). Dr. Gerardo Jimenez thought that article 7-bis of the law to create the INMEGEN was part of the democratic game, and that the important thing was the creation of the institute (Interview paraphrasis 2008).This miscalculation meant that one of their closest allies and constituencies became reluctant and suspicious of the ability of epistemic entrepreneurs to represent not only their immediate interests but their future ambitions. An epistemic community in the Mexican case should be understood as a heterogeneous network that might share an issue area of interest. When consensus is missing—not an unusual phenomenon in highly uncertain scenarios—boundary objects can help us understand the distribution and reasons for cooperation/dissidence amongst social worlds or different communities of experts. Rather than thinking in terms of the diffusion of policy, and a certain epistemic consensus, we should start thinking of governance and the differential distribution of knowledge and responsibility.

In April 2004, when the final agreement to create the INMEGEN was voted and agreed by 426 votes in favour to modify the general law of health, and 113 against the modification of the article 7 section bis (all of these votes from the conservative party), the idea of genomic sovereignty as a key to bind the political body was beyond discussion[90]. The joint Episcopal Declaration that

Votación en la Cámara de Diputados 29/04/2004

Votos	PRI	PAN	PRD	PVEM	PT	CONV	Total
A favor	147	0	89	0	3	0	239
% a favor	*98.7*	*0.0*	*100.0*	*0.0*	*75.0*	*0.0*	*63.1*
En contra	2	137	0	0	1	0	140
% en contra	*1.3*	*100.0*	*0.0*	*0.0*	*0.0*	*0.0*	*36.9*
Abstenciones	13	1	0	13	0	3	30
Asistentes	162	138	89	13	4	3	409

Nota: Votación celebrada el 29 de abril de 2004 para adicionar la fracción V bis al artículo 5 y un artículo 7 bis al capítulo I del Título Segundo de la Ley de los Institutos Nacionales de Salud. El porcentaje de votación considera cada grupo partidario por separado a fin de disminuir el impacto de la conformación de la Cámara.

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sanctioned the removal of the prohibition (article 7 bis) of the law to create the INMEGEN, who in the voice of the Prime Cardinal Norberto Rivera said: "it is unbelievable that the cloning of credit cards is sanctioned while human cloning is not", tacitly accepted that genomic medicine was a promising science that could bring great health and economic benefits to the country: "Genomic Medicine, by identifying the variations in the human genome that bring with it risks to illnesses, could be a great hope to improve the life of many Mexicans".

Although it took another 3 months (due to the pressure of the Catholic church), and a few confrontations between the senate and the executive power in the country, to make official the creation of the INMEGEN, the process of issue framing had been successful. The talks that the negotiators and political operators of the project had with the Prime Cardinal Norberto Rivera (Soberon 2008) redirected the attention to the promises and the technological visions of genomic medicine. The Catholic understanding which emphasised the role of humans as the raw material in genomic technologies or the view of an increased path dependency with the developed nations—which are going to take advantage of the moral deficit in the Mexican legislative framework—was decoupled from genomic medicine. Yet these visions left a foot print in the discourse of Mexican genomic science, since after 2002 and until 2006 all the policy documents produced by the INMEGEN, or the Consortium, have a section differentiating genomic medicine from cloning and stem cell research. In August 2008[91] the role of the church had changed as dramatically as it began; a hand written note left by the Cardinal Sandoval Iñiguez in the guest book of the institution testifies to this unusual conversion: "Very Satisfied to visit this institution, I congratulate everyone that has made it possible, and the Mexican people that will have great benefits in their health be grateful to you, God bless you all. Cardinal Sandoval Iñiguez. 20/08/08 (Jiménez Sánchez Interview 2008)".

3.5 Genomic Sovereignty: Postcolonial Biopolitics

Genomic Sovereignty is inextricably linked to the progressive materialisation of a postcolonial biopolitical regime, and the coextensive legal framework constructed to protect a national genetic patrimony. The creation of the INMEGEN projected different and mostly complementary areas of

[91] In the picture you are watching from these last 8 years, when we started from nothing until today, this that you call the controversy, that was very important in its moment, was the one hundred per cent, but you notice that is not as important anymore, as you say the record has to be there, but that is not the issue anymore, the issue now is the millions we need to keep with the research, the links with the exterior...(Jimenez Sanchez int. 2008)

opportunity to the many social worlds involved in the lobbying of the new M-NIH. Through this cooperation they (1) framed the range of political controversy, i.e.: genomic medicine was a question of independence and emancipation from disease, foreign domination or hegemony, and unnecessary financial burden. (2) They were pivotal in the definition of state interests, protection of Genomic Sovereignty and the creation of national centre of reference to protect it (INMEGEN). By defining State interests epistemic entrepreneurs also defended their own interests, we should not forget that Gerardo Jimenez became the founding director of the INMEGEN; and Dr. Soberon became the President of the National Commission of Bioethics, after ending his time in FUNSALUD.

(3) The setting of standards in the policy arena followed a different strategy than the one previously described by the ideal type in section 3.4: its translation into a new regulatory and punitive framework delivered a different message to many of their original supporters, one of sovereign (unilateral) regulation. As you will read in Chapter 6, the way in which Genomic sovereignty has been translated to the rule of law is aligned with fragmentation and silencing; another way of creating boundaries and mapping concerns different from the production of boundary objects (Cf. Star & Griesemer 1989: 417). Even though all of the epistemic community shared the common belief that genomic medicine could be a technology of emancipation, the way and processes on how to arrive to that emancipation were not so easily delineated (see: chapter 4,5 & 6). The key to such emancipation rests on the assumption that human populations have become a resource to be exploited and medical-population genomics resides in the bodies of all of us. The other face of the coin is that the socio-political agency attributed to those populations and the governments representing them.

3.5.1- Policy innovation and boundary objects

In this chapter I illustrated how the creation of new political and scientific spaces are brought forward through boundary objects and the. My description of the cultural scripts and styles of public communication used by genomic entrepreneurs to establish the notion of genomic sovereignty was the main interest of the chapter. The ill structured nature of boundary objects was of primary importance to create alliances between social worlds, accept the contradiction inherent to the notion of genomic sovereignty and manage uncertainty. For example by emphasising a future in which the dangers of international hegemonic appropriation at a global level, the antithetical relations between uniqueness and genetic diversity were not only surmounted, but generated an ill structured map in which diverse interest and expertise could coexist. What is even more impressive and should not be taken lightly is that not only

contradictory elements could coexist in the framing of genomic sovereignty, but they provided a generative space in which diverse social worlds could help to avoid the dangers of biocolonialism (giving everyone a role to play in the vision of a shared future). The commoditisation of genetic information in order to oppress possible consumers and citizens in the developing economies, were sustained by historical experiences of dispossession "in archaeology, botany or zoology... (IFS 2001)" stressing the need to protect national interests against exterior plundering.

The novelty of Genomic Sovereignty lies in the existence of a new world order configured mainly by knowledge based economies, and the ability of population genomics to scan all the genetic information of individuals and transform it into useful knowledge that will emancipate the country from costly and (what could become) preventable diseases. By mobilising a very particular vision of the future, they were able to displace the questionings generated by their basic assumptions "Mextizaje" and redirect the attention to a repetitive history in which Mexico is plundered and remains passive. This visualisation of a future gave Mexico—according to genomic entrepreneurs— the unparalleled opportunity not only to defend its sovereignty, before it is too late, but compete in the Knowledge economies[92].

Alfonso Reyes, the same intellectual who coined the famous phrase "...Mexico arrived late to the banquet of Western Civilisations," would write a poem to his father General Bernardo Reyes, who died in one of the famous battles of the Mexican Revolution in 1913. Intellectuals and public figures such as Vasconcelos and Alfonso Reyes (co-founders of the Ateneo de la Juventud a liberal intellectual movement in Mexico) contributed to the generation of a post-revolutionary Mestizo identity, in line with the ideal of a more just and egalitarian society (see: Basave Benitez 1992). One hundred years after the Mexican Revolution and ten years after the so called democratic transition the creation of the INMEGEN was trumpeted as one of the few times in which Mexico indeed arrived on time "to the table of history (Frenk 2004)". However many of my informants would sadly acknowledge that their hopes in a new democracy turning the whole "System" around were only that, hopes. After almost a decade such a transformation is yet to come, and for many of my policy oriented informants Mexico is still, and will probably continue to be, on the brink of Modernity

[92] As Cori Hayden (2003) identified, the discourse of knowledge economies has become ubiquitous in Mexico and in many regions of the world including Latin America.

4- *The ethos of "genomic sovereignty" in practice and the ELSI centre*

> *Knowledge and wisdom have helped us fight against diseases, have liberated us from darkness, providing us with electricity [...] In brief, knowledge is power, whomever is capable of controlling science and technology, is capable of controlling his destiny, keeping his liberty, autonomy and sovereignty (Preamble of the law on the Human Genome, Mexican Congress 2001[emphasis added]).*

The chapter engages with the legal regulation of genomic medicine in Mexico and the practices of the centre designed to regulate and comment on these matters: INMEGEN´s ELSI centre. The ELSI centre is itself a novelty; there is no similar area in any other national institute of health in the country. The commitment to ELSI dimensions of genomic science in Mexico had its origins in the negotiation process of the INMEGEN (1999-2004), which, in order to avoid or try to prevent biogenetic dispossession, advanced the idea that the creation of appropriate regulatory measures was absolutely necessary (CPMG meeting 2003; D.OF 2004; IFS 2001). The INMEGEN compromised itself to assure that research done in medical genomics would harmonise scientific practice with universal ethical values, and the ELSI centre was the materialisation of this compromise (cf. Annex B; IFS 2001:10-12; Jimenez Sanchez 2004: Strategy 8; cf. Angeles-llerenas Wirtz & Lara 2008; Jimenez-Sanchez and Lara 2007; Dr. GJS int. 2008; Marco Aldebaran, int.2008).

As I have briefly described in the methods chapter, the ELSI was the place in which the legal regulation of population genomics was mostly localized. At the beginning (1999-2004) the ELSI was devised as a semiautonomous research centre devoted to exploring the socio-legal implications, public utility and possible discriminatory practices of population genomics or human genetic research (see: INMEGEN´s vision and mission at: www.inmegen.gob.mx). In practice —meaning after 2004 when the INMEGEN began functioning— the ELSI was the institutional politico-legal arm and had the tacit tasks of influencing policy, generating regulations and showing to external audiences the institutional commitment to a bioethical practice tailored to Mexican challenges and "universal" ethical principles. During the MGDP journeys the ELSI conducted and designed informed consent practices (interviews with Dr. Belmont 2009; M. Aldebaran 2008; Altair and Volkovak 2008)

Surprisingly when I entered the field, the ELSI, a foundational piece of Mexican genomics (it is the 8th central strategy of the INMEGEN, see; Annex C.2; Jimenez Sánchez 2004, 2008) was basically composed of one legal scholar, Volkovak, and an epidemiologist, Altair. In the case of Altair he basically left "...those bioethical issues to be discussed by the experts (i.e. Volkovak and Marco Aldebaran). Throughout my fieldwork Volkovak constantly said: "...they destined 3 to 5% of

the budget of the HGP to ELSI, I don´t think they pay Altair and me 3 or 5% of the 120 million dollars they gave them for the INMEGEN". The work of the ELSI can be divided in two periods: 1st from the MGDP sampling and informed consent process which ended at the beginning of 2008. The second period starts with the creation of the "Law on genomic sovereignty (beginning of 2008)", and its approval in July 2008. Unfortunately, seven years from its original conception the ELSI is underfunded, and lacks the autonomy to pursue ethical, legal and social topics out of the official agenda.

My ethnography started a couple of months after the law on genomic sovereignty was approved and continued until the last days of the first administration of the INMEGEN in which Dr. GJS was on charge (August 2008- Oct 2009), and almost the first year of the administration of the new Director General Dr. Xavier Soberon (Oct 2009- Sep 2010). For most of the time I spent in the field—regardless of whom was the head of the institute—the making of laws and the bioethical ideas coming from the ELSI, systematically avoided debate or engagement with anyone who was not part of a close group of trusted experts and political friends. Such a way of conducting affairs had some interesting consequences; one of the most evident was that the original community of experts (CPMG) that generated the notion of genomic sovereignty is now divided on the possibilities and benefits on regulating the field of biomedicine with a sovereign principle in mind.

The ethical basis on which the INMEGEN was created—genomic sovereignty— is now seen as an imposition of a few scientists and legal specialist over the rest of the biomedical community (cf. www.cuestionableinmegen.blogspot.mx; COMPTRA 12/05/09) [93]. The polarisation of debate has made it even more difficult for dialogue to happen. So in order to gather different views from those I could access through Volkovak and the ELSI-INMEGEN, I conducted semi-structured/ in depth interviews with policy makers, lawyers and bioethicists working (mostly) at the Federal level: National Commission of Bioethics (CNB), Institute of Juridical Research of Mexican National University (IIJ-UNAM); and the Bioethical Collêgium (the group that opposed to the article prohibiting cloning in the law to create the INMEGEN). In the field of bioethics and genomics of the Bioethical Collêgium, Dr. Elias is probably the most active member and it's most visible scientific representative. Federal deputies and senators were interviewed as well, specifically those involved with this law in the commission of health and science and technology. Nonetheless my interaction with the legal regulation of genomics in Mexico was mostly mediated

[93] At this point, and for the purpose of this chapter, I just want to make it clear for the reader that the way this centre managed the ethico-legal aspect of genomics, and the extremely vertical way in which it produced knowledge, was a very polemical issue, and a widely known practice (amongst the reduced group of experts in bioethics at the federal level).

by Volkovak (as representative of the ELSI), because neither: the CNB, the IIJ nor any other federal office had the duties of designing or advising on the regulation of population genomics (and the work of the congress was basically deciding on pre-drafted laws).

In my first interview with CNB´s president (2005-2009) and co-founder of the INMEGEN, Dr. Guillermo Soberon, he told me that they had little to do with the bioethical sanctioning or advise to the MGDP: "...that was something done by the INMEGEN, ask about those details to Gerardo (int. 2009; top officers and analysts at the CNB confirmed Dr. Soberon version). I interviewed at least three officers from each of the federal offices who were involved in the CPMG, and who were willing or confident to talk about genomics. Most of the people I interviewed were more interested in topics such as stem cells, cloning, euthanasia and abortion than in population genomics and its implications, and many felt ill equipped to say anything about it (the field of genomic right is the most incipient in the bioethical agenda).

Apart from the CNB, the federal bioethical authority (D.O.F 2005 7/09), the other federal institution that had been involved in the regulation of population genomics was the IIJ-UNAM (The bioethical Collegium had severed relations with the INMEGEN since the times of the CPMG; interviews with Dr. Laura, Dr. Belmont and Dr. Elias). Various top personalities of the IIJ-UNAM were still close collaborators and allies of the INMEGEN since the days of the CPMG. Volkovak was recruited from the IIJ, his supervisor Dr. Eulalie was still an advisor of the INMEGEN, and very active in bioethical circles. Dr. Diego Valadez (IIJ researcher)a very influential policy maker and participant in the CPMG, with a very prominent career as a public servant[94] was still a close ally of the institute, and personal friend of Dr. GJS, Dr. Guillermo Soberon and various genomic entrepreneurs. The support of some of these characters of IJJ-UNAM to the INMEGEN was basically shown in public venues, conferences and papers discussing bioethical and legal matters of importance for genomics (cf. Valades 2009, Mexican Senate 9/03/09; Valades(ED) 2003).

Even though Dr. Guillermo Soberon was the president of the CNB, supporter of the INMEGEN and personal friend of Dr. GJS, the relations between the CNB and INMEGEN were also severed because of similar reasons to those of the Bioethical Collêgium: unilateral decision making (especially around the process of informed consent of the MGDP). When dealing with bioethical matters concretely intercultural informed consent (with indigenous communities) the way in which

[94] Former Minister of the Supreme Court of Justice, Ambassador of Guatemala and also former Federal Attorney General (amongst other public posts) He was also the former Attorney General of the health system when Dr. Guillermo Soberon was secretary of Health, and he was close to various senators and deputies in Mexico (cf. Annex 4.1). Other academics of the IJJ-UNAM, as Julian, are part of the bioethical Collêgium and work on a different agenda.

the INMEGEN preferred to deal with this matters, was without the input of other federal agencies or bioethical authorities. Dr. Belmont—former ELSI researcher reported that to me (int.2009) now she was part of the bioethical Collêgium—, and Dr. Rilke (CNB officer) confirmed the distancing between both organisations. When the ELSI team knew that I was visiting the CNB and talking with some of their "enemies", they said to me:"...don´t tell that to the boss, he might not let you back if he knows... (Altair and Volkovak, field notes 16/11/08)" It was very interesting to realise that the 4 bioethical bodies at the federal level which participated in the CPMG[95], were now working in a way such as to avoid interaction with certain ex-members of the epistemic community. As an instance, top officers of the CNB were working with the National Collêgium, while INMEGEN was allied with IIJ-UNAM. The places in which all these different bioethical groups met were in large international conferences.

As a matter of fact the way the interaction between Dr. Rilke, Mr. Uranga (both officers of the CNB); and Volkovak & Altair started, was in the International Bioethical Conference (IBC) organised by UNESCO in Mexico City on November 2009. This just happened after I introduced them to each other (I have met the CNB officers during interviews at their institute) and they realised they had many things in common. Through close observation—and sometimes participation— in the responses to new laws or topics of bioethical importance, was that I really had access to the ethico-legal culture around population genomics and genomic sovereignty. Although most of the laws reviewed in the ELSI were looking to use DNA for identification purposes, population databases and the sorts of things a State in a constant war against Narcotraffickers would be worried about. I was able to have regular encounters with matters dealing with genetic patrimony, data sharing and genetic privacy[96].In this chapter —and the whole dissertation— I focus on the legal dimensions of population genomics and the protection of national genetic patrimony, which was an activity mostly circumscribed to the ELSI centre of the INMEGEN, and the few elite policy makers and top officers who knew about it and devoted their

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[9595] The ELSI and the CNB were shaped by the lobbying of the INMEGEN and the intense four years in which the CPMG kept functioning until it disappeared. For example the CNB was not an autonomous body before 2005: when Dr. Soberon became its president (D.O.F 7/09/2005).The CNB was a body of the SSA since 1982, still today the president of the CNB is appointed by the secretary of health.

[96] National security and sovereignty are indeed contentious topics in the country. In the middle of a volatile and dangerous time, traditional "modern" sovereignty posited in the State is challenged in a daily basis by organised crime. The war on drugs, which is a central strategy in the Agenda of Mexico´s president, has made evident the limitations of the State as the monopoliser of violence. Already the executions, vengeances and territorial disputes of drug cartels, have reached 40, 000 victims. The declarations of the former chief of security of the United States, talking about the rise of Narcocracy in the country add an international twist to the issue (Miguel 2009).

energies to its regulation[97]. What is described in the coming sections is a summary of work done in the ELSI (in practice the work was mostly done by Volkovak) and the way in which it dealt with bioethical matters around genomics.

4.1- The work of the ELSI as regulator of Mexican Genomics

> *Los aspectos éticos, legales y sociales de la medicina genómica recibieron el mayor de los intereses desde el diseño inicial del Instituto. Es así que el Programa de Trabajo 2004-2009 del Director General dedica una estrategia al cumplimiento de este tema…(INMEGEN 2009 vol. 2:167)*[98]

According to the law and the organic rules of the institute, the ELSI was the wing devoted to the overall regulation of human genomics in Mexico (Jiménez-Sánchez 2005; INMEGEN´s organic statute 2005; also cf. D.O.F 18/04/04). However in the first informal conversation I had with Marco Aldebaran (September 2008) who was in charge of legal and ethical issues and Director of institutional links of the INMEGEN (after Artemio Cruz left office) he briefly pointed to the discordance between law and practice: "The regulator of these issues in Mexico is the COFEPRIS (National Commission to protect against Sanitary risks) ... / ES: But if the law explicitly states that one of the functions of the institution is to regulate human genomics / *Marco Aldebaran*: You know Mexico, one thing is what it said and another what is really the case..."

This confusion between *de facto* regulatory attributions and *de jure* regulatory attributions is a constant tension in Mexico. Marco Aldebaran, lawyers of the IIJ, Volkovak, scientists at the INMEGEN and bioethicists at the CNB would refer to the lack of congruence between law and practice. Between lawyers there even was the famous saying: "...I obey but I do not comply"[99]. The idea that legal ordering is an instrument in political struggles is still very present in the regulatory field of Mexican medical/population genomics today, in which there is a constant opposition between what is written and what is done. The very practice of the ELSI centre was a clear example of this incongruence, since silencing strategies dominated the work of what was

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[97] There are currently many laws on National security circulating in Mexico; some of those laws aim to identify individuals in order to control the movement of people in the country and start a new genetic database for newborns nationwide.

[98] Ethical, legal and social aspects of genomic medicine received the greatest of interests since the initial design of the institute. That is why in the work program (2004-2009) of the Director General a whole strategy of the INMEGEN is dedicated to comply with these matters…

[99] This saying, made famous by the Colonial Viceroys in the New Spain (now Mexico), resembles the ambivalence and the strategic use of law in Mexico. Carlos Lomnitz (2002) uses a phrase coined by *Francesco Da Matta* when referring to the political system in Brazil, which he thinks can be applied to the way the friend/enemy scheme functions in Mexico: "to my friends all, to my enemies the law...(pag.94)"

supposed to be the institutional champion of ethical practice in the country. Along with the aspiration of creating a grounded (yet universal) bioethical practice, came the reiterative discourse on democratic informed consent and deliberative bioethics restated in each and every one of the ELSI public interventions (cf. Lara 2009; Jimenez-Sanchez & Lara 2006; Lara 2008). The disciplining of ELSI researchers was one of the principal tactics devised by top officials at INMEGEN in order to achieve these goal and avoid what they thought would be unnecessary confrontations. During my time in the field I thought this was a discouraging finding indeed, but a very important one (field notes 26/01/09:15-16).

4.1.1- Silencing and the boomerang effect

The style of regulation and public engagement/communication of the INMEGEN can be best described by a code word used by those involved in ELSI research and regulation: "The boomerang effect". This codeword was used whenever there was a need to tightly administrate communication, erase prickly debates from the agenda, or systematically avoid debate i.e. an "explosive" topic; any of which was supposed to come back to haunt them later (Field notes12/12/08 & 7-25 of January 2009). The idea was that debate or controversy itself was dangerous and it should be avoided at all costs (cf. Annex C). Therefore opening a discussion or a consultation was systematically avoided, especially when it came down to public items and laws that would be under the scrutiny of governmental bodies and other expert groups.

Processes such as the bioethical approval of research with human subjects, or the much more publicised informed consent practices with Mestizo and indigenous communities, were constantly framed as instances of a deliberative bioethical practice:"...we think of processes such as informed consent[100] as long democratic engagement that entails so much more than signing a paper..." (Aldebaran: int. 2008). INMEGEN and its internal committees (ethics in research and scientific) were the ones who dealt with most of the decision on research issues on a daily basis (cf. MGDP protocol 2005; INMEGEN´s organic statute 2005); the way in which these committees functioned was by the inclusion of two internal members and two external authorities in the field[101]. Before INMEGEN´s MGDP journey informed consent had never played such a central and public role in biomedical research, and community engagement was sometimes not even

[100] The topic of informed consent deserves more attention than I am able to give to it in this dissertation. My only contact with informed consent documents was when I archived the indigenous leaders consent in the PGL, and interviews of those who participated in the MGDP Journeys. Also, I hardly found any instance in which informed consent became a central topic of legislation or ELSI debate.

[101] Nonetheless for the drafting of law and the commentary on legislation no such mechanisms were in place, inside the ELSI there was no space for open debate or dissent.

done by the principal investigators of classical population genetics projects (Dr. Elias said he did not conducted the process of informed consent in his own research in the 70´s). In that respect indeed the bioethical practice of the ELSI was very novel, and rather a new thing in the legal and bioethical panorama of Mexico.

4.1.2- The ELSI centre and the production of ethico-legal knowledge

There was a time in which the ELSI centre had 3 researchers on its payroll; a few months before I arrived to the field one of its researchers Dr. Belmont had left the institute.[102] She said her resignation was due to personal disputes with Marco Aldebaran and Dr. GJS; mostly as a consequence of the lack of autonomy to pursue original research and ethical practices:

> ...you cannot believe it! I came from Paris to take part in this novel research centre [...] I even went to train myself in bioethics one year to the [----] organisation... and I came back to take my promised post at the ELSI and I could not publish without permission, and my name was erased from the very papers I had written...can you imagine that... just to be substituted with the name of Marco Aldebaran... at the place from which ethics "emanate"[she makes the quotation marks with her fingers], you find the most unethical and abusive behaviours... (Dr. Belmont, int. 2009: paraphrasis) [103].

I am not going to engage with the numerous instances and examples that Dr. Belmont, or for that case Volkovak, or Altair narrated in order to describe the subservient status of INMEGEN´s ELSI researchers (because it could potentially damage my informants careers and make them even more easily identifiable; for more information cf. Annex C). Basically the tacit rule was that the top ranked officer would place his/her name as leading author, sometimes leaving the name of its subalterns and sometimes not, cutting out anything that looked potentially problematic or was not closely related with the official discourse of INMEGEN, its vision and its mission[104]. ELSI researchers: Volkovak and in a lesser degree Altair who were working inside INMEGEN, found the way by which the ELSI basically functioned to be fundamentally flawed, since it did not allowed even a bit of space for debate or discussion on bioethical matters. The way in which the ELSI functioned can be easily divided by the main chores each of its participants had:

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[102] When Dr. Belmont left the ELSI, she became director of a department at the Secretary of Health.

[103] Dr. Belmont agreed to give her real name since she knows in such a small community giving her real name or using a pseudonym would not make any substantial difference. I have tried to change style of her verbalisations to try and avoid her easy identification: (------) = omitted information.

[104] Status inside the Institute was related to authorship, but this was far from fixed: there were some people that showed their loyalty through the acceptance of this asymmetrical relation, while others who were aware that their knowledge was much more esoteric, exclusive and needed, changed their negotiation strategy to demand the recognition of their authorship (this was mostly the case of natural scientists).

1) Marco Aldebaran mostly **censored** the work of Volkovak (mainly by erasing prickly topics);

2) Volkovak **drafted and evaluated legislation** as well as writing technical opinions on laws related with genomics;

3) Altair would help with **administrative functions** (and continue with his own epidemiological interests).

The cosmetic or superficial approach to bioethics I have very briefly described was not something neatly circumscribed to the managing of ELSI, or something done or enforced solely by the legal experts or top bureaucrats in charge of bioethics. A top ranked scientist who holds a key position in the field of medical genomics disdainfully answered my questions about research autonomy: "...if they want autonomy they can go to Mexico´s National University (UNAM), here they are [ELSI researchers] in a M-NHI, when they work outside they can be as critical and autonomous as they like... (Dr. Alvarado, biotechnologist int. Oct 2009)"[105]. The surprise for me was that he [Dr. Alvarado] was not only well aware of the way ELSI was conducted, but he endorsed this way of producing knowledge. I guess my informants were right to call me naive: "so you did not know...in what country do you live!! (Volkovak in field notes, page 15, 7/01/09; also see: chap.2).

Although Dr. Alvarado regarded the originality and autonomy of population genomics research as essential even in the face of problematic categories (such as race) "that society might not like, but that science might prove to be correct (ibid)", for him it was not problematic to say that social research had to be more in tune with what society and the institutional authorities wanted to hear. This division between natural and social knowledge, in which natural order had the upper hand, had very practical repercussions. The most evident example for me was that the ELSI´s lack of autonomy was inbuilt in the very organisational design of the INMEGEN[106]: they were supposed to regulate and critically engage with the very scientists and officers who decided about their

[105] This quote belongs to a scientist occupying one of the highest offices in the human genomics arena, and who had the bureaucratic authority to change this way of conducting ELSI research. My very participation in the ELSI placed me in a very politically charged position since most of the national legislation circulated through the ELSI, but also because it was one of the institutional sites subject to various types of control and silencing.

[106] As a matter of fact the precise allegiance of the ELSI was something that was in disputed almost all the time I did my participant observation, sometimes Dr. Max would claim that since he was the head of research wing he should be in charge of the ELSI. However Marco Aldebaran was the one who won the institutional dispute and retained control of the ELSI. When Dr. GJS left office, the ELSI changed its name to EJES (its Spanish translation: Estudios Jurídicos Éticos y Sociales) and was now part of the research department.

permanence or removal as valuable public servants and sound bioethicists (cf. INMEGEN organic rules 2004).

The known lack of research autonomy deeply damaged the reputation of this centre amongst the very few bioethicist and officers that new about its existence; for example informants in the CNB and other prominent bioethicist had been disappointed when attending to the meetings of INMEGEN´s ethics in research committee (Dr. Belmont int. 2009). As a matter of fact the very existence of the ELSI centre as an institutionalised space devoted to serve the best interests of the public and engender a culture of deliberative bioethics was a contentious topic for influential bioethicists working outside the institute:

> I think we could think about these things together [bioethical regulation of the Mexican HapMap]...the way we found about their work was through conferences... it was really a pity... one of the persons working for me [Dr. Gonzalez Camarena] tried to take part of the ELSI but it seems that there is no such centre (parenthesis added, Dr. Laura int. 2009).

Dr. Gonzalez Camarena narrated his experiences dealing with the ELSI, first as someone trying to get a job and afterwards as a bioethical regulator in another federal office as elusive and frustrating. He thought that the ELSI was frankly suspicious or did not exist at all (informal chat, 24 of August 2009). Strategic bioethical audiences working in other high ranked federal offices as Dr. Belmont (Ex-ELSI researcher), Dr. Elias, Güero (CNB)[107] and Dr. Sofia amongst many others commented on the lack of debate and the repetitive discourse which she faced when dealing with the ELSI as one of the features that made it difficult to generate a common bioethical platform. I had similar informal talks with junior researchers and bioethicists at the IBC-UNESCO conference (Mexico City Nov. 2009). My own experience in the Mexican senate (cf. Annex B) and participant observation at the ELSI leans me toward supporting this claim.

4.2 Genomic sovereignty and the ELSI

> *…The production of boundary objects is one means of satisfying these potentially conflicting sets of concerns. Other means include imperialist imposition of representations, coercion, silencing and fragmentation (Star & Griesemer 1989:417)*

Despite all these difficulties, one of the biggest achievements of the ELSI centre of the INMEGEN, and most punctually of the top officers and policy makers whom promoted it (mainly Dr. GJS and Artemio Cruz), was the so called law on genomic sovereignty (both at the federal and local level).Nevertheless the law was also the mark of an important rupture between former

[107] Güero was my original contact with the CNB, and he was one of the friends of Altair even when official communication between the CNB and the INMEGEN seemed to be running as usual it was a rather difficult enterprise to move between both institutes.

members of the CPMG, other bioethical bodies and the biomedical scientific community. The so called law on genomic sovereignty sanctioned the movement of biological samples (cf. Chap 8) which added a specific national legal interpretation of the international declaration (UNESCO 1997) to the national law of health (D.O.F 2008). And was considered by international observers—part of the epistemic community— as a unique feature and step in the right direction for developing countries (Seguin et.al 2008; Seguin in Mexican Senate 09/03/09; Daar int.2009).

According to the CPMG that negotiated the INMEGEN and the congressmen whom approved it, the UNESCO declaration (1997) was directed to avoid the possible threats of exterior plundering. The INMEGEN and the ELSI centre was the way to enforce that interpretation of UNESCO declaration (1997), and that is why in the law one of the specific functions of the INMEGEN was to regulate everything related to the human genome (D.O.F 2004; D.OF 2008; Canal del Congreso 2004). The constant mobilisation of foreign plundering as a negotiation strategy was described by Artemio Cruz, (int.2010) designer and lobbyist of the law, as almost a magical trick:

> ...you go there and you talk about the *gringos* [Americans] trying to plunder our blood and our indigenous heritage... and kaput!! Almost immediately you have the senators listening… I mean we had a fast track law that was approved in less than 6 months, and it's a major addition to the general law of health which passed with no major observations..."

Different from previous nationalist discourses, this claim for independence was not directed against the USA as a dominating empire (cf. Lomnitz 2010; Miller 2004), but as a huge capitalist system which could easily absorb the biomedical demand of genomic medicine and diagnostic tests in Mexico (cf. IFS 2001, Jiménez-Sánchez 2002a). Although Mestizaje was still a popular way to think about the ethno-racial origins of the country, it was not a question of asserting a racial policy of miscegenation against the hegemonic presence of clear cut racial categories operationalised by its northern neighbour US, as it was after the Mexican revolution (cf. Lomnitz 2010; Gutierrez 1999).

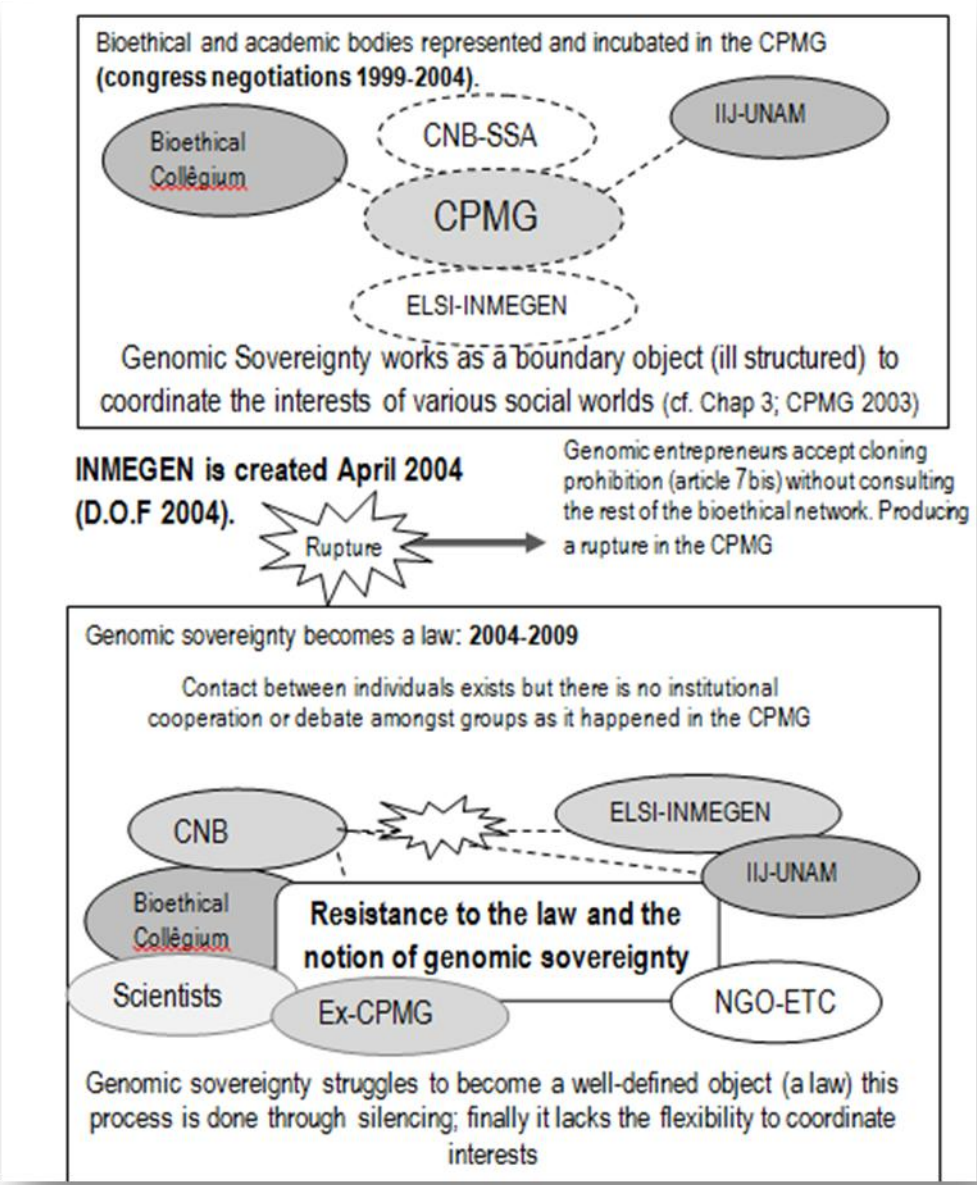
The relation between both nations (Mex-US) had changed a lot since the Mexican Revolution (1910-1920) and its aftermath and now they were trading partners (NAFTA agreement 1994). What was even more important from the specific viewpoint of genomic entrepreneurs was that many of its international supporters were leading scientific figures in the USA (Francis Collins, Craig Venter, David Valle and Eric Lander: all of them international authorities in the field). This commitment to avoid the "anti-Yankee" discourse, while at the same time asserting the possibility of genomic dispossession and new colonialism coming from "mad personalities or unscrupulous private interests (D.O.F 2001 a, b)" was an important way to assert the ethos of genomic sovereignty.

4.2.1-From a boundary object to a monopoly of genomics

If we compare the work of the ELSI with that which produced genomic sovereignty as a boundary object while negotiating inside the Mexican congress we can highlight the main differences of boundary creation through ritualisation and boundary creation through fragmentation, imposition and/or silencing (cf. Star & Griesemer 1989: 417). Let us start by recovering a bit of the work of ritualisation that allowed genomic sovereignty to circulate amongst various social worlds without cracking and collapsing into its contradictory elements: nation (singular); population genomics (plural and probabilistic[cf. Chapter 3,5 &8]), on the contrary it was a notion that helped coordinate interests and establish a very successful policy agenda. At the beginning of the lobbying it was the question of us (Mexicans) and them (undefined capitalist and private interests) mediated by dispossession: this vision of plundering was reiterated in many ways (CPMG 2002, CPMG 2003; IFS 2001: 25).

The most popular way to talk about plundering was to elicit memories of biopiracy in terrains such "as botany, zoology and archaeology (IFS 2001:25)" in the Mexican congress, and making various rounds of negotiations with strategic constituencies (CPMG 2003). Nowadays the National Commission of Bioethics (CNB) —nominally the national centre of reference for ethical and legal matters around biotech(D.O.F 2005: 07/09)— was not even invited to the discussions on the ethical dimensions of genomics (Informal chat with Dr. Rilke and Mr. Uranga November 2009 at UNESCO-IBC conference). According to genomic entrepreneurs the vision of genomic sovereignty and its legal dimension was advanced through a reiterative and coherent notion that appeared in each and every one of INMEGEN´s public displays was that was linked to its first mobilisation during the negotiations of the INMEGEN: "... and of course you would not imagine that Mexico had a law of genomic sovereignty, if we had not passed in the last six years the barrier of information, in order to communicate with the wider community; with the scientific community, deputies, church, to...to the universities, if we had not passed to each, each, each and every one of them... consistently with the same messages...(Dr. GJS int. 2008)".Yet, it is no coincidence that many of the expert's discontent with the Mexican Genome and the nationalist Media coverage appear at the moment in which Genomic sovereignty struggles to become a hegemonic ethos in the legal landscape of biotechnology in Mexico (cf. www.cuestionableinmegen.blogspot.com; COMPTRA).

Figure 4-A - Genomic sovereignty and Bioethics before and after INMEGEN´s ELSI[108]



4.2.1.1- Biomedical community

Originally biomedical scientist and human geneticist were amongst those whom supported the creation of the institute; after genomic sovereignty became a law they became one of the most critical audiences—regardless of their institutional allegiance— i.e. it did not matter if they were in

[108] Certainly the dead of Marcia Muñoz de Alba was another factor for the dispersion/rupture of the bioethical epistemic community since she was a member of the Bioethical Collêgium, IIJ-UNAM and the main bioethical –juridical lobbyist for the CPMG, and previously close collaborator of Dr. Frenk at INSP. In such closed expertocratic regimes the membership of one key person can make all the difference in terms of political operation and the possibility to enrol sceptic audiences.

or out of the INMEGEN. Their critique was basically directed to what philosophers call misplaced concreteness or what many of the scientists mostly called a farce[109]. Certainly the translation of genomic sovereignty into law aimed at protecting the "Mexican Genome" was very unpopular amongst various groups; Dr. GJS knew about this and in our first interview he mentioned: "many scientists are upset by our regulation, but what they don´t see is that the law is giving them increased negotiation capacities when collaborating with foreign researchers (int.2008)". Nonetheless by trying to invigilate the field of population genomics, biomedical scientists felt that the real burden was put on doing independent research or anything different from the desires of the INMEGEN. The next quote from an anonymous user of the "The White Elephant (critical blog)" shows the discontent in a more colourful way than many of my interview quotes:

> With that crazy invention of "Genomic Sovereignty" they have "protected" the MEXICAN GENOME in order to prevent that foreign companies design diagnostic tests for "Mexicans", but what does it matter? if we "in general" are similar to Latin America; variations from which the INMEGEN wants to take advantage and protect its "CAKE" The idea is good, who knows, maybe, but meanwhile it has FU***D the ones who really want to do research, and because of our third world situation we need to collaborate with foreign researchers. It turns out that we cannot even send a tube with DNA from our samples, because we are fined and put in JAIL, assuring with this a monopoly over genomic research, because no one in this country has the technological capacity that INMEGEN has!

Based on the notion of sovereignty and population genomics was that distinctions between legitimate and illegitimate scientific endeavours were made (mainly by idea of the law, rather than its implementation) and alliances built; becoming one of the aspects that most bothered many of the human geneticists in the field. Even amongst those who think that a law to protect genomic sovereignty is not completely misplaced, they would not be so sure about its democratic spirit: "the overall idea of sovereignty and the law is not bad... but we should question it, since there was no public debate before its instauration... what is preoccupying is that it could easily be misinterpreted by some people, or misused to flag racism and discrimination (Dr. Soma 2009, Molecular Anthropologist)". Informants working at various M-NHI acknowledged that the monopolistic concentration of high throughput technology and massive sequencers in the INMEGEN obliged them to work in what they thought to be an asymmetrical and unethical fashion, just because of their lack of technology:

> ... We thought it would be very horizontal and were confident about it and hope it would be so... but at some point it was like it lost its original virtue... so I send my

[109] Most of my informants emphasised the technical difficulties of delimiting a Mexican genome. Also INMEGEN´s double edged discourse: in one side genomic sovereignty was tried to be imposed by controlling imports and on the other hand there seemed to be a need to collaborate and share samples due to lack of expertise.

> PhD student, and you make him sign a confidentiality agreement and a collaboration agreement... but you are working on his dissertation that is his research!!... And all with the argument of sovereignty, we did not like it (Dr. Sofia, human geneticist 2010, former supporter of the CPMG, also top officer of the second administration of the INMEGEN).

Readers might want to know that INMEGEN´s new administration (2009-) found the law on genomic sovereignty so offensive to the wider scientific community (whom they represented before taking office) that they wanted to abrogate the new legislation; soon they were informed that the INMEGEN had no capacities to do so (the only ones who could do that were congressmen, see: field notes 05/07/10). Soon afterwards Dr. GJS left office the announcement of a multimillion investment in the research of cancer and diabetes funded by CARSO group[110], a private institute, which began a huge project to sequence various Mexican samples in Harvard-MIT BROAD Institute changed the political atmosphere around genomic research in Mexico (Dr. Y and Dr. Sofia Interviews 2010). That agreement needed that a huge number of Mexican samples and clinical records be sent to the USA in order to be sequenced and analysed with more markers and more infrastructure than the MGDP; the MGDP was designed to make these type of huge projects possible inside Mexico, or at least with national institutions doing the bulk of the research.

For many of my informants this meant that the ones who created genomic sovereignty were now bypassing it, since more than 90% per cent of the money was sent to Harvard-MIT BROAD Institute and the INMEGEN kept just enough funds to send a couple of bio informaticians to be trained in the USA (int. Dr. Y 2010; and Dr. Sofia 2010).This auto-violated "sovereignty" just came to confirm what the legal specialists who designed the law and conducted ELSI matters thought: this was nothing but rhetoric (Cruz int. 2010 and Volkovak 2011): in Artemio Cruz words: "...the use evidently is not regulatory... it is made to attract the attention of media, become visible in the public sphere [and you know Dr. GJS lives for that] and inflame the spirits of congressmen... that as I told you before... simply love the idea... (Cruz, int. 2010)"

4.2.1.2-Policy makers, NGO´s and ex-CPMG members

During the time I spent in Mexico City studying national medical genomics, the notion of genomic sovereignty became a kind of hoax, not only for critical academics, but for previous supporters of the project: "…many of the lawyers and top ranked officers had said to me that this thing of preventive, predictive and personalised medicine sounds more like a worldwide fallacy than as a

[110] The health foundation of Carlos Slim, the richest man in the world in 2010-2011and Mexican citizen; Dr. Julio Frenk Mora was the president of the organisation for a couple of years.

scientific fact, maybe we were too enthusiastic about it without really knowing what this was about...(Eulalie, UNAM´s academic, supporter of the CPMG, also see Dr. Laura chapter7; field notes 12/02/09 & 17//04/09 2010)". Inside INMEGEN the question of "Mexican Genetic Uniqueness" started to become more difficult to sustain for Volkovak and therefore for the ELSI and the internal bioethical committee: "...that discourse of genomic sovereignty, we both know is something they NEVER believed in": Volkovak personal communication 20/06/2011).

When I interviewed Dr. Heladio Verver—congressmen part of the federal commission on health in charge of collecting expert opinions on laws—recognised that the law on genomic sovereignty would probably be another of those *adhoc laws* (in this case meaning readymade) put forward by some federal agency interested in the topic and/or deputy or congressman who wanted to champion the topic (int. paraphrasis, 2011). Although the status of the INMEGEN as regulator, and the problems product of the corruption scandal (cf. Chapter 2 & 6, Annex B) which basically froze the implementation of the law and the creation of the necessary administrative procedures to make it actionable[111].

In a discussion with Juan (UNAM bioethical researcher, interested in genomics) about the operability and implications on the law on Genomic Sovereignty, and its relation to the defence of "health, dignity and justice" he said: "you know this all might be nothing but rhetoric and ideology, maybe it is nothing but a friend/enemy scheme in order to... to talk about a profitable concept, while blocking enemies and helping allies... I still agree with others, that you can talk about technologic sovereignty, but not genomic sovereignty" (Juan Bioethicist 2009, field 25/07/09). The former boundary object which was able to coordinate the interest of various social worlds was now seen as an illegitimate legal imposition. If federal offices were suspicious about the ethical dimensions of Mexican human genomics groups such as the ETC were openly dubbing the INMEGEN as a colonial enterprise (Ribeiro 2005, 2008). In this case the law had little to do with their political stand, the ETC (before RAFI, see: Hayden 2003; Reardon 2005) has been very active in the biogenetic fiels—mostly in green biotech and indigenous knowledge—and were amongst the first to voice their concerns against genomic sovereignty and the INMEGEN: "...I do not know what they mean with genomic sovereignty, but evidently what there is, is an interest, of,

[111] The difficulty of delimiting whose interests were represented in the law and if the law itself would not become a tool for those who could profit from it, the murky waters of regulation, and the difficulty of establishing proper responsibility made it even more difficult to implement the law. As an example Dr. Daniel—human medical geneticist—the first one to ask permission to the INMEGEN to export some biological material had to wait several months without knowing what to do with his samples, since there was no administrative procedure to deal with population genomics research :finally he continued with scientific life as usual, (int. 2010).

of ... great corporations that have made consortiums with public research institutes around the world (int.2008)".

4.3- Drafting and evaluating genomic legislation

According to INMEGEN´s report of 2004-2009, one of the main achievements of the ELSI was the specialised bioethical training of Dr. Belmont and Volkovak[112], and the counselling and expert advice given to the congress in order to push the three main laws on genomics in the country; promoting it legislative process and careful design (cf. INMEGEN 2009, Vol. 2: 166-169). Basically throughout the two years I spent doing research at Mexico City and the ELSI, the legislative process: by this I mean debate around the normative claims of law, was non-existent and the design of law was a closed door work done mainly by Volkovak (cf. Annex B & C). None of the laws were discussed in any public forum and the drafting of legislation was made between legal specialists in federal offices. When it came specifically to the law on genomic sovereignty the drafting and afterwards the evaluation of the law was basically done by the ELSI—since there was no other federal expert body of reference— (cf. Section 6.3).The texts of laws were written in the offices of the subalterns of political figures who negotiated the need for a law—mostly behind closed doors and in private meetings (of which I did not take part)—and who announced their commitment to new regulations in public venues afterwards.

I constantly heard the idea that legislation on these issues (biosciences) was 30 years ahead in the first world: "...in advanced countries they have already regulated all the issues we are just starting to think about (Juan in Field notes 7/01/09; also IBC 2009)", and at the same time I also heard the reiterative claim that laws needed to fit the national realities of Latin America in which inequality and lack of techno-scientific funding are the norm (IBC-UNESCO, Mexico City, Nov. 25-26 2009). However the writing of law was a minor technical chore (in this technical chore I could participate) done independently of the existence or not of a social debate around it, or without regard to the inclusion of societal voices in its design.

In order to produce the text of the law juridical articles of admired first world countries would be mixed with existing constitutional principles[113], in the process of course there were implicit

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[112] To train two researchers, which only one stayed amongst its rank is a rather modest achievement for what was supposed to be a national centre of reference in ethical, legal and social dimensions of genomics.

[113] Amongst legal scholars the process of importing legal dispositions and frameworks from other countries is called "juridical transplant", and as with any other transplant, sometimes it is successful and sometimes it is not. In the Mexican case, most of the times such transplantations are seen as unsuccessful because the socio-political conditions are not the same as those of the original country, therefore law turns out to

judgements about the nature of the objects to be regulated. Nonetheless before the law were implemented, approved or even designed none of the social experts questioned the ideas advanced as scientific realities in the preamble of the laws. A similar thing happened with "due process" and social debate before the instantiation of the law: "...like now with the topic of anticipated will and euthanasia, we are already legislating without discussion...they say we should do this like Holland and like this other country, but wait! We have not even discussed that here! They took 30 years to debate the topic, and then created a law... (Dr. Laura, int. 2009)".

Laws were basically done by experts in the negotiating offices: in this case the ELSI researcher Volkovak, or Artemio Cruz before him (Cruz int. 2010). The legislators who backed up the law had little or no input at all on the production of legal texts, until it came to the legislative day of voting and discussing the law (and in both the federal and local laws on genomic sovereignty nothing was changed). According to my informants and my own observations at INMEGEN the code of law is commented upon by a bunch of legal clerks and researchers distributed amongst a couple of governmental offices (mostly of the political sponsors in this case at the federal level). In the process of bureaucratic law circulation, legal clerks (sometimes consultants and lawyers) question the law and make formal comments on its contents. Although the law circulated amongst health related governmental offices and expert academic bodies, the main body of the legal text remained unaltered, and revisions or challenges to the law were written in the form of suggestions in a separate document. Since most of the laws related to genomic science were analysed or written by the ELSI, this actually made Volkovak the *de facto* authorised voice in the field of the legal regulation of genomics; the other offices involved in the process of regulation more often than not would make very general comments and recommendations, without challenging the assumptions of the legal text.

4.3.1- Boomerang effect and the "lonely" process of law making

> *...I ask—kindly and respectfully— to the deputies of all political factions [...] they offer the opportunity to the people of Nayarit to have the right to know their genomic map (Lic. Ney Gonzalez 2008)."*

One of the most alarming consequences of silencing —from my own perspective—is that interlocutors are rapidly lost, and with them the capacity to create an intersubjective world of "as if". What is left is a world of "as is" that is easily challenged by many expert audiences. By tacit principle or institutional ethos these challenges cannot be engaged with, because by engaging with them you recognise their existence (again the boomerang effect). There is a long list of

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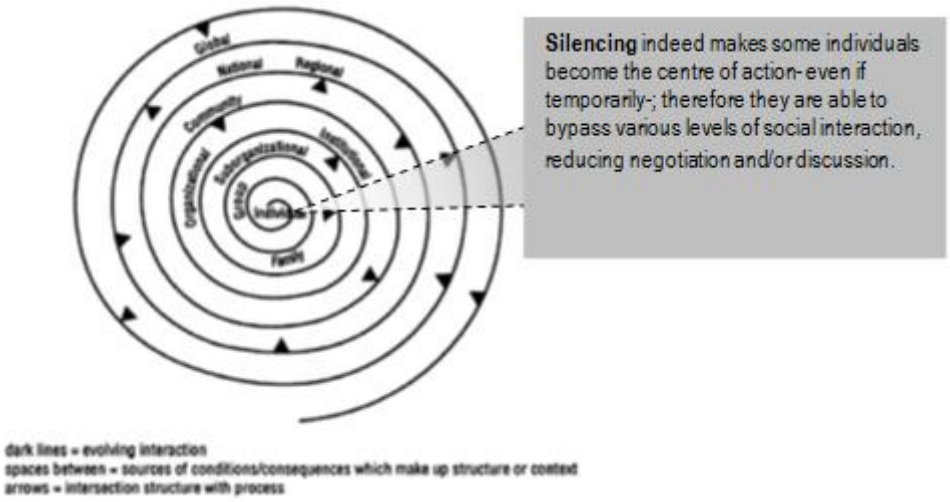
be inapplicable and largely unconnected with "everyday social reality".

topics under the "boomerang effect" category, amongst them the topic of indigenous biological patrimony and autonomy, stem cells, cloning, health disparities, "reddish-leftish" opinions; etc. Following such logic to the absurd you will end up just talking with yourself; which was precisely what happened when the law on "genomic sovereignty" circulated from the federal to the local constitutions.

Figure 4-B- Strauss and Corbin´s (1999) Conditional Matrix, and the consequences of silencing



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The movement of the law protecting the "Mexican Genome" to the constitution of the State of Nayarit was also another *ad hoc* law, born from the encounter of Dr. GJS with Senator Francisco Castellon Fonseca of Nayarit (President of the Science and Technology Commission of the Senate 2009). This encounter occurred after the corruption scandal broke into daylight and the 5th anniversary of the INMEGEN was celebrated at the Mexican Senate (Chap. 4). After a tour through INMEGEN´s facilities, Volkovak was told about the idea to create a local law was first thought of by high ranked officers. Three weeks afterwards, Lic. Ney Gonzalez, constitutional governor of the state of Nayarit, while holding the new legislation on local genomic sovereignty in his hands, publicly declared: "...we in Nayarit have the right, for each and every one of us —because each and every one is Nayarit— he said, the right to know us; know where we come from; and know

[114] Image taken from Strauss and Corbin 1999: 181, Adele Clarke thinks that the conditional Matrix is not the best way to engage with actions and social world commitments. She criticises this graph since it re-enfranchises the modern idea of a central rational actor. I agree with Adele Clarke´s critique of Strauss and Corbin´s (1999) conditional matrix as too modernist, situating the individual—and not action— in its core. Nonetheless the conditional matrix is more accurate in describing how the legal dimensions of genomics work in Mexico, since the messiness of action and debate is precisely what the "boomerang effect" is trying to avoid, and as a consequence regional and national interest is centred on key individuals.

where we are headed as a human race (Anon 2009a)".

The weeks before this public declaration Volkovak produced and wrote the law; fortunately I could be around while he did it. Although he knew I was completely useless with laws, he liked to show me his juridical work, expert opinions and most importantly the way in which he designed the regulatory instruments of the future. When announcing the new legislation, the local constitutional initiative of genomic sovereignty in the state of Nayarit (north of Mexico) was founded in a legislative practice by which one legal researcher designed, evaluated, and amended the law. That meant that Volkovak ended up being the federal specialist in the subject since he was literally the ELSI centre and the only person in charge of making technical commentaries on the law.

In the case of the law protecting the genome of Nayarit, I did not only observe but indirectly participated in its design. I did this by asking Volkovak if while comparing various laws of the state of Nayarit we could raise new topics such as indigenous rights. Normally he used to answer to me that this was not what he had been asked to do, or that it was not part of the law, but since the autonomy of indigenous communities was contemplated by the local constitution he made an exception. He recovered a specific claim of the state constitution; in which the autonomy and self-determination of indigenous peoples was translated into the idea of indigenous genomic patrimony:

> *Second paragraph*-**erased from the law:** Our plural ethnic composition is sustained in indigenous communities and peoples, assisted by a right of self-determination, expressed by the autonomy to decide over their internal forms of coexistence, as well as its social, cultural and economical organization; in the creation of their normative systems, uses and customs, forms of traditional government, development, forms of religious and artistic expression, and in the faculty to protect their identity, as well as their cultural and genetic patrimony (translation made by the author, quoted from the legislative design made in the ELSI for the local law on genomics in Nayarit´s constitution).

The whole process of making the law on genomic sovereignty in the congress of Nayarit took approximately a month, after which Volkovak received the law now with the added "discoveries" of precise racial combinations, and important erasures (i.e. there was no acknowledgement of indigenous genetic heritage). Both the additions and omissions now became part of the regional legal interpretation; laughing he said:

> ...As you can witness I am judge and jury...there is no way you can tell this law is the manifestation of debate and consensus... I don´t want to lie I feel great in one way... I am actually the one making the law-something I would never think off, when I was doing my B.A- but at the same time it is a little bit depressing to know that national regulation is being done by a junior legal researcher (field notes 02/19/09-12/10/09)".

In a trip to the State of Nayarit, I had the opportunity to talk with officers in the regional bioethical office and lawyers of the State which had no idea of the new law. I found I was basically giving them the news about the plans to create a new genomics institute at Nayarit and its brand new law of genomic sovereignty[115]. I cannot be sure where, when or whom erased the paragraph of the law dealing with indigenous cultural and biogenetic heritage, but its erasure is a window into the tense relationship between indigenous and national (Mestizo?) patrimony in Mexico

4.3.1.1-Indigenous genomic patrimony in Mexico

The protection of Mexican genomic patrimony has become quite popular in local legislative spheres, but not the question of an indigenous genetic patrimony; the erasure of this piece of law makes this disjuncture more evident. The idea of a unitary Mexican nation was a cohesive project with assimilating objectives, and with a central agenda of modernization (Gutierrez 1999; Miller 2004; Underiner 2004:27). Such modernity came at a high cost to indigenous communities that, even if equal at the constitutional level, are still today suffering from preventable diseases, malnutrition and discrimination (Zolla 2007, PNS 2006-2012). In a round of questions after a celebration event (National Collêgium, 2 of July 2009), a journalist from San Francisco asked the panel of experts about the scarce access of indigenous communities to medical care and technology, especially to a very expensive technology such as medical genomics. Director General Dr. GJS immediately answered: "...we have been especially careful to ascertain that access is the same, and that is the spirit of genomic sovereignty law (transcription from field notes 02/07/09)".

The response of Genomic entrepreneurs, especially from Diego Valades, IIJ-UNAM researcher and policymaker, was to reassure attendees that matters such as privacy, equality and protection of genomic patrimony was completely covered by the current legislation. However when such reassurances encountered questions about benefit sharing with indigenous communities, or the genetic patrimony of Tepehuanes, Zapotecos or Mayans (instead of the patrimony of Mexicans), the answer is silence, erasure or omission. The idea of a Genomic Map of the "Mexicans" (as a unique category) or of the existence of a national heritage might lead us to praise egalitarian values unreflexively. This non-reflexive praise is especially evident when it comes down to juridical and cultural differences. As an example, when asked about the needs for defence

[115] Local bioethicists were much more interested with topics related to abortion, and the medical dilemma of providing health services to religious minorities like Jehovah's witnesses that refuse blood transfusions. The notion of genomic sovereignty was a completely new concept for these local experts, yet they consistently reported that most of the laws were hardly discussed at all (informal chats with various experts at the 1st Annual Bioethical Conference at Nayarit´s State University 8-9 August 2010).

against discrimination of indigenous communities, former Director General (2004-2009) Dr. GJS said: "the protection is the same; finally they are Mexicans, the same as us (Jimenez-Sanchez int. 2008)".

4.4- Managing bioethical conflict and expertise

The very idea of the composition and functioning of bioethical committees at the federal level and decision making inside M-NHI, expert bioethical bodies such as the CNB and in even in Mexican legislation presents a technocratic ideal of virtue, which disenfranchises the common citizen: "here the law says that the same professionals should be capable of representing the values of the population under investigation, we are hopeless—that is what I was telling you— the law is already endorsing an attitude of scientists that say :we can evaluate things by ourselves, we don´t need anyone else, this is a question of experts"(Dr. Laura, Influential Federal bioethicist 2009). The example of Dr. Lisker, a human population geneticist and the only Mexican who participated at the UNESCO 1997 Declaration, is illustrative of this technocratic system and its new creation: in 1996-7, approximately 7 years before INMEGEN´s creation, Dr. Lisker went there "without representing any Mexican official body": he was a personal invitee (cf. Lisker 2004)[116].

At the time the institutional structure that preceded the CNB was still part of the Secretary of Health; but this bioethical body did not participate in the UNESCO process. This is an example of the incipient organisational status of bioethics in Mexico at the time (the CNB was not constituted yet in Mexico-its official constitution happened in 2000), but also of the lack of systematic engagement with new fields of bioethical interest, which is still a difficult task for the semi-professionalised and very small group of Mexican bioethicists. Another characteristic of the practice of bioethical and legal normativity is that many of its members are the same experts it aims to regulate; the most prominent bioethicists on the issue are same scientists who started with the discipline of human genetics in Mexico like Dr. Sofia and Dr. Elias. Both of them were leaders in the field and had occupied top positions in M-NHI since the 70´s, and then became

[116] For a narrative of the experience of the only Mexican who participated in the creation of the Universal Declaration on the Human Genome and Human Rights see: Lisker 2004. In this document Dr. Lisker clearly states two interesting points: first that the role of the scientific advisors in his perspective was to check that the legal experts and the biologists were on the same "wave length" when talking about biology and genomics, and second that he was not appointed as a representative of the Mexican government since he participated in the International Commission of Bioethics as a personal invitee (that is why in his paper he said he could not answer the question: what was the feeling of representing Mexico in an international organisation?).

very active in the field of bioethics: "when you get old...you tend to philosophise and do ethics [Dr. Sofia, int.2010]").

The new field of genomic right and bioethical regulation and advice on cutting edge biomedicine had to deal with harmonising the interests of their bioethical peers—biomolecular scientists—and establishing their own terrain of expertise. On the other hand most of the interrogations put forward by bioethical experts on topics considered to be in the domain of science would be carefully phrased and generally would refer back to "Dr. X or Y... so you can hear the more nuanced scientific story". So, many of the interesting conversations regarding the physical properties (states) of genomics and its social ordering (status) were simply erased as the product of a tacit acceptance of a profound divide between scientific and legal expertise.

The distinction between citizenship, scientific/bioethical authority and expertise was a preoccupation for many of my informants, who like Dr. Laura, thought that the critical edge of bioethics had become a blunt bureaucratic object. The deliberative bioethics envisioned by and clamoured for by many officers was a long road ahead, in the meantime a bureaucratic bioethics still reigns (at least in the federal organs and in the topics related to genomic sovereignty)[117]. The mark of such bureaucratic bioethics lies in the "boomerang" censorship strategy which was repeated endlessly while I was in the field, and the lack of autonomy to discuss bioethical matters in ways that are different to the official agenda or the interests of the presidents or directors of the institutes.

4.4.1-Ethics, deliberation and research autonomy: where?

This way of making laws was not circumscribed to the people who controlled the ELSI, neither to its first years of creation, or to the leadership of an authoritarian figure. After interviewing or talking with various officers, bioethicists and researcher of the IIJ-UNAM, CNB, INMEGEN and the Bioethical Collêgium, I think the lack of debate is a common feature of the bioethical and legal arena around genomics in Mexico. Interesting instances of this non-debate culture are the commentaries about laws done at the ELSI, which are still made by one person —not Volkovak anymore— but his ELSI boss Gabrielle. Similar to the times of the "old ELSI," open discussion is simply absent (even though in this new period I cannot assure if this is a systematic silencing or not). There are many ways to interpret the continuation of such a practice, after the "censor" left office, but definitely what we can say is that deliberation is still not part of the process of law

[117] Julian, philosopher of law, recognises that topics such as "genomics" bear a double burden of public silencing since conservative governments are ambivalent about it. On the one hand they don´t want to lose business opportunities and on the other hand they don´t want to make their conservative constituencies mad about their open support to scientific quests they might find risky or unethical.

making, not even at the level of the ELSI centre which now is composed of 4 researchers instead of just 2 (or just 1 when it came down to analysing legislation and making ethical evaluations).

An example of this closed expertocratic way of dealing with bioethics—which happened when Dr. GJS and Marco Aldebaran had already left office—was the new legislative interest on regulating genetic-genomic privacy. When Volkovak heard the news that new legislative interests and debates arrived to the ELSI he thought that at last: "...democracy has arrived to the institute (field notes 27/07/10)". He presented me to the new research director, Dr. Sofia, and asked her if I could participate as an empowered citizen in the discussion of the law; she said yes. The next week she made a private meeting with the people she trusted (I was not one of them), the ELSI researchers and the consulting team of the Magistrate of the Supreme Court who had shown interest in the law. I became aware of such meetings when Volkovak talked about them, and then officially, when Gabrielle—the new ELSI head after Dr. GJS left office—asked me if there really was no difference between genetic and genomics, since this was a point made in the discussion between the legal experts dealing with personal privacy. Dr. Sofia, human geneticist (who said there was none), and the ELSI researchers (i.e. Volkovak), insisted that there was indeed a difference and that it might be difficult to establish clear boundaries on what constitutes personal, familial or population wide information.[118]

Silencing and fragmentation was not a practice confined to the INMEGEN. The CNB and various other people at the M-NHI worked in a very similar fashion to the INMEGEN, in relation to its verticality and lack of transparency. Voices in bioethics recognised that they suffered from the same curse in various Mexican institutions; Dr. Rilke—philosopher and bioethicist—was one of those voices. During most of my fieldwork he occupied a high position in the CNB, but in 2011, when he questioned his new boss and president of the CNB about his bioethical credentials and ideas, he was asked to present his resignation and leave. A couple of weeks afterwards he began to work for the ELSI at the INMEGEN, even though there was no methodology or real bioethical autonomy he said at least there was time to write and do some research, something he was unable to do in the National Commission of Bioethics (CNB) (personal communication 09/02/11).

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[118] For the sake of following how discourses change across time and under different circumstances we can remember the words of Dr. Velazquez Arellano, who at the time- and I assume he was also speaking for Dr. Sofia who was one of his close collaborators in both the CPMG and at a M-NHI- said: "the difference between genetic and genomics is the one between studying one isolated instrument (genetics) or the whole orchestra (genomics)[anon. n. d., available at: compumedica.com]". I assume the discourse of Dr. Sofia had changed in part because accepting the break between genomics and genetics meant accepting there was an expertise gap between human geneticists and the brand new genomicists- and she now believed that this argument was only used to keep away the people Dr. GJS did not like.

At the moment when I entered the field the few bioethicists trained or doing research in the ethical-legal aspects of biosciences, not to say genomics, who could at some point break with its own expertocratic membership to establish a more citizen led bioethical body, were following the orders of senior biomedical researchers or (ex)leaders of the CPMG. Mexico´s National Commissioner of Bioethics was appointed with no regard to his credentials in bioethics (there were female bioethicists such as Dr. Laura who were recognised internationally, but who did not have the political profile to become the CNB´s president).

Since 2005 (the year when the CNB became an official autonomous body) the president of the CNB has been nothing near an expert or a practitioner of bioethics. The first president after its change of status was Dr. Guillermo Soberon, who came to the post after leaving FUNSALUD and whom openly said: "... ask those bioethical details to Gerardo, he knows better... (int. 2008)" In a similar way the current president of the CNB, Dr. Manuel Ruiz de Chavez (also the ex-president of FUNSALUD) became famous when in an international bioethical meeting with partners of both the INMEGEN and the CNB he openly acknowledged: "I do not know anything about bioethics, my appointment was purely political... (reported by one of the high ranked officers of the CNB-field notes 06/08/2010)".[119]

4.5 - Silencing as coproduction: final comments

For the purpose of this chapter, which was to explain the regulation of the "Mexican Genome," the way in which the flexibility of genomic sovereignty is lost or "dies" is very important: "...Over time, people (often administrators or regulatory agencies) try to control the tacking back-and forth and especially, to standardize and make equivalent the ill-structured and well-structured aspects of the particular boundary object (Star 2010:614)"[120].In the Mexican case this happened through the gradual transformation of a nationalistic discourse, rooted in the notion of genomic sovereignty an ill-defined boundary object, into a law that intended to monopolise the research on population genomics in the country. In order to maintain ELSI´s a progressive identity and still assert its nationalist tone, institutional communication had to be managed in many ways: mostly by erasing dissonance, controlling institutional communication and avoiding debate. Mechanisms such as

[119] The consolidation of the CNB as a national body was a gradual process that coincided with the creation of the INMEGEN. It began as a bioethical body of the SSA that was not "autonomous" and existed since 1989 (cf. http://cnb-mexico.salud.gob.mx/interior/antecedentes.html; nevertheless the CNB gave me the feeling of an embryonic institute since my first trips to its temporary site in 2008. Both Dr. Soberon and Dr. GJS were amongst the key genomic entrepreneurs and also the heads of both institutes at the time I entered the field (2008).

[120] See: boundary objects' life cycle "especially death" in Susan Star (2010).

silencing and fragmentation are common currency in the field of Mexican genomic regulation. At the level of everyday legal and regulatory practice "Mexican Uniqueness", genomic sovereignty and silencing are produced together; simply because in practice there is no place for debates or policy alternatives. So you can indeed say that social and natural orders are produced by thoroughly undemocratic practices. This is an aspect that has been mostly effaced from much of the contemporary explorations of coproduction (Jasanoff 2003, 2005; Reardon 2005). Even though Sheila Jasanoff (2007) recognises the need to study the way in which legal and scientific ordering works in different cultures and institutional settings, little has been done in terms of studying coproduction in non-democratic cultures. The analysis of scientific regulation amidst expertocratic and fairly undemocratic civic cultures opens up new paths for analytical inquiry in Mexico and beyond

In Mexican human genomics arena the public compromise to "deliberative bioethics" was a buzz word; in practice autonomy and critical engagement at the ELSI was not really valued, except as a cosmetic commitment, which was systematically avoided: i.e. the boomerang effect. All the laws that went through the ELSI in my days in the field did not follow a wide public discussion, controversy or interest. This anti-deliberative production of socio-legal categories occurs in the everyday practices of the ELSI. Aspect that became more evident while following the diffusion of federal normative claims such as genomic sovereignty and its movement into the context of local constitutions. These practical aspects created a sharp and heavy disjuncture with the public claim of an ELSI devoted to the promotion of a democratic culture, and a fragmented and divided bioethical community unwilling/unable to engage in dialogue (cf. INMEGEN-UNU Bio-Lac conference, July 2008). Related to this fragmentation, the uniqueness of Mexicanhood was beyond questioning in the Mexican Congress, even though it became the centre of critical examination for biomedical scientists (who felt betrayed and controlled).

The design of the law literally meant imagining what science did and did not do, what its impact would be on society at large, and then making a comparison with the laws in developed or first world countries (USA, UK, Holland) dealing with similar issues. This produced a closed group of experts that could effectively imprint their concerns, visions of causality and values in the text of law (the question of the representation of popular concerns is something other might need to research). I think there are important empirical lessons to learn from the way in which laws are made in the field of genomic medicine, which need to be thought through. However the problem was not simply that different legislative ideas were not part of the public debate or the closed door meetings made in order to design the laws, but that the institutions that could have an input on the regulation of genomics: CNB,IIJ-UNAM and the Bioethical Collêgium, did little to push the

desired deliberative agenda: "Mexico has had an incredibly sad scenario and very poor public debate, not only on bioethics but on general topics of importance, there is a lot of promise but not discussion... the public speech that says this the panacea...is associated with this (inaudible).... way of dealing with things out of proportion... (ibid)

The mechanisms to even start discussing bioethical matters are non-existent. As an instance other policy initiatives, instead of looking to protect the Mexican Genome, were dealing with genomic sovereignty understood as benefit sharing with indigenous communities and affected patients (Dr. Laura int.2009); however they were not part of Mexican legislative agenda. The idea of creating new mechanisms to manage complexity (Siqueiros et. al. 2011) has not generated any re-engagement with the topic. Silencing and closed door politics meant that no alternatives could be openly discussed and that the nationalistic—reified notion of a "Mexican genome"— was still the cornerstone of genomic rights and its legislative products, even when it was problematised in many ways by former supporters of the CPMG (cf. Chaps 8, 3 & 5).

5- *The ethico-legal protection of "Mextizaje"*

5.1 Reification and the law: sovereign typologies on the ground

> *...real sovereignty, independence as it has actually existed, has generated a dynamic of cultural production that shapes Mexican obsessions with national teleology because it creates a systematic divide between national ideology and actual power relations. This chasm is especially evident in the state's tense relationship to modernization and to the broad project of cultural modernity (Lomnitz 2002: 82)*

This chapter interrogates the idea that a "unique"[121] regulation and analysis of populations is emerging as a product of new genomic knowledge. Instead it presents the dilemmas of legal regulation in the fairly undemocratic and closed politico-legal culture of Mexico (cf. Chap 4), which finds it particularly difficult to delimit this biogenetic uniqueness in technical-legal terms. Pilar Ossorio (2007:436) warns us about the reification of DNA in jurisprudence: "the Common Heritage Duties Doctrine may inappropriately reify the genome and attribute too much significance to human DNA as a mark of, or bearer of, our humanity". The Mexican case goes a step further (in reification), by making the "Mexican Genome ("the material vessel of national history and identity)" a sovereign resource. One of the challenging and thrilling features of a molecular sovereignty resides in the confrontations between the normative work committed to framing the Mexican Genome as a national public good, and the ontologies at play in the field of population genomics. Following Foucault (2007), I think about the relation between normative-legal, and population-relative-probabilistic regulation as a relationship characterised by constant tensions and a deep ontological-practical divide:

> We could even say that the law works on the imaginary, since the law imagines and can only formulate all the things that could and must not be done by imagining them. It imagines the negative. Discipline works in a sphere that is, as it were, complementary to reality [...] So within the disciplinary space a complementary sphere of prescriptions and obligations is constituted that is all the more artificial and constraining as the nature of reality is tenacious and difficult to overcome (Foucault 2007[1977-78]:47).

In exploring the Mexican patrimonial notion of genomic sovereignty we find a disjuncture at the intersections between legal and scientific ordering, characterised by the confrontation-exchange between the binary mechanisms (prohibited/permitted) of law, and "the tenacious nature of reality

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[121] Both are fundamental premises of biocolonialism: the problem I found with such notions is that they do not question the existence of biological uniqueness inherent to the molecular identification and differentiation of populations (cf. Thacker 2005:163), and throughout my fieldwork I have found that idea to be truly problematic and contested by the few legal experts in the field.

(ibid)". I endorse the idea that juridical principles (in this case patrimonial) are still dominated by the logic of sovereignty/discipline: understood as an action over individual bodies, nations or political-territory (as somehow well-defined entities). This is in contrast with a probabilistic liberal governmentality more in tune with the relational qualities of population thought. In the case of Mexican genomic right we can actually say that the practice of regulation was a question of working on imaginary planes; literally the legal experts would imagine what were the risks related to ideas such as "Mextizaje" and then would develop legislation trying to avoid those threats (cf. Chap 6).

By following the ontologies[122] intertwined with the regulation of the "Mexican Genome" and the associated difficulties of trying to impose existing juridical principles to the field of population genomics based on the idea of uniqueness. The artificiality—in this case mostly understood as simulation or superficial arrangement—of legal ordering in a country in which law has been something used and abused, either as a weapon of the elites or at the prerogative of public functionaries is nothing new (cf. Chap 1). Yet, the novelty emerges when this incompatibility is not only the product of corruption, cronyism, or imposition but rather a question of incompatible ontologies (Nation= singular; population genomics=polyvalent) in confrontation with each other. Nonetheless the implications of sanctioning the movement of biological material as the embodiment of population genomics is based in very interesting assumptions in need of further examination.

5.1.1- The Metaphysics of sovereignty, people and law

Once in a discussion with Julian, a philosopher of Law, he told me that the difference between the metaphysical concept of sovereignty from the ancient times and the modern or Democratic Sovereignty lied in its source of power. While the absolutist Monarch relied on his privileged connection to God to claim sovereignty, the modern Social Contract or parliamentary corpus represents the "people". His brief clarification had no trace of doubt or irony; he firmly believed that the absolutist sovereign who made claims of knowledge of God and the cosmological order to legitimate his rule, was metaphysical, while the modern legislator claiming to represent the "people" or the "nation" was not.

I spent another couple of minutes trying to problematize his claim, but again I received a brief lecture: "the difference between the modern legislators and the ancient sovereign is that he/she is

[122] I understand ontologies not as a fixed essence or structure from which everything else is derived, but as an "empirical investigation into the kinds of entities, the forms of being, or the structures of existence in an area (Knorr Cetina 1999: 253)".

the legitimate republican representative, defined by popular vote, while the ancient sovereign was imposed through tradition and religious beliefs" facing this apparently irreconcilable difference we both politely left the discussion for another time[123]. Julian was a voice amongst many other lawyers, political scientist and academics whom firmly believed that the legitimate source of power comes from the "people (a concept which I think is not adamant to its own metaphysics, unquestioned assumptions and beliefs)". When I first interviewed Volkovak he framed Genomic sovereignty as another emanation of the social contract:

> ...well the concept of genome comes from the science, and sovereignty is a juridical notion which talks about the capacity of auto-determination of a nation, basically is a concept related to States... when we translate it to Genomic sovereignty... at least we understand it this way... we are talking about the capacity of our country to exploit its genomic resources, obviously by genetic resources we are talking about the *Mexican Genome...* and also produce knowledge in order for it to become a public good...but is a concept that is still under construction... (emphasis added, Volkovak Int. 2008)

For all its theoretical complexity and the debates generated around it (cf. Prokhovnik 1999, 2009; Barbour 2010; Singer & Weir 2008) the notion of sovereignty had a very definite meaning on the ground. For most of the legal scholars and policy makers I interviewed it was a combination of two elements: popular will (meaning representation and democracy) and the capacities of any given government to act independently and autonomously according to its best interests (Volkovak 2008; Cruz int. 2010; Verver int.2011; Belmont int. 2009). These two elements could be combined to support the role of government as the legitimate representative of the nation or to destabilise it.

For example in my first interview with Dr. GJS he said that Genomic sovereignty was a concept developed to avoid foreign researchers coming to the country to "...plunder indigenous blood and samples" (int. 2008). In other public venues he also defended that the notion of genomic sovereignty was a guiding principle to share and promote the benefits of genomic medicine with indigenous communities (Jimenez Sanchez in Academia Nacional 2 of July 2009). However Silvia Ribeiro (int. 2008) NGO researcher (ETC group) and critical journalist, saw precisely this type of discourse as a mask for a much less altruistic enterprise by which national geneticists plunder—

[123] Again we have a reading in which the old fashioned traditional and premodern societies are governed by exogenous and largely unquestioned rules, while the new modern societies are the expression of an authentic popular will: "...in which norms, customs and authority are accepted only through the conscious choice of the rational individual (cf. Seligman et.al. 2008:.179)". In this reading there is an implicit notion of the nature of power (substantive: power as a property) and social relations, which ultimately can be quantified, aggregated and posited into a representative that will then use this power in the congress as the individual who becomes the people.

with the help of transnational pharmaceuticals— the indigenous biogenetic heritage of the country and its native groups (cf. Chap 6).

In the hands of experienced policy makers and international figures such as Dr. Julio Frenk Mora, the search for sovereignty was actually to be found in a cosmopolitan ethos of international cooperation and mutual responsibility (Frenk, Int. 2009). While the same conception in the hands of Artemio Cruz, the political operator and lawyer who was part of the CPMG, and who designed the law and is now an outcast, it was a tool for manipulating and monopolising genomic research (Cruz, int. 2010). Both conceptions of Genomic sovereignty could not be more contrary to each other yet both depart from an acceptance that Mexican genetic patrimony lies in the genetic structures of a *national* population (either in its blood or biological materials, or on a more elusive informatic stratum). In one of the initial framing efforts Dr. Julio Frenk (2001) presented what would become the fundamental political grids of Mexican Genomic sovereignty based on a national population:

> ...Research, knowledge, it's an international public good [...] therefore, it could be easy to conclude that Mexico does not need to make its own research...I think, that is a mistake in the case of any research; but is a fatal mistake in the case of genomics. The variability of our own populations obliges us to count with our own research policy. This is really a case in which the research we don´t do, no one is going to do for us.

The declarations of Beatrice Seguin (quoting one of his scientist-informants) presented at the Celebration of the 5th Anniversary of the INMEGEN in the Mexican Senate, are a great example of the currency of such ideas: "...First world countries have the best resources... so it is very hard for us to find an area of opportunity, awfully difficult if we talk about electronics, technology and computing... if you talk about genetics and genomics being so particular in our population, having this huge resource that is our history [genomic patrimony] and I think we can definitely do it (Seguin in the Mexican Senate. 9 March 2009]".

Eugene Thacker (2005) recognizes two characteristics of post-genomics politics that match the basic assumptions, underpinnings and logics behind the notion of "genomic sovereignty". The first one is that with molecular genetics "a new type of identification and differentiation has come about in which individuals and populations can be uniquely analyzed and regulated (Thacker 2005: 163)". The second assumption makes an analogy between classical colonialism and new developments in bioscience, that can transform bodies, or at least parts of them, into new use value: "In this case "population" morphs into territory and resource, and in the more economically motivated ventures, these things in turn translate into biological *value* (Thacker 2005: 163)". Mexican genomic entrepreneurs have departed from those two same assumptions to mobilise

their own policy agenda alongside a vision of future dangers (Chapter 3) but most importantly they have created a law to enforce such vision.

5.2- The legal consequences of genomic sovereignty.

> *...and of course there is no country, not underdeveloped, nor... nor emerging economies that have a law of genomic sovereignty (Jiménez-Sánchez int. 2008)*

The move from a diffuse relation between national security and Mexican uniqueness to a law embedding sovereignty in genetic material, available in "...corpses, blood samples or human tissue", did not obey any long term juridical strategy. According to top officials, and in-house bioethicists of the INMEGEN, the legislation was a response to bio–piracy, or what they call Safari research, specifically from the Genographic project (int. Cruz 2010, Aldebaran and Jimenez Sanchez 2008; NAS 2005). Another source of anxiety was the patent permission asked of the Mexican office of intellectual property (IMPI) by Myriad Genetics on BRCA 1-BRCA 2 genes[124] (cf. Schwartz &Pollack 2010). According to Artemio Cruz, who designed and wrote the law when he was in charge of the ELSI[125]of the INMEGEN, it was a pragmatic response to safari research. He thought the response was exaggerated and too nationalist, and Artemio Cruz says he continually discussed with Dr. GJS about making an alliance with the Genographic project (2010, int). At INMEGEN´s web page the intentions of the law are explained as follows:

> ...it [the law] recognizes that national sovereignty must include everything related to the genetic material of Mexicans. Therefore, before the misuse of information, it is very important to prevent the biological material and information derived from it from being transferred outside the country without regulation. Notwithstanding the foregoing, the approved project is not intended to impose barriers to research, it tries to stimulate national and international scientific collaborations, through a permit system in which the Ministry of Health and INMEGEN will have greater involvement (www.inmegen.gob.mx, emphasis added [English webpage version]).

For Dr. GJS the law was a response to the materialisation of threats (i.e. Genographic project, Patenting of BRAC-1 & 2) that were flagged by him to congressmen while the INMEGEN was lobbied: "...the law was closer to reality!!! It was not only the plundering of indigenous

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[124] The BRAC-1 & BRAC-2 genes became famous in the field of medical genomics since they were the first sequences of DNA used to diagnose breast cancer (with an 85% accuracy it was said) based on Ashkenazi Jewish female population. In Mexico this case was constantly referred to—by genomic entrepreneurs as Dr. Frenk Mora and Dr. DR.DR.GJS— as an example of how private interests were making profits in the wake of the HGP, and how genomics could be used to privately appropriate pieces of Mexican ancestry to do the same type of capitalistic expropriation of genetic resources.

[125]The law I am referring to is in the D.O.F 2008, Fraction IX to the 3rd article, a title 5*bis* and its only chapter, and the article 421*ter* of the Mexican Federal law of health

communities but the hegemony of one nation over another for the genomic knowledge; and then the concept of genomic sovereignty that I was talking about in the year 2001-2002 was taking shape with concrete examples, products and populations (Jimenez-Sanchez 2008)!! The defence of a specific "Mexican" genomic sovereignty has produced legislation that sanctions the circulation of genetic material for population genomic studies, defined as: "...the analysis of one or more genetic markers in unrelated individuals that describe the genetic structure of a population, identify an ethnic group or identify genes associated with a trait, disease or drug response (D.O.F 2008, Article 317bis, section III)".

The boundary object which once entailed a set of statements about the future independence of Mexico in the emerging field of medical genomics was now framed as a legal commitment to protect the source of such independence by sanctioning anyone who wishes to threaten the possibility of creating a future Mexican bioeconomy:

> Whomever moves or perform any act aimed at moving outside the national territory, organs, tissues and human components of living or dead, without express permission of the Secretary of Health, will receive a prison sentence of four to fifteen years and fined the equivalent of three hundred seven days of minimum wage in the economic area concerned (D.O.F 2008, article 416).

According to its promoters and designers the implicit code of conduct in the law requires demonstrating a benefit for Mexico, that if bypassed, will nullify any intellectual property claims: "...the requirement is... that there should be benefits for Mexico... but implicitly it includes another point, that if you took samples without permission, and then you generated intellectual property, and you want to take it to Mexico to generate high profits [...] intellectual property won't be recognized (Jimenez Sanchez int. 2008)! Nonetheless the law said nothing about the mechanisms of non-recognition of intellectual property. During the two years I stayed at the ELSI the implicit mechanisms of non-recognition of intellectual property were never in place, and the role of the INMEGEN as a regulator was not very clear[126]. Yet the law of genomic sovereignty implicitly recognised the INMEGEN as the authority on the regulation of the movements of samples related to genomic research, and above all the existence of Mexican Genome in need of protection.

[126] As I mentioned in Chapter 6 Dr. Daniel was the first (and last scientist) to ask permission to the ELSI to send his samples to USA, he completely agreed on the need for regulation, but he, as everyone else, was very unclear on how to deal with the new legal dispositions.

5.2.1- The flaw of the law according to its designer[127]

The draft of law on genomic sovereignty was made by Artemio Cruz who indeed believed, as almost all of the Congressmen I have talked with or which have left written record (D.O.F 2001a, b; 2004; 2008), that there is something unique in the biogenetic stratum of Mexicans (cf. Canal del Congreso 2001, 2002 a, b, D.O.F 2004, 2008).He also thought that the law on genomic sovereignty was not simply a naïve protection of blood samples, but a strategy to manipulate congressmen and control scientists working in the field of molecular biology(cf. Chap 6: 6.2). For him the great flaw of the new legislation was trying to control samples instead of controlling Intellectual Property (IP): "...the law just went through because it was about Mexican genomic sovereignty... and logically what you have is a law that will never be operative, never!... it is easier to protect intellectual property rather than... I do not know how they are going to control the question of health... (int. 2010)" [128] He then shared what would be in his perspective the best way to protect genomic sovereignty, instead of sanctioning the movement of samples:

> ...everyday... (and we discussed this) thousands of samples go out of the country—just think about the hospitals—you send little papers with blood and results are send to you via internet [...] indigenous blood is everywhere... as a matter of fact the biggest Mexican Biobanks are in Oxford and Harvard I think... the real purpose of the law was to limit Mexican scientists from sending any more samples to their foreign collaborators...
>
> I am going to tell you one thing...the key for all of this... we don´t need more regulations that does not help... more laws, useless!! Simply any study in which you have a gene or a polymorphism characteristic of the Mexican population is of Mexico...it does not matter where the research is done... if it's in Europe, USA...it does not matter... any study that has a polymorphism or a sequence that identifies the Mexicans...is of Mexico, why? Because you took it from here...no more regulations or trying to control the entire world! Or saying you are the God of Genomics! Just do it through intellectual property... (int. 2010)"

This piece of interview is specially revealing and I would even say representative of the juridical-political social world in Mexico because it emphasises the type of natural order circulating amongst legal and policy experts. This natural order was composed of three main ideas: 1)

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[127] The way in which Artemio Cruz, identified himself was by bringing a set of documents in which he appeared during the negotiations to create the INMEGEN, the MGDP journeys and the picture in which he appeared in the founding patronage committee of the INMEGEN, with top policy makers and public figures of business and health.

[128] We have to bear in mind that Artemio Cruz is now a public opponent of Dr. GJS, and his story about the law could be very different if he was occupying his top bureaucratic office still. Yet he and Dr. GJS knew that for many Mexican scientists doing genomic research, the availability of samples was fundamental in their partnership with international teams. It was precisely this practical knowledge about the asymmetric relations between scientists in Mexico and developed countries what the law tried to regulate (the question was if this was done for personal or public gain).

populations can be uniquely identified, and they coincide with categories such as the nation; 2) The relation between Mexican bodies and "Mextizaje" is so clear that can be policed throughout international networks of cooperation; and 3) that the more efficient way to achieve sovereignty is by controlling intellectual property (rather than the movement of samples which was a strategy devised to control biomedical research in Mexico. The next section tracks the genealogy of these set of ideas in the legal and strategic documents in the Mexican human genomics arena.

5.3- Natural order in the texts of Law.

The adherence of scientists-lobbyists, congressmen and Mexican public academics to the common heritage doctrine and the UNESCO´s (1997) Universal Declaration on the Human Genome and Human Rights, was overwhelming. Such was the extent and success of a patrimonial (i.e. national genome idea) that in the exposition of motives of seminal laws that served as a precedent to the creation of the INMEGEN, the human genome was treated as humanity *real* common heritage *–or the most intimate element in the constitution of our humanity* (cf. Chapter 3):

> The defence made by the UNESCO of the Human Genome Project as a patrimony of humanity, is coherent with the right of the human being to freedom and democracy; with the right to health, dignity, justice and well-being (Precedent of the law on genomic sovereignty, D.O.F 2001)".

Another aspect of the way in which law was created that needs to be strongly highlighted is the notion of causality and the reification of national identity put forward in law and public venues such as the Congress was of strategic importance for the creation of the INMEGEN (chapter 4). The legal and policy visions that fuelled the creation of the INMEGEN (D.O.F 2001 a, b; 2004 & 2008; Canal del Congreso 2001 & 2002) were undoubtedly bolder, more reductionist and mechanistic than anything my scientist/informants would be willing to accept, or even less publicly endorse (cf. Chap 8 & 7) at academic conferences or seminars (these scientist's views became more lax when they talked in TV shows and magazines).For example, the following statement appears in both the preambles of the laws on genomic sovereignty (Federal and local level):

> ...you will be able to tell a person, that s/he can eat fatty foods because s/he lacks the genetic predisposition to obesity and cardiac disease, but that s/he has to avoid alcohol because s/he is genetically predisposed to alcoholism... (Preamble of Nayarit´s genomic sovereignty law: 09/09/09).

Adding to such causal and mechanistic statements, the law continued to assert:

> It has been found that certain populations of the country are at risk of developing diseases such as diabetes, cancer or hypertension; this is due to the history of populations and *not* to their environment or feeding habits. Also with the information

> collected there have been other results not less important or interesting, as an example, 58% of the genome of the population of Sonora has a European component, while in Guerrero; 22% of the genome of their population comes from African genes (ibid, emphasis added).

The preamble continued making bold assertions like: "with the entire data gathering of the MGDP, the revolution of genomic medicine was just around the corner"; a promise that many local secretaries of health heard. As we know from Deputy and former secretary of health of Zacatecas Heladio Verver (int. 2011), local authorities were willing to get the revolutionary genomic chips to equip their own local hospitals. After providing a pretty mechanistic vision of nature and genetics, the law of Nayarit proceeded to sanction the conduct around objects such as "the Mexican Genome" through very general ethical claims like:"... everybody in the state of Nayarit has the right to know their genetic information and biological origins (article 7, IX-b)".

When compared to the federal law, the idea of specific percentages of racial heritage was new, but the bold notions of causality, risk and ethnoracial uniqueness were to be found not only in the federal law, but in the INMEGEN´s Feasibility Study (IFS 2001: 10). Many of the statements of risk, causality and ethics that appeared in the laws relating to genomics and biomedicine at large were self-referential, meaning they were scripted over pre-existing laws, and remained unquestioned and widely reproduced in the legal documents and discussions on the issue. In turn these political projects and its documents implicitly entail certain assumptions about the natural order that we can trace back to INMEGEN´s lobbying.

Figure 5-A- Genomic Paradigms: Notions of causality and ethnicity advanced by the CPMG in the INMEGEN´s feasibility study

The new genomic paradigms provide us with the following conclusions:

- The project of the HGP that had as its goal the generation of a genetic map, resulted in genetic information; that is to say the personal identity of each individual.
- The content of genomic information has a dual nature: it allows for individual identification, but at the same time it provides unequivocal identification of filial information, making clear the relation between an individual and a group. And that is how the concept of genomic privacy emerges.
- Genetic information possesses a predictive character: by applying certain techniques and proofs we can know the future health of an individual.

Genetic material has always existed in nature, and thanks to human intellect this information acquires meaning (IFS 2001: 10).

Without the idea that there exists a Mexican genome; the legal protection of Mexican uniqueness hardly makes any sense. Notions of causality and ethical commitment put forward in preceding texts were mostly reproduced or copy-pasted into the new text (cf. Annex C, C1 & C2; D.OF 2001 a, b; 2004; 2008). All the same, the source of many of those statements can be followed down to the very epistemic network that created the IFS and lobbied the INMEGEN; an epistemic network that at the time of my fieldwork was divided and in open confrontation. Important products of this brief association, like the IFS (2001), continued to inform the legal regulation of genomics in Mexico, and also provided counsel as to how to deal with the consequences of natural discoveries:

> ...as a consequence of ethnic and geographic differences between allelic frequencies amongst persons and even whole populations, both could be exposed to ethical dangers. Actions that go against the most basic ethical principles are already becoming possible, and these dangers will increase exponentially as the HGP reaches its end. In the long run, when the manipulation of human beings becomes possible, risks and promises would be even greater. Like everything in science and technology, knowledge is not good or bad in itself, it all depends on the use we give to it (ibid: 10).

Although genomic entrepreneurs such as Dr. Julio Frenk Mora denied any deterministic claims were put forward on the medical or scientific front while negotiating in the Congress, from the documents produced by the CPMG we get a very different idea (in the terrain of economics he accepted that the visions were made to be very clear, and could be interpreted as a kind of determinism: int.2009). Dr. Max was convinced that during the negotiation process genomic medicine became a panacea, but he did not attribute any of these exaggerated visions to the work of the CPMG. However the text of a seminal document for the creation of the INMEGEN, the IFS, says otherwise.

Such was the extent to which these reductionist and mechanistic visions of causality permeated the bioethical and regulatory field, that Marco Aldebaran openly said that with the creation of the MGDP we can now track the origins of a person to a specific region of the country and determine the exact ethnic origin of unidentified individuals, linking it with a geographical area (field notes 16/06/2009). Though the Marco Aldebaran statement became an instant joke at the INMEGEN, especially within the PGL (cf. Chap 5), his conclusions were not drawn out of plain ignorance; again we can trace his ideas to the notion of ethno-racial uniqueness put forward by the CPMG in its negotiating efforts (IFS 2001:10-52). With this in mind, we can actually trace the way in which the close expertocratic circle of politico-legal regulation of genomics produces natural and social orders.

5.3.1-Mextizaje in the policy world

The entire policy world agreed on the need for regulation around Genomics, and most of those I interviewed believed that there was something unique in need of protection in Mexican genetics. The scientific disquiet with the reification of Mexicanhood, was something that did not permeated the general opinion, except of a very small circle of bioethical experts (mostly those who dealt with molecular research, were themselves geneticists, were interested in biology or who had links with former members of the CPMG). Although in political speech genomic sovereignty has many valences and moves around easily, its public-patrimonial character has been constantly reasserted as the most important of its valences. Just one of my informants considered genomic sovereignty to be related to the right of an individual not to know or to do as s/he wishes with the results derived from genetic tests (Dr. Max int. 2008, 2009) Dr. Max opinion was an exception. Throughout my engagement with ELSI matters, the CNB, independent bioethicist and scientist in the country it became clear that the relation between domestic and international cooperation was especially poignant in the bioethical and scientific practice of genomics.

Even sceptical Congressmen who were extremely disappointed with the INMEGEN had no problem or questioning about the existence or importance of the Mexican Genome. As an example, in a telephone interview (2011) with Federal Deputy Heladio Verver of the PRD, who was in charge of gathering technical opinions on the law of genomic sovereignty, I directly asked him if he found the existence of such a thing as "a Mexican genome" problematic. He said the Mexican genome was something of great transcendence and that he did not find the idea of a Mexican Genome problematic at all:

> E.S- Do you think the notion of the Mexican Genome is problematic?
>
> **H.V-**No, no on the contrary it holds great promise...When I was secretary of Heath of Zacatecas, Dr. GJS talked about Zacatecans...whom have more Spanish genes as a product of the process of Mestizaje... to be honest it [making reference to the Mexican Genome] looks really attractive for me... something that can be used like neonatal screening..

The talk of Mextizaje simply made sense: genetics was telling a story Congressmen and various audiences already knew (cf. Altair chap 7). The interesting bit was that now with Mexican genes, social and political realities could be transformed and improved i.e. like the double epidemiological burden of Mexico (cf. Frenk 2004; 2005; 2009). In the case of congressman, as with many others, genetic knowledge was something revolutionary and closely tied to national identity. What he found problematic was the lack of transparent management of the institution and the fact that middle ranked officers were used as scapegoats. Let me give you another

example: according to the policy makers and legislators that approved the law on Genomic sovereignty its primary objective is "to assure that the Mexican genome becomes the property of Mexicans and that population genomic research is assured to be of public utility (Saro-Boardman in Notimex 2008)". As you can read in the previous quotes, the idea of a Mexican Genome that can be circumscribed to a nation-state is not problematic for Ernesto Saro-Boardman, the representative of Mexican congressmen in 2008, or for key congressmen dealing with the law as it was for molecular biologists (Chapter 4 &5).

5.3.2- Mextizaje in the international policy arena.

The next quote, taken from an international meeting in Washington D.C in which Dr. GJS participated and presented the INMEGEN to key international policy audiences, makes evident how the idea of becoming the biomedical gatekeepers (as well as the idea that there is a Mexican biogenetic uniqueness) in the coming genomic revolution was constantly mobilised in the national and international scenario (cf. NAS 2005):

> A Mexican genomic platform is considered key to discouraging non-Mexican research and development of Mexican-specific products and services. Anecdotal reports indicate that U.S. field workers have, in the past, collected blood samples from Mexican indigenous populations and taken the samples back to the United States. Presumably, polymorphisms could be identified and genomic-specific medicines made and sold at U.S. prices. If this were to happen, Mexicans would likely not be able to afford the drugs, thereby worsening economic and inequity problems that already exist (NAS 2005: 10-12; also see: Dr. Jimenez-Sanchez 2008, 2009; Frenk 2009; IFS 2001; Jimenez-Sanchez et.al.2002 a, b, c, d; Seguin et.al 2008, 2009)[129],[130].

All the international supporters of the agenda of genomic sovereignty endorse the idea that the Mexican population could be uniquely analysed and studied, something that on the other hand was deeply problematic for those working at the laboratory bench (cf. Chap 5).These ideas were born in the first years of negotiation of the INMEGEN before even the first sample of the project

[129] Report available at: http://www.nap.edu/catalog/11301.html. This particular document is revealing of the extent to which Mexican biogenetic uniqueness and INMEGEN´s role as the centre of medical genomics in Mexico was mobilised in the international network of scientists, policymakers and bioethicists.

[130] This international workshop report continued to say that with the knowledge of the specific polymorphisms of the Mexican population new destructive bioweapons could be developed: "Moreover, it has been realized that the same knowledge and technology could be used to make Mexican-specific bioweapons. While the dual-use risk is for the most part considered only hypothetical, it has raised a security issue and prompted action (NAS 2005:11)"In this context action meant creating the INMEGEN; the law on genomic sovereignty is not related to bioweapons, the only other context in which I have heard the idea of using "biogenetically tailored" weapons has been in the NGO ETC group-Mexico´s Branch. This of course means you have tacitly accepted the idea that a population's "biogenetic uniqueness" can be identified and manipulated by the new science.

was taken, and immediately started circulating international policy circuits (Seguin et.al 2008 and NAS 2005). After presenting some of the reductionist statements of the IFS (2001) and the acceptance of Mexican biogenetic uniqueness while negotiating the INMEGEN and designing laws, we can definitely say that boundary objects such as Mextizaje have an important role to play in the way legal and political projects are built.

5.4-Can we protect "the Mexican Genome"? Uniqueness and false dichotomy

> *...in no way is the intention to identify all Mexicans in the world to claim sovereignty over their Mexican ancestry... you are opposing the concept of sovereignty with the concept of cooperation, and that's a dichotomy that does not hold ... I think the whole point, the essence of international cooperation is being able to share sovereignty, what has been called "Sovereignty sharing" ... and yes it is a paradox... (Frenk, int. 2009)"*

The previous quote is derived from a discussion with a man who I think, at least in its beginning, was one of the genomic entrepreneurs who most firmly invested in and developed the concept of genomic sovereignty: Dr. Julio Frenk Mora, former Secretary of Health and Dean of Harvard School of Public health. This quote was the response he gave to me to what he thought was a false dichotomy i.e.: the opposition between national independence and international cooperation[131]. In our first talk I questioned the very notion of genomic sovereignty and the text of the law which was aimed at regulating the movement of all sorts of biological samples (D.O.F 2008), and controlling scientific practices. Part of his response to my questioning is presented here:

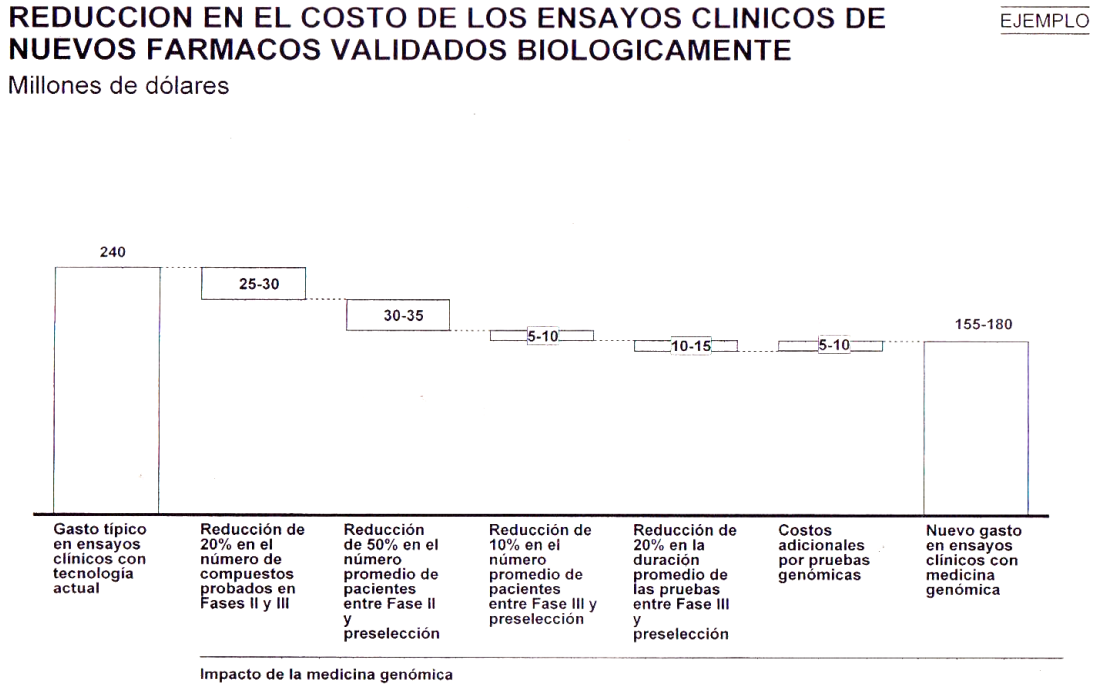
> ...the knowledge of the genome of a population is liable to be patented. Therefore genetic sequences produced by these enterprises could limit further access to that knowledge, and its application in technological and social needs may be limited by private interests ... and then, as a consequence this will limit the degrees of freedom of a State to promote the health of its people ... I think what is protected is not the genes themselves, but the knowledge derived from them.

I continued questioning if it was even possible to effectively regulate the movement of samples or control its use, since evidently there was a well of Mexican ancestry all around the south border of the USA. Laboratories like that of Esteban Gonzalez Burchard which was already researching on asthma in populations of Mexican origin, would be an example of the difficulty of controlling genomic research. He continued to remark that this was exactly "a case in which genomic

[131] Amongst the interviews I had with policy makers endorsing a patrimonial conception of genomics, and the public actors responsible for mobilising and negotiating the creation of the INMEGEN and genomic sovereignty, the interview with Dr. Frenk Mora (2009) were amongst the most interesting.

sovereignty was being lost" and that it was precisely to avoid these types of "sovereignty deficits" that the notion was mobilised in the first place[132].

Figure 5-B- Reduction of the cost of clinical trials by using new biologically validated pharmaceuticals (according to the CPMG)



Fuente: Bhandari, M., *et.al.*, "A Genetic Revolution in healthcare", *The McKinsey Quarterly*, Vol. 4 1999 12

The law on genomic sovereignty tries to mediate between public interest, research and private-market incentives, and yet little has been done in the way of clarifying what would be the specific mechanisms to do so. Medical/population genomics has only been possible through an international network of cooperation, and on the other hand cooperative relationships are mediated by commercial patenting and business opportunities working on "private property" models which exclude certain actors from the profitable benefits of research. The tense relationship between private appropriation and public benefit is traversed by the idea that genomic information is a valuable and central resource which needs to be protected by juridical mechanisms.

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[132] The idea that power is an attribute that can be gained and lost has been linked with the ability to manipulate the knowledge of genetic variation in order to create drugs; therapies or new diagnostic tests are notions that I constantly found in the field of Mexican medical/population genomics, precisely in the way law on genomic sovereignty is crafted and thought about. One of the unusual legal opinions around genomic sovereignty holds the idea that the very claim on genomic sovereignty is a sign of the lack of sovereign control: "...I have never heard UK, Germany or USA claim sovereignty they don´t need to...(Juan Academic IIJ-UNAM)"

For other top officers at the INMEGEN and the CPMG epistemic network, the ethical negotiation at the heart of the Law of Genomic sovereignty included the tacit regulation of the candidate biotechnological drugs of the future (IFS 2001:12). The idea was, and still is, that with population based biomedicine huge savings and new ways to test drugs would be possible. At the same time this would open another way in which the fluid notions of population were linked to a geographical space: "In the future, we have this on the agenda, our most important asset is information... to do this we will have to generate an adequate legal framework, and we are working on this, from here to there the national interest...this goes on and this doesn't [... Dr .Max int. 2008: referring to biomedicines]".

Because the idea of sovereignty was tied to Mexican uniqueness and the role of the INMEGEN was as the *de facto* regulator of the field, its centrality in the Mexican political and scientific scene was unchallenged: "Having created a national institute gives us advantages, we can easily move in the public field, and also in the private... there is new legislation on the international sphere, in different countries, these are establishing that if someone wants to introduce a new medication in the market, there should be genomic studies based on the populations of the market (Dr. Max, int. 2008 Head of Research- INMEGEN)".

5.4.1- Policing the Mexican Genome

> *What is being protected is the knowledge about genes … and especially to protect it from private interests that could generate barriers of access to that knowledge and the technological developments derived from it. There are concrete examples already; the case of Iceland is one of them… (Frenk, int. 2009)*[133]

As a problem of circulation, the law works at the level of the State, its territory and the normative capacities to enforce the law i.e. accept or not accept patent permissions or prohibit the movement of samples without the surveillance of an authority. Trying to control something that by definition exceeds all your surveillance capabilities, namely genetic-information-material, has generated critiques by very diverse stakeholders (for different, yet interconnected reasons). In a chat with Dr. Lopez, genomic scientist (field notes 02/05/10), he argued that the genomic information of populations could be exchanged without any problem within the framework of the law, since the law does not say anything about information: "... If you like, you could develop your own ancestry markers (AIM´s) with the information given in the open access web page of the INMEGEN".

[133] To read about the controversies around the case of Iceland see: Palsson and Rabinow 1999, also Sigurdsson 2001.

The substantial pragmatic aspect that sovereign claims overlook is the international network of cooperation through which the "Mexican Genome" came into being: the international HapMap, the Human Genome Project and the academic exchange that allowed for a transnational network, such as the one made by genomic entrepreneurs such as Dr. GJS, to emerge. In addition, Mexico is part of the international open access network, to which INMEGEN´s research contributes and wishes to enrich through further alliances with Latin America (cf. http://diversity.inmegen.gob.mx). In a similar sceptical argumentative line, Silvia Ribeiro, representative of the Erosion, Technology and Concentration NGO (ETC) summarises this critique to the patrimonial protection of genomics as follows:

> Open access does not guarantee that genetic sequences are not patented with a minimal modification... they can say that this is for the benefit of all, or that no one can monopolize it, but how they are going to control that, or are they going to have a special department to check genomic patents around the world, to see if a piece of information corresponds to the INMEGEN´s... in databases with millions of pieces of data, I mean the question already gives you the answer... (Ribeiro, int. 2008)

Before my stay in the ELSI centre I thought that the criticism made of the enforceability of genomic sovereignty was misdirected, for the simple reason that the realm of enforcement was not bioinformatic surveillance (Schwartz-Marín 2008: 51-53). But now I think that such criticisms touch an underlying problem in the normative configuration of population genomics. Basically the problem is one of irreducible multiplicity and ontological ambivalence.

5.5- Patrimonial—genomic— regimes and sovereignty

Regardless of the way in which we approach the question of sovereignty, as a question of policing information, revoking unlawful IP or becoming a biomedical gatekeeper to the Mexican market, the delimitation (and surveillance) of Mexican genetic uniqueness and public benefit continues to be a fundamental problem in practical terms. How can the Mexican genome be protected if it is not a well-defined entity, but rather something composed of frequencies of DNA and not completely distinct chunks of DNA? What would be the mechanisms to assure that the popular appropriation of genomic science occurs? The biopolitical design founded on collective sovereignty and the protection of a "Mexican Genome" (translated into the rule, security and self-determination of a nation-state) is increasingly incapable of grasping the radical novelty of population genomics.

In contemporary Mexican bioethical and policy agenda it has become fashionable to speak about the human genome as Humanity's Common Heritage, yet when examined closer it appears that

the Common Heritage Doctrine hardly grasps the intricacies of human genetic knowledge and its implications:

> Human genomes also have a complex, dual nature. Each person's total genome is unique to her (unless she is a monozygotic twin), and the information contained therein is importantly about her. Yet each of us shares parts of our genomes with parents, siblings, and other family members. Because parts of our genomes are identical to the genomes of our relatives, one person's genetic information also constitutes information about family members. One person's genetic test may disclose health risks for other family members and/or ancestry information that pertain to other family members (Ossorio 2007:7).

During my stay in the ELSI the problem of ontological ambivalence —complex dual nature— presented itself in many forms; either when discussing media coverage talking about the "Chilango"[134] genome, or when elucidating what constituted primary data or restricted samples, in order to analyse the policy harmonization proposed by the P3G (Public Population Projects in Genomics, see: http://www.p3g.org/, cf. Annex C). Specialists in the field simply did not know what could be treated as special or restricted data[135]. After my first year in the field I became increasingly aware that the notion of genomic sovereignty was highly contested both in technical and ethical terms, even if still seductive for mass media and legislators (cf. Ch. 7).

5.5.1- Patrimonial regimes and biogenetic ambivalence

Here I bring forth an example of the points of tension buried in the personal archives and stories of politico-legal experts, who mobilised the notion of genomic sovereignty or those who have designed or evaluated the law. Perhaps questions about the appropriateness of patrimonial doctrines to regulate human genomics, have not bothered legislators and their counsellors, since the law assumes that the Mexican genome is a public good and the genome of each individual is his/her own personal property (cf. D.O.F 2008). Yet the response from the ELSI centre to article 103*bis* (22 of April 2008), which delimits the entitlements of individuals and collectives on genomics, engages with such assumptions; making evident the elusive metaphysics at play between the ontologies of law and that of human genomics:

> In respect to the "*Article 103 Bis-The human genome and the knowledge produced from it, is a patrimony of humanity. The individual genome of each human being*

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[134] Popular way to refer to Mexico City's inhabitants: After reading the promotional article, one of the researchers at the CID library (cf. Chap 2) continued discussing if the next idea of marketing would be the genome of "la Condesa" (upper class neighbourhood), and then the genome of "Iztapalapa"(popular neighbourhood). Volkovak and I laughed about it and made it clear we shared his concern.

[135] Volkovak asked the IP department of the INMEGEN to assess the ELSI in these matters. The difficulties of delimiting what was primary data and what should be protected depended basically on the type of research being done, which could not be established a priori (field notes12-15/02/09 &).

> *belongs to each individual"*. The content of this article produces confusion, since by a question of logic the human genome is not patrimony of humanity, since it is not a "tangible thing". In the same sense the Universal declaration about the Human Genome and Human Rights approved the 11 of September of 1997 has been very precise to point that the human genome, is symbolically, humanity´s common heritage.
> ...The Mexican State should delimit the sense that it wants to give to biomedical research. The INMEGEN is confident that the legislator has acknowledged the priority of fomenting biomedical research. Therefore we should be very careful at the moment of redacting a norm that will rule on this matter. Delimiting that the individual genome is the property of each human being is very interesting, since it looks as if there is an existing property right over the individual genome. In this respect we have to remember that the juridical doctrine of real property is translated into the faculty that is conferred upon the subject to use the "thing" in which the right of property rules. In the same sense we should think if we can really enjoy, dispose of and use the human genome, since it is an intangible thing.[136]

For the legislators (as well as for their scientific advisors) the distinction between collective and individual will and a person's right to their own genetic information does not seem to be problematic at all, neither in technical nor in bioethical terms. Legally, the individual genome is considered to be an intimate element in the composition of the person and its human dignity, while the "Mexican Genome" or the "The Genomic Map of Mexicans" is endlessly treated as a public good (D.O.F 2008; D.O.F 2001, Calderon 2009) [137]. The ELSI centre's response to article 103*bis* of the law on genomic sovereignty addresses the incompatibility of population genomics and traditional property regimes[138]. Such incompatibility became a question of concern for Volkovak (who crafted the response to the law as the only ELSI legal researcher- I was not doing participant observation when this happened).

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[136] Footnote in the original: Universal Declaration on The Human Genome and Human Rights, adopted on November 11, 1997. 1- The human genome is the basis of the fundamental unity of all members of the human family and recognition of their inherent dignity and diversity. In a symbolic sense, the human genome is the heritage of humanity. Property: From the Latin ***proprieta-atis***, is the right or power to hold someone-something and to dispose of it within legal limits (Dictionary of the Spanish Language). Therefore, it allows dominion to be exercised over the thing possessed, in this case the genome itself.
Ius utendi: The power of using the thing according to nature;
Ius fruendi: The right to receive the benefits or fruits of the thing subject to ownership;
Ius abutendi: The power to destroy the thing or the benefit of using and dispose of it in full and final way.

[137] Other famous examples such as the Regents vs. Moore case in USA can show otherwise, yet the battle over patents is far from over as the Supreme Court case against the patenting of BRAC-1 and BRAC-2 by Myriad Genetics has recently shown (moving back to privileging the market logic of discovery). In Mexican legislation, the human genome is the sole property of the individual and it cannot be estranged for commercial purposes; also see (Lolas et.al 2004).

[138] Recently congressmen asked for a new commentary on the same law and the text I am quoting is now being redrafted completely in order to make "things right", again without any wider discussion, consultation or even engagement with the regulated object.

He used to compare the difficulty of protecting the "Mexican genome" with the way in which the extent of the territorial sea-water of each nation was decided. According to him it was through measuring the distance that cannon balls (or other defensive projectiles) travelled that the extent of the territorial waters was decided (he never gave me a reference but he talked about *Grotius* and other jurists) [139]. He continued to say that the important thing to know was that you cannot claim sovereignty over something you cannot protect: "...sovereignty is what the US Supreme court is doing, by revoking the patents of BRAC1-BRAC 2 genes of Myriad Genetics®... that is sovereignty and not our *mamarrachadas (bad copies* [field notes 03/05/10])". However none of these interesting insights reached any public forum, formal debate or even the desk of a feisty congressman willing to destabilise the hegemony of "the Mexican genome": this was simply a lively topic of debate amongst a bunch of silenced experts[140].

As an example apart from the ELSI, The National Academy was one of the expert bodies whom responded to the legislators' call for analysis and commentary on the proposed legal text, and the question about the feasibility of making the genome of each person their own "real" property was not even identified as a problem (ELSI 22 April 2008). Somehow the ELSI´s response to the legislation of human genomics simply had no repercussions: a couple of weeks ago (26 of May 2011) the law proposed in 2008 was on its way to being ratified by the Mexican house of deputies without any change to its text (cf. Annex C, C1). Invariably, when discussing the implications of incompatibility between population genomics and sovereignty, the response was the "boomerang effect (actually the lack of answer or engagement with the topic was the response)".

5.6- Sovereign disjunctures and the Mexican Genome

Ironically the way in which the inoperability of the law and the multiplicity of genomics was dealt with had nothing to do with the re-engagement with the polyvalent (population, family, personal)

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[139] cf: Walker (1945). The next historical quote popular in the 19th century is found in the work of Wilson (1928), one of the legal experts on international maritime law, which I think summarises this matter in a rather nice way: **"***Far as the sovereign can defend his sway; Extends his empire o´er the watr´y way; The shot send thundering over the liquid plain; Assign the limits of his just domain* (Azuna in Wilson 1928).

[140] The last part of my ethnographic engagement was basically to periodically meet and talk about these bioethical matters with a team composed of 2 ELSI researchers, at the time Gabrielle and Volkovak, and two officers of the CNB who had met with us at various times to talk and discuss about bioethical matters, amongst them the concept of genomic sovereignty. In our last formal meeting at the CNB (field notes 27/07/10), I raised the question of what to do with the ambivalence of information that is at the same time relevant at the levels of population, family-group and as a personal identifier. Some of the results of these talks were to identify that further discussion was needed, but also that complex and stringent regulations or clear cut prohibitions would hardly ever be appropriate to regulate these matters (cf. Siqueiros et.al 2011)

status of genomic information. Neither did it have anything to do with the reframing of the law or its administrative dispositions to make the new legislation operable, or even the creation of IP surveillance mechanisms. What happened was simply that Volkovak found that the main doctrinal framework of the law was obsolete. And as a consequence of being asked by his new bosses (again in a very vertical way) to find a way of sending and receiving samples, he found that the 1994 General Agreement on Tariffs and Trade (GATT) already dealt with the use of biological samples for medical and pharmaceutical research, in a completely lawful and legitimate way.

Since almost all of the samples destined for medical/population genomics were related to health research, all entered into the domain of the international treaty (GATT 1994): "the law not only had loopholes, it was a loophole (Volkovak int. 2011)".Before the law is completely born (it still needs the proper administrative mechanisms put in place) it is already dead in everyday practice. Mexico is a signee of the GATT agreement; therefore it is obliged to observe international dispositions which have a higher juridical status than the constitution. The whole law on genomic sovereignty and the way in which it reconstructed nature and society was simply out ruled by the hierarchies of international and domestic law (1st International Treaties, 2nd Constitutional dispositions) without the need to discuss or re-design any juridical patrimonial notion (i.e. it was a question of ordering legal dispositions without the need to engage at all with the physical properties of the regulated object).

At the end it was not inconsistency, ontological incompatibility, the inoperability of the law, its non-democratic spirit or even the elusive "national interest" that regulated the movement of biological samples and population genomics in Mexico. There was no need to define the cannons of the post genomic era, since an international neoliberal mechanism of free trade —signed 14 years before "genomic sovereignty" even reached the Mexican congress—*de facto* regulated the field, making all kinds of import/export of biological samples a lawful and probably well-defined enterprise (at least if we compare it with the federal law on genomic sovereignty). The struggle to avoid biocolonialism, or control the field of population genomics, is a battle that might need to be fought (if ever someone wants to fight it) in the international arena. Genomic sovereignty was a question of "sovereignty sharing" indeed; because research on population genomics is becoming an increasingly transnational enterprise, but also because international legal instruments have already made an impact on the existing pathways to deal with "domestic" matters like biological samples or even genomic sovereignty itself.

5.6.1- The dominance of reification: final comments

It is time to close the circle we opened in the first section: on reification and its legal consequences; has the new biomedical era opened a space in which populations can be uniquely regulated and controlled? If this is so, how does that happen? Can it be done through applying existing juridical principles such as patrimonial doctrines? My answer to those questions is that it does not make much sense to keep thinking in binary terms when regulating a polyvalent object, such as population genomics. Therefore we should consider if tropes by which "population morphs into territory and resource (Thacker 2005)" are not rather very specific sovereign articulations, and by this I mean binary oppositions and dual ontologies, that don´t make sense when engaging with the polyvalent, probabilistic and relative features of population genomics practice.

The difficulties of applying existing patrimonial principles to population genomics can be followed in the progressive materialisation of genomic sovereignty into the mechanisms of law. A process which entails a set of contradictory notions, which illustrate the intense fascination-perplexity that the Human Genome produces in the social worlds involved and/or interested in genomic regulation. The first of these fundamental fascination/perplexities addresses the circulation of "Mexican" DNA, and its legislative existence as a national patrimony. The second explores a classic dilemma of liberal politics, the relation between public (collective) and private (individual) property rights. Both of these issues remain completely overlooked by the wider political community, even when they have been clearly identified as profound incompatibilities between juridical doctrine and population genomics (cf. ELSI 28/06/08; Siqueiros et.al 2011; also Ossorio 2007).

The lack of common language or ontological confrontation between sovereign-legal mechanisms and the polyvalent features of populations was most visible when it came down to thinking about the actionability of the law at the national level. The possibility of protecting Mexican genomic patrimony with the juridical and punitive instruments at hand works on the notion that the Mexican genome can be defined and protected. On the other hand the everyday practice of genomic research constantly challenges the fixed categories in the text of law: i.e. genetic information circulates in international informatic networks, is the product of transnational cooperation and is based on relative genetic frequencies not circumscribed to the territory of any Nation State. During my time at the INMEGEN what I saw was that legal and scientific experts as well as policy makers work around boundary objects such as genomic sovereignty and "Mextizaje", to develop ethico-juridical claims and sanctions. Sometimes legal and policy experts—in closed technocratic regimes like Mexico— freeze terms of scientific usage- informed by the way a social world has tailored a boundary object previously- to construct and endorse certain social orders and not others.

Even though the incompatibility of individual property and patrimonial rights around genomics might be nothing but an unnecessary and irrelevant nuisance for many of those regulating human genomics in Mexico, these ontological contradictions are of great importance when we try to apply existing juridical doctrines to population genomics (cf. Ossorio 2007). As an instance the idea that the personal genome is the real property of its bearer is also problematic in its own terms. The notion that personal genome can be "uniquely" regulated since it's a distinct sequence of letters which can be clearly distinguished from any other genetic entity (except in the case of monozygotic twins) does not make it feasible for a person to exploit and profit from his genetic information, except with the aid of huge techno-scientific arrangements: molecular biologists, massive sequencers and a whole technological infrastructure that would make that information meaningful, and then again this will only be meaningful when compared to wide population studies.

On the other hand INMEGEN´s infrastructure and the whole "Mexican Genome" cannot be uniquely protected the same way you would do with a "personal genome"; since its polyvalent and it addresses familial, population and personal genetic information, all at the same time. It is between the tension of private and collective patrimonial notions that the juridical dimensions of genomic sovereignty have been overlooked, favouring a binary natural order. Throughout my fieldwork I found that law needs to regulate well defined objects. An integral part of law and its contribution to social ordering is done by conglomerating and distinguishing between various kinds of physical, moral and institutional objects and the proper relation that people should establish with them under given circumstances(i.e. the law on genomic sovereignty). Sometimes it does that by arbitrarily setting parameters, when scientific experts would rather talk of a continuum, or imposing "concreteness" to a certain entity that natural experts would not (except when they are in the policy room trying to convince congressmen; cf. Chapter 3).

Even though the law is clearly recognised as unilateral and largely non-operative by its own designers and many influential experts in the field, the incongruity between Mexicanhood and a national genome is not part of the debate. The incompatibility of legal and scientific ordering is still something like a philosophical delicatessen reserved for the esoteric circles of Mexican genomics arena. On the other hand it is telling that regardless of all the rhetorical effort put towards protecting and in some way making the Mexican genome a "national patrimony" (coming from regulatory agencies, the Mexican Congress and the INMEGEN) the law amounts little to producing a set of coherent regulation around genomics. This happens in a great measure since the object and actions the law wants to regulate are divorced from the practices that engender

population genomics, but also because the punitive mechanisms of law have no language to engage with polyvalence (cf. Foucault 2003).

The Mexican Genome Diversity Project:

Disputes, laboratory practice and publicity

6- *Disputes around the Mexican Genome Diversity Project (MGDP)*

> *Distortion, stereotype, rumour and conspiracy theories are rather an integral part of knowledge production and the expression of state power in contemporary Africa, as well as in many other parts of the post-colonial world (Kuziak 2010 SSS)*

Just as Kuziak (2010) posits that stereotype, rumour and conspiracy are integral parts of knowledge production in the "post-colonial world," I believe that this is the case in Mexico. The "Mexican Genome" or "The Mexican Genome Diversity Project (MGDP)", its lesser known technical name, was surrounded by public criticism, rumours and scientific and political scrutiny. In the specific case of Mexico, rumour and conspiracy were also related to the rupture of the heterogeneous group of lawyers, scientists and policy makers that pushed for the creation of the INMEGEN. I have divided this chapter into 5 reiterative themes of confrontation and criticism which constantly popped-up during in-depth interviews, informal chats and group discussions and which permeated critical or official positions in Mexican human genomics arena in the first 5 years of INMEGEN´s life. The first part of the chapter briefly touches 3 topics that situate the political atmosphere:

- Rumour, corruption and trust: The constant difficulties of establishing dialogues about what was happening in the political circles and the negotiation of science in Mexico was deeply affected by public scandals of corruption, anonymous—and highly critical—cyberspace groups and a fragmented expert community (6.1.1).
- Scientific caudillismo: a style of public reasoning and constant way of approaching public issues as if they were linked to the vices of its leaders rather than an institutional or collective set of relationships(6.1.2);
- National Sin: the idea that somehow Mexicanhood possesses negative valences which preclude the collective from its arrival to a desired state of public affairs (6.1.1 & 6.1.2).

The second part presents the way in which the MGDP was produced and the public health promises it entailed. Then it addresses the problems that former members of the epistemic community that lobbied the INMEGEN, genomic entrepreneurs, cyber audiences {http://cuestionableinmegen.blogspot.com}, and the ETC group (the only active NGO on these matters in Mexico), had with the MGDP:

- Inflated promises: a critical stance towards the exaggerated benefits that genomic medicine would supposedly bring to Mexico (6.2.1);
- Perverse representation: is related to the disputes about Sampling and the MGDP design and scientific claims (6.2.2 & 4.3)

The relation between these 5 themes moves from general to specific, and they are all influenced by a decisive event, which was INMEGEN´s permanent building corruption scandal. However, I will not abound on the corruption scandal since my focus of interest is how these issues relate to the making of the MGDP (for a more detailed narrative about these events see: Annex B; Federal Audit Report ASF 2008: T5; and for a general overview over time: www.cuestionableinmegen.blogspot.com)[141]. Nonetheless in order to situate the atmosphere under which my study was conducted, as well as most of the final stages of the MGDP research, I mention some of the most visible reactions towards this event and the way in which members and ex-members of the CPMG reacted to the events. On the other hand, since INMEGEN´s creation its flagship project, "The Mexican Genome Diversity Project (MGDP)," became the strategy to avoid foreign biological appropriation and in turn propel domestic knowledge production (IFS 2001:25-27; Jimenez-Sanchez 2002; MGDP protocol 2005).

Soon afterward the MGDP became a battleground in which the ethics of population-medical genomics and its scientific basis was questioned and disputed. As I present in more detail later in this chapter, the equipment, sampling and resources (human and economic) needed to launch a massive techno-scientific project like the MGDP are very scarce in the country, and the voices which dispute this project are scattered amongst the M-NHI of Mexico City, many of whom hardly had similar access to resources and equipment (at the time of my study the only similar equipment could be only found at UNAM´s centre of genomic sciences, and was mostly used for green-plant genomics).

The disputes around the MGDP happened to a lesser extent in other specialised governmental bodies dealing with cutting edge biomedicine, but two voices were the ones seen as representative of the dispute: on one side Dr. Elias was considered the father of population genetics in Mexico, and on the other Dr. GJS was the main genomic entrepreneur involved in the creation of the INMEGEN. Dr. Elias was also one of the most visible representatives of the Bioethical Collêgium (a body dedicated to the promotion of non-religious inspired bioethical debate) in Mexico, and Dr. GJS was the public face of the INMEGEN and its ELSI centre. These two characters were the leading voices of a dispute that happened between the former CPMG

[141] I don't engage in detail with the corruption scandal even though this was one of the all present topics of my informants regardless of allegiance or institutional membership, simply because adding more detail would do little for the delineation of Mexican civic culture or what Sheila Jasanoff (2003, 2005) names as civic epistemology . In order to describe the events with the necessary detail to make justice for a complex and delicate subject, I will move too far away from mi focus, nevertheless if readers need a more detailed account see; Annex 4.1., in which I present most of what I got to know about this event apart from the mass media that covered these issues (Blanco 2007; Cruz Martinez 2009; Bonfil 2009; Gomez 2009)..

members and genomic entrepreneurs, nonetheless it was a dispute that never reached any public venue or transformed itself into an open scientific controversy or confrontation. The disputes I present in this chapter occurred mainly in cyberspace {http://cuestionableinmegen.blogspot.com}, and to a minor degree in more traditional public venues and media such as newspapers, but not in any systematic or open public debate. For instance, in the congress nothing of this was mentioned, except for one abrupt communication in which the Senate demanded that Dr. GJS explain the rumours of corruption and misadministration coming from the medical-scientific community (D.O.F 04/12/2008) [142].

6.1- Caudillismo, rumour and national sin at the roots of Mexican medical genomics arena.

> *...you have to keep in mind that Gutenberg invented the press in 1450 and it was not until 1492 that America was discovered, so you cannot compare the democratic mechanisms and maturity of UK, with the democratic mechanisms of Mexico....(personal communication with Ivanovich, Mexican Presidential Staff, 16/07/11)*

A feeling of non-sophistication, or as Lomnitz (2002) names it, a hyper awareness of backwardness, was a pervading topic whenever my informants explained the multiple contradictions between public speech and political practice. This was a topic that came through in the description and contrasts made between Mexico and other nation States. For example, several of the molecular biologists which talked with me or that even wanted to do formal interviews (most of them were afraid to be identifiable) thought that American debate culture was incredibly open and very refreshing when compared to Mexico. They described times when going to scientific congresses in the US in which freedom to engage for several days with interesting bioethical topics was possible; even when the main event was supposedly just one of technical experts in population genomics and medicine (Field notes 25/09/2009).

On the other hand, when it came down to making reference to the national conditions in Mexico, the idea that "Mexicans are denied their entry to national happiness because our internal vices and divisions (Lomnitz 2010)" is still common: "... you know how Mexico is... (Common way to start a phrase in which national context is to blame for a negative outcome)." All sorts of events and things were qualitatively and quantitatively different inside the national territory- mostly in a

[142] The anonymous membership and the exposé tone of the blog made it easy to follow the links between rumour and national interest in Mexico. On the other hand it made more difficult to produce a dialogue between citizens and public servants, since the overall narrative of the blog was centred on the factions of experts fighting for "scientific truth", or against "public vice".

negative way. Mexicanhood was a burden, a sin, a backwardness inscribed into the very national subject and the citizens that compose it:

> A)...he said to me...you are a typical Mexican, giving away your samples for authorship... those are @#/X+%$ (bad word)!!... and you are just providing raw material (Dr. Y when talking about what was said to him by Dr. Alvarado about collaborating with Singapore by sending samples and training himself on new whole genome sequencing techniques)"
>
> B) We Mexicans don't like to share and are very jealous of the success of others...but you already know that... (Informatician making reference to the difficulties of finding someone to share his bioinformatic knowledge with him: Haplotype class: 16/06/09)
>
> C) So we have again the story in which they give us little mirrors and we give them gold... you know I am sick and tired of the "System" and the way things are done in Mexico... and we thought things would change when Dr. GJS left office [...] it is not... it was not Gerardo´s fault, it's our "politica bananera (derogative way to refer to bad politics)" that keep us in this nasty situation (Volkovak, int.2011)"

The reiterative narrative of Mexico's original sin was most of the time accompanied by the difficulties of engendering trust and the implosion of basic public institutions. Lack of trust in public speech, in the face of repeated experiences of negotiations which happen without any public scrutiny, supports the idea of a backstage politics that happen everywhere and functions on the basis of rumour. The misadministration around INMEGEN's finances began as one of these backstage rumours, but it rapidly turned into a mass media corruption scandal. A couple of months after I entered the field the scandal of possible corruption in the administration of INMEGEN´s finances and its permanent building reached the Commission of Science and Technology of the Mexican Congress (Parliamentary diary, 04 Dec 2008, Commission of Science and Technology, also see: 2008 report of Federal Auditing Bureau, Section T5).

I was already aware of such accusations, since they were sent by email to INMEGEN´s researchers by an anonymous Committee for Transparency (COMPTRA), yet nobody discussed this issue openly; it was, in Mexican parlance, "... un secreto a voces...(a secret out loud)". A few months after the appearance of COMPTRA, another virtual citizen´s space appeared called "The INMEGEN: Another white elephant?[143]"(www.cuestionableinmegen.blogspot.com). The difference between them was that the preoccupations of this blogger moved beyond the wasting of millions of dollars in construction, and slowly became a forum in which criticisms about the INMEGEN´s director's expertise and the quality of its science (the MGDP) were "exposed". When such a

[143] In little blue letters at the bottom of the title you can read: A compendium of unfortunate events about the National Institute of Genomic Medicine, to document the pessimism of those who try to make Science in Mexico (www.custionableinmegen.blogspot.com), last visited, August 15 2009).

scandal was made public it brought with it relief and pain. The tension produced by the anonymous emails sent to INMEGEN employees finally became a public topic. This meant that you could talk openly about it, but at the same time it made it difficult to talk of different topics, since the corruption scandal generated a great deal of interest amongst my informants. On the other hand it deeply damaged the credibility of the MGDP project, and its director general; in the words of Dr. Julio Frenk Mora: "... Unfortunately in Mexico, one of the risks is that anyone can get information into the headlines, and then if you get a trial that shows that this was not true, and yes you win ... but the media damage was done and that will not be repaired (int. 2009)."

Figure 6-A- Computer Model of INMEGEN´s Building

[144] Image taken from the CPMG (2002)

One of INMEGEN´s principal commitments was to create world class facilities to propel the study of medical genomics at a national scale. An important part of their initial budget was devoted to the construction of this facility; approximately 1.2 billion pesos or 100 million dollars, (Jimenez Sanchez 2002, 2005). According to newspaper articles and the Federal Audit Bureau (ASF 2008: T5), the misplaced resources, irregularities and administrative failures reached almost 466 million pesos, or 2.5% of the building´s budget (Cruz Martinez 2009: Gomez 2009; COMPTRA 2009 www.cuestionableinmegen.blogspot.com; Bonfil 2009)[145]. Criminal proceedings have been

[144]In the final iteration of the building the immense purple DNA staircase is gone, to some of my informants it was just an excessive and costly addition.

[145] In the review of 13 public works contracts, it was observed that in the year 2007 there were eight agreements jointly or separately accounted for the modification of more than 25 percent of the agreements originally set. The ASF quantifies the total observations at 34, million 868, 000 pesos, of which 21, million

initiated as a result of these irregularities. The former director of administration had to pay a hefty monetary sum and was also banned from public service for 10 years. At the moment many other penal actions are still under way against the architect and some of the corporations responsible for the project (Bonfil 2009). After the drafting of a very detailed plan to create one of the most amazing buildings devoted to science and medicine in the country, the construction of INMEGEN's permanent site started almost straight away after it was officially created. The design was ready —the plan had been waiting for almost two years on the desks of congressmen— and a small team of scientists, lobbyists and administrators was already in place to take the plan into action. Meanwhile they would occupy their temporary place in *Torre Zafiro*, a corporate building.

Figure 6-B- Images of the "real" INMEGEN appearing on Mexican Newspapers


REFORMA

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EN PAUSA. Iniciadas en 2006, las obras de la nueva sede del Inmegen registran un avance de 85 por ciento, pero este año fueron paradas.


Foto: Rubén Darío Betancourt / contralinea.com.mx

Auditoría Superior detecta irregularidades cercanas a los 400 millones de pesos en la construcción del edificio sede del Inmegen

More than six years afterwards the INMEGEN is still crammed in two floors of a corporate building with a growing number of students and projects. The situation makes the space limitations and its associated administrative and political causes more evident and frustrating. At the moment (March 2011), some of INMEGEN´s departments are starting to move to parts of the building that are ready to use.

191, thousand 600 pesos correspond to lack of repayment of advances and 13, million 676, thousand 400 pesos for non-existent documentation of expenditures not provided for in the contracts. In addition to these observations, by analyzing the over exercise of 78 million 178 thousand 400 pesos, and gaps in the log book make it is impossible to know precisely what companies complied with contract terms and which ones did not, a situation that requires a thorough review of the materials used in the construction. Three years alter the commencement of construction, the building and materials present cracks and structural damage (Gomez 2009)

6.1.1-Institutional and Socio-scientific context

COMPTRA was a self-identified group of academics and citizens that preferred to keep themselves anonymous and who were the first to blow the whistle on the irregularities surrounding INMEGEN's permanent construction site (personal communication, 2008). When they added me to their mailing list, I found that the list included more than 70 prominent national and international academics, genomic scientists and politicians. Their role as public "watchdogs" was muddied by the anonymity of their endeavours and the animosity of their communication. The way in which they somehow had access to the internal collective mailing list of the INMEGEN also raised suspicions about the "objectivity" of the opinions of COMPTRA. During my stay in the field the role of COMPTRA as a public "watchdog" was important in making INMEGEN´s corruption scandal public, as well as contributing to many topics of conversation and debate. The appearance of COMPTRA also marked a moment in which my ties with my contacts were tested, since my sponsors directly asked me if I was the one "filtering" all the information.

During my fieldwork narratives of corruption served to represent a world that existed everywhere; for many of my informants the question was not who is corrupt, but why do we get to know that someone is corrupt, since most of these things are dealt with without public knowledge: "...almost everyone is corrupt which makes me wonder why we even know about Gerardo's misbehaviour, with whom did he fight?... who does not want him there? (Dr. Lopez, human geneticist field notes 05/07/09)"[146]Almost inevitably when corruption talk was elicited issues about secrecy and rumour accompanied it. Chats about the practices of corruption in the public administration were everywhere. I could literally elicit an informal talk about the "not so underground" practices of misadministration and abuse with almost anyone. Top policy makers in Mexico such as Professor Goldsmith (pseudonym int. 2009) and middle top officers of the INMEGEN had plenty of references of how these backstage negotiations happened, the difficulties of facing and dealing with issues of misadministration, and the main actors involved in this war between the policy elites. It was seen by INMEGEN´s top officers and top policymakers as an attack from right-wing orthodox Catholics: "...it is incredible that today in the middle of the 21st century we are still fighting against the factual powers of the church (Aldebaran 2009)". Nonetheless the fight not only

[146] Actors in the Mexican human genomics arena constantly refer to such backstage practices, raising the question of whether discourse and political action is not the product of personal animosities or of a private interest disguising itself as public denunciation or collective interest (cf. Annex 4.2; www.cuestionableinmegen.blogspot.mx; COMPTRA 2009).

included ultra-conservative groups in the Secretary of Health of Mexico, but molecular biologists, ex–CPMG members and ex-top officers of the INMEGEN.

Despite all the trouble around INMEGEN (the scandal was growing really fast between the months of September 2008 and June 2009) no official communication or position about the rumours was given by Dr. GJS and/or any of INMEGEN´s top officers. The Federal Audit Report (2008) really fuelled the corruption scandal, yet no communications were pronounced even when the event reached mass media (cf. Cruz Martinez 2009). Throughout the years and as the corruption scandal became more widely known the tone and approach to genomic medicine in Mexican policy circles changed. As an illustration, Congressmen and Secretaries of State were much more sceptical about the potential of genomics and the abilities of its public entrepreneurs to make their promises a reality (yet the idea of Mexican uniqueness remained unquestioned, cf. Chap 8). For example Federal Deputy Heladio Verver of the PRD (left), part of the Federal Commission of Health, described this network of experts as: "El club de Toby...[old boys' networks] (telephonic interview. 2011)." and he continued to say that the Congressional commission of health and many of his fellow deputies were extremely disappointed with all the opacity surrounding the INMEGEN. Not only with the corruption scandal around INMEGEN´s building, but with the lack of accountability and the broken promises of a revolutionary medicine:

> ...we should not fund anymore until the decisive route of the institute is made clear, I am very disappointed with all these misdemeanours around the administration of the INMEGEN, but we have to put that in the past in order to look to the future of the institute and make that strong investment we made on it, be worth it...[147]

He also thought that the lack of attention given to this corruption scandal obeys to the protection given to Dr. GJS by the highest policy circles in Mexico, "...that preferred to avoid any more scandals and bad publicity (int. 2011)". It came as a surprise inside and outside the INMEGEN that GJS did not compete to stay for another 5 years as the head of the institute. Many explanations circulated in the months of August and September of 2009. Most of them favoured the version of pragmatic negotiations behind closed doors in which the pressure of the corruption scandal and the division amongst experts obliged Dr. GJS to make a deal with his enemies and leave office (field notes: 07/08/09). Two weeks before his time at INMEGEN was finished I had an interview with GJS. During the interview he showed me the documents in which the Senate congratulated the Institute, and explained to me how he managed the last impressive days of the

[147] The only explanation he could give for this "governmental opaqueness" was that "someone from the highest spheres of government must be protecting them; he thought that top officers must face penal responsibilities too.

MGDP and its celebration by the Mexican President (cf. Chapter 7). About the scandal and the disputes, he just sadly mentioned how Mexicans kept losing time fighting unnecessary battles, and immediately kept on enumerating his achievements and future projects: he was still OECD chair of Biotechnology, Member of HUGO and occupied many international positions of great prestige.

When news about GJS leaving his office reached the Blog it publicly stated that their mission was accomplished; at least that is what Cristobal Medina, the author of the blog, said to me[148]. When I last interviewed Dr. GJS a couple of weeks before he left his post at the INMEGEN (2009) he preferred not to talk about the accusations, rumours and confrontations and specifically the destitution of the initial governing body of the INMEGEN, saying: "... you have found one of the threads of a very complex, embroiled and troubled skein of political events, one that we will talk about, when the time is appropriate (ibid)"; two years afterwards the time to talk about this has not been appropriate yet[149]. My experience in the Mexican Senate was the only time in which I could really experience indoors political culture and backstage negotiations (cf. Annex B & C) [150]. Since these backstage closed door events are referred to as the real moments of decision making in the face of non-existing public debate by many of my informants, they become anecdotes amongst elite policy and scientific groups, who used to narrate how decision A or B was made by two or three policy makers. Since there are no written records of such meetings, and the few written records that are left don't say anything about what my informants report, I have drawn heavily from interview material to write this chapter. For the same reason, I don't enter into details about the problems with INMEGEN´s permanent building.

6.1.2-Scientific Caudillismo

> *"...we are more than one person we are an institution... (Silva-Zolezzi, field notes: 10/06/09, when reading the Blog)"*

Since the MGDP was INMEGEN´s flagship project and the most publicised item of the Institute apart from its Director General, its reputation was fundamentally and intimately intertwined. Dr. Gerardo Jiménez Sánchez (GJS), his behaviour as well as his public image, suffered a constant

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[148] Informants inside the INMEGEN´s thought that the factions in dispute had stopped paying his check. When I asked Cristobal Medina, laughing he said "... What? Now, no one believes you can honestly dislike something so much that you can spend your time criticising it without a pay check? (Medina int. 2010)

[149] The initial governing body of the INMEGEN was composed of several of the CPMG supporters, amongst them Dr. Julio Frenk, Dr. Manuel Ruiz de Chavez (cf. INMEGEN 2009: Vol. I-IV).

[150] A discourse of a deep commitment to conform to globally recognised ethical maxims (amongst them openness and governmental transparency) is flagged by the INMEGEN (see: www.inmegen.gob.mx.)

attack during the almost 8 months in which an anonymous citizen group called COMPTRA and a blog entitled "The white elephant" appeared denouncing the scientific and political claims of the INMEGEN and its top officers (cf. COMPTRA 2009 and www.cuestionableinmegenblogspot.com). Critics of INMEGEN linked the MGDP with hype and fraudulent pretensions, but also almost inevitably to the dominant figure of GJS: "...I am super biased if you want, but GJS is the type of public figure and scientist we don't want any more in this country... (Cristobal Medina, Blog author int. 2010)".

Figure 6-C Scientific Caudillismo and 7 Mediatic images of INMEGEN´s Director General

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The centrality of Dr. GJS in the field of Mexican human-medical genomics was unequalled by any other public figure or scientist in the field, and his presence in the public field is still strong and very visible (cf. Jimenez-Sanchez, Frenk and Soberon 2011). For his enemies, and previously close collaborators, GJS was a kind of "Pop" scientist: a public figure that had no remorse in twisting the facts to his convenience, or tapping into the "dark" corners of personal marketing (Artemio Cruz int. 2010; Dr. Belmont int. 2009: both former officials of the INMEGEN; also see:

151 All of the Images are taken from widely distributed media and are but a brief composite of the huge amount of pictures in which Dr. Gerardo Jiménez appeared through the 10 years in which he became the public face of genomics in Mexico. The INMEGEN communication department has already made most of the work of compilation (cf. INMEGEN 2009 Vol.IV).

www.cuestionableinmegen.blogspot.com). On the other hand, for the various young researchers and workers inside the INMEGEN he was the figure who had made Mexican science visible in the international arena and a powerful leader who did what the old scientists in Mexico were unable to do in all their careers: "...for me Gerardo was and still is the figure of Mexican genomics the one that put us on the international scene" (Focus group 2005). The day when I was going to interview the "Boss", Dr. GJS (a couple of days before he left office) Altair said to me "let him know that I admire him and support him"

The ambivalent responses to Dr. GJS leadership, his communication style and the administration of INMEGEN are a phenomenon that can be easily portrayed as "Scientific Caudillismo". With its roots in the old authoritarian regime, Caudillismo —or the cult of the political leader— reflected the ambivalent relation with strong and sometimes authoritarian leadership and a tendency to think that institutions are somehow embodied by their leaders. The scientific reputation of INMEGEN´s leader was entangled with the "demagogic" communication of mass media (cf.Chap.7). Dr. GJS's strategic use of newspapers and popular magazines placed him at the margins of science, according to his critical audiences, a fallen angel from the objectivity of scientific revelations, who flirted with the hypocrisy and lies of politics:

> ... it seems like Gerardo Jiménez, betraying all scientific spirit of objectivity, wanted to delete all those unflattering records in order to achieve his obscure goals, a strategy which in turn highlights the disturbing manipulation of information that has created false expectations among the population about health applications of the "Mexican" HapMap (COMPTRA 08/07/2009)".

On the other hand, media portrayals talked about GJS as "a Mexican scientist whose passion had made him devote his life to uncovering the genetics of Mexicans to deliver them with new ways to take care of their health..."; the tool to deliver that promise was the MGDP and its applications to health (cf. Chapter 7). As a public figure, Dr. GJS was not at all afraid of cameras and publicity; as a matter of fact he harnessed his relations with TV emporiums in Mexico to help him promote the INMEGEN and its mission (cf. INMEGEN´s promotional video in "The Map of the Mexican's genome 2009" and INMEGEN´s report 2004-2009). The patronage of the institute had amongst its ranks the owner of the oldest Television Company in Mexico: Televisa ®. All this publicity made it easy for many of the academics and lay audiences in the field to recognise GJS as the leader of the new genomics (cf. Chap 7), but it also made it easy to make him the target of public resentment.

According to many of my informants Dr. GJS was a master rhetorician, Deputy Heladio Verver described him as a "charismatic and great speaker, who had the talent to convince" (int. 2011). Some critics who closely collaborated with GJS described him "...as someone who could sell

sand in the desert...." (Dr. Belmont, Former ELSI researcher). According to critical voices Dr. GJS's dual identity (scientist/politician) made him compromise his scientific ethos with private interests[152], most specifically his own; the next quote appearing the 4th of December of 2008 in a document of the Committee of Science and technology of the Senate illustrates this point more eloquently: "Something that draws attention from the medical and scientific community, close to INMEGEN are the activities of its director general, Dr. Gerardo Jimenez Sanchez, who uses public resources in the Institute for his own promotion and personal image" (cf. Comision de Ciencia y Tecnologia, 4/12/2008).

6.1.2.1-Caudillismo in INMEGEN´s audio-visual discourse

> *"The cult of personalismo aimed at creating the myth of one man's indispensability, and the longer a caudillo ruled, the more he came to accept the myth which he himself had created (Beezley 1969:351)"*

Caudillo culture works on the idea of the big man; the way in which it does that is by presenting history as the achievement of great figures or leaders. History then becomes the time of a Man (very rarely women) who is the symbol of an epoch. Official historiography in Mexico has cultivated this type of storytelling to celebrate the founding fathers of the nation, the past (pre-Columbian) indigenous glory or to describe the tortured and greedy spirit of those who have betrayed the Nation, even in times when the nation did not exist (cf. Lomnitz 2002). The idea of the progressive movement of time until it reaches a zenith or completion is particularly well cultivated in these portrayals of national destiny, in which certain essences of the nation or in this case human genomics migrate and transform but always end up coming to terms with a present moment to which all these events were predestined (cf. Alonso 2005; Gutierrez 1999).

INMEGEN´s own big man story is most visible in the timeline below entitled "Chronology from the Human Genome to the Map of the Mexican's Genome". The images in this timeline were designed as a prop to be included in the "Mexican Genome Kit,"" which was an audio-visual object made for the massive ceremonial event prepared for the publishing of the MGDP (Focus Group 05/07/10 also cf. Chapter 8). If you observe the timeline briefly you will notice that it presents a genealogy that spans from Mendel's laws of heredity to the publication of the MGDP (including events such as the celebration of the HGP by Clinton and Blair in 2000 and, the

[152] The opposition to Dr. GJS followed the same tropes and dramas as those proposed by scientific caudillismo, but reconverted them by reading the myth of great men under the light of national sin. In an interpretative note from a scholar (Beezley 1969) talking about Caudillismo culture in the Latin America of the 19th century much of the modern disputes around the INMEGEN and its endeavours can be illustrated when he comments on the relation between opposition, myth and caudillismo (cf. Beezley 1969:351 and contrast it with: www.cuestionableinmegen.blogspot.com).

HapMap 2002(cf. Gabriel et.al 2002). This presents a story in which great scientific advances and great men are the motors of progress, until it reaches a Zenith: in this case with the publication of the MGDP. This is a visual testimony that the Caudillo culture was not only a construction by mass media of Dr. GJS's leadership, but a feature of INMEGEN´s own public communication and Dr.GJS strategic management of INMEGEN´s and his own personal image (cf. INMEGEN 2009: Vol. 1-Vol.4; The Map of the Mexican's Genome 2009; cf. Chap 8).

Figure 6-D- The Map of the Mexican's Genome timeline

6.2-The Mexican Genome: inflated promises and a brief history

> *In the long run if we don't continue investing in genomics it's going to become a burden rather than a public asset (Dr. Y, One of the MGDP authors)*

In a country as diverse as Mexico, to talk about an epidemiological scenario is to face abysmal asymmetries, and historical inequalities. As Julio Frenk (2004) said, the epidemiological model of the country is one of "prolonged polarization" in which the old illnesses of poverty (infectious diseases), coexist with chronic illnesses like diabetes or hypertension. This epidemiological juxtaposition coincides with the asymmetries in health access and income; most of the infectious

diseases in Mexico are found in the poorer south and south east of the country. National epidemiological projections present diabetes as the single most preoccupying health problem nowadays and in the coming decades. If you compare this tendency with the health problems of Chiapas, the poorest state in the country, the statistics and illnesses are totally different (PNS 2006-20012) [153].

Another way to approach the asymmetries is through the health of the 100 most marginalised municipalities in the country, in which the 1 million poorest Mexicans live; these municipalities are predominantly indigenous (PNS, 2006-2012:39) [154]. If compared with urban congregations, these epidemiological scenarios are similar to the health scenario that was predominant in Mexico 18 years ago. The double epidemiological burden demands that developing countries adapt to the challenges of chronic and very costly disease and at the same time take care of infectious diseases commonly related to poverty. The interest in addressing this prolonged and polarised epidemiological burden was one of the priorities of what was known as the neo-sanitarian movement in Mexico of which Dr. Soberon and Dr. Frenk were leading figures[155].

In Mexico the movement to a neo-sanitarian model started to be visible in the middle of the 70´s before the economic crisis of 1982 struck, when a few dissident groups, minor unions, students of the 68 movement, some medics and scientists that disagreed with the hegemonic uni-partidism, started to push some reforms (Abrantes & Almeida, 2002). The rise of a new vision of medical care and health services took shape amidst uncertainty and continual crisis. The syndicalist-clientelism was a networked scheme closely related to the ruling group inside the hegemonic party. Therefore few programs and innovations survived for more than six years (whenever a new president took office). Health reforms were not pushed as aggressively as the "neo-liberal" program; they emerged and were shaped through various years, promoting inter-institutional collaboration, articulating the health system in Mexico around the use of graphics, high-tech, international alliances, increasing inclusion of enterprises, scientific experts, and an opening of the market of health.

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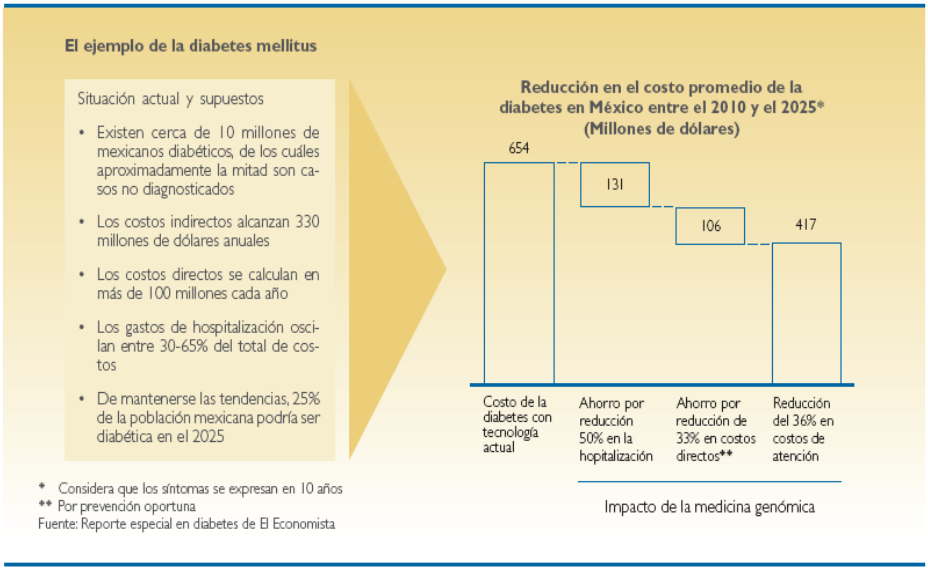
[153] More than 85% of indigenous communities live in conditions of high or extreme marginality, and suffer from infectious and preventable diseases (Zolla, 2007). That is why a purely altruistic integration of these populations, might turn out to be one of the less altruistic enterprises.

[154] "...If we compare the last 10 years (between 1998-2008) of research and development between China and Mexico, we can see that Mexico has grown only 0.03 per cent while in China they have increased their investment more than 10% each year reaching a 1.5% of the GDP (Frenk 2009 a)".

[155] Compared to Mexico City alone such a health environment was predominant more than 35 years ago (PNS 2006-12).

Figure 6-E- Economic projections of the impact of Genomic Medicine on Diabetes Mellitus and Hypertension



156

This "neo-liberal," or in this case neo-sanitarian, model of the terrain of public health is the historical predecessor to INMEGEN´s genomic medicine programme, and had as its own flagship institute the National institute of Public Health (INSP), the last M-MHI to be funded by the Mexican government before the INMEGEN. The neo-sanitarians' general policy was to remain apolitical: "we want to produce statistics and information, free of political pressure and bias" (SSA, 1987:19 cited in Abrantes & Almeida, 2002). They devised the coalition and emergence of a flexible institutional framework that resisted a direct link or dependence with governmental practices, such as FUNSALUD, and had a strategic importance for an even wider emergence of political spaces and realities in this sector, functioning as a think tank and political forum. The creation of the INMEGEN mobilised promises about the prowess of genomic medicine on the grounds of the transformation of Mexico into a knowledge based economy, using genomics as its strategic platform to reach a bioeconomy in the coming 30 years:

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[156] The Methodology applied in the analysis considers the comparison between the total cost of creating the INMEGEN against the cost of not doing so; defined as the financial burden that represent to the Health System posed by the treatment of the two most common diseases in Mexico: diabetes mellitus and arterial hypertension; functioning on the assumption that genomic medicine, will allow us to identify the predisposition or resistance to illnesses. The economical evaluation was made under the calculus of the Present Net Value, and the Annual Equivalent Cost, for a horizon of 10 years, as a first exercise, which was later extended to a period of twenty-five years, by the solicitude of the Secretary of Treasury and Public Credit. The results shown by the analysis of cost-efficiency, demonstrated the viability of the creation of the INMEGEN, since it represented a cost that is substantially smaller than the treatment of the patients that suffer diabetes mellitus and arterial hypertension; therefore the contributions made to prevent some of these cases, will result in great financial benefits to the country (Jimenez Sanchez and Taracena 2005).

> Looking to the future, new techniques in biotechnology, genomics, genetics, and proteomics will continue to converge with other technologies resulting in potentially large scale changes to global economies in the next thirty years. Unsurprisingly therefore, strategic interest is growing in the biosciences in both OECD and non-OECD countries (OECD, 2006: Currently Dr. GJS is the OECD chair of biotechnology).

The promises of a new bioeconomy were present in the INMEGEN´s design plan since the very beginning —that is why the INMEGEN is the only M-NHI with a business incubator— yet their most visible and unique features are the ones related to public health (according to Professor Abdalla Daar of the McLaughlin Rothman Centre, international advocate of the INMEGEN). These promises on public health were most visible in the INMEGEN´s feasibility study (2001), which circulated the promise of decreasing by 36% the total cost of diabetes mellitus; this claim by itself was a very strong argument especially since diabetes is one of the most pressing health problems in Mexico (PNS, 2006-2012). The Congress took the good news of a technology that could help them decrease the expenses on health without further examination of its premises, making a heavy investment in the INMEGEN. Every time the economic impact of genomic medicine wanted to be represented this graph was shown in a PP presentation, sometimes appearing more than twice in a public venue (cf. 5th Anniversary of the INMEGEN at: Colegio Nacional, UNAM and the Mexican Senate all in 2009).

8 years after its birth in the Feasibility Study (2001) it was used in the 5th anniversary of INMEGEN, and was present in the slides of three top officials. The purpose of the previous graph was to compare the total cost of producing the INMEGEN against the savings produced in two diseases of first sanitary priority in the country. To show the congressmen that such an investment was not only based on moral and scientific urgency, but on a good cost opportunity strategy, helped to inspire national authorities that have historically invested little in Science and Technology. Graphs ended up being a political asset after all, when the future needed to be mobilised in order to act in the present. In this respect one of the leading neo-sanitarians, and also a genomic entrepreneur, Dr. Frenk, accepted that they had to be a bit "deterministic on the presentation of the graphs and the economic benefits of genomics in order for the congress to have a clear picture of the importance of these topics (int. 2009)".

The economical analysis on which this graph was produced derives from the very premises put forward by the epistemic community (IFS 2001); it is a self-referential tool to look towards a desired future. A future that is as much the product of International Organisations' projections of knowledge and policy orientation on the issue area and a future bioeconomy(OECD 2006; WHO

2002)[157], as an ad hoc visual tool to ascert the need for present —and urgent— action. After the first 5 years of the INMEGENs existence this graph has become a kind of failed, or still to come reality. As such it is a target for criticism and reflection for critical audiences such as scientists, NGO´s and even skeptical workers inside the INMEGEN.

According to a brief questionaire applied to medics and scientists in 2006, their views about genomics were already moderately skeptical regarding the ideas put forward by the CPMG: especially those of a revolutionary medicine that would be just around the corner once Mexico entered the new knowledge economies with the creation of the INMEGEN (Oliva & Schwartz-Marin 2009). Nonetheless, with all the turmoil and unrest, the promises of INMEGEN made at the initial stage of its creation became achievements in the last reports of Dr. GJS's administration (INMEGEN 2009: Vol. 2) in which most of the 9 central strategies (cf. Annex C.2) were said to be achieved 100%. According to Volkovak the idea that the ELSI had achieved even 40% of what was being promised was an exaggeration, not to say 100% (field notes 12/05/09).

The promises of a revolutionary new genomic economy or bioeconomy are still forcefully pushed forward by the genomic entrepreneurs; just recently Dr. Jimenez-Sanchez, Dr. Frenk and Dr. Soberon (2011) published a paper in which they highlighted the economic advantages and promises of genomics to an audience of elite private investors in Mexico City (Notimex 2011). In this event they stated: "I know of no business, at least legitimate business that produces 141 dollar per dollar invested, for the world this was a big surprise. In this period of time the human genome generated 796 billion dollars, 244 billion dollars in wages and 3.8 million jobs per year (Notimex 2011 03/05/11)", at the end of the press release there was a remark for the disbelievers: "not so bad for those that said that nothing would come of this…"

6.2.1- The ETC group and the privatisation of the Mexican Genome

> *…for me the conclusion is that Mexico puts the public resources of the State, Mexican researchers, even though they are repatriated…the genes are indigenous and the results are all transnational!!! (Ribeiro int. 2008)*

The only NGO publicly active in the field of human genomics was the ETC group, formerly called RAFI (Rural Advancement Foundation International), which since the seventies was active in questions relating to intellectual property, identity and the survival of farmers in the south of the

globe. In the 90´s they were the main NGO who organised indigenous groups and opposed the Human Genome Diversity Project (HGDP), which was a project looking to an international endeavour which wanted to look for genetic variation in "isolated populations", mostly various hundreds of indigenous groups around the world (cf. Reardon 2005). In the Mexican context the ETC was active in questions of bio-prospection and indigenous knowledge (cf. Hayden 2003), mostly in green biotech. As soon as the INMEGEN was announced the ETC criticised what they thought was a pervading international tendency to privatise traditional knowledge and now even indigenous genes:

> Those projects have not benefited—*and will not benefit at all*—indigenous populations. But, on the other hand, the researchers have benefited by obtaining publications, academic credits and scholarships, and the institutions have got the justification to ask for more public resources. In both cases they produce information that is later capitalized by the pharmaceutical corporations (Ribeiro, 2007).

The suspicion that the MGDP and genomic medicine aims at the privatisation of public biogenetic heritage can be summarised by the term biopiracy, coined by Pat Mooney, the CEO of the ETC group in 1993: "*...* the use of intellectual property systems to legitimize the exclusive ownership and control of biological resources and knowledge, without recognition, compensation or protection for contributions from indigenous and rural communities... thus bioprospecting cannot be considered anything but biopiracy (Pat Mooney in Delgado, 2002)."[158] The relationship of the INMEGEN with transnational enterprises, and its ties with the National Foundation for Health (FUNSALUD), "...their close relation with the Mexican foundation for Health (FUNSALUD) have been a point for critique by the ETC. FUNSALUD is the private foundation which has more influence in the (privatising) policies of health in Mexico and it was also the first promoting institution to back the creation of the INMEGEN an alliance that was seen as the marker of a private interest behind the rhetoric of the Mexican genome as a public good. As a matter of fact both the ex-presidents of FUNSALUD became the presidents of the CNB and Dr.GJS and Dr.Frenk had kept a close relationship with the institute.

The second point of concern was born from the CPMG divulging article; *Opportunities for the pharmaceutical industry* (Jimenez Sanchez 2002a), in which the genomic entrepreneurs said that the homogeneity of indigenous groups in Mexico could make the search for disease-causing DNA

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[158] NGO´s critiques have not engendered a lot of credibility amongst scientists; most of them did not know ETC existed before I asked them about it. The few who knew about their existence thought they were either "anti-science (Barba int. 2009-biologist and critical journalist)" or simply criticising something that was not happening yet: INMEGEN´s business incubator, since this department was not generating a lot of new products. When it comes to policy makers it is more a question of what I called the "boomerang" effect (cf. Chap 6), for example Artemio Cruz said he was not talking with NGO´s because: "it is like if I come to the interview and you punch me in the face..."

easier: "…this institute commenced its activities affirming that Mexico was a country of "opportunities for the pharmaceutical industry" because of its" 60 ethnic groups", but later changed the language to dissimulate their intentions, affirming that their project would be done with "admixed" populations (Ribeiro int. 2008)". She continued stating:

> ...what is interesting is the difference because this is what can tell you if there is or there is not an association to some disease [...] to search for a group which is more or less homogeneous from the genetic viewpoint, then it is easier to detect the differences. That is the reason and there is no other, they are purely research bridges, but is not because they are interested in the health of indigenous people... they have consistently been framed as objects and not as subjects of research (Ribeiro int. 2008).

In 2005 Silvia Ribeiro, researcher of the Mexican Chapter of the ETC group, recovered the preoccupations and critiques made to the Human Genome Diversity Project (HGDP)[159] but applied them to the INMEGEN and its construction of the Mexican Hap Map, dubbing it as another "vampire project" that would not benefit the indigenous populations who were—in her perspective— the real resource to develop genomic medicine in Mexico. Nonetheless most of her critiques remained as critical articles in the newspaper, very different from the role the ETC group and various indigenous groups had in stopping one of the most ambitious and well-funded projects of population genomics in the world: the HGDP (cf. Reardon 2005). In Mexico the critical approach to an indigenous identity that can be clearly separated from the mainstream Mestizo identity is difficult to sustain; it is also difficult for many of my critical informants (even the most critical of them) to support the work of the ETC since very few scientific projects of the MGDP's calibre are done in Mexico, and to openly debunk the MGDP was seen as something like auto-sabotage (Barba int. 2009; Dr Y int.2010; Dr. Belmont 2009)[160].

6.2.2-The MGDP: a brief history and the rationale for its creation.

> *A great priority should be given to the recollection and study of Mexican germplasm, by our own scientists, without hindering international collaborations; but avoiding at all costs, that this national resource becomes appropriated and used in an almost exclusive fashion by foreign researchers, as it has happened before in archaeology,*

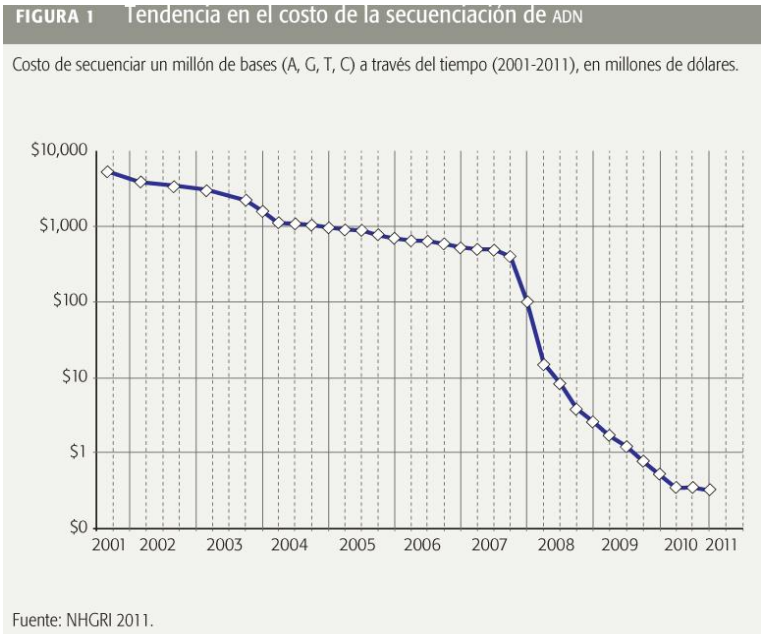
[159]There are many international and national projects, which are active today, to take blood samples (or other tissues) and use the genetic information of indigenous communities. This type of vampire project is not a new phenomenon....With the new technology available, the implications of this Project go far beyond of individual biopiracy, in order to establish forms of social control—through the control of genetic identity— and commercial exploitation by the pharmaceutical and bioinformatic industries, with widening and unknown consequences for indigenous communities and for society in general (Ribeiro 2008).

[160] In personal chats with Maria de Jesus Arellano, researching in the field of stem cell regulation in Mexico, she told me her informants said similar things to her when talking about the INMEGEN.

botany or zoology (Feasibility study, 2001:25)[161]

The first action and plan for research was called "Genomic Structure and Haplotype Map of the Mexican Population (MGDP protocol 2005)", the purpose of this project was to include an overall vision of admixed populations and indigenous groups: "…through the application of high throughput analysis of six or seven different populations distributed throughout the whole of the Mexican territory (MGDP protocol 2005:3)". The new massive sequencing and population genomics research followed the tendency of economies of scale (i.e. as technology is developed to sequence more SNP´s sequencing becomes cheaper per base pair, cf. figure 4 (D)). Therefore when reading tag SNP´s you would increase the cost/benefit relation because by reading one SNP you can infer the rest.

Figure 6-F-Decreasing costs of DNA sequencing per 1 million base pairs (2001-2011, taken from: Jiménez-Sánchez, Frenk and Soberon 2011)[162]



The decreasing cost of technology could be exponentially improved if you already know the haplotypes: "the financial benefits of the "HapMap" project will be visible when it allows us to make studies of association evaluating a lower number of SNP´s, a process that will in turn reduce considerably the costs of genotyping (MGDP protocol 2005)". In 2005 when the MGDP was officially launched by the INMEGEN, the International HapMap project had not included Mexican

[161]Germplasm: the genetic material, especially its specific molecular and chemical constitution that comprises the inherited qualities of an organism.

[162] A couple of weeks ago (03-08-11) the three main genomic entrepreneurs of the CPMG (Dr.GJS, Dr. Julio Frenk Mora and Dr. Guillermo Soberon published a paper (Jimenez-Sanchez, Frenk 2011) in which the promises to build a bioeconomy in Mexico are advanced again and in which they invite wide sectors of entrepreneurs and private investors to participate

Americans or admix populations in their study yet. This gap in the mapping of populations around the world meant that Mexico had a niche opportunity to advance the knowledge of genomic variability on its own population (Amerindian+ European: cf. MGDP protocol 2005) or subpopulations (any human group mixed with Amerindian). The potential market for its medicine and knowledge lay far north and south of its border: Mexican-Americans in USA and similar admixed population throughout Latin America. "The Cosmic Race" of Vasconcelos (1925, cf. Chap.3 & 4) became an attractive biomedical sea of captive consumers, in turn fuelling a national project that wanted to genotype an underrepresented population in order to open business possibilities and save money on public health. However those that had direct contact with the theoretical and practical tools of the large scale population genomics project in Mexico were very few. During the first couple of months of fieldwork it seemed to be incredibly odd that a country which has more than 107 million inhabitants has but a few specialists in genomic medicine working in Mexico.

Figure 6-G– Human Genetic expertise and laboratories in Chile, Mexico, Peru and Argentina[163]

Tabla 1

Recurso	Chile	México	Perú	Argentina
Nº Genetistas	100	250	100	250
Nº Especialistas Genética Humana	35	162	25	70
Nº Laboratorios Investigación	10	40	6	20
Nº Laboratorios Diagnóstico Molecular	10	20	1	60
Nº Secuenciadores	10	10	6	10
Pruebas terapia génica	Si	No	No	Si
Microchips	No	Si	No	No

[3] NCBI. Genome Sequencing. [Sitio en Internet] Disponible en http://www.ncbi.nlm.nih.gov/genome//seq/

The number of specialists was possibly not greater than 35 dealing with human population genomics working inside the INMEGEN: that is if we take into account all the technicians, scientists, bio-informaticians, lawyers and ELSI people who collaborated in the MGDP project (cf. Jimenez Sanchez 2009). According to Fernando Lolas et.al. (2004), the number of geneticists

[163] Taken from: Lolas et.al. (2004). the paper compares the development of biotechnological and ethico-legal initiatives dealing genomics in the developing world.

working in Mexico in 2003 was 250, of which 162 were human geneticists (approximately 1 human geneticist per 660,500 Mexicans). According to this data, there existed in Mexico more than 10 massive sequencers, and according to the comparison with the other 3 Latin American countries, Mexico had approximately twice as many research laboratories than Argentina, four times the research laboratories of Chile and almost 6 and a half times the research laboratories of Peru. When the INMEGEN was created it became the emblem of a new knowledge frontier, one that had at its core important new allies: the massive sequencer, (which was a scarce ally in Mexico but already existed before the institute was created)[164] resources to sample different ethnic groups and a supercomputing department.

It also had on its side the access and availability of hundreds of systematised blood samples (cf. Chapter 4; Garcia-Deister 2011). These samples were taken from various groups around the country with the aim of producing the first catalogue of genetic difference: an unprecedented effort in the country. Indeed this catalogue was one of the technical assets (apart from the ELSI and the business incubator) that separated the INMEGEN from other laboratories doing genetic medicine at any M-NHI, who were also exploring the new genomic possibilities after the HGP (almost all of the M-NHI´s had a wing devoted to genomic research). According to Singer (2010) the INMEGEN "is analogous to the U.S. National Human Genome Research Institute". The difference between the INMEGEN and other M-NHI´s lay in the machinery, statistical tools and team of specialised human resources concentrated at the INMEGEN: "...In this year, in June we had already passed one thousand million SNP´s..... In the third year one thousand million SNP´s, when we started this project... no SNPS were made in Mexico...they were not made... (Jiménez-Sanchez, int. 2008)"[165] Even though the claim that SNP´s were first done in Mexico by the INMEGEN is an exaggeration (cf. figure 5C), the idea was that the new institute would become the platform to advance and make all of this research more efficient in the country and even all around Latin America.

If we then compare the number of scientists working on this new field with the total number of human geneticists in 2003 —according to figure 6(C)— not even ten per cent of the total number

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[164] Dr. GJS said that SNP´s were not made in Mexico before the creation of the INMEGEN, but according to other sources, including Dr. Y, one of the authors of the MGDP, he was doing microchips at the Mexican Institute of Social Security (IMSS) specialised unit before the INMEGEN was created.

[165] One of the most problematic issues was the one related to cooperation, sharing information and the completion of scientific projects. In my own ethnographic experience just one of the projects of the PGL reached its completion: the MGDP.

of human geneticists in Mexico were involved in the development of the platform for genomic medicine which produced the MGDP (an elite enterprise amongst an already elite profession). One of the things that Dr. GJS liked to mention in public interviews and to interlocutors of all kinds was the young age of researchers, their Mexican nationality and the fact that the disciplines involved in the construction of the MGDP included physicists, chemists, biologists, medics, lawyers and yes, specialists in human population genomics (Jiménez-Sánchez 2009 in TV interviews between the 11th and 13th of May: Cadena Tres; Hechos por la mañana & Dr. Carlos Supercomputing department of INMEGEN in Entre tres 2009).

An unavoidable dimension of practical import for the scientists that supported the CPMG was to move from human genetics to genomics. This last disciplinary transformation had to be accompanied by learning how to use different platforms of massive sequencing and new statistical tools to deal with hundreds of thousands and even millions of SNP´s. Since all of the Mexican scientists involved in genetic research were human geneticists, and none of them had formal training in population genomics, the scientific work implied autodidactic learning and a trial and error process. Amongst the very few ones who were working in relation to human variation and population wide differences, the scientists and staff at the PGL were the first in the country to have access to this kind of extensive sequencing and sampling in a systematic way.

Dr. Maria Teresa Tusie Luna —one of the pioneers of genomic medicine in the country— working in the genomic basis of diabetes at the INSZ (M-NHI), could simply not be familiar with the practical dimension of managing and curating huge databases of genetic variation, or high density haplotypes, because neither the density of SNP´s, the mathematical and software tools and most importantly the systematisation of thousands of samples —like the one produced by the MGDP— existed before in Mexico; at least at the scale necessary to produce a catalogue of genetic variation. Scientists that had researched and published articles on genomic medicine were not really familiar with massive sequencing, high density haplotypes or with the new software used to link thousands of genetic variations with disease[166]. Former mentors of DR.ISZ were still not familiar with massive data analysis and the software used to organize it and start making hypotheses with the objects it yielded (field notes 16/06/09)".

[166] Others, who were also in the field of medical genomics, such as Dr. Daniel, a scientist from a research centre out of Mexico City, said to me he was not familiar with any of the sequencing of genomics and its statistical models: he basically sent the samples, with very detailed clinical histories and laboratory analysis to his partners in the USA to do the massive sequencing work (Daniel int. 2010). The work of Daniel was characterising patients and designing part of the study, he was already sending some of his students to learn to UTAH, his partners in Argentina were also doing the same.

6.2.2.1- A brief History of the MGDP

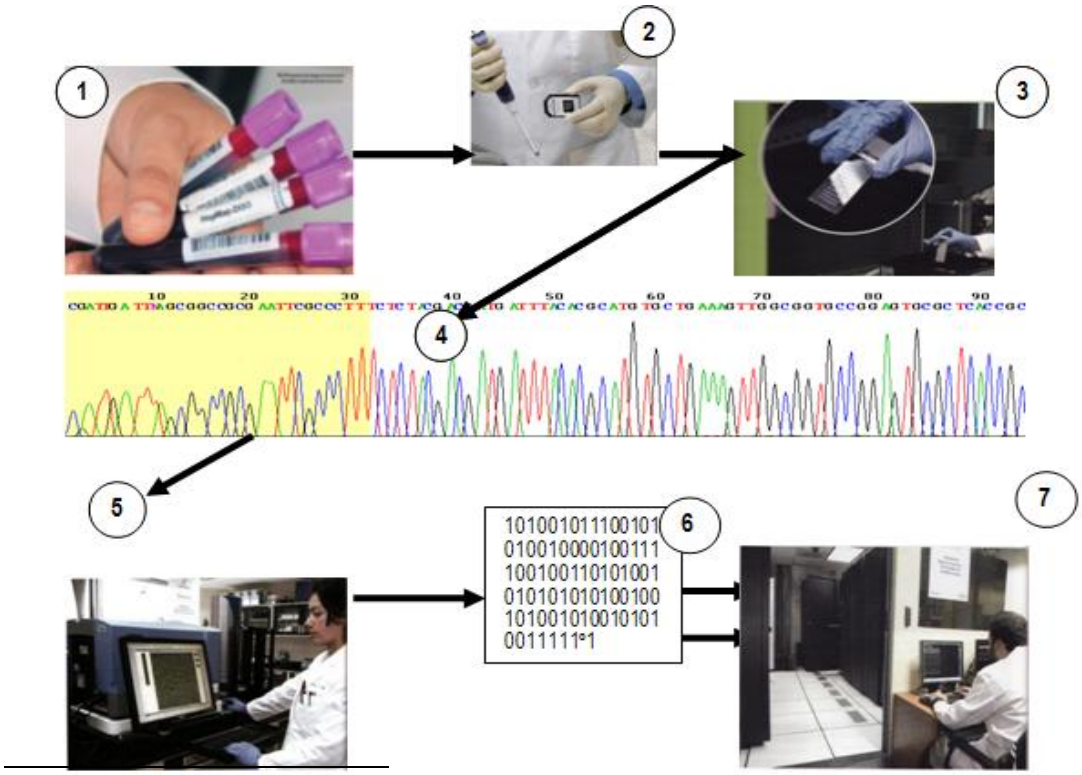
The first draft (2004-2007) of the MGDP was the product of a series of blood sample collections in several states, starting with Yucatán, later Sonora, Guerrero, Veracruz, Zacatecas and Guanajuato. In this first stage no indigenous communities were approached, although the idea to include them was present since the first promoting documents (Jimenez Sanchez 2002; CPMG 2003; IFS 2001). The second phase of the project sampled the states of Durango, Campeche, Oaxaca and Tamaulipas, and also included indigenous populations such as the Tepehuanes, Tzotziles, Mixtecos, Zapotecos and a Mayan group of Campeche. The final draft of the Mestizo Map resulted from the selection of 300 individuals, including the indigenous communities of Zapotecs (this group served as the indigenous reference in their public internet page: http://diversity.inmegen.gob.mx). The use of a haplotype mapping project rapidly became a central strategy in order to find meaningful genetic variations related to disease, without having to read the whole genome of a patient. Although these regulations not only complied with but exceeded international standards, according to INMEGEN´s officials (cf. INMEGEN´s report 2005), the use of an open informed consent in every collection event was linked either to a regional university or laboratory, as well as the regional ministry of health, and the local authorities and governors[167].

The conditions to be included in the sample population included: being Mexican, local to the state and the demonstration of at least four generations of "Mexican" ancestry. The sampling was divided according to sex (50% of each) among the 200 hundred participants in each collection journey. The condition was that each of the parents of the participant was born in the state as well as the four grandparents. A totally anonymous format was privileged in the process of sampling. The use of informed consent and 2 witnesses was standard practice, until the inclusion of indigenous communities which obliged the scientists and bioethicists to redesign informed consent practices.

[167] Other states of the country such as Morelia were already included in the sampling process, but the war on drugs and the spiral of violence in Michoacán prevented that collection journey from happening. A similar situation occurred with many of the massive events such as the diabetes sampling in Mexico City that was supposed to involve more than 15,000 participants. Official communications—so it was said to me by top officials— suggested that it would be better not to become a target for violence or attack.

Figure 6-H- Map of the Mexican's Genome Map Crusade

Figure 6-I- A brief illustration of the MGDP & medical/population genomics technical process[168]



[168] The process shown in these pictures is an oversimplification of a very time consuming and complex process in which various sub-processes of visualisation, measurement and analysis were included. All the images included in the figure come from: (Villar 2009, Medicos de México, special issue celebrating INMEGEN´s 5th anniversary)

The sampling of indigenous groups (and to a lesser extent in Mestizo groups as well) has been deeply controversial. This has been a problematic issue for NGO's and presumably some indigenous representatives collaborating with them (Ribeiro int. 2008).[169]In its first collection journeys Mestizo populations with university education were the only group included in the project, the reasons for this are clearly exposed by the INMEGEN in its public report of 2005:"The decision to invite the academic community as participants, obeys the preference to work with an informed population, with whom feedback could be exchanged, doubts could be clarified, and questions could be answered, to be able further on, to present the results, and share the success. This has been one of the greatest achievements in the methodological planning (Jimenez-Sanchez 2005)"[170].

Probably the first institutional construction of what constitutes Mextizaje in the field of population genomics research started with the informed consent process and the conditions of inclusion in the project. A process which in turn touched on the awkward relation between the nation-state and the sovereignty of indigenous people in Mexico; a question which is very controversial and diffuse at both the constitutional and practical level. For instance when asked about their consent as Mexicans, the leader of the Tepehuanes said: "no we are not Mexicans, we are the Tepehuanes, and you are looking for the genome of the Tepehuanes! (Lara 2008)". As Jenny Reardon has shown, the very first labelling of populations starts in the sampling and informed consent process (Reardon 2005, 2008).

Once this initial labelling and categorisation occurs in the communities, samples move to the laboratory and new labelling and measurement occurs. Figure 6(D) very generally illustrates the transformation that occurs in the laboratory in order to produce a genomic reference platform to start the search for the genetic causes of disease, and progressively visualise genetic difference. Basically the first step is one that I identified as purification and amplification. This step comprises various techniques such as the standardisation of the molarities of samples; there is also electrophoresis to divide the genome into smaller died segments, and PCR (Polymerase Chain Reaction) which serves to amplify the number of copies to make DNA visible, all of these basic processes occurs between steps 1 and 2.

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[169] The debates around informed consent in Mexico are a rich an important part of the MGDP production, however due to the limited (non-existent) access I had to indigenous communities or representatives, this is one aspect of the MGDP I cannot explore with sufficient (or almost any) detail.

[170] The centrality of informed consent has been a point for criticism by the ETC group; special emphasis is made in the open format of consent with indigenous communities, leaving space for people to authorize the use of their blood samples for further research which is not specified yet, and which probably will not benefit these communities at all

Consequently CHIPS that cover a range of 100K, 500K or 1.5-1.8 million SNP´s of genomes are read by the massive sequencer which shines a laser into the chips (step 3, 4, 5) in order to produce a sequence a computerised images by combining how each of the four base pairs reflect a different wave length, this sometimes is not very clear and a part of the genome is not read properly. When this happens for more than one to two per cent of the DNA read in the sample, it does not pass the quality control test and is excluded from the study. All this data is then translated to a binary code and send to the supercomputer of the institute, their staff arranges the trillions of numbers that produce this data in order to make an aggregate landscape of single nucleotide polymorphism: i.e. frequencies of SNP's in the samples studied (Davila in Hechos de la Mañana 2009). This data is then reanalysed by the bioinformatician and the leading scientist in the project in order to produce graphic representations of the differentials in DNA frequencies between the studied groups (cf. Chap 5).

Although today the idea of rare variants connected to disease has become more attractive, in 2002-2003 when INMEGEN's scientific team started working, the idea that SNP´s common at the population level (present in more than ≥ 5% of the sample) could help reveal the aetiology of disease was dominant (Silva-Zolezzi field 15/03/2010).

6.3.-Perverse representation: disputes over sampling and design

> *The selection of sampled populations is both a combination between intention and opportunity…from the very beginning we tried to sample human groups from different regions of the country (Silva-Zolezzi int. 2009).*

The MGDP rapidly became the embodiment and vehicle of sovereignty, both because it already was accepted by the community as a fundamental piece for the development of Mexican genomics, and because it provided a platform to propel more expedient scientific research. At the same time it also became a contentious and highly criticised object. The construction of the MGDP was justified in terms of the cost-benefit relation that a national genomic platform could bring to public health care, compared to the use of a combination of existing (i.e. mapped) ancestral populations (cf. MGDP protocol 2005; Silva-Zolezzi et.al 2009). Another fundamental dimension of the MGDP is the materialisation —through the collection of germplasm— of the promises and statements advanced by genomic entrepreneurs. A science which cannot be "imported"[171] because it's based on the populations that are the platform for its construction, as

[171] Imported is a misguiding term, since all of the equipment comes from USA (Illumina©, Applied Biosystems©, and Affymetrix©) and mostly all the scientists have received training in the US.

well as its final consumers:

> "México has extraordinary opportunities in their isolated populations, with a great degree of consanguinity, genetically very homogenous, characteristics that allow to make the isolation and identification of genes that cause illness or those that provide resistance to them (Jiménez Sánchez et. al. 2002)"[172]

This argument was used in combination with the more known and widely publicised idea of racial admixture in Mexico. Together these ideas provided a circular narrative on how "uniqueness" understood either as homogeneous (Indigenous group) or a heterogeneous (Mestizo population) could provide an epistemic vantage point into the genetic origins of disease; captured by the MGDP.

6.3.1-Sampling disputes and representativeness

> *"...they might be jealous and afraid... to know that a bunch of young scientists did a map, they could not do... in more than 30 years of studying Mexican populations"*[173].

We can trace the historical roots of sampling disputes to the very origins of population genetics thought in the 20th century. According to specialists in the topic there have been two very different approaches to the way various experts in the field of human sciences have parcelled human variation. The first of these approaches can be described as simply selecting a geographical grid and studying all those individuals in the selected area to uncover what is a population, instead of assuming the contours of a population beforehand. The second of these approaches considers it to be sensible to study individuals belonging, or thought to belong, to the same cultural entity- ethnicity, tribe or group; assuming that culturally isolated groups partially coincide with biologically distinct groups (Reardon 2005; 2008; Gannet 2003; Griesemer and Gannet 2004). Even though the MGDP was designed to become a biomedical tool intended to capture common variability, and not a map representing the whole genetic diversity in the country, fierce criticism has arisen[174].

Marco Aldebaran (INMEGEN´s top official) stated in our first interview and continued to say that the sampling was subject to the approval by each of the governors the 32 states of Mexico, and their local health secretary. The evident relation between political opportunity and sampling was

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[172] When I asked Dr. Irma Silva Zolezzi about the decision to use Zapotecs and public universities she mentioned the project was based on the work of population geneticists who addressed these issues before. Her account was consistent with the MGDP official project (2005).

[173] Dr. Gerardo Jimenez also emphasised his solid academic career in Science with more than 18 years of experience in genetics, paediatrics and medicine.

[174] Most of the lay opposition has also paid attention on the lack of representativeness of the mapping project, combined with its exaggerated nationalist marketing (www.cuestionableinmegenblogspot.mx; Edu. 2006).

one of the arguments that has fuelled what Troy Duster (2005) identifies as a dangerous reification of race. Duster's argument is that convenience and not careful design directs the sampling of population genetics, characteristics that in turn show the arbitrariness of populations boundaries, making it very hard to claim they are natural categories: "Finding a higher frequency of some alleles in one population versus another is a guaranteed outcome of modern technology, even for two randomly chosen populations (Duster 2005)". Public critical scientists, such as Dr. Elias, mobilises similar arguments to Troy Duster in order to destabilise the MGDP. Simply by emphasising the great diversity of the Mestizo category in combination with long standing socioeconomic/ethnic barriers in Mexico, Dr. Elias is able to exemplify a sampling bias and the unfounded reification of "artificial" political categories by the MGDP:

> ... If you go to any private university in the country you will find a predominant European ancestry—over 70% most surely—, but if you go to UNAM (Mexico's National University) European ancestry will hardly reach 50 or 40% [...] ...I don't have any doubt their measures of genetic markers are right, Gerardo has the best technology and he is very good with quality control[...] the doubt arises when they say this is the genetic structure of Aguascalientes, or whatever... this is a country of free circulation [...] I don't think their samples are representative enough to assure it.[175]

Doubting the scientific merits of INMEGEN´s declarations, Cristobal Medina (Blog author) also criticised the scientific endeavour, emphasising the lack of novelty/utility of the scientific object:

> The MGDP is a mere imitation; phase 3 of the HapMap is publicly available since last year. In this project Mexican samples were analyzed with 15 times more SNP´s density than the INMEGEN MGDP. This is scientific opportunism "electioneering" because Jimenez is seeking re-election and wants to overshadow all the mismanagement that has happened inside the institute (Cristobal Medina in Barba 2009, electronic version).

The points raised against the INMEGEN by COMPTRA summarised, and in some way framed the scientific critique towards the project: "… the design of the "Mexican" HapMap was controversial since the beginning, because the selection of individuals included only medical students (50 from each of 6 regions) and a group of Zapotecs, which represents a bias in the selection of a group of individuals, it is not a representative sample of the general population (COMPTRA 2009, 08/06/2009)". Adding to this critique it goes on to say that 50 or 60 medical students, representing all of the regions or states is simply not representative enough. Critiques towards population genomics, its representativeness and objectivity were countered by claiming a paradigmatic shift between old population geneticists and new genomic science. Dr. GJS said that the scientists using microchips and cutting edge technology who were looking for patterns of variation simply

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[175] Ironically the work of Dr. Elias and other respected population geneticists informed the scientific committee of the project to conduct the sampling of Mexican Mestizo in public universities (in order to avoid a European bias.

worked on a different paradigm:

> …The resolution of the Map is the best in the world, if you compare 300 individuals representing all of the country, against 90 representing all of Africa in the international Hap Map; thanks to the decreasing costs of the technology we have as many SNP´s as the Hap Map. The sample would not be representative for classical epidemiological or public health studies... 300 hundred individuals, sounds too little, but you don't need more because from there, the next step is to map the individual

As a consequence he interpreted the critiques of the old geneticists and those wishing to impose epidemiological ideas of representativeness on genomics, as signs of an obsolete or passé knowledge (Jimenez-Sanchez int. 2008, paraphrasis). One of the main differences between population genomics and genetics lies in the number of variants read and analysed with new statistical tools and software (cf. Edwards 2003). There is no wonder why Dr. Elias, along with many others criticising the MGDP, were unable to crosscheck the claims of the MGDP: basically the technological and statistical tools on which they were based lay outside the scope of their expertise and material possibilities. The lack of technical engagement with the MGDP responds to the technological gap between old population geneticists and the new genomics:

> ...these criticisms, that I don't think are really academic, at least not in any serious way... they have not told us, no....no.... move this here it is not a .8, it is .5, or this graph is wrong and this other piece is not well examined....are more the product of facing a very junior team of researchers, that have been able to publish in the PNAS, without sending samples or clinching to the "gringos (Americans)" using budgets very similar to the ones they used, all of them Mexican, and then looking at themselves they are senior, very senior! ...and they have not been able to do what we did in four years with a rented building, and doing everything from scratch (Dr. X int. 2009)

As a response to criticism coming from expert groups, composed of population geneticists, bioethicists and afterwards the cyberspace, the so called "Map of the Mexicans´ Genome" was defended by Dr. Y, Dr. ISZ, Dr. X, Dr. Max and all of the MGDP authors which I talked with, on the grounds of being able to do such a project without "clinching to the Gringos". It was important for many of the experts and top officials of the INMEGEN to make it clear that this was all done by Mexicans and that the claims against the MGDP's representativeness were a paradigmatic confrontation rather than a miscalculation on the sampled populations, or a lack of care in the design. In another interview after the MGDP was published Dr. GJS restated the need to make the map inside the country, conferring privileged authority to the mathematical demonstration of variability, in front of which, rumours and envy should bow according to him(October 2009):

> ***G.J.S-*** We defined in the paper... with numbers!! That none of the other maps cover us satisfactorily... and that any combination of two Mexican states covers us better, between 96-97%...
> *E.S*- Yes, and as more distance exists it is better... Sonora and Guerrero...
> ***G.J.S***- Yes, exactly... So we demonstrated that effectively, we cannot import genomic medicine... we demonstrated that we can do a map, and we have the capacities, to do it rapidly, in time and put it in the

web... we demonstrated that we can!!

The paradigm and technological gap argument was mainly the way in which the authors of the MGDP resisted the attacks of former CPMG members and supporters of the project, on the other hand the rupture between geneticists and the new genomicists was made smooth in order to integrate the publications of recognised authorities in the field of population genetics (Dr. Elias; Clara Godorezky cited in the MGDP protocol 2005) to back up the sampling process. Substantive debates around the creation of the map remained rather polarised between the empiricists (numbers speak for themselves) and contingent repertoire (bad sampling and personal interests, also cf. McCann Mortimer et. al. 2005)[176] without a substantive revision of the procedures that gave rise to the MGDP or the assumptions on which it was founded (mainly because other scientists and institutes lacked the technology, training, resources and time to do so, cf. Chap 6).

If we compare the disputes around the MGDP's representativeness and the criticisms of the idea of a "Mexican genome" with the disputes of the opposing parties around the concept of race in the confrontations of the HGP (see: McCann-Mortimer et. al 2005), we would realise that in contrast with the debates in the USA, none of the expert groups disputing "Mexican Uniqueness" or the MGDP's representativeness interpret their confrontations as the product of a racist ideology or discrimination. Rather, they conceive of it as a strategic exaggeration in order to get mediatic attention and resources; I think that it is also important to recognise that the claims against the MGDP come at a very particular time in which the expertise and reputation of Dr. GJS is being questioned, and the law on genomic sovereignty is imposing a heavy taxation on biomedical research (cf. Chapter 6) [177]. These critical voices, in the same way as Dr. GJS and genomic entrepreneurs, had invested their time and reputation in constructing the MGDP as a vehicle of sovereignty. Attached to it, they had accepted the reification of Mexicanhood as a tool to create the institute and circulate the ideas of the IFS (2001) inside the Mexican congress.

6.3.2- Summary and Closing remarks.

[176] Both parties in dispute use quantifying arguments, and a recourse to science as the final arbiter of these disputes using empiricists (quantification, recourse to bad/good science) and contingent arguments (ideology, public manoeuvring, personal interests).

[177]…apart from the administrative scandal the science done at the INMEGEN has problems as well. Its relatively modest study of the "Mexican genome" inflated to make, according to Felipe Calderon, our entrance into the XXI century medicine. These celebrations have massively exaggerated the benefits of a still distant genomic medicine. His ability to sequence (read) genomes, underutilized during the influenza epidemic, has already been surpassed by the UNAM, which has just opened more efficient facilities. And its reductionist approach, speaking of the genomes of "Mexicans", "Sonora", etc. is ethically and even biologically questionable (Bonfil 2009)

The use of negative stereotypes and the idea of national sin traversed a self-defeating culture of corruption, which in turn permeated the whole politico-scientific atmosphere around the Mexican human genomics arena. On top of that the tropes of Caudillismo or the cult/aversion of political *personalism* were dominant in the field. What is at stake in Caudillo culture, most of the time, is related to the virtues or vices of a personality and/or the society in which such a personality unfolds, diluting responsibility of one entity, the "Caudillo," to transfer it upon another one, "the jealous and divisive others". The mightiness of Dr. GJS was almost unanimously recognized, he was the astute, brilliant and enterprising scientist who single-handedly convinced congress to invest more than 120 million dollars in the new field of genomics (somehow many of my interviewees forgot they were signees of the CPMG efforts in the Mexican Congress and official documents too). On the other hand his personalistic, strong and very public style of leadership was seen as being at the root of the INMEGEN´s and the MGDP's failure (cf. COMPTRA 2009; www.cuestionableinmegen.blogspot.com).

The question was not centred on the group that lobbied the INMEGEN or the civic culture that consumed such inflated rhetoric, but on the figure of Dr. GJS. Accused of using mass media to enhance his personal image and tweaking scientific facts, he was also narrated as the character controlling with an iron hand the field of genomics in Mexico: it indeed looked like Dr. Jimenez was an almighty character capable of controlling various socio-political spaces (this opinion was widespread in the scientific community, and it even reached the Mexican Senate, cf. D.O.F 04/12/08). Another point of concern was what many of my informants thought were inflated promises and ungrounded economical claims, that only added to failed promises at the end. For critical NGO's even if these promises became a reality it would not really improve the health of indigenous communities who were only a standing reserve for the profit of multinationals and private interests who would benefit from their pure genetic information to develop new drugs and therapies for those with the money to pay.

When it came down to the technical disputes around "The Mexican Genome" the way to disenfranchise the authority of genomic medicine and its claims was through questioning the sampling and representativeness, rather than crosschecking or trying to reproduce the procedures to create the Mexican HapMap. The problem with crosschecking the MGDP was that many samples from similar regions needed to be collected, just to start the dispute. On top of that massive automatic sequencers and bioinformatics should be in place and engaged in a long period of training in cutting edge software, statistics and experimental design to create a similar object. On the other hand the reification of nationhood, and what is more the idea that there are regional genomes —like the genome of Sonora or Aguascalientes— made the constructed-like

qualities of the MGDP a sensible target for scientific critique based on the unwarranted genetisation and the reification of political identities. However, at the level of bioinformatics and scientific crosschecking no challenges occur since the anonymous self-identified scientist said "who has the resources, machines" (www.cuestionableinmegen.blogspot.mx also cf. Chapter 6). Apart from the technological gap the number systematised samples was something unique in the country, these two features (massive sequencers and systematised samples) made it very difficult to cross check or question the MGDP on technical grounds.

7- *Time is of the essence: the coproduction and re-articulation of Mestizaje and population genomics*

> *...what is new with Mexicans is that we have a recent admixture... admixture has happened all across the world and throughout history... ours in particularly, is recent, which generates a genetic landscape that is interesting... (Silva-Zolezzi int. 2009)*

To show how the "interesting genetic (admixed) landscape of Mexico" is not only composed of what is framed as objective mathematic relations between DNA but also of value laden ethno-racial interpretations of variability, we need to explore scientific practice. Notions of genetic admixture and *Mestizaje* are constantly mobilised by medics, scientist and human geneticists engaged in population genomics in Mexico. This chapter mainly focuses on the way in which those who authored the MGDP (and their staff) use ethno-racial notions to give meaning to population genomics. I sustain that such interpretations are filtered by vernacular approaches to racial difference and only partially map into what I call the relative, complex and probabilistic production of population genomics inside the laboratory[178]. To make this comparison I contrast the practices that produce genetic variability inside the Population Genomics Laboratory (PGL) of the INMEGEN with two notions: 1st "Mextizaje"; the idea that Mexicans possess a unique genetic structure product of admixture (cf. Chap 3) and 2nd that DNA provides an objective account of human history without the need of any external pointer or index (cf. Sommers 2008, 2010).

Taking as my vantage point the socio-material production of population genomics at INMEGEN´s PGL[179], I compare the understanding of those experts that committed to institutionalise genomic medicine in Mexico, and whom extensively mobilised the notion of "Mextizaje," with the work done to produce the MGDP. The advantages of grounding our enquiries in the production of genetic admixture in the laboratory are that we can delineate how a vernacular ethno-racial framework, "Mextizaje," undergirds both the interpretation and production of genetic difference in Mexico

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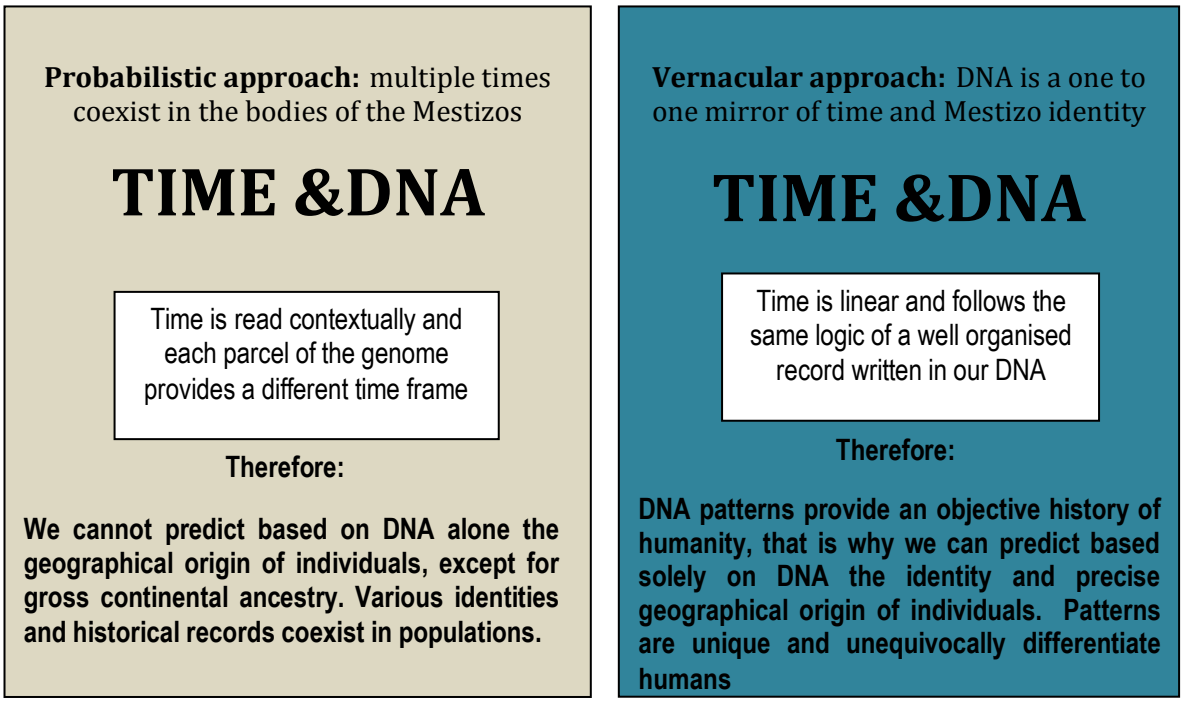
[178] Although I had contact with all of the MGDP authors not all of them were formally interviewed. Because some felt uncomfortable about the technical details of haplotypes, were antagonist of the PGL (i.e. they belong to another laboratory inside the INMEGEN) or because they did not want to be recorded or cited since they could be easily identifiable to potential employers. Therefore the voices who accepted to talk about the details and meaning of haplotypes are very few. I use pseudonyms for almost all of them.

[179] Other ethnographies of the PGL explore the topic of Mestizaje and ethnoracial categories. The work of Vivette Garcia Deister (forthcoming) follows the movement of mestizo and indigenous labels around the laboratory to establish the points of epistemological continuity (her ethnography began in the last month of Irma as PGL head—and my last couple of months in the field—and followed the work of population genomics in the second period after Dr. Xavier Soberon took the Directorship of INMEGEN).

amongst a very small group of specialists. Therefore we can flesh the way in which novel configurations brought by population genomics' scientific practice mark shifts and discontinuities between racial, national and biogenetic identities as portrayed by the dominant notions of admixture. The conflation between folk stories of Mestizaje and the creation of "The Mexican Genome" are what I have described since Chapter 4 as "Mextizaje" [180].

To avoid repetition I will not come again to the topic of *Mestizaje*, its historical roots, or the ideas of Jose Vasconcelos (to refresh your memory you can go back to chapters 1&3) The retooling of Mestizaje under the idioms of probability, relativity, and complexity privileges certain properties of admixture over others, depending on the question and the data available. Contrary to the popular-romantic version of *Mestizaje (or what I have called Mextizaje, when it is specifically applied to Mexican Mestizo)* which reads genetic variability as a fixed mirror of national history. The probabilistic, complex and relative approach is the one I found amongst the esoteric users of bioinformatics, massive sequencers and basically those who had to make sense of genetic variability out of raw data. Organising millions of SNP´s with algorithms, statistical tools and specialised software. The romantic-vernacular version approach is the one I found mainly between those authors of the MGDP, who had little or no contact with the aforementioned entities.

Figure 7-A– Probabilistic and vernacular approaches to time, genetics and Mestizos



[180] The conflation between Mexican national identity, and the notion of admixture as a product of population genomics research, is what I have previously called "Mextizaje", chapter 3 develops the concept more fully, also see: Schwartz &Silva Zolezzi 2010. In this chapter I expand on the previously mentioned paper and the notion of "Mextizaje" and present examples of its common day use amongst experts in the field in both population genomic research and genomic anthropology.

Recent work on the relation between identity, genomics and DNA history has shown that the way in which genetic data is used to reconstruct past histories or look for the causes of disease in DNA is embedded in various interpretative and material processes that are not univocal or beyond dispute. Taking back and forth vernacular notions of race and kinship to make sense of genomic information, and to at a latter point relate it to diverse fields of human knowledge as medicine or anthropology (cf. Fullwiley 2008; Abu El-Haj 2004, 2007; Sommers 2008, 2009), is a rather common practice. In most of these couplings with other fields of knowledge genomic technologies claim for themselves the upper hand of objectivity when reading history or disease into the living records of humanity, against palaeoanthropology, folk stories, environment and other reconstructions of human history (Abu El-Haj 2004; Sommers 2008, 2010). The historical records read by new massive sequencing technologies in the genetic structure of humans serve as the basis for new claims on identity politics, economic and development agendas, medical promises (Hardy et.al. 2008 a, b, c) and in Mexico to claim sovereignty over a national genomic patrimony (D.O.F 2004, D.O.F 2008): in practice genomics travels as if it was indeed a univocal and hegemonic revelation, which many of my informants refer to as being the origin of disease, the loyal reflection of heredity and the most objective way to divide human groups in the world.

Contrary to those objective approaches to genomic science what I found in the laboratory was that basically linking ethno-racial categories to clinical phenotypes was a much more elusive, humble and probabilistic enterprise than anything I had found in the written records of "Mexican Genomic Medicine". As a matter of fact population genomics' ambivalent and paradoxical use of race-ethnicity arrives late to the cultural field produced by Mestizaje, which has harnessed throughout the years its own strategic use of racial ambivalence (cf. Stepan 1991; Stern 2002; Wade 2004, 2009; 2004; Vergara 2011). In order to analyse the dynamics between the romantic-vernacular and biogenetic identity, we have to elaborate on the politics of time proposed by Nancy Krieger (2005); understood as the way in which mostly unconscious beliefs and implicit assumptions feed into choices of time scale, shaping scientific questions (2005: 2157).

The data in this chapter is mainly the product of the close interaction with one of my key informants, Irma Silva Zolezzi, and the members of the Population Genomics laboratory (PGL): Mrs. Crown, postgraduate medical doctor; Alma.Molecular Anthropologist; and Rita and Elisa: laboratory technicians. To a lesser extent with other latecomers to the laboratory such as Dr. Celina, with whom I had contact before since she is a MGDP author. Ethnography done in the PGL began in November 2008, during which the first visits and informal chats with laboratory technicians took place, to the 5th of July 2010, on which my last formal interaction with laboratory

members occurred. In between this period the most intense engagement occurred between January 25, 2009 and June 13th 2010, the intensity of fieldwork and the scope of my access to diverse laboratory settings and discussions during this year and a half is something for which I am extremely grateful.

My entry into the laboratory coincided with the final preparations and revisions to publish the MGDP, as well as the first application of this knowledge for projects searching for the genetic origins of complex diseases. The medical applications of the MGDP were centred on research on hepatic disease, macular degeneration and some of the first pharmacogenomic applications of genomics (Contreras et.al 2011). The only project I could follow until its completion was the MGDP. Although I centred my attention on the Hepatic disease project and in a lesser extent on the physical anthropological project of Dr. Soma and Alma´s research, my main interest was on the relation between ethnicity, genomics and medicine. This interest was truncated by INMEGEN´s own internal struggles and lack of research continuity. After 1 year and 9 months of ethnographic engagement Irma left the laboratory, Alma went to work to Chile and Mrs. Crown left to live in Boston, this meant that my own objects of study (scientific projects and scientists) had dispersed and now were unavailable.

The next sections describe important issues and scientific "curiosities" that I think best illustrate the dynamics between ethno-racial categories, scientific practice and national identity in Mexico. The problematisations and disjunctures between the biogenetic identities produced in the PGL and its wider circulation challenge —even though not publicly— a dominant interpretative repertoire which maps specific historical, rhetorical and ethnic logics as natural properties of admixture in Mexico. In the Mexican case, both, coproduction and articulation (cf. Chap 1) are complementary and are much closer to the notion of multiple enactments in which race gives the "illusion of a thing (M´charek 2011)". Certain characteristics of ethnorace are tailored and enacted slightly differently as they circulate amongst social worlds or are appropriated in new research endeavours. Therefore I think that natural orders can be re-articulated to pre-existing racial orders, yet haplotypes and genetic variants do not behave as identical reflections of vernacular notions of history. As a consequence these resistances bring forth spaces in which coproduction and novelty is possible, making evident the effort to re-articulate pieces of scientific experience that don´t fit with the dominant ethno-racial narrative. Put simply we need to know what is old in order to evaluate the novelty of a certain process, entity or new piece of knowledge. When linking genetic variability with notions of ancestry or race it is exactly the same, though in order to

distinguish between the old and the new in population genomics we have to engage with the material dimensions of genetic variability and its scientific practice [181].

7.1- Situating expertise: the central role of haplotypes

> *Genetics has transformed from academic discussions between very small groups of specialists, into an important issue that fulfils a preponderant role in caring for human health, with special repercussions, like none other in the history of humanity... (Preamble of Nayarit´s law on genomic privacy and sovereignty: 9/09/09)*

A genomic cartography is a description of common genetic variability (SNP´s found in≤5% of the sample) within a group or population[182]. Through the aggregation of a mass of individuals, common genetic diversity arises, which is not only directed to inform about the presence or not of certain genetic variants, but also (and most commonly) of their relative frequency in a certain population. The objective of the MGDP was to produce a road map of haplotypes, with the hope of uncovering the way certain SNP´s were probabilistically linked with common complex diseases (cf. Chap 4). The MGDP was consistently described by public informants as the construction of a highway (cf. Mendoza 2007), this catalogue of variation claim it would be easier to start diagnosing individuals based on their relative genetic risks. A road map that would afterwards be translated to diagnose the probabilities of patient X to suffer from a set of complex diseases. A road map to calculate the higher or lower risk of having and adverse reaction when taking a new drug, it was designed to become a bridge between personal diagnosis and directives for public health. The MGDP would then effectively become the platform for a new medical practice:

> The idea of the HapMap is... in order for genomic medicine to be a reality, what you would like is that a DNA sample is taken and they tell you what your relative risk to hypertension is; yours!!! Not the one of your community, your family or your cousins, you want your own risk!!! So in order for us to make your own, the relative risk is a coefficient, in which the numerator is your genome, and the denominator is the population to which you belong. (Jimenez-Sanchez, 2008)

Since my early interviews at INMEGEN I found haplotypes (or haplotype blocks) to be key elements in the interpretation of genomic cartographies. Haplotype blocks are specific arrangements of DNA that travel across generations, composed of SNP´s in physical proximity to

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[181] Genetic Variability: i.e. haplogroups, haplotypes, mutation rates, Ancestry Informative Markers [AIM´s] and SNP´s. For a sharp and detailed ethnographic account on the construction of ancestry markers and admixture mapping, as tools in the search for racial differences in US health research, see: Fullwiley 2008. Basically in the population genomics lab AIM´s are those SNP´s with a relatively high frequency, compared to other populations of the International HapMap (i.e. European, African and Asian).

[182]Even when the scientists in the PGL are aware of populations' malleability it does not change the practical use of populations as a representation of a cultural and biological community: this delimitation can be done through their genotypes or other characteristics as language, mobility, and phenotypes amongst many others (which of course make it a very problematic concept).

each other in the same strand of a chromosome. As medical and cost/benefit devices, haplotypes, are pivotal to find meaningful genetic variations related to disease, without having to read the whole genome of a patient (Gabriel et. al. 2002, Silva-Zolezzi et. al. 2009; Price et. al. 2007). Haplotypes have also been strongly correlated to populations' temporality, ethnic boundaries, ancestral lineages and evolutionary narratives (like in the Cohanim haplotype; Abu El-Haj 2004; Thomas et.al 1998; Sommers 2008). The paradigmatic example of this type of research is the Cohen Modal Haplotype which is a genetic sequence found amongst self-identified descendants of Rabbis, whom by following this sequence said they could trace their religious and historical origins to the times of Moses, and Aaron, his brother. The distinctive haplotype was found among 50 to 60% in the Y chromosome of both Sephardic and Ashkenazic populations; matching with the estimated time in generations and the shared ancestry of the Cohanim lineage, which was not found in lay Jews (Thomas et. al 1999).For molecular anthropology and population genomics in Mexico the search for high density haplotypic variability is a rather recent technique, highly dependent on the use of massive sequencers, supercomputers and sophisticated software (cf. Chapter 6).[183].

7.1.1- Haplotypes: linkage disequilibrium and tagging efficiency

Haplotypes (or haplotype blocks) have become central actants (Latour 2004) in the search for medically significant SNP´s[184] (single nucleotide polymorphisms). Around 2002, while the negotiation to create the INMEGEN was under process, an international research group working with new computational algorithms published an important paper for the launching of a global (Mexicans included) post-genomic era: "The structure of haplotype blocks in the human genome (Gabriel et.al 2002)".The previously cited paper opened its lines claiming that: "Variation in the human genome sequence plays a powerful but poorly understood role in the etiology of common medical conditions (Gabriel et.al 2002:2225)", its purpose was to provide the necessary tools to fill this knowledge gap. The paper mathematically estimated, presented and compared different patterns of genetic variance associated with populations across the world. From such endeavour it concluded that the human genome could be objectively parcelled in haplotype blocks (Gabriel et.al 2002: 2226).

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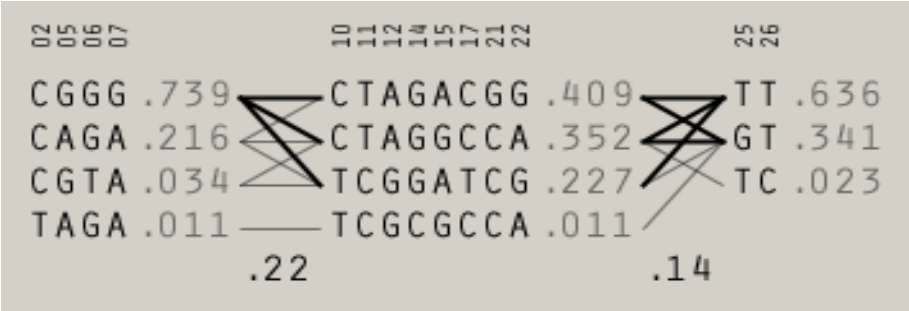
[183] ...a full-scale genomic mapping project would be wise both scientifically and economically. It would allow doctors to analyse fewer genetic markers when diagnosing the risk that a patient will develop a disease that depends on complex factors (Frenk in INMEGEN 2009)

[184] Association Studies: These studies will be aimed to identify haplotypes in Mexican patients, and their association to multifactorial traits such as variation in drug response. This strategy can contribute to identifying captive markets within the Mexican population (Jimenez Sanchez et.al 2002a: script directed to the pharmaceutical industry and other private investors).

For Mexican genomics the fundamental contribution of Gabriel et.al 2002 consisted in showing that haplotypes could make the reading of genetic variance cheaper and more efficient; maximising the cost/benefit relation of medical genomics To fulfil such promise (especially when you have limited resources) the phenomenon known as Linkage Disequilibrium (LD) is fundamental. To understand the role of haplotypes in contemporary genomics, we need to engage with the notion of Linkage Disequilibrium (LD), understood as the probability that a combination of certain genetic polymorphisms is non-randomly associated at two or more loci (Slatkin 2008). So when geneticists say that two variants are in LD (this can be weak or strong, ranging from 0 to 1) it means that they are correlated. According to Gabriel et.al 2002 and the HapMap consortium the patterns of LD clearly differ from population to population[185], providing a tool for researchers interested in identifying specific markers (known as tag SNP´s) that may act as reporters of other associated polymorphisms (Frazer et.al. 2009).

Figure 7-B - Variability within haplotype blocks



As an example in figure 7.B, the middle haplotype (block 2), covering SNP´s 10 to 22, depicts a high (LD) between SNP´s 10, 11, 12, so by genotyping any of these three SNP´s you will immediately know the other two. The first two combinations are CTA, and the combination of the other two haplotypes is TCG. So if you genotype SNP 12, you will know that depending on the allele, either A or G, it will be accompanied by CT or TC respectively. The basic idea is that in any specific Haplotype there are tags SNP´s that can inform about other genetic variants that most probably accompany the reported polymorphism. This peculiar characteristic of population genomics provided a strong argument to strengthen the cost/benefit relation in favour of creating the INMEGEN and the so called "Map of the Mexicans Genome".

[185] ...haplotypes seen outside Africa tend to be subsets of the haplotypes inside Africa. In addition, haplotypes in non-African populations tend to be longer than in African populations, because populations in Africa have been larger through much of our history and recombination has had more time there to break up haplotypes (HapMap web page).

7.1.2-Haplotypes as markers of knowledge status

Such is the current importance of haplotypes and massive sequencing for the comprehension of variability, medical research and time, that in Mexico we can interpret them as markers of exoteric and esoteric scientific knowledge. Indeed those that hold the key to work the properties of genetic variation (haplotypes, SNP´s, mutations, repetitions, deletions, etc.) in order to link it with disease would have a lot more chances to publish and succeed in their medical-scientific careers. A group of biomedical scientist researching on the relation between SNP´s and heart disease in Mexican patients came to visit Dr. Irma Silva Zolezzi´s (Dr. ISZ) Laboratory to learn about haplotypes, one of them commented on his experience trying to find a teacher of sorts:"... people just don´t want to share that knowledge, and if they do they would ask you to give away your research to them, the nice ones will ask for authorship... it is really hard to get someone to help you with haplotypes..." to this statements Irma added: "...it might just be that they don´t know, and they prefer not to say (Field analysis notebook: 16/06/10)"[186].

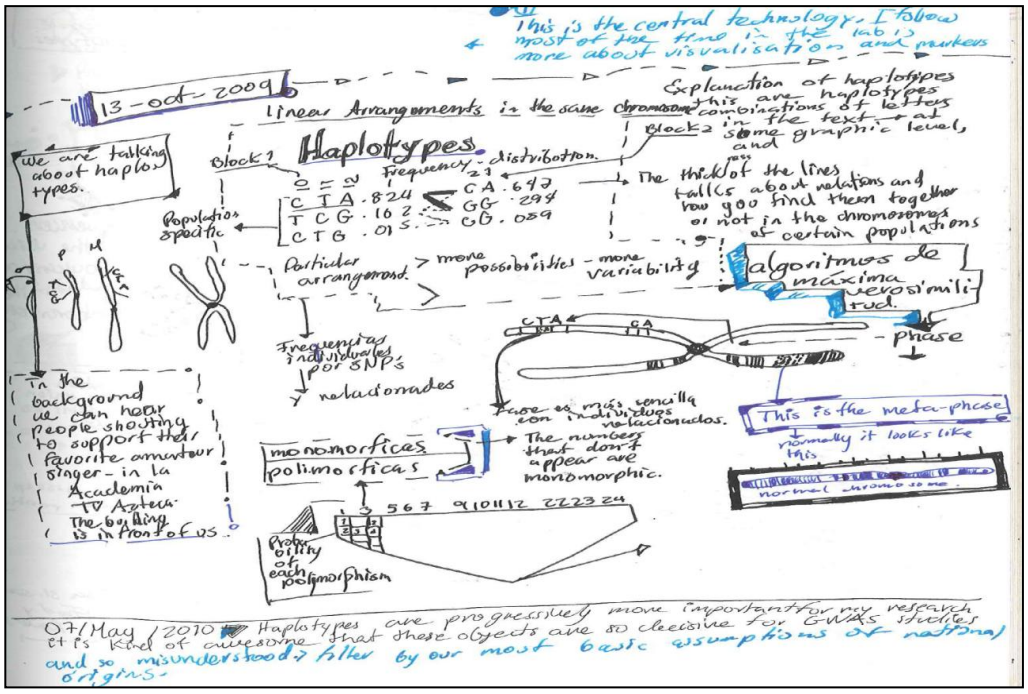
Public scientists and top officers inside the institute, such as the ones I have interviewed for this chapter, are not really trained in population genomics. Readers might find it incredible to know that many of those that I interview in this paper—except Dr. Elias, the PGL staff and postgraduate students—are listed as authors of the MGDP. For example many of the voices in this dissertation such as Dr. Max, Dr. X, Dr. Y, Marco Aldebaran and even Artemio Cruz were listed authors of the MGDP (some of them did parts of the project that had little or nothing to do with the work done in the PGL). During my two years at INMEGEN I had contact with all the MGDP authors except with Jesus Estrada, the leading bio-informatician who developed the initial analysis of the project with Dr. ISZ and who left the INMEGEN to take a post in Rotterdam. Throughout the two years I spent at the INMEGEN I found that the knowledge and familiarity with haplotypes was a marker of knowledge status of population genomics; even amongst the mentioned authors of the MGDP. From the group of 16 persons that authored the MGDP I present some of the views of those public voices of the project that have been widely cited in mass media and public venues. I specially centre my attention in haplotype talk to explain ethnic and medical differences, which I

[186] As a matter of fact it turned out that this group of researchers composed of two medics and one informatician-statistician had not enough density in their DNA data to produce haplotypes. So when they came to visit ISZ to the laboratory the haplotypes they had produced were just shown in one software (according to ISZ a not very reliable one), when they entered their values in the software used in the PGL much more sequencing quality was needed (field notes: 18/06/10 & Haplotype Class: 16/06/10). Medical/population genomics is a young and very fragmented disciplinary field; as an example medical doctors working in genomics use gen-ethnic labels without really knowing how they were produced.

argue were deeply touched by the idea of "Mextizaje". The very small number of specialists in population genomics and medicine in Mexico are the product of organisational efforts such as the INMEGEN (although some of them are scattered around research institutes in the country), or are still to graduate from the BA in Genomic Science of Mexico's National University (UNAM).

Dr. Irma Silva-Zolezzi (human geneticist) knowledge about population genomics has been the result of an intense five year process of experimentation and autonomous learning in order to develop a map of common genetic variability in Mexico; rather than the product of formal training in the area of population genomics. My own relation with haplotypes was one of gradual acquaintance and progressive interest. First I engaged with its probabilistic and structural properties by assisting to Dr. ISZ data analysis sessions and sitting with her a couple of hours to get a detailed hold of haplotypes visual-statistical meaning (figure 7b & 7C).Just after hearing a lot about all their properties —from almost anyone related to the project— is that I began to understand the roles of these objects in the search for the genetic causes of disease was fundamental. Then slowly I became more and more aware of the manifold ways in which haplotypes were invoked in informal and formal interviews to provide explanations or justifications of ethno-racial identity, genetic parcelling and medical opportunity costs.

Figure 7-C learning about haplotypes in the laboratory: field notes (13/10/09 &07/05/10). [187]



[187] As you can read in this field note image, I came back to the page in which my first orderly notes about haplotypes were scribbled to make sure I remembered, 6 months afterwards, the increasing importance that haplotypes had acquired in the field. I began to be interested in them after my initial interviews with MGDP authors such as Dr. X and Dr. Max, and after realising that they were widely invoked.

Even inside the PGL haplotypes were something that was used by Dr. ISZ, Carlos and Dr. Celina who were close collaborators in the MGDP project, and who were involved in the interpretation of population genomic data. Laboratory technicians who were in charge of doing the PCR, sequencing and keeping the technologies running were not familiar with their interpretation or production (I also rapidly became aware that my status as a naive observer changed as I came closer to these objects; after a while I began to be considered as a biologically educated social-philosophical researcher). Those scientists out of the PGL who participated in the project knew the basic literature about haplotypes but were not really familiar with the way haplotypes were produced (the software, the kind of data needed etc.)[188]. The question of Haplotypes was so difficult for some of the top ranked officers of the field that when I interviewed Xavier Soberon, INMEGEN´s Director General after Dr. GJS, he refused answering to my question saying: "I did not know this was a technical interview (int. 2009)".It became a rumour around the INMEGEN that he used to say "I hate haplotypes (also see: Garcia Deister 2011)".

Authors of the MGDP such as Artemio Cruz or Marco Aldebaran (both lawyers) even believed that Mexican biogenetic uniqueness could be separated from the rest of the genome or that with the existing technology Mexican genes could be policed (cf. Chapter 3 & 6). While other authors who were human geneticists or medics basically said that the computer or the statistical methods applied to the analysis of hundreds of samples provided reliable results in which ethnicity was reflected and uniqueness mathematically corroborated. It was not only that haplotypes were really flexible when it came to interpretations, but that they indeed mediated the relations between race (Mestizaje), medicine and techno-science in multiple ways; making it impossible to isolate one coherent and consistent way to delimit genetic Mexicanhood.

Ethnoracial labels imposed to scientific practice had little to do with the multiple ways in which ethno-race/ancestry was enacted in the laboratory. Public figures in the field and MGDP authors not very familiar with haplotypes made sense of knowledge gaps by making reference to popular and uncontested notions of Mexicanhood such as Mestizaje (cf.Schwartz-Marin & Silva-Zolezzi 2010). Nevertheless, I think that the use of haplotypes and genetic variability (genomic identity) as

[188] Dr. Trotsky a medical doctor which had various international collaborations with groups studying the genomics of complex diseases in USA, is a very influential figure in Mexican health scenario and the boss of Mrs. Crown, whom started working at Irma´s laboratory (the PGL) to gain the inside knowledge and expertise to start doing these type of projects in Mexico in collaboration with the INMEGEN; which was until then the only institute that had the necessary equipment and infrastructure.

a bridge to understand, order, and reinforce what we already know about Mexican origins (popular identity), reveals something much more interesting than the "ignorance" of notorious scientists, medics and MGDP authors in Mexico. What the dynamics between these two identities (popular vs. genomic) reveal, is the work of alignment or calibration that remains hidden, since it is re-articulated (Fullwiley 2008:617) or made to fit into century old notions of Mexican origins.

7.2- Mexican Uniqueness: medicine and biogenetic identities inside the laboratory

> *From 1990 to 2004 we had a history of the Human Genome Project (HGP), if one thing did the HGP, was to debunk any ideas about the existence of race, since we all share the 99.9% of the genome. [...] the idea is not to say there are superior or inferior characteristics of Mexicans; it is not nationalism or patriotism. It is just to say we are the first developing country able to do this massive mapping (Jimenez-Sanchez in field notes July/2/2009).*

It is indeed completely true—based on my own experience— that no Mexican scientist or lay Mexican ever mentions anything about racial superiority, for many of my lay and expert interlocutors the very idea is abject racial non-sense. If anything, most Mexican informants feel to be backward in comparison to other cultures and nation-states and more developed communities. Almost all of my interviewees admired and respected the West, first world countries and the peaceful and prosperous democracies of Europe and USA: some of them —like Dr. Max— were amused that developed and peaceful countries, he admired, still retained racial categories as white and black (int. 2009, field notes 16/06709). One of the principal objectives of mapping Mexican genomic diversity deployed on public venues such as the congress or international meetings was to describe how indigenous ancestry has contributed to the "unique" genetic makeup of Mestizos:

> ...The hypothesis is that Mexicans have a particular genomic structure, because of its demographic history. We proved that the different admixture compositions of the country are so many that we would have to make a curve. That curve requires two extremes, the Spaniards and the Indigenous (Dr. GJS int.2008).

This interview with Dr. GJS happened almost a year before the MGDP was published, and his approach to the MGDP was one in which a pre-existent structure of genetic variation is simply shown to behave in a way consistent with demographic history. In all my time at the laboratory I hardly heard any of the hard science talk that Dr. GJS used to describe the findings of the project. Instead I constantly heard the words probable, correlated and relative when talking about genetic variability. The first example of what I call the relative, complex and probabilistic features of population genomics in the laboratory became apparent to me in my first formal interview with Dr. ISZ (MGDP first author) at the beginning of my laboratory ethnography.

In this initial interview the idea of "genetic uniqueness" was immediately dismissed (cf. Silva-Zolezzi int. 2009 & field notes 25-26/01/09). To talk about "uniqueness" and associating it with sovereignty in the laboratory was talking non-sense. As a matter of fact the relation between differential genetics frequencies across the globe and the normative and ethical practice of regulation based on "uniqueness" was an antinomy when thought at the level of populations. When I asked Dr. Irma Silva Zolezzi about genomic sovereignty, in our first in depth interview, interrupting my question she said[189]:

> ... It is technically feasible to speak of sovereignty when we speak about an individual genome, which is *unique*; but to speak of sovereignty over the genome of a whole population is pretty difficult. We cannot speak of a unique Mexican make up, when we are talking of shifting percentages of DNA fragments which are shared by humanity and various populations across the world (Silva-Zolezzi Int. 2009)

The idea that genomic sovereignty was a groundless category, if thought to be built on top of a stable genetic reality of some kind or a "Mexican race", kept coming back as a non-sense in the laboratory. Even if we took the indigenous heritage of Mexico to be the basis for its genetic uniqueness "indigenous groups were not solely circumscribed to Mexico, they are living all across the American continent (Silva Zolezzi 2009)".

7.2.1-Race, Castas and Mexicanhood: in and out the Laboratory

Once in a laboratory chat between Alma (molecular anthropology grad-student), Dr. ISZ, Mrs. Crown (physician) and me about the idea of race, they coincided in their views. Basically they prefer to talk about ethnicity or ancestry, rather than race: "race reminds me of those seventeen century classifications like: "salta atras (jump backwards)", "Lobo (wolf)"... and all those demeaning names" said Alma. In the laboratory race was something different from ethnicity, since there was no "real" parcelling which clearly divided human groups. Nonetheless categories such as Indigenous and Mestizo are the product of a tacit acceptance of racial stocks. Many times at the laboratory I pushed those ideas around, responses gravitated towards the notion that we are all Mestizos- in biology there is no purity but a continuum (Alma field notes, June 2009)

A strong work of demarcation between race, and populations has given genomic entrepreneurs —and laboratory scientists— enough space to talk about an underlying national biology —or about a particular set of (Mexican) genetic markers— without engaging with any of the thorny debates around the biological "reality" of ethnicity or the less charged use of ancestry (race?). In the arena

[189] I regard it as an antinomy rather than non-sense or an open contradiction because at the level of individuals DNA is unique, but at the level of population most of the frequencies are shared across different populations around the globe: making both premises tenable at different levels of aggregation.

of Mexican Genomics race is strictly avoided, in and out of the laboratory, except to state that genomics has shown that races don't exist. After a series of seminars between jurists and scientists in Mexico, the consensus that emerged was that the concept of race was to be avoided, in order to leave space for the concept of human geographic variation (Max int. 2008)[190].

Figure 7-D -Race and unfounded category for the PGL members

...in the middle of a discussion on genetic data at Irma´s office: the place in which fresh data was mostly discussed I interrupted to say: "well you know...I have heard these philosophers of biology say... that even when you don´t use the word race, assuming there are discrete biological groups does the same work as race (also cf. Arias & Restrepo 2010; Lopez-Beltran & Vergara-Silva 2008)". My untimely interruption marked the beginning of a heated argument; Irma and Alma were immediately bothered by my questioning:

> **Alma:** I am tired that you socials want to tag us as racists.
>
> *E.S*- I am not here to tag you as racists or not, I am just very intrigued about your shared ideas about it; and in all the time I have been here, I have never asked you... well we have never really discussed the issue directly. I want to know what do we talk about, when we say Indigenous or Mestizo; it is important to many people and me...
>
> **Irma:** But what is the big problem here? We don't talk about race because there are no significant variations that separate one human being from another. We are talking about a two per cent difference, two per cent!! We still have everything in common...I mean; we are not talking about superior or inferior biological characteristics. We still have two legs, two eyes and two arms... come on!!!
>
> **Alma**: You socials must be thinking we are Anglo-Saxon or U.S molecular anthropologists and we are not!! We are physical anthropologists, we don´t consider biological characteristics alone, we take on board language, culture, traditions, all of it... we are not looking solely to biology

A couple of weeks later, an invited scientist in the laboratory described the use of race in genomic research as a question of political correctness. Alma looked back at me and said "... okay, okay you had a point in asking us about our points of view on race... (Field notes: 17/11/09).

However other experts who had almost no contact with the production and disputes of biogenetic identities, as Dr. Max —a physician with some training in medical genomics; also one of the listed

[190] Researchers that were in the event, told me that the question of race was never a topic for debate, the event was a continuous presentation of experts from various fields, that endorsed the idea that race was an unfounded category. So we could say that this institutional effort, added very little to any open discussion of the topic, what is true is that all of the scientists involved in population genetics or genomics, that I have interviewed, prefer the word ancestry, over race. In the case of other scientist who use ancestry categories for their research, but who are not familiar with the discussions in the field they might not see any difference, even when they prefer to use ethnicity or ancestry: "we discriminate indigenous peoples, and we despise Spaniards... it might be a political nicety, but we would be better off without getting any racial tags (Dr. Y former first author of the MGDP)".

authors of the MGDP in charge of top administrative functions inside the INMEGEN— (Int. 2008) had a different take about the problematic racial-profiling in genomic research: "it is not like we are using race to discriminate or something like that... on the contrary we are using it to bring future health benefits to the population". Other authors of the MGDP like Dr. Y said that we have to avoid race, because we "discriminate against indigenous and we despise Spaniards (int. 2009)" but for him the question of a genetic continuum or the diversity amongst population was not the basis of the refusal to use the notion of race, but its political and social consequences and troubled history.

However inside the laboratory there was not ultimate objectivity and no Mexican Genome since the awareness around the malleability of genomic clusters and its relativistic/probabilistic qualities were constantly struggled with. Nevertheless there was the belief that the MGDP had something important to offer to the biomedical community As a matter of fact, during my time at the PGL, I learnt that genomic medicine was not all about ethnic or so called "racial" differences (in Mexico the word is mainly avoided):

> ... you know you are very interested in this ethnic related variations, but genomic medicine is not just made out of ancestry related SNP´s but kind of universal SNP´s which are the same in two or three different populations—regardless of ancestry—, like in my project of macular degeneration, which is as valuable as any other type of genomic research related to ethnic differences... but in which the same disease related SNP's are present despite of being Mexican or European (Ibid: field notes 01/09/10).

Yet somehow ethno-racial differences kept coming back in different flavours; either when comparing alcohol consumption, the rate of hepatic disease amongst indigenous and mestizo communities, or when talking about deep medical and economical inequalities in the country. On the other hand ethnic distinctions were inscribed since the very beginning of research endeavours, its sampling design and in the way in which the Mexican Mestizos or indigenous recognised themselves as bodies/individuals pertaining to certain ethno-racial categories or ethnic communities.

7.2.2- PNPLA3, hepatic disease and the MGDP

The way in which genomic populations emerged could be well described as a process of progressive visualisation in which the characteristics of normal/pathological groupings emerged at the end of the process. The only reference that is kept through the whole process are the ethno-racial label that travel with the samples since they are first taken from the blood stream of the MGDP journey's volunteers and then become a mobile reference (cf. Garcia Deister 2011).My own interest was centred in the way in which data was assembled and the production of genomic populations in the dry lab, so after the first months of fieldwork I completely centred my attention

in the last steps of data organisation, interpretation and its links with disease, migration or any other environmental phenomena of interest. The best example I could provide about the pragmatically-research oriented constitution of populations and ethno-racial identity, I am endorsing, can be illustrated by the work done in the gene PNPLA3 gene related to hepatic disease done by Dr. ISZ and Mrs. Crown. In the laboratory this was a very interesting research since in large cohorts in the USA (Dallas heart study cohort, cf. Romeo et.al 2008) working in the PNPLA3 gene[191], SNP´s had been identified that conferred an increased risk to developing hepatic disease, especially amongst Hispanics (whom in the laboratory were thought to be basically Mexican-Americans, since most of them were sampled in Dallas, see: Romeo et.al.2008; for a more detailed account of the way in which Hispanics and Mexicans related at the population genomic level inside the PGL see).

The probabilistic and relative characteristics of population genomics became visible to me since the first days of the PNPLA3 project. The role of the gene in the pathway of hepatic disease is very ambiguous still[192], so the way in which the research and the clinical tests done to patients were designed could be determinant for the type of claims the project could make. For example if the battery of clinical tests could scan different biochemical components of the disease, the populations could be more finely divided relating to endo-phenotypes (enzyme levels, body fat, etc.) rather than complete phenotype of the fatty liver disease or other hepatic illness. Therefore it was not simply a question of finding a mind-independent object such as a population which largely coincided with demographic data but something closer to what Lisa Gannet's (2003) argues: "biological populations are pragmatically and variably constituted within specific contexts of scientific investigation (996)".

The PNPLA3 project coincided with my entry into the field and as soon as it was launched it became the "genomic sovereignty trial" since the risk SNP´s associated with hepatic disease had an unprecedented 75% frequency amongst indigenous populations of the MGDP; and over 50% frequency amongst Mestizo populations. Dr. ISZ said if something like genomic sovereignty had any material basis this type of project could be the way to prove it (laughing) or simply disprove it:

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[191]Patatin-like phospholipase domain-containing protein 3 (PNPLA3) located in Chromosome 22. The protein it produces is thought to be involved in the mediation of energy balance -usage/storage- between adipocytes (fat cells), this protein is mainly located in the cell´s membrane (taken from: http://www.genecards.org/cgi-bin/carddisp.pl?gene=PNPLA3). This gene has been associated with hepatic disease in GWAS studies see: Yuan et.al 2008; Tian et.al 2010; and Romeo et.al 2008.

[192] "The biochemical function of the PNPLA3 protein is unclear, though it appears to have lipogenic transacetylase activity. The gene is highly expressed in adipocytes and liver, and the protein may have a role in energy homeostasis (cf. Tian et.al 2010:22)"

"...this is the idea of gold, what researchers such as Burchard or Taylor (genomic scientist in the USA) would love to find". A previous research made on Mexican patients by the same group—in which the boss of Mrs. Crown had participated by donating the samples—had published that the same SNP´s (in this case the SNP was the: rs738409)[193] were correlated with increased risk of hepatic disease, particularly alcoholic and non-alcoholic liver disease: "All common haplotypes containing the rs738409 [G] allele were more common among individuals with cirrhosis than in the control group (cf. Titan et.al 2010:22)".

The competitive advantage in the PGL was related to the level of detail that the sampling of different ethnic groups in Mexico with high frequencies of liver diseases SNP's and haplotypes could provide, added to a detailed analysis of disease phenotype and the division of clinical phenotypes into its most simple biochemical components. Since the patients of the sample had been treated in Mexico for years the possibility of developing a cohort of patients with enough statistical power and clinical data to nuance previous findings was possible.

In Mexico liver disease related deaths is the 5th cause of morbidity in the country and approximately (statistics on indigenous health had different data) the 3rd cause of death amongst indigenous communities (field notes: 11/11/09) it is also recognised as a leading cause of dead amongst Hispanic communities (cf. Tian et.al 2010). So even though there was no Mexican uniqueness as a national racial entity, inside the laboratory there was a structural "uniqueness" in the haplotypic patterns of Mexican samples (both in Mestizo and indigenous) that conferred an increased risk to liver disease according to the ethno racial category to which bodies were ordered. For example since most of the indigenous communities have higher LD and less genetic diversity the frequencies in which disease related genotypes appeared were considerably higher to any studied population of the HapMap. The same happened—despite the fact that it occurred in a lesser extent— with Mestizos which according to laboratory calculations had an average of 50% prevalence of risky mutations.

Inside the PGL there was always the disclaimer that this genetic structure was not particular to Mexico but was something probably shared by many of the Mestizo and indigenous groups of the American continent. What the MGDP revealed for those involved in the PNPLA3 research was that those SNP´s that conferred increased probability of liver disease in Hispanic-Mestizo populations, were polymorphism found in an unusually high frequency in Mexican-Mestizo and indigenous groups sampled by the project, which in turn opened an important avenue for public

[193] The nomenclature to identify SNP's in the laboratory is always (rs) the rest of the numbers locate the SNP´s in the human genome sequence.

health in Mexico and even Latin America; especially amongst the less favoured communities of the whole country (indigenous) and probably the whole Latin-American region: in the end and for this specific disease, ethnicity or ethno-race mattered.

7.3.-Genetic structure, time and Mestizos inside the PGL

Time is central for the understanding of the structure of populations and the delimitation of the epistemic properties of statistical objects such as the frequencies of certain alleles or the relation between ancestry and genetic structure. In the case of a genomic cartography, the time frame of analysis is inseparable from the interpretation of a population´s genetic structure and diversity. According to the esoteric circle of users and scientists who were intimately acquainted with haplotypes, AIMS and SNP´s—its interpretation and production— time was an important dimension to look for the ancestral background or individuals and populations and also an important tool to search for the molecular origins of disease at a fundamental molecular level; in the words of Dr. Irma Silva Zolezzi:

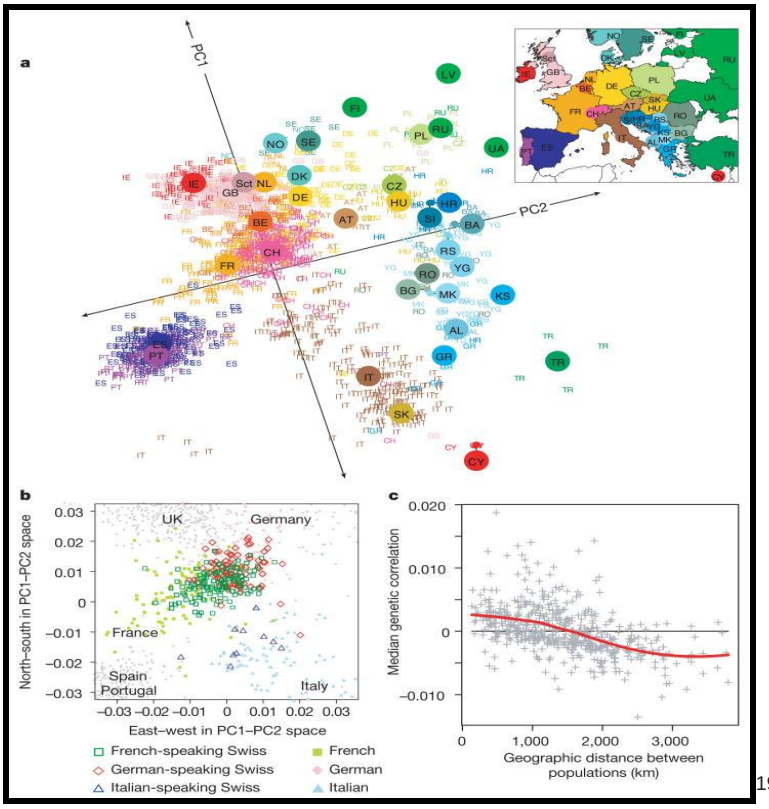
> Having a recent admixture means that...in the same individual and inside the same population you are sampling genetic characteristics that are common both to Europeans and indigenous populations in the same group of individuals, it is like... under certain circumstances and scenarios...you were studying two populations simultaneously... but also the genome has interactions that we don´t understand or know well, that when [certain genetic characteristics] are studied in Africans or Europeans are measured and studied in a particular way... that when are combined in the same genome you can find a richness of information that... confirms observations in the original populations or that allows you to make a new discovery of an interaction, that could not be seen in those populations because there is no such interaction... I do believe that the study of Mestizo populations is valuable, and that it adds to the current state of knowledge (Silva-Zolezzi int. 2009).

The new epistemic status of populations is founded in the notion that the genetic structures of Mestizos can produce a new way to understand disease which is not apparent when researching diseases in other human groups. Mestizaje became a material entity —artefact like— which could reveal new relations between disease and genetic/environmental interactions. The mapping of Mexican´s genetic variability has become a privileged epistemic tool to uncover gene-gene interactions and with some luck new lines of medical inquiry.

Different from other research on population genomics around the world the key interpretative tool to understand genetic variability in Mexico is time. For example according to research on population genomics in European countries and in the context of the existing populations to compare and track genetic diversity, geography is closely linked to DNA diversity: "Global human genetic variation is greatly influenced by geography, with genetic differentiation between populations increasing with geographic distance and within-population diversity decreasing with

distance from Africa. In fact, these 'clines' can explain most of the variation in human populations (Handley et. al. 2007:432)". The 20th of March 2009, Carlos Bustamante a prominent population genomicists from Stanford, gave a conference entitled "Population genetics for the personal genome era". The basic premise of his conference was that geography was highly correlated to genomic variability, better explained by the title from his 2008 paper "Genes mirror geography within Europe (cf. Novembre et.al 2008)".

Figure 7-E- Population Structure within Europe in Novembre et.al. 2008



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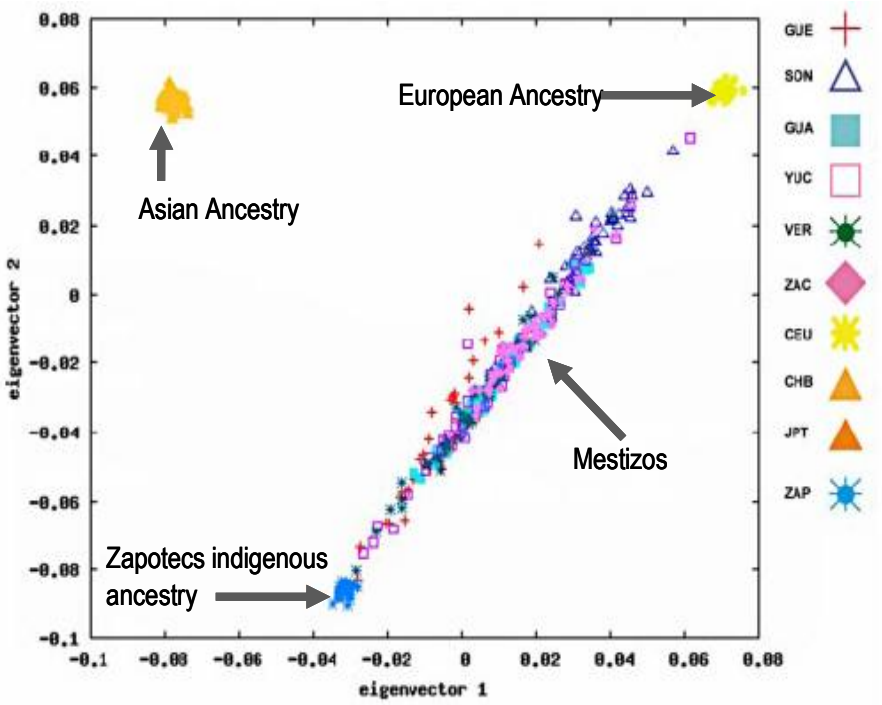
194 **Population structure within Europe:**
a. A statistical summary of genetic data from 1,387 Europeans based on principal component axis one (PC1) and axis two (PC2). Small coloured labels represent individuals and large coloured points represent median PC1 and PC2 values for each country. The inset map provides a key to the labels. The PC axes are rotated to emphasize the similarity to the geographic map of Europe. AL, Albania; AT, Austria; BA, Bosnia-Herzegovina; BE, Belgium; BG, Bulgaria; CH, Switzerland; CY, Cyprus; CZ, Czech Republic; DE, Germany; DK, Denmark; ES, Spain; FI, Finland; FR, France; GB, United Kingdom; GR, Greece; HR, Croatia; HU, Hungary; IE, Ireland; IT, Italy; KS, Kosovo; LV, Latvia; MK, Macedonia; NO, Norway; NL, Netherlands; PL, Poland; PT, Portugal; RO, Romania; RS, Serbia and Montenegro; RU, Russia, Sct, Scotland; SE, Sweden; SI, Slovenia; SK, Slovakia; TR, Turkey; UA, Ukraine; YG, Yugoslavia. **b**. A magnification of the area around Switzerland from a showing differentiation within Switzerland by language. **c.** Genetic similarity versus geographic distance. Median genetic correlation between pairs of individuals as a function of geographic distance between their respective populations.

When Carlos Bustamante continued to say that with population genomics it was possible to predict where "an individual comes from (ibid)", Irma turned around with me and said:"...there is no way to do that in Mexico... there is absolutely no way to compare Mexico with Europe, we are totally different". .A Principal Component Analysis (PCA) in Mexico could be quite tricky (field notes 20/03/09)". History, rather than geography, was the central variable to understand the complex process of Mestizaje, and the way in which variability was different in Mexico when compared to Europe "... geography is not really closely related with genetic structure in nothing like this predictive thing, it has much more to do with socio-history, to understand variation is to understand history... (ibid)"

Figure 7-F- Principal Component Analysis (PCA) of Mestizo populations (MGDP) [195]



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For example in the MGDP PCA (figure 7F) two individuals from Yucatan occupy positions that are very close to both to Indigenous and European ancestry clusters, so it would be impossible to predict their geographic origin using their genes. A similar thing happens with various individuals of different sampled regions from Mexico. In comparison to the unitary Mestizo narrative, the way

[195] The PCA shows the main two axis of genetic variation-difference between individuals genotyped by the MGDP. The distribution of Mestizos between the ZAP and the CEU shows the position relative to ancestry of each individual and also the distance that exists between Mestizos and Asian ancestry (JPT+CHB).
[196] Image used with permission of Proceedings of the National Academy of Sciences (PNAS), taken from (Silva-Zolezzi 2009: figure B:6)

in which diversity is represented in the strong visual and probabilistic laboratory culture, comprises multiple concomitant ways to visualise admixture. Mestizos can become a cline along two clusters; one representing Europeans (CEU: coming from 30 US trios with central and western European ancestries) and the other cluster representing indigenous or Amerindians (AMI: coming from 30 Zapotecos). Despite the fact that studying indigenous genetic contribution (traduced in the lab as AMI—Amerindian ancestry—) is fundamental to the emergence of the Genomic Mestizo, it can only be understood in comparison to other "ancestral" populations (i.e. Asian (EA), African (YRI) and European(CEU) as represented in the international HapMap).

Mestizos can also be presented as a specific composite of ancestral percentages "in this model their mean ancestries (SD±) were 0.552 ± 0.154 AMI, 0.418 ± 0.155 EUR, 0,018 ± 0.035 for AFR and 0.012 ± 0.018 EA (Silva Zolezzi et.al. 2009:2)". The Mestizo category can also be disaggregated to compare differential contributions of ancestry in different states of the country, differences in heterozigocity and haplotype diversity; or it can be put together to show common variability and AIM´s (ancestry informative markers). Most importantly the majority of these molecular movements fit into existing knowledge, historical records (African Slaves entry points) and known indigenous population densities (Silva Zolezzi et.al. 2009:5). In the field of genomics, genethnic distinctions are differentials in the frequencies of certain genetic variants between studied (i.e., mapped) populations (Figure 7-F, presents the principal vectors of variation). Historical and demographic records are privileged interpretative tools against readings that simply want to correlate geographic and genetic distance.

7.3.1- We are all Mestizos: time, admixture and identity

Although the "Diversity Project" had a biomedical logic, it attracted anthropological interest, so a leading molecular/physical anthropologist of Mexico´s National University (UNAM) invited INMEGEN´s populations genomics lab to pool the data analysed and 3, 000 new samples from various indigenous communities. The idea was to elaborate a project to trace continental ancestry in Mitochondrial, nucleic and Y chromosome DNA in Mexico. This pooling of expertise and data lasted for more than a year and eventually gave birth to a paper and a presentation of data that was displayed as part of the Mexican celebration of 200 years of independence and 100 years of the Mexican revolution in the massive exhibition in the State of Guanajuato (cf. Gonzalez-Sobrino; Silva-Zolezzi and Sebastian-Medina 2010). Since Mestizaje and native indigenous ethnicity were the dominant categories inside the laboratory, I had to make sense of what indigenous or mestizo meant in different research settings. For example when I joked with molecular anthropologists that my Y chromosome could turn out to be from the (Q) haplogroup, which is privative of native

indigenous communities, my mestizo identity was displaced and I became European: "... come on Ernesto if your granddad is Hungarian there is simply no way for your Y chromosome to be native indigenous.... unless... your mother, grandmother or grand-grand-grandmother lied big time to their partners [laughs]... (Alma field notes: 04/05/09)"

Figure 7-G.1-MGDP AIMS (1814) as published in the PNAS article (Silva-Zolezzi et.al. 2009)

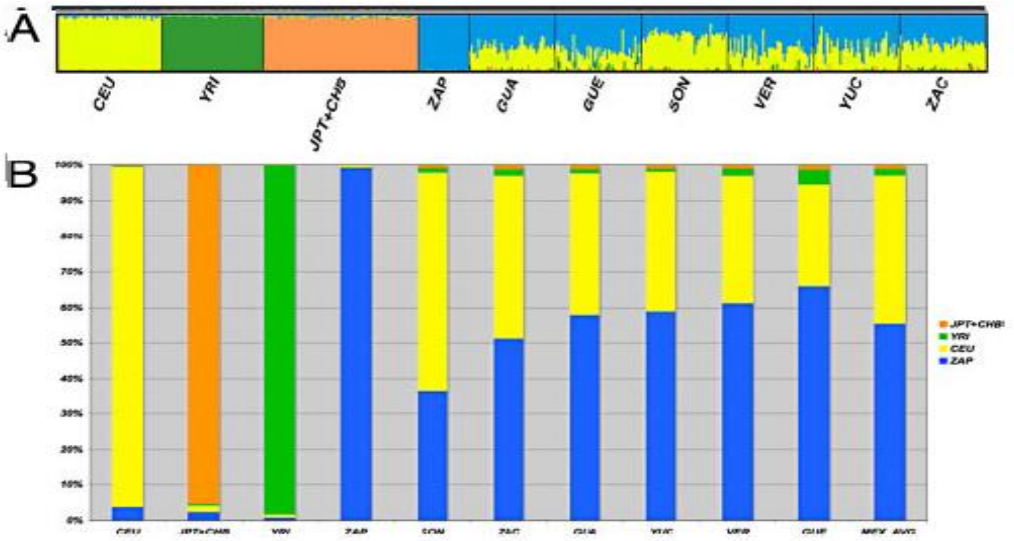
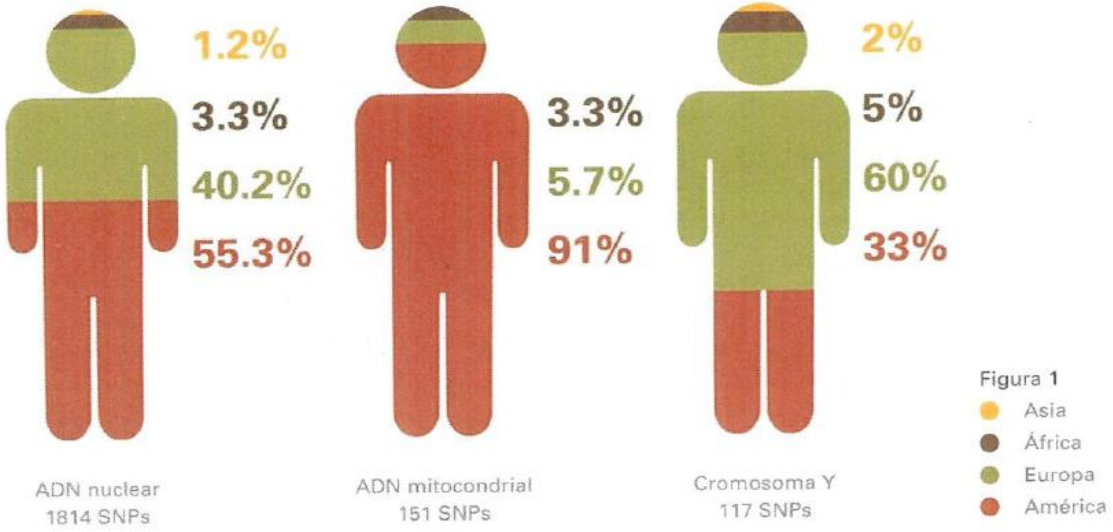


Fig. 3. Population structure analysis using 1814 AIMs. (*A*) Individual ancestry proportions. (*B*) Average ancestral contributions in Mexican Mestizos. Significant differences in ancestry proportions were mainly observed for EUR and AMI contributions (Table S2).

Figure 7.G.2 - Ancestral contributions seen from Nucleic, Mitochondrial and Y chromosome DNA in Mexican population (cf. Gonzalez-Sobrino, Silva-Zolezzi & Sebastian Medinaet.al 2010: 54).



When making reference to the idea of Mestizaje in nucleic DNA, I questioned Dr. ISZ if it was not the case that everyone is Mestizo, even the indigenous samples that were run through the

software (STRUCTURE®) appeared to have at least a tiny percentage of European and African ancestry: "... well if you put it that way of course we are all mestizos, we can say that the prototypical mestizo could be the 50-50 % European and Indigenous, but that will be just an arbitrary parameter, and then you have all the different mixtures you can imagine (field notes:27/05/09 to 04/06/10 also see: Gonzalez-Sobrino et.al 2010)." Although the graphs presented in the MGDP paper appear to have no space for ambivalence, laboratory work and the constitution of biogenetic identities inside the PGL was very different. In practice various identities coexisted side by side to each other in the laboratory. This polyvalence became more visible every time a new parcel of DNA was studied and thought about by the PGL team and its collaborators.

The polyvalent approach to population genomics generated tense dialogues between molecular anthropologist and medical/population genomicists that undergird the collaboration between these two disciplines. This was made visible—and constantly came up in the discussions between Dr. ISZ and Dr. Soma—when the appearance of L0 and L2 haplogroups (exclusive of African descent) was made visible in the mitochondrial DNA, of two individuals from Sonora, the state considered to be more European from the whole country-according to the MGDP data. The appearance of L0 and L2 haplogroups would not be problematic at all, except that the nucleic DNA of these two individuals had a very small African component, and high percentage of European variability according to MGDP analysis. So, if you wanted to elucidate the ancestry of these two anonymous samples you will consider them to have a predominant European ancestry when looking to their nucleic DNA, and be of African descent when looking to their mitochondrial DNA(mt DNA).

This relative/probabilistic constitution of populations depending what you parcel of the genome as well as the number of markers you were studying and what were the reference population you were comparing it with (cf. M'charek 2000, 2005), was what Dr. ISZ, the bioinformaticians and Dr. Celina informed me, had been dealing with in the last 5 years of learning how to make sense of genetic variability and population genomics. Nonetheless for Dr. Soma this relativistic concerns and approaches could be explained by the complex process of Mestizaje in the country in the last 500 years. For Dr. ISZ the response to such discordance should be answered in temporal/structural terms. Inside the laboratory, and publicly (Silva-Zolezzi in Sapiens 2009), she supported the idea that the African ancestry in mtDNA let us look way back in time (to an older ancestor), in comparison to nucleic DNA which let them visualise relatively recent admixtures: "I mean that could explain why the African contribution is so little in the nucleic DNA, while visible in the mitochondrial sequence". On the other hand Dr. Soma endorsed the idea that the Black-

African population started to mix with other "Castas" in the colony to acquire a more advantageous social status marrying with indigenous and other better off groups to gain privileges for their offspring, explaining why Y chromosome of African ancestry appeared in the individuals thought to be of European descent when analysing their nucleic DNA.

In her historical study of Molecular Anthropology, Marianne Sommers (2008) presents the strategies of Molecular Anthropology as an emerging discipline looking for scientific prestige and epistemological superiority in front of paleoanthropology. In her study one of the principal epistemological claims that differentiated molecular anthropologist from their counterparts in paleoanthropology and related disciplines revolved around the idea that they had a more objective technology of time measuring: a molecular clock. Following time is not an easy task in our everyday lives technologies such as a calendar or a clock are amongst our best efforts to discipline the ubiquitous and omnipresent entity we call time; in contrast in the field of genomics time is a property encapsulated in populations DNA (i.e. nucleus, mitochondria and Y chromosome) and its structure. Temporality is something to be read in the probabilistic and mathematical properties of different arrangements of genetic variations which according to molecular anthropologist transform an incomplete, partial and subjective history, into an objective material manifestation of time (cf. Sommers 2008, also see: Abu-El Haj 2004):

> ...Our written and oral histories are incomplete and lack much time depth, but we carry a genetic signature of past events. In this sense, the study of genetics in living people can provide clues to past human history. As we study patterns of genetic variation, we look for such clues that have been preserved in our genes, generation to generation. We can (within limits) learn about the past by studying the present (Relethford in Sommers 2008).

However as Marianne Sommers (2008) and Nadia Abu-El Haj (2004) have shown the way in which those histories emerge are never a complete genetic quests; on the contrary those histories needs to borrow from other disciplinary backgrounds as well as vernacular and religious records to become meaningful (Abu El-Haj 2004). In the PGL such is also the case, genetics cannot speak solely for itself, and genetic records/patterns are far from univocal. For example Dr. ISZ found the explanation of Dr. Soma unacceptable, since she argued if that something like Castas mixture in the new Spain happened in the time frame of 500 years (since Mestizaje occurred) it would have left more traces in the nucleic DNA of these two individuals, like in the regions of Guerrero and the coast in which more African ancestry was reported (cf. Silva-Zolezzi et.al 2009). Automatically this opened a heated debate amongst both scientists. Irma rapidly showed us a paper in the screen of her computer, with pie charts that represented the ancestral contributions in different regions of Spain, some of them with important genetic contributions of North Africa to

make her point: "African heritage mostly comes diluted through our Spanish ancestry (field notes: 14-18/09709 & Silva-Zolezzi in Sapiens 11/05/09)".

Figure 7.G.3 – Reading the temporal framework, ancestry and parcel of the human genome in the esoteric community of Mexican population genomics

Parcel of the Human Genome	Temporal framework	Ancestral framework	Research uses in the laboratory
Y chromosome and mtDNA - Haplogroups	Allows you to see very old ancestors back in time 34-50 or even 100,000 years back (cf. Brenna et.al. 2009). Time is read by punctual mutations related to paleoanthropological records; the so called molecular clock (cf. Sommers 2008).	Broad continental categories like African, Amerindian or European. Produces a tree of descent by following the most frequent haplogroups in each geographical region. Since they are clones inherited from mother/father to son there is no recombination.	Patrilineal or matrilineal heritage, 1 ancestor of 8190 in fourteen generations. Reconstructing a limited kinship story and sometimes past histories (cf. Abu el Haj 2004).[197] The Cohanim modal haplotype found in descendants of Jewish rabbis linking them to a common ancestor is the prototypical example.
SNP´s in Nuclear DNA (AIM'S)	Makes distinctions on populations based on differential of SNP´s frequencies which more differ between sampled regions across the globe (cf. Fullwiley 2008).	Links to continental groups, subpopulations, and recent admixture around the whole genome. As more recombination occurs, more private (unique SNP´s are found) at the population level.	Produce the ancestral component of individuals with software like structure® evaluating percentage of ethnoracial continental contribution (cf. Silva-Zolezzi et.al 2009).
Haplotypes blocks (Arrangement of SNP´s travelling together in the same chromosome).	Out of Africa story 100,000 years— all the way down to recent admixture between Spaniards and indigenous populations 500 years ago—. The basic idea is that as populations migrate out of Africa the size of haplotype blocks increase.	Depending on structural characteristics (longer-shorter blocks), recombination and their location in 23 different chromosomes they relate individuals to a continental ancestry, ethnicity, and histories of migration and population bottlenecks.	Relevant not only for molecular anthropology but for medicine and the search for disease causing mutations. The study of this entities promise to make genomic medicine cheaper since by reading some of the SNP´s in the block others can be inferred.

[197] For example, if one assumes that the founding ancestor had two sons, and in each subsequent generation each male descendant had two sons who survived, by generation 14 (the current generation) these two men would be related to 8190 other men (214-1 assuming the founding father is generation #1:taken from Abu-El Haj 2004). For literature on the Cohanim haplotype see: Thomas et.al. 1998; Parfitt & Egorova 2005).

The punctual mutations in Y-chromosome and mtDNA and the diversity in the nucleic DNA was something that Dr. ISZ could not fit with molecular anthropological stories produced by Dr. Soma, simply because while Dr. Soma assumed that time could be simply mirrored from historical to genetic records, Dr. ISZ knew by her own experience that different parcels of the genome were windows to different points in time (cf. Brenna 2009; Abu-el Haj 2004; Wall &Pritchard 2003) Finally in the paper this profound divide between the authors was erased, and those cases in which nucleic, Y and mitochondrial DNA were counterintuitive and even contradictory were not mentioned at all. Instead it appeared as if genetic identities were a stable reflection of our socio-demographic-racialised selves which could be divided in clear ethnoracial percentages while in practice the biogenetic identities were malleable and highly dependent on which genomic markers were chosen.

To be fair one of the most interesting reflections of the collaboration between the PGL and molecular anthropological research became the closing remark of the paper; Mestizos in all their diversity were progressively becoming more indigenous with each generation; because no new massive genetic influxes of African or European origin were coming to Mexico. The socio-demographic processes of the last two centuries in which socio-racial distinctions disappeared enriched the indigenous genetic heritage of urban-Mestizo centres with Indigenous-rural migrants who were constantly feeding the labour force demanded by urban development and industrialisation (Gonzalez-Sobrino et.al 2010:58). Behind the well divided ancestry percentages shown in figures 7 (G1 & G2) lies a story in which the static identities based on genetic frequencies are really moments subjected to demographic densities, migration policies and socio-political arrangements in constant flux and change.

7.3.2- Genomic "Mextizaje": history and population genomics mirrors of each other?

> *They had just studied ancestral populations not very mixed, we now integrate "Mestizo" populations, and this has anthropological consequences because our genome is the consequence of our history*[198]

The premise which states that "The Mexican Genome" is a consequence of our history is an assumption in need of critical engagement and exploration. Not on the grounds of racist

[198] Despite the fact that biologistic characterisations of genomic sovereignty have been evidently endorsed by medical genomic entrepreneurs (see: Chapter 4; Seguin et.al. 2008; Jimenez-Sanchez 2005; Frenk 2009); when confronted with a direct question about the nationalistic implications of genomic sovereignty by Edna Suarez, an academic from UNAM, Dr. GJS denied any nationalistic emphasis since he was not talking about superior or inferior characteristics of populations.

thought/practice: because that has never been mentioned to me in any of my elite interviews or even by the NGO´s which are critical about INMEGEN´s endeavours. The critical appraisal of population genomics is built on the grounds that the mapping of Mexican genetic variability enfranchises dominant visions of ethno-racial history, that are imposed into population genomics scientific practice; as a consequence obscuring the way in which these ethno-racial and biomedical categories are produced. In the field of population genomics haplotypes, mutations and genomes are the manifestation of time itself; holding the key to demarcate racial differences and identify DNA records of evolution and adaptation. However they are not free standing and completely objective parameters from which you can evaluate all other types of knowledge about identity, admixture and history. Differences in genetic patterns amongst the populations in the international HapMap are thought to be related to the process of adaptation to new environmental circumstances, population bottlenecks and also to medical dispositions and susceptibilities. On top of this, peculiar arrangements of DNA (haplotypes) are also the vehicle in which national identity is built into scientific understanding. In a very simple and straight forward manner all biogenetic structures are a product of history, i.e. sexual matting, diasporas, interbreeding, migrations and many more human and non-human phenomena that could drastically change the genetic structure of a human groups. However when we talk of a history of admixture and the integration of a Mestizo population the question is not so simple (cf. Annex D); the purpose of using analytical tools such as coproduction and articulation is showing how certain notions of past and present are not only encapsulated in genes but are also the product of particular socio-cultural understandings. In the Mexican case filtered by the use of popular history that has strong roots in vernacular notions of ethno-racial identity (cf. Schwartz-Marin & Silva Zolezzi 2010).

Self-taught population geneticists enjoy the puzzles in which common sense and genetics do not match, since they have to work around them. During the almost 1 year and a half I participated in their laboratory, they enjoyed knowing that the time story told by genetics needed to be contextualised by historical records. They were also aware that the European models of genetic-geographic prediction were not fit to understand Mexican populations. As a synthesis the practitioners of population genomicists had developed a way to read genetic variability in which time and concerns for the malleable qualities of population genomics occupied centre stage. On the contrary the group of MGDP authors, collaborating scientists and laboratory technicians who were not familiar with software and bioinformatic practice thought that with genetics alone, clear, incontrovertible and simple ethnoracial distinctions could be made (Annex D). The intimate relation between time and genetic polyvalence is a question that remains out of the everyday work of many geneticists and other scientists. The discordances between Y-Chromosome/mtDNA &

nucleic DNA renders visible the coexistence of more than one possibility in the constructions of genetic identities and times frames. Nonetheless most of the human geneticist and anthropologist still find it difficult to engage with the polyvalent features of population Genomics (cf.Annex D & Schwartz-Marin &Silva Zolezzi 2010).

7.4- Coproduction as resistance: national genome and probabilistic populations

For STS scholars there might be no surprise in discovering that in the terrain of "neutral" DNA "Mextizaje" mediates the understanding of genetic groupings in Mexico. A similar thing happens in US in which race is constructed as —*les Américain*— know it (Fullwiley 2008:706). I have come to think about the dynamics of "Mextizaje" as tensions between two incommensurable frameworks read as if they were mirrors of each other. The first temporal and identity framework is derived from an interpretation of Mexican history, filtered by a dominant and widely spread notion of national identity linked to post-revolutionary ideas (Gutierrez 1998:292; Lomnitz 2010); very similar to what Duana Fullwiley (2008) identifies as re-articulation. The second framework is the product of interpretations of genetic variability produced in the population genomics laboratory, mediated by haplotypes and marked by probabilistic calculations, which I think are closer to what Jenny Reardon (2001; 2005) identifies as coproduction.

Fullwiley's notion of re-articulation depicts a tautological relation, in which seemingly neutral DNA reinforces centuries-old categories of race, and vice versa; while Jenny Reardon (2005; 2008; cf. Chap 1) champions the idea that social and natural orders come into being at the same time. The intersections between a popular and romanticised-vernacular version of *Mestizaje* in Mexico, and the production of biogenetic identities at INMEGEN´s PGL are thus presented in order to flesh the ontologies at play in population genomics scientific practice, and illustrate the complementarity between coproduction and re-articulation, privileging Amade M'charek treatment of race as an enactment that is partially created a new.

The malleable characteristics of population genomics in Mexico were made visible by showing the way in which different parcels of the genome—like mitochondrial and Y chromosome—let the specialists in the field see through different time frames, bringing with it partial and polyvalent genetic identities (the same can happen when we think about the relation of markers in nucleic DNA and a reference population: cf. M´charek 2000). In this complementary approach *Mestizaje* functions as a cultural filter to make genomic science meaningful in many ways i.e. to support the project, to claim sovereignty or to question its representativeness. All the same the circulation of

haplotypes as mediators between bio-genetic and ethno-racial identities in Mexico draws heavily from the popular notion of a dominant Mestizo identity. When compared with the terrain of laboratory work all of these uses of Mestizaje are the product of an erasure of the probabilistic and relative construction of the MGDP and medical-population genomics in general.

Almost all the time during my stay in the PGL, the relativistic qualities of population genomics were emphasised. The way in which the relative and probabilistic material properties of population genomics play a role in the conception of ethnoracial categories is an important point to analyse. Coproduction as resistance is the product of incompatibilities between "uniqueness" and polyvalence (rejection of genomic sovereignty or the map of the Mexicans Genome). For example different from public mobilisations of "Mextizaje" in the Mexican congress, inside the laboratory ethnoracial categories were one amongst many variables of research which categorically could not be circumscribed to any nation-state or region. Ethno-racial categories popular in USA such as Hispanics—for example— could be easily nuanced and disaggregated in various ways according to disease severity, tiny differences or similarities amongst indigenous groups genetic variability (PNPLA 3 gene), and Mexico´s own ethno-racial understanding and sampling.

This type of coproduction can be also understood as the generation of specialised communities of practitioners that have developed a particular sensitivity towards the material production of variability and the dominant national narratives. This rather small esoteric group of scientists sustained, that different from the idea of making predictions based on genetic variability similar to what other scientist say from European populations (Novembre et.al. 2009), we cannot read admixed genetics without historical records. Although my findings may only be generalised to the very few Latin American countries that are actually developing their own genomic platform; the relation between history and Mestizaje that this chapters presents can be a flexible model to interrogate the relation between temporal and ethno-racial identities in population genomics research.

Unfortunately one of the characteristic of the communication of science is that it leaves behind that population genomics production and interpretation is polyvalent and dynamic. What is left in their place are simplistic narratives and interpretations[199], which in order to legitimate, dispute or make sense of the production of genomic cartographies implicitly involve unconscious beliefs;

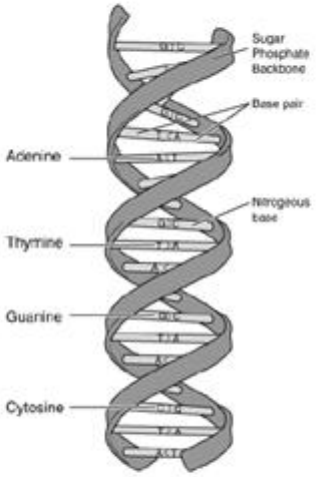
[199] Although many of my informants would say the flattening of population genomics is beneficial for science communication and political negotiations, since it makes science "accessible", I think such flattening leaves unexplored a whole range of topics of public interest for both, juridical regulation and science (cf. Chap 8).

borrowing time frames, scales of explanation (cf. Krieger 2005), and identities that reinforce "what we already know... about admixture in Mexico". These simplistic visions tell us what we already knew from historical and demographic records, which in the Mexican case is said to coincide with the dominant national identity. Making flat, what is really complex, and reproducing received knowledge, instead of problematising and exploring emergent properties and contradictions. Yet it is only thanks to the reiterative framing of population genomics under the idioms of "Mextizaje" that emergent properties and bioinformatic curiosities—such as the length of haplotypes and its relation with time— are identified and made relevant inside the laboratory in the first place.

8- *The mediatic construction of the MGDP*

Representations of the Double Helix

1) Soberonita: Sculpture of the Double Helix name after Guillermo Soberon Acevedo, Ex-Secretary of Health, Co-Founder of the INMEGEN, Ex-Rector of UNAM and former president of FUNSALUD and the CNB



3) Textbook Image of the Double Helix. Spinning from left to right with 10.5 base pairs per helical turn (360°), image taken from: http://www.mitochondrialdnatesting.com/diagram-of-a-dna-strand.html

2) Image of the Double Helix as its appears in the front cover of the "Map of the Mexicans Genome" given to the Presidential Persona the 11 of May of 2009 with the PNAS paper enclosed and the imagery of Mexican Genomics inside.

8.1- The wrong Helix: Representation as a question of expertise

Oh... my god the Helix was wrong! [I would never, ever, realise that myself, I thought.] But my informant was infuriated, how come top notch biologists and geneticists, have the Helix wrong! I was there interviewing Barba (pseudonym), one of the few active communicators of science interested in Mexican Genomics, and receiving the news that the representation of INMEGEN´s purple Helix was wrong! Reading my blank expression, Barba immediately printed an image of a double helix—with its bases and everything— and started rotating the picture against one of the DNA helixes produced by the INMEGEN: "...You see it does not matter how much I rotate the image the way the helix is structured does not fit with Watsons and Crick´s discovery, the Helix should spin the other way! (Barba paraphrasis, field-notes and interview 2009)"

As with many of the events and points of concern of the Mexican Human Genomics Arena, the wrong Helix had important implications for different segments of social worlds. Once somehow localised disputes were taken out of their situational origins they could become threatening topics, rich and thrilling debates, or at their worst uninteresting and mostly ignored background noise[200]. I had the feeling that this wrong helix could become a topic for debate with my informants, if addressed properly I could even avoid its transformation into a threatening issue. As usual I could not control the wrong helix[201], and once I popped the question onto the table with INMEGEN's design/communication department awkwardness and debate were unleashed: "well it is a representation of the Helix, not the real helix... its purpose is to communicate not to provide an exact scientific representation! (Field notes April 2009)".

What both parties of Science Journalists and INMEGEN science communicators in Mexico were basically telling me was... "This is not a Genome". Science Communicators at INMEGEN would add: "and therefore anyone reading it as such is misrepresenting the issue"; while the voices outside the institute were telling me "This is not a Genome and anyone representing it in this way

[200] Nevertheless I normally pursued these inter-situational disputes; I frequently used them to open debate in my fieldwork. I personally had found that strategy rewarding in terms of data gathering even if stressful at the level of interpersonal bonding.

[201] Many of my plans for prudent intervention in the field were failures. Most of the time raising a heated or compromising theme, would imply messy debates and unorganised flux of opinions and discussion. In the middle of such a flux of information, I would generally ask myself why I had started all of these in the first place.

clearly knows nothing about genomics or molecular biology". In an era in which images can be materially reproduced by the thousands, the ubiquitous presence of "Wrong Helixes" still bothers many of those trained in molecular biology[202]. For its producers it is amazing that a single image (even if widely reproduced) becomes another target for virulent critique. On the other side, the science journalists and critical audiences are upset because it is a visual testimony of the lack of "expertise" of those at the positions of power. How do we analyse this difference between producers and consumers of an image; should we accept that "the client is always right" and scold designers and institutional authorities that circulated the "wrong helix"? Or should we accept that the wrong helix is an innocent representation of another more specific and authoritative "scientific" object.

The purpose of this chapter is to explore the audio-visual discourse produced by the INMEGEN and the mass media around the "The Map of the Mexican's Genome"; relating it with the ceremonial-ritual events that accompanied such visual discourse during the first five years of institutional life. Highly publicised events and their more routinized representations serve the purpose of flattening because this re-presentation provides the type of repetitive and constant operation needed to bridge epistemological and spatial gaps. In this section I recollect and organise the memories of my informants, and their ideas about what constitutes a valid link with other people and the audio-visual object created to do so. These audio-visual objects were said to be designed for the general (lay) public, but most of their consumers were strategic audiences (including other offices at the INMEGEN), legislators or important observers (the church, researchers and invited speakers). The general (lay) public almost never actually appeared anywhere near the places in which scientists did their work, except in the so called "Crusades/Journeys for the Creation of the Mexican Genome" in which thousands of Mexicans participated by donating blood samples.

The way in which experts portrayed the lay public were mostly accompanied with the qualifiers of "docile (Aldebaran int. 2008)", "enthusiastic (Silva-Zolezzi int. 2009)" and very rarely as menacing (when referring to individuals or groups that behaved in an unruly manner during the blood sampling events: Dr. Belmont int. 2009 & Volkovak field notes 12/12/09). The participation of the wider public in the event done around of Mexican genomics is something I did not study, but

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[202] Talking with an English molecular biologist who went to the OECD headquarters, of which Dr. GJS is still the chair of the biotechnology committee, he reported that a reproduction of the *Soberonita* stands in their offices, he was amused by the same fact as my informants:"... [laughing] have you notice that the DNA strands spins the other way and they don´t have enough base pairs per spin...[laughs] (personal communication, 02/25/11)"

according to my informants most of the visual and audio-visual objects I analyse in this chapter were designed to divulge science to a wider audience.

Figure 8-A - INMEGEN´s visual production: Comic books, timeline and "The Map of the Mexicans Genome-Kit"

Figure 8-B-Strategic audiences, comic books and INMEGEN´s top officers (2007) 203

Dr. Lucio Galileo Lastra Marin, Assistant Director General of Linking and Social Participation, Ministry of Health; Representative Maria Oralia Vega Ortiz, member of the Secretariat of the Health Commission of the House of Representatives; Eduardo Barrientos Rangel, MSc, Director of Institutional Linking and Development of INMEGEN; Senator Guillermo Enrique Marcos Tamborrel Suarez, member of the Secretariat of the Health Commission of the Senate; and Dr. Gerardo Jimenez Sanchez, Director General of INMEGEN.

This marketing-divulgation of the "Mexican Genome"[204] was especially composed of objects such as comic books, TV spots, videos and songs that I succinctly refer to as the audio-visual

[203] Last Updated Mexico City, Wednesday, 10 September 2008. 09:37 by Victoria Castellanos, image taken from: www.inmegen.gob.mx

production of the INMEGEN and that can be seen and heard in "The Map of the Mexicans Genome kit (2009)".Elite audiences consumed these audio-visual objects and related to them in very different ways than the general public: "I was given one of these beautifully done and very well printed volumes of the Mexican Genome made by the INMEGEN... and the no less impressive 4 volumes of final reports as well (Verver 2011; Mexican Federal Deputy)". Whatever the audience (strategic or lay) the relation between them and experts was mediated by ritualisation, i.e. a group of objects and activities composed of INMEGEN´s audio-visual production, mass media coverage of genomic medicine and ceremonial celebrations made by elite republican and scientific authorities. Together, I think they fulfilled a work that could be well described by the name of "flattening". This is not to say that mass mediatic ritualisation achieved a homogenous ideoscape (Appadurai 1999) but rather that through the repetitive, formal and fixed enactment of visibility, dramatic tension, reversal and opaqueness a series of power relations were put forward which were integral to the creation of a common space in which the fixed ontologies of nationhood were coupled to the probabilistic and more open notions of population genomics science.

8.2-"Pop" genomics: flattening, or how stereotypes travel

> "This is an age of faith" the J. Walter Thompson blue book announced in 1906 "all ages have been ages of faith, disbelief requires an effort of the will while belief requires only acquiescence. Advertising turns human faith into an asset (cited in Lears 1994:217)"

I think of flattening as a phenomenon that emerges when advertising is enrolled by science to communicate its findings, as it did in the INMEGEN, the process of flattening can be best described by that of a common memory, or a shared experience that remains unquestioned since it belongs to the background of more "interesting" happenings. Common tropes that remain highly uncontested, objects that appear so common and boring that need no further exploration, it is precisely then when they become more powerful (cf. Miller 2009). These background objects appear to be just "there," thrown into existence; something to sit, write or sleep on. A tree in an oil painting landscape that seems to be repeated everywhere. The repetitive media portrayals are one of the strategic activities that produce these types of differentiation and flattening.

The conflation between the official Mexican identity and the Mestizo ethnicity, grounded in genomics, has travelled with relative ease among the mass media, Mexican Senate and

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[204] According to the specialists working in the marketing-communication department of the INMEGEN one of the older genomic entrepreneurs described the institutional video and other audio-visual promotional pieces as "*chabacanerias" (meaning vulgar or tasteless: personal communication Pelado informal chat after Focus group, 2010)".*

international genomic networks (cf. Seguin et.al 2008 a, b, c). I think this has been possible precisely because it has circulated as a background to much more dramatic ordering in which the future of the developing world is at stake; since a genomic revolution has made it possible to appropriate whole national identities through genetic patenting and then use this knowledge as a capitalist tool of control- that is the socio-drama! (cf. Chapter 3) The rest appears as background or the scenography in the stage; nevertheless its acceptance as a background provides the interpretative framework by which the socio-drama becomes meaningful.

Sometimes the sheer amount of extraordinary objects simply overwhelms the user/reader/practitioner. Such abundance produces a certain numbness, or insensitivity helping us to cope with the constant exaltation produced by novelty. That was precisely my feeling when walking or moving inside the INMEGEN and that was shared by some of my close informants who constantly said: "...this is not Mexico; laboratories are not like this...government buildings are not like this one... (Alma —post-grad molecular anthropologist— and Elisa —lab technician— field notes12/06/09)" The immaculate cleanliness of the building, the types of machines, their newness and cutting edginess existed in an opposite dimension to the laboratories my informants had lived in: "well our lab has termocyclators... similar to the ones you see here... but they are as old as the revolution! [Group laughs]...and of course we don´t have any of the last generation equipment, chemicals are short, and budgets minuscule [...] INMEGEN is the exception and not the rule" (ibid). Inside the INMEGEN huge inequalities in research funds and technology were somehow flattened, producing an atmosphere that visually and spatially separated the INMEGEN from the rest of the laboratories in the country —according to my informants— (I have an almost inexistent knowledge about Mexican research facilities or laboratories around the country).

8.2.1- The flattening of categories and ethno-racial history

One of the most evident, problematic and at the same time "invisible" ways in which flattening works, is by the production and reproduction of vernacular notions of Mestizaje. In order to frame the meaning of population genomics racial admixture is constantly brought forward in public speech, visual discourse and strategic publication directed to important audiences such as private investors (Jimenez-Sanchez 2002a; Jimenez Sanchez 2009 a, b; Anon 2007). In fact when it comes down to the classification of human beings, vernacular notions of ethno-racial categorisation are all over the place; there is no one "univocal" meaning of mestizo or an *a priori* relation to measure how much of the genetic variance corresponds or not with everyday identity labels, and when such efforts are made they result in tautologies (cf. Chapter 5 and Fullwiley 2008). When we move closer to the terrain of how cultural and racial hybridisation is presented in the visual discourse of the Mexican government and its institutions we have a very specific

ordering that against all odds is radically homogenous when it is presented to the public: "....the interesting aspect of the celebration of the Bicentennial of Mexican independence and the centennial of the revolution is its homogeneity, its predictability and the use of the same old symbols (Tenorio-Trillo int. 2010; cf. Figure 8(C))". According to Gabrielle, ELSI's head (2010-) this picture was not only a stereotype, but an academic flaw since it was conflating nation and ethno-racial categories, and the text was also flawed since it was mixing nations, with regions (North-America: "Mexico is part of NAFTA(ibid)") and ethnicities (focus group 05-07-10)[205].

Figure 8-C– Racial/National Drugs: stereotypes, nation and ethnicity.

Diversity makes us different from other human groups such as Europeans, Asians and North-Americans. Each ethnic group has its own levels of tolerance and acceptance of different drugs, giving as a result a personalised medicine (Jimenez-Sanchez 2009 Vol. IV: 475, Comic book 3: 14)

Before entering into the matter of ethno-racial stereotypes let me briefly tell you about the production of INMEGEN´s comic books and audio-visual productions, which were basically a chaordic enterprise i.e. : "...the behaviour of which exhibits characteristics of both order and chaos... (De Hook 1995)". For example, the way in which dialogues were made to fit the comic books was separate from the images; dialogues could be made by Volkovak while other pieces of the text of comic books or informative leaflets could be written by any other trusted member of the institute, and even a third party could write a bit of dialogue; comic books were a group endeavour that hardly followed any rigorous system:

> Volk: you know how things are made here!…taking on board time restrictions, one week one event... well it does not give you time to enter in any detailed negotiations or… /--- *interruption of* **Petro**---/: there is really no discussions no analysis / *Volk*: This is a great example of how the law is made in Mexico... there is no moment of discussion! ... There are decisions... trends..../

[205] However the International HapMap project did something very similar to that since "Yorubas" are a very specific ethnic group in Nigeria, representing maybe tens of millions of individuals, while Japanese and Chinese represent something around 1.4 billion people in the world and are nations and not ethnicities (cf. Fausto-Sterling 2005:12)

> /--**Petro**--:...yes it has to do with very fast decisions and projects. Many factors, it is the result of compendiums of things... that were meditated-thought a bit, but... but had to be finished and thrown to the audience.../
>
> /Faba: ... this is a reflection of the institute, and our lack of communication... nobody asked us, scientists/ *Pelado:* ... yes...there...we did not consult with the scientists.../ Faba: and no one asked us, we just saw it finished and at the end it's a lack of communication... (Focus group: 28/06/10).

The explanation of scientific work was the product of informal interviews at the laboratory; this info was then put together by the team of scientific communication and marketing at the INMEGEN. Finally all of this was illustrated by an illustrator hired for the job (Mauro: pseudonym), which received some of the sketches and visions from the department specialists and brought in the final comic booklets a couple of weeks or days afterwards. These products were then approved or revised by INMEGEN´s Director General Dr. GJS. This chaordic production of comic books and audio-visual discourse had a relatively non-surprising and rather dull outcome: a stereotype. Although the way stereotypes travelled in the field of Human genomics was seen as a necessary vehicle for public understanding, it was not what many of its producers endorsed when presenting their knowledge claims to peers or expert audiences.

The use of stereotypes was something justified in terms of an imaginary audience: the lay public. Yet, comparing the audio-visual production with laws could be deceiving because even though both objects, audio-visuals and laws, were made in a closed non-deliberative fashion, laws continued to be a rather elite enterprise after they were finished, mostly reserved for legal experts and congressmen. On the other hand comic books, leaflets, timelines and the kit of "The Mexican Genome" was widely circulated, displayed, publicised, exalted and massively celebrated, practices that at least open the possibility for non-expert audiences to appropriate these objects and/or challenge them.

The first products of the communication-marketing department were the posters of conferences at the INMEGEN and informed consent posters to display at the MGDP Journeys/Crusades (2005-2007). Shortly afterwards they started producing INMEGEN´s comic books, and finally the closing masterpiece of Dr. GJS's administration and the MGDP project: "The Map of the Mexicans Genome and INMEGEN´s Kit" and INMEGEN´s final reports 2004-2009. I used one of the images of INMEGEN´s comic books (Figure 8D) to conduct the final focus group (Focus Group: 05/07/10) with the people that I knew had been involved in its production, which included the ELSI (Volkovak, but his new boss Gabrielle was present), the communication-marketing department and Elisa (PGL technician).

Figure 8-D- Ethnoracial Flattening: INMEGEN´s Comic Books[206].

When I presented the picture in figure 8(D) to the heterogeneous disciplinary group of creators who intervened in the production of INMEGEN´s audio-visual discourse, they had a very similar response: stereotypes travel. Faced with the image and my questioning about the frontiers between race, nation and ethnicity they immediately responded "... well... well... by saying race you are already guiding us to think in those terms... and race is discriminatory and we don't use it...if you want to know what we think tell us what you see...(Focus Group 05-07-10)". In my own

[206] **A)** In our case we Mexicans descend in a great measure from Spaniards and indigenous; **B)** Stereotyped image of Asian and African Ancestry; **C)** Also, even though to a lesser measure we also have African and Asian Ancestors; **D)**... mmm... in our classes we studied that we Mexicans are the result of the mixture of different ethnic groups.

words I described the picture in figure 8(D) as a very particular vision in which a Tlatoani—Aztec Emperor (not any indigenous individual)— and a blond bearded Spaniard conqueror (with its traditional warrior suit and sword, not an artisan or a monk) stand on an equal footing against the backdrop of a famous Mayan pyramid.

To my informants this image made reference to "Mestizaje". The idea that admixture was the basis of Mexican identity was simply equated with a stereotype, or what some of my marketing-communication informants recognised as agreements or shared codes, but also family realities: "...my mother is the grand-daughter of an Italian, my dad is *prieto (dark skinned), really prieto very indigenous looking,* I am light skinned and my brother is dark skinned but we are brothers of the same family, so then I can really talk about Mestizaje as an everyday reality...(Pelado 28/06/09)". The main idea is that stereotypes are instant communication toolkits; things that easily travel (and that talk about an everyday experience of admixture). All of the participants in the focus group agreed that stereotyping Mestizaje is the best way to communicate, for them Mestizaje can be easily portrayed by an indigenous, a Spaniard and a pyramid. The question was not if this indeed resembles the complex process of Mestizaje, but if this is similar enough to be accessible for other publics; if this makes ideas circulate rather than being accurate, then it fulfils its purpose.

8.2.2-Mass media and Mexican Race

The triumphant announcement of the "Mexican Genomic Map" was received by mass media with outstanding admiration (Rosen & Vitela 2009). Mexican mainstream newspapers, magazines, and internet journalism celebrated the national bio-technological deed that revealed the secrets of Mexican national biological heritage. There was no single TV news show in Mexico, which did not include the publication of the "Mexican Genome" as an extraordinary scientific event. Just one of the TV shows in which the INMEGEN staff presented his findings questioned the idea of a genetic makeup specific to Mexican territory (Jesus Silva- Herzog in entre tres, broadcast 2009):

> *JSH*-I am uneasy by... let's say... the subject of this cartography, the fact that there is a great intellectual and academic enterprise that refers to a character, the Mexican or the Mexicans... how ... how can you draw, in scientific terms this unit of knowledge... ehhh... like a biological category... that makes us.../**GJS-**... different...ehh/
> *JHS*-Different...hmmm... what makes us different from the Guatemalans , the only thing that could separate, in certain sense, is the caprice of a frontier, or those that live in the other side of the Bravo river—to make a reference to the north— how do you draw this border of research?...
> **GJS-** I would say that it is Mexican, because we did it with Mexican population, but it most probably a very powerful instrument to study other Latin American populations that share a lot of population history and admixture with us ... but we were saying that

> all human beings... we share 99.9% of the text... which has some variations splattered throughout the genome...

As an example, when widely distributed Mexican newspapers first engaged with "national" genomics, the ethnic composition of Mexico suffered a drastic racial reconfiguration. One of the most widely distributed newspapers in the country, "El Reforma," reported that Mexicans were the combination of 35 races (Alcantara 2007a, b). Two paragraphs later it said: "The doctor [Jiménez Sánchez] underlined that due to race, there is a pronounced difference between the populations of various states within the country. In Sonora they have the highest prevalence of European genes, 58%, while in Guerrero, their population presents a major index of African genes, 22% (translation made by the author, emphasis added)".

> There, she made a terrible mistake... because really there are no 35 races, what happens there, is that, well... we human beings share almost the 99.8%, which is exactly the same between, independently of what region or population we belong.....Now what the INMEGEN is observing is that inside that 0.2 per cent that gives us our individuality, taking that .2 % as a 100%, there is a 35% of that .2%... in which we differ from the rest of the populations of the Hap Map, so there is not 35 races, not the 35% of all our genome, it is only from the part that gives us our individuality, which is a 0.2%, from which a 35% of that segment is the one we have different with respect to the Caucasians, Africans and Asians (Dr. Max, int. 2008)

The dominical supplement entitled "Our Mexican Genes", that appeared in the same paper one day before used "old" physical anthropology based on 19th century racial groups to classify the pictures of Mexican individuals. Comparing their skin colour, cranial measures, height, complexion, and finally the shape of their chins and the features on their face (cf. Dia-Siete 2007, available in: http://xml.diasiete.com/pdf/356/17GENOMA.pdf).

Mass media gave a visual narrative to the MGDP project, not by conflating but by equating ethno-race and genomics. When the MGDP was published (two years after the appearance of the special supplement, the Genes of Mexico) the idea that there are genes for race, or that races exist in certain percentages inside the bodies of Mestizos made its reappearance in Mass media. Some of those who interviewed the MGDP team (especially Dr. GJS since he participated in all the interviews, sometimes accompanied by top INMEGEN officers (cf. Vision 40, Hechos de la Mañana 2009, entre tres 2009; Cadena tres 2009;Pensar Mexico 2009; Lolita Ayala 2009), asked the interviewees what was the Mexican signature. In Vision 40 TV news they said that the MGDP was reflection of the Mexican race, something like a unique Mexican signature: "like enchiladas and gastronomy the ingredients are the same but Japanese food is very different to Mexican food," to which Dr.GJS answered, "well races not really; what we have found is that those things we believed about races are something rather arbitrary since you and me share almost 99.9% of the genome…we can talk about the great diversity of Mexican Mestizaje".

Figure 8-E - The racial composition of Mexico according to Mass media: Genes of Mexico (images are not displayed as they appear in the magazine)[207].

These racialised "misunderstandings[208]" could be easily evaded by administrators and directors inside the institution by emphasising the distinction between expert and lay knowledge. Yet when Dr. Max was questioned about the findings of genomic mapping; genotype and race were not only conflated but corroborated. In one of the segments he clearly points out:

> ...as an example... the sampling that we analysed from Sonora, is the one that has more genes coming from the Caucasians. We *already knew* this, because you can *easily observe the traits of people*, but now we can know in more detail what the genes are (Garduño and Nava, 2008 [emphasis added, translation made by the author])".

In the same period of time (around the MGDP publication) almost all of a sudden the division between journalists' ignorance and superior expert knowledge disappeared; when Marco Aldebaran publicly announced that with the brand new Mexican HapMap: "...now we are going to be capable of doing a genomic identification of those persons that belong to any of the states studied, and tell their specific origin". The comments of one of the scientists about these ideas were: "I mean...you just have to think two minutes to know there is no set of markers to distinguish individuals from different nations, and even less, to distinguish from different

[207] Each one of the images occupies a whole page in the magazine, and has their own racial description.
[208] Enfoque 2009 Movistar, radio news, changed the version saying the genome of Mexicans was unique in a 65% and that the population was composed of 35 different ethnic groups

localities... (Transcription made from field notes: 16/06/09)". However as is visible in the example in figure 8(F) the defence of the MGDP tagging efficiency made in the paper (Silva-Zolezzi et.al. 2009: 5) and by Dr. GJS in public venues and interviews was visually represented as the mixture of various races which alone or combined could be related to the Mestizo in different numerical and physical proportions. The constant visual racialisation of genomic research made it difficult to clearly separate the ethno-racial fantasies of control of Marco Aldebaran or Dr.Max, from the scientific work of the MGDP.

Figure 8-F - The Racialised International HapMap and its comparison with the MGDP (2009).

The hopeful announcement of Marco Aldebaran rapidly occupied a place in the everyday jokes of biomedical scientists working at the PGL, just below the number one joke of the hall of shame occupied by an intellectual property (IP) specialist who dreamed about finding and patenting the genome of water: "... could you imagine the possibilities?(01/09/09 field notes)". In media, as well as for many of the audiences of the INMEGEN, genomics became shorthand to talk about essence, a few days after the MGDP was released this became apparent in an article announcing that the genome of the kidnapper had been discovered (Benavides 2009). This article had nothing to do with genetics; it was a socio-demographic study that tried to profile the average criminal that perpetrated kidnapping in Mexico City. For a couple of weeks after Monday the 11th of May population genomics became one of the most important topics of national mass media.

8.3- Ceremonial events and the astonishing Mexican HapMap

In the avant-garde
Decided!
For health fighting together
By the hand of science
For a better life for Mexico
...INMEGEN! ♪♪♪
♪♫... In the avant-garde
Decided!

For health fighting together
By the hand of science
For a better life for Mexico
...INMEGEN! ♪♪♪
Chorus: For you, for me, for everyone...INMEGEN♫
Global economy based on knowledge.... INMEGEN♪♪

For a more preventive, predictive an personalised
Medicine...INMEGEN
An achievement by Mexicans for Mexicans...INMEGEN♫♫
For the development of our great nation....INMEGEN♪

(Opening of institutional promotional song of the INMEGEN)

INMEGEN´s promotional song is an example of the constant celebration of national genomics. In Mexico there was no single national TV news show which did not include the publication of the "Mexican Genome" as an extraordinary deed (cf. Entre tres 2009; Hechos de la Mañana 2009; Primero noticias 2009; Adela noticiero 2009; Vision 40 2009; CNN en español con Carmen Aristegui 2009). One of the prime time news programs even named it "revealing the Mexican Genome: the before and after in Mexican medicine (Noticiero con Lopez Doriga 2009)". An all too visible aspect of Mexican Genomics is the constant and reiterative discourse celebrating the new medical-genomic paradigm.

Figure 8-G- "Heroes" Picture of the MGDP authors[209]

Crucial moments of Mexican genomics have been intimately related to existing molecular maps or activities leading to their construction. It was with a printed copy of the Human Genome Project map that Dr. Gerardo Jimenez Sanchez was convincing congressmen to invest in the new genomic era in the congressional hearings of April 2002, entitled Human Genome and its Challenges (Canal del Congreso, 2002a). It was again, 7 years later in 2009, delivering the Map of the "Mexican's Genome" to the hand of the Mexican president Felipe Calderon, that Dr. GJS led one of the most impressive ceremonies made around a scientific artefact.

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[209] This picture was known inside the institute as the "Heroes" photograph taken to imitate the popular US TV show depicting superheroes; taken from Reforma: Rose & Vitela 2009, Trazan mapa genómico, 11 of May. The huge mediatic coverage around the MGDP and INMEGEN leader were important sources of criticism for experts and critical audiences (cf. Chapter 7).

8.3.1- "The Map of the Mexican's Genome" is celebrated by the Mexican Presidential Persona

> *The question was if Mexicans could import the three first maps of ancestral populations: Africans, European and Asians and the answer of what we published yesterday was no… if we used these it would be incredibly costly, financially a great burden, and using a combination of our data we can do it better… (Jimenez-Sanchez in Vision 40 2009)*

It was May the eleventh 2009; an unprecedented event was taking place in the garden of the presidential residence; for the first time in Mexican history a scientific paper deserved being celebrated with the highest honours available. With a protocol just appropriate for the most serious of state affairs —since as I said, there is no precedent for such an extraordinary and rare gathering! — The article entitled "Analysis of the Mexican Mestizo populations to develop genomic medicine in Mexico (Silva-Zolezzi, et. al. 2009)" was delivered to the maximum republican authority, Mexican President Felipe Calderon. Mass media and popular magazines celebrated such an extraordinary event in the middle of an international swine flu crisis (AH1/N1) that had its origins in Mexico:

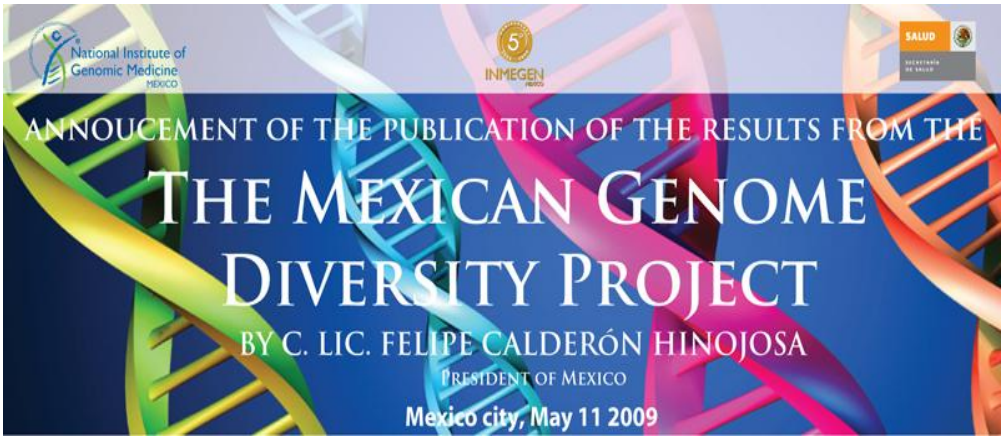
> Only a story as strong as the decoding of the Mexican Genome could compete in Geneva, Switzerland, with the attention that the World Health Organization (WHO) had given to the health alert for AH1N1 flu. On May 11, when the results of four years of efforts of the National Institute of Genomic Medicine (INMEGEN) were published in the third most prestigious scientific magazine in the world, Proceedings of the National Academy of Sciences, WHO believed that Mexico had spent time and resources in an area that if left uncultivated threatens to widen the gap between rich and poor: genomic medicine (Cruz 2009).

Not only was the Mexican Genome strong enough to compete with the flu story inside Mexico (I would not be so sure that the story made the same international impact as the Swine Flu crisis) but it probably displaced a huge political scandal in mass media. At the time the celebrations of the MGDP were a sign of relief; most Mexicans had stayed in their homes waiting for new instructions on how to proceed with the newly discovered AH1/N1 flu virus, and the state of emergency in which certain constitutional rights were suspended had been declared a few days before. A moment to celebrate the latest and biggest investment in science and technology in Mexico seemed reasonable and necessary, that is why the event was re-scheduled ahead of time by the presidential office (informal chat with Dr. Max at the PGL June/04/09). While all the federal TV news channels had at least a small section celebrating the "Mexican Genome," nothing was said about the disputes about sampling procedures or the rejection of something like Mexican uniqueness; it was simply a question of exalting the MGDP grandiloquent characteristics.

Figure 8-H- The Mexican president receives the Map of the Mexican's Genome (11th of May 2009)

With the sculpture of Francisco Madero at the bottom of the garden (the legend at his feet reads; "Apostle of the Mexican Revolution") flanked by a semi-circular arrangement of shields of each of the 32 states of the Mexican republic, the setting was ready for the official discourses. In the meantime a promotional video of the Mexican Hap Map, with images of indigenous communities and scientists, was changing slides to the sounds of Moncayo´s Huapango (anyone who has heard the song knows the national tones it evokes). In the podium, the national shield and the Mexican flag had as their backdrop colourful DNA helixes[210], framed by the kind of blue used in colonial buildings and an intense "Mexican" pink.

Figure 8-I- Announcement of the MGDP by Mexican President-Promotional Image



[211]

[210] In the Blog following INMEGEN´s permanent building administration there has been a lot of attention devoted to the reversed image of the double helix, appearing in all the genomic marketing produced by the national institute of health.

[211] This image is taken from INMEGEN´s web page (www.inmegen.gob.mx). This was also the image used as a scenario for the official announcement of the Mexican Hap Map. The paper published in PNAS, was presented in a different way. A special carton framework with the same image and the names of all the participants guarded the paper in English and Spanish, as well as an interactive CD andother publications

We were seated approximately one meter from each other (after crossing two inspection filters), wearing surgical masks, in order to maintain the sanitary measures. Before the presidential arrival, Mexican politicians and scientists exchanged greetings, smiles and opinions. That day enemies and allies sat together under the flag of a genomic map that promised to become the platform of a new "preventive, predictive and personalized" medical paradigm. The previous months were marked by confrontations among the power elites of health and science in the country (see : www.cuestionableinmegen.com ; Bonfil 2009; Cruz-Martinez 2009), a public scandal around INMEGEN´s finances and the construction of the building (Reporte ASF 2008: T5 section, cf. Chapter 6). These issues had captured the attention of several audiences including the Mexican Senate (point of Agreement- Dec, 4–Mexican Congress; Commission of Science and Technology) and the presidential office, not to mention the various groups of academics, journalists and the internet/virtual group of citizens in favour of transparency(cf. Chapter 4).

In the middle of such distress (public destitutions, fiscal investigations, and incriminatory motions inside the Senate), INMEGEN´s Director General was able to present a speech on "the book of life... for Mexicans, by Mexicans and of Mexicans (transcription from field notes; also available in: www.inmegen.gob.mx)". Once again the plasticity of genomics to become a nation building discourse became of interest for scientists and the political class[212]. In between the draft of the HGP that Gerardo Jimenez used in the first public speech in the Mexican Congress and the ceremony held in the official presidential residence showing the "Mexicans´ Genome Map," more than 8 years had passed. In that time period it was imperative for the project to keep alive the promise of revolution, and mostly the way it did that was through the ritual representation of Mexican genomic science.

8.3.2 The genomic era is here! And Mexico arrived on time!

> *"Mexico contributes with global science (Jiménez Sánchez in hechos de la mañana 12/05/2009)"*
> *"The information was not directed to scientists... it was at the beginning something thought to be distributed to the general public... so the information was not necessarily scientific (Pietro in Focus group 05/07/10)"*

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and promotions

[212] To be completely fair with the huge mediatic re-launching of the Mexican hap Map, I should place it apart even from the creation of the institution itself that did not receive as much attention as the Mexican Hap Map did. It was present in every national newspaper, TV news and popular magazines. Interviews with the authors of the Mexican genome were a much demanded asset for Mexican journalists. That kind of attention is way over the very limited publicity INMEGEN´s inauguration received five years ago.

The promise of genomic medicine had to be kept alive through various years in which the INMEGEN was gathering the necessary expertise and samples to deliver the MGDP. So the way in which the promise of a more "preventive, predictive and more personalised medicine" was kept alive was through the constant re-launching and re-inauguration of the INMEGEN and the MGDP through massive events: open conferences, marketing stands and by spreading the leaflets and comic books produced inside of the institute (Figure 8G).

Public events were so many that during the 2 years I spent in the field I attended a big open conference, symposia or elite gathering at least once a month. During busy weeks like the one in which the MGDP was given to the Mexican president (11th to the 15th of May), an important interview, gathering or public ceremony happened two or three times a day. The sheer amount of publicity and mediatic interest that the INMEGEN received was something that had to be accommodated with the rest of its institutional activities; in each of the MGDP journey's TV shows and radio programmes which were devoted to the project, plus meetings with politicians and the governors of each state, meetings and newspapers that gave birth to the genomes of Sonora, Aguascalientes, Oaxaca, etc...(cf. INMEGEN 2009 Vol. 4). Mass media campaigns, rather than being a peripheral activity, were a central part of INMEGEN´s public strategy -that is why it is the only M-NHI with a communication/divulgation/marketing of science department.

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Figure 8-J- INMEGEN´s visual compendium of Marketing stands, massive events and highlights of 2008-2009.

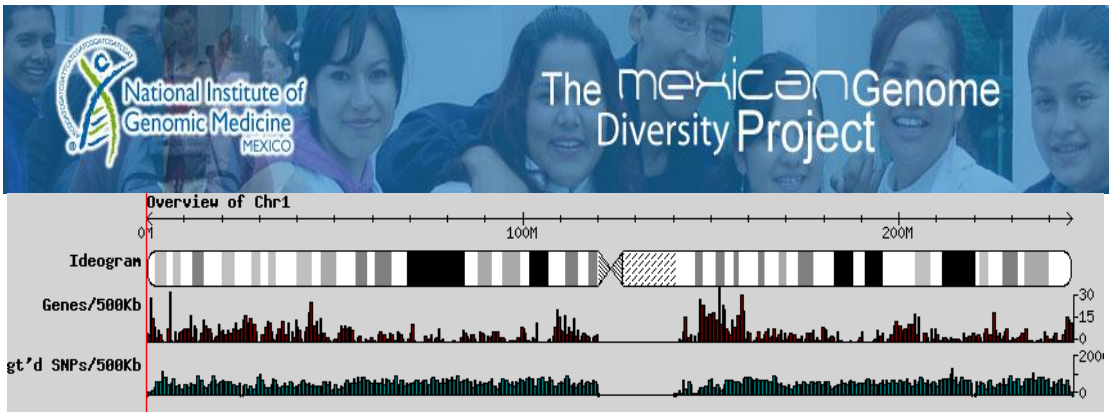
The centrality of media promotion is also visible in the digital records included in the Map of the Mexican's Genome Kit. Inside it more than 28 regional newspaper articles of the 10 Mexican states were available, plus 120 pictures—approximately 12 per state— in which health authorities

appeared side by side with INMEGEN scientists and officers, plus INMEGEN´s promotional song and handpicked audio-visual material of the MGDP's journeys or crusades. This audio visual Kit was sent to all participant authorities, as well as redistributed at the locations in which the MGDP did its first sampling. Most of these events were organised around an artefact —the MGDP— that for 4-and-a-half of the first 5 years of the INMEGEN´s institutional life had not generated publications, i.e. the ceremonies were organised around promises and scientific expectations.

Before the publication of the MGDP (11th of May 2009) the project had been launched and announced various times; in 2008 it was said that in September of the same year the project would be published (Lopez 2008; Jimenez-Sanchez et.al 2008), however it was not until May 2009 that the publication appeared.

In these first 5 years of mediatic annunciation of the MGDP (especially 2007-9), it was said that illnesses and predispositions to disease could be measured with incredible precision, transforming health care and revolutionising diagnostic practice and prediction. In various popular magazines the great benefits of making the MGDP were promoted, as a matter of fact INMEGEN´s own audio-visual artefacts are a little archive of all these promotional ceremonial moments in which tours through the different states of Mexico for the MGDP were publicised, looking for the genome of each of the regions which were visited: as a result of these regional transformations the media began talking about the Mexican genome, side by side with regional genomes such as the genome of the Sonorenses, or the Genome of Nayarit or Durango (cf. INMEGEN 2004-2009, vol.4; Mexican Genome Map Kit 2009).

Figure 8-K- Opening image of the Mexican Hap Map (Chromosome 1) in its hosting web page.[213]



Again in 2008 (Jiménez-Sanchez et. al. 2008), there appeared another paper explaining the role of the INMEGEN and the advantages of the MGDP, yet this paper gave the premier of the MGDP

[213] This is the image that appeared on the web page of the MGDP and its open source of genomic data, which was available since 2008.

web page to the world, through which data from the project could be accessed by the international scientific community. A year afterwards the same webpage was now inaugurated— globally as it was announced— by Felipe Calderon, Mexico's president: "…when our President gives the first click to our internet webpage he will be inaugurating an open source database that will put Mexico at the same level as the most advanced nations of the world (field notes 11/05/09)". According to Dr. GJS's declaration, Mexico's president Felipe Calderon was giving the first click to the open source data of the MGDP. Nonetheless the MGDP national and world premier had been extensively rehearsed in mass media and even published previously (Jimenez Sanchez et.al 2008). During the four years before the MGDP publication (Silva-Zolezzi et. al. 2009), the promises of genomic medicine were accompanied by gradual advances in its research and data organisation and analysis which were extensively promoted:

> ...the first map in the world that is done in a Mestizo population, so we predict that it will have great impact for other Mestizos in the world, principally for Hispanics in USA and other Latin-American countries...(Jimenez Sanchez in Zea 2009 also Hidalgo in Adela 2009)"

I do not know about the impact of the huge MGDP mediatic campaign on the general public in the middle of the swine flu crisis[214]. I know less about lay perceptions of genomic science, the healthcare system or national pride and identity, because I did not conduct a survey or study to engage with the opinions of lay audiences. However from my own experience as a Mexico City inhabitant who mostly stayed at home watching TV to follow the swine flu crisis news, I think such ceremonial events enjoyed a unique moment to be publicised, and circulated to wider audiences than ever before.

8.3.3- Strategic ordering

Let me illustrate what I mean by strategic ordering by presenting 3 tiers of pictures representing the PGL; the very place where most of the analytical work in population genomics was done. The first tier of pictures presents two moments in the laboratory which were quite common in the work done at of the PGL. Picture (A) in figure 8(L1) is a picture taken of Elisa with one of her friends celebrating good news, at the side Alma keeps on working with her molecular anthropological project. In picture B we are discussing the length of haplotype blocks (field notes 13/05/09 also see: Chapter 5) and its meaning a couple of days after the MGDP is presented to the Mexican

[214] I can just tell you that the MGDP was amongst the most important news on TV and Radio on Monday 11 of May 2009, and even overshadowed a major political scandal concerning Mexican ex-presidents in Mexico (Carmen Aristegui 11 of May 2009).

President Felipe Calderon Hinojosa, after a PGL seminar (or what we called the tropical seminar, because of its relaxed atmosphere)[215].

Figure 8-L1- Two everyday images of the PGL

1) Alma working with samples and Elisa+ friend posing for the picture.

2) Haplotypes and populations temporality: Laboratory discussion (13 of May 2009)

The pictures in figure 8-L(1)are telling of common scenes in which pizzas, lunch boxes and even a surgical mask —a common item during the days of the Swine Flu crisis (A H1/N1)— appear as part of the scenery. In the pictures you can see that the actors (including me) are engaged with each other, sitting and living in the laboratory with the messiness produced by everyday work around us. If you pay attention you can even catch the slight anger in Dr. ISZ while I question the representativeness of the MGDP. If you contrast these first tiers of pictures with Figure (L2) it's immediately evident the idea that ritualisation is closely related to strategic ordering: ""the Christian mass and the gift are not models for a normal meal or family shopping; they are strategic versions of them (Bell 1992:91)".

The PGL was constantly visited by various elite strategic audiences, and their TV crews (cf.figure 8(L3)). Apart from these elite visits, biologists, chemists, Illumina providers, external collaborators, scientists (within the INMEGEN the laboratories had a bad relationship, the product of the lack of clarity around who should be the leading author of the MGDP) and medics doing social service or specialised courses at the INMEGEN were around.

[215] The images used in this subsection were provided by INMEGEN´s communication department and the persons portrayed in the picture have given me their consent to use these images.

Figure 8.L2- Strategic image of PGL's Laboratory

1) Elisa, Rita and Mrs. Crown preparing the hybridized chip for analysis.

2) Elisa and Rita analysing the Chips.

In the second series of images 8(L2) produced by the INMEGEN the front matter that is shown (picture 1) is the cutting edge equipment; laboratory technicians are using latex gloves and one of them is handling a micropipette while the other helps to hybridise a chip. The latex gloves stay on even when handling the computer, this rarely happened, and the blue light inside the laboratory emphasised INMEGEN´s cutting edge cleanliness and the massive sequencers. There are no laboratory notebooks, a companion of the laboratory practice in order to keep track of the steps taken; there is not the minimum hint of disorder, and everybody is concentrated on the objects to be studied and laboratory process. They are idealised moments of productivity and efficiency, in which man and machine create knowledge.

In figure 8.L(3) a mock laboratory sequencing is put in place to show top policy makers such as the Secretary of Health, the first lady and governmental authorities; "science in the making", as a matter of fact the robot, or Eva as was known inside the laboratory, was used in very few occasions even though it was one of the most spectacular machines in the laboratory. The way in which the PGL and the INMEGEN became the wellspring of knowledge about genomics and populations is due to many material and knowledge factors: massive sequencers; specialised equipment; PCR machines; primers and chemicals; bio-molecular scientists; informaticians, supercomputers and technicians. But its demarcation as the place from which the knowledge of population genomics emanated was no less thanks to the efforts put in portraying scientific work in mass media and institutional communication, so others could see (a strategic version) of what was mostly reserved for a small group of scientists and technicians.

Figure 8.L3- Mock massive sequencing with policy makers

1&2) Dr.GJS tours Margarita Zavala the first lady and the Secretary of Health Dr. Angel Cordova Villalobos into the PGL, showing hybridised chips and the Automatic Massive sequencer, while the robot moves samples to be read by the laser.

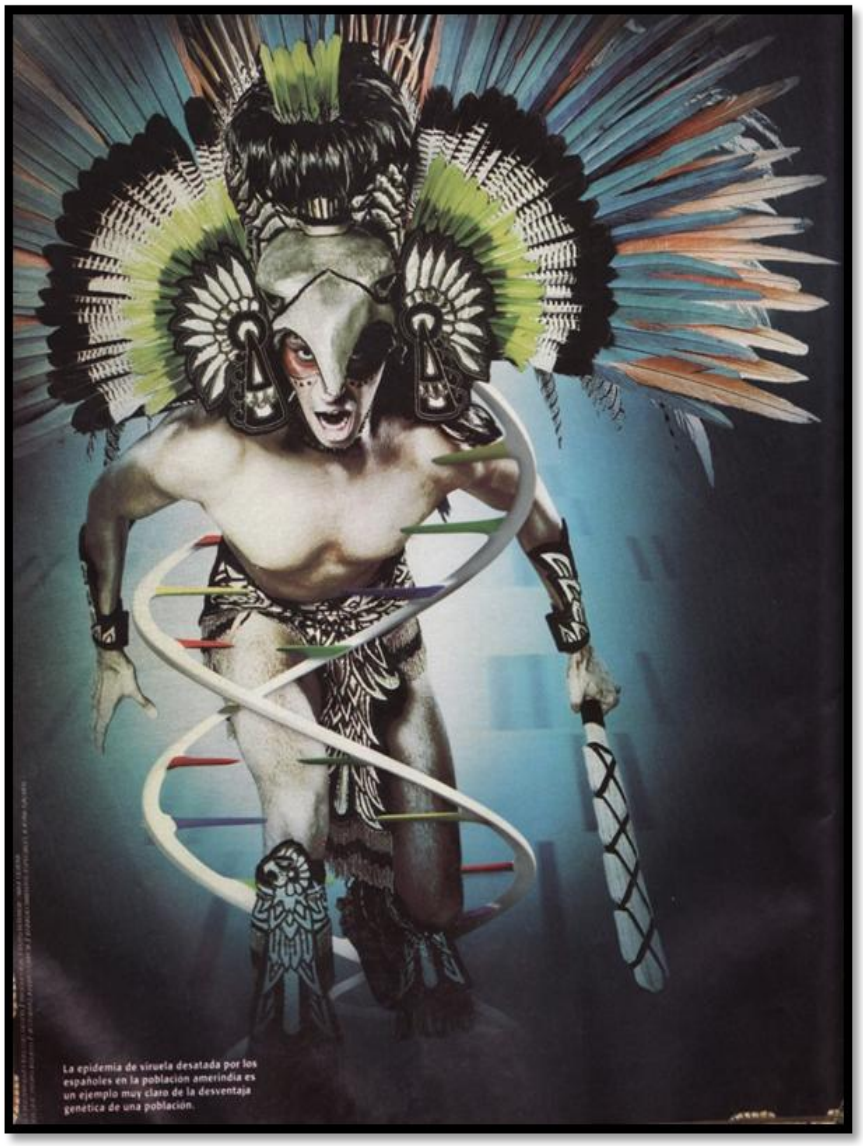
Strategic ordering is a game of visibility and invisibility in which the humans and non-humans that coexist in a social world produce distinctions with everyday practices. As a consequence of such ordering the demarcation between socio-technical spaces in Mexican human genomics is achieved, as well as the presentation of a world-vision "in a nutshell" to others. These characteristics of ritual and visual communication were one of the constant repertoires of the INMEGEN to mobilise genomic medicine, and its associated sovereign claims, in public forums.

8.3.4- "The Map of the Mexican's Genome": an art like object

The MGDP's capacity to be appropriated and transformed for various purposes like classical music, plastic and visual arts, institutional, personal and political promotion as well as wider science communication and marketing make it easy to package it as a ceremonial object. During the two years I was in the laboratory a classical musician and plastic artist visited the laboratory in order to create artistic representations of the "Map of the Mexican's Genome"; in the state of Oaxaca a museum in which they exhibited the advances of Genomics had its own wing for the Mexican genome (field notes 06/07/10 and Rojas-Aréchiga 2007). Almost a year and a half after the public announcement of the MGDP publication, on September 2, 2010, Alondra de la Parra, a well know young orchestra director, presented the famous Sala Netzahualcoyotl of UNAM her concert "My Mexican Soul".

Amongst her exclusive pieces was the opera prima entitled "Admixed Genomics" by Enrico Chapela, which he described as a piece inspired by: "... the 89 private SNP´s based in the project of the Mexican Genome".

Figure 8M-Popular media, genomics and the idea of the Cosmic Race (Barba 2009:30).



In a very brief chat with the orchestra director in the backstage before the world premiere, she was explaining to her musicians (most of them foreign —probably to the national musicians there was nothing to explain—) that the piece was inspired by "… the racial roots of Mexicans that were of a mixed blood between Indigenous and Spaniards, and the notes were inspired by the 89 unique mutations found in the genome of Mexicans.../ musician interrupts: I knew you were a mutant... laughs(personal communication 02/09/10)[216]". Natividad Gutierrez (1998) has named the national valorisation of Mestizaje as "Mestizoism", since this is not the only national narrative of Mexico. There are many other historical events and indigenous foundational narratives that remain obscured by the dominant Mestizo identity.

[216] I want to thank my friend Ruben Marquez, for quickly introducing me to the orchestra director before the concert since the tickets were booked long before I knew about the event.

The widespread idea of a Mestizo Nation made from Spaniards and indigenous communities can be adduced to the particularly strong investment of the Mexican state to construct a National subject (Basave-Benitez 1992; Martin 2009; Gutierrez 1999; Miller 2004). The very first day of fieldwork I started a three hour discussion about the existence of "The Mexican Genome" with Volkovak and Altair, INMEGEN´s ELSI researchers.

My very first "finding" in the field came as I said goodbye to Altair, who was still passionate with his arguments: "I recommend you to read the Cosmic Race of Vasconcelos—he kind of whispered across the room—to understand what genomics and the Mestizo is all about (field notes, August 2008)[217]. The idea that Mestizaje could be translated into a genetic basis was not only seductive for the Congress and many regional authorities but for artists, museologists and magazine editors who did their bit to re-enfranchise the dominant national narrative based in *Mestizaje.* The next image, appearing in a special issue of the MGDP and in the Quo magazine entitled "The Mexican Genome: uncovering the secrets of the Cosmic Race" is an example of what I have just mentioned

Altair argued with me that Vasconcelos was all around us, either in the guise of the books given to us in the school or in common everyday usage, when dealing with issues of Mexican identity. According to specialists in the topic, the blend of fact, legend and fantasy intervening in the construction of *Mestizaje* has proven its obdurate character*:* "The idea of the cosmic race has proven highly resistant to demythologization. It has tended to be taken at face value rather than examined critically, as though a commitment with the Mestizo meant an acceptance of all and every race in the nation, or even a devaluation of racial biology in Mexican history (Stepan 1991: 145)"[218]. I found this to be true in my field work; almost one year after our initial discussion about the existence of a Mexican Genome, I confronted Altair and his admiration of the "Cosmic Race" (Field notes 03/09/2009):

> E.S-Have you really read the Cosmic Race? —The response was clear and strong—

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[217] Following Altair's advice I read Vasconcelos' "Cosmic Race" (1958), the reading was a surprise; his references to a Hyperborean race, the old forgotten Lemurians, both of them linked to an occultist cosmogony (taken from Theosophy and Masonry, cf. Miller 2004, also cf. Didier Tisdael Jaén prologue of Vasconcelos Cosmic Race) were particularly amusing, especially since Altair is a proud (although ideologically eclectic) Christian missionary in his free time.

[218] Many of the experts thought that Mestizaje was precisely the antidote to racism and even when they claim that racism exists in Mexico, they tend to think about it as a consequence of material inequality rather than of violent racial categories. Nonetheless according to the National program of Health the 100 most disadvantaged municipalities in the country are all indigenous (PNS 2006-2012)

> **Altair-** I have not only read it, I know it by heart!!
>
> E.S-[...] But you know, it is pretty racial, even essentialist in its approach to racial types... I don't know if you are aware of those connotations?
>
> *Volkovak*: Come on Altair... that is true!!
>
> **Altair-** You know I really like it, with its essentialist tones and everything... I like it... it is not racism, but integration and fraternity!!!

Until then I had not experienced the strength and resilience of *Mestizaje* —explicitly— in any discussion with my informants. Even though very few informants, such as Altair, make explicit reference to Vasconcelos' work or to national *Mestizaje* as the framework to understand genomic medicine, I have found the logics of a Mestizo identity intertwined with the interpretative repertoires used to approach genomic science (Chap 5). Some of the dominant ideas of nationhood and what I called *Mextizaje* serve to differentiate between Indigenous and Mestizo Genomes (cf. Chap 5). Notions of national identity and ethno-race also inform the idea of the law on genomic sovereignty (cf. Chap 8) and the constant celebration of national identity and racial admixture in Mexico.

8.4- Resistance and laughter: reconverting the values of flattening

> *Come, Come... Sir, Madam,...ja, ja, ja, ja... come, come and take your very own copy of the Map of the Mexican's Genome... signed by the authors, including photographs of the MGDP crusades and your complete kit with all the media articles inside it, the MGDP article in English and Spanish, come, come and take it, limited offer (simulating urban street sellers)... ahh... and don't forget your INMEGEN´s promotional video featuring Dr. Celina....[noisy laughter](PGL joke during the weeks after the MGDP public release)*

Conscious that the categories of "The Map of the Mexican's Genome" were not innocent, experts in the field questioned the project's representativeness (chap 4; cf. Bonfil 2009 for a summary of the critiques)[219]; but also the use of media to advance a nationalist agenda that was very far from what they thought would be an ethical approach to science communication. The problem was framed to me at interviews, discussions or confrontations as one in which the epistemic properties and political promises intertwined with the so called "Map of the Mexicans´ Genome" or the MGDP become illegitimate. According to critical audiences, the promises of genomic medicine and the "Mexican Genome" had moved from hype to a dangerous zone near to scientific fraud. Dr. Laura (int. 2009), one of the most influential Mexican bioethicists, commented when discussing about the Mexican Genome, and the media coverage around it:

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[219] www.lacienciaporgusto.blogspot.com/ September 2009

> ... I also listen to contradictions in... ...in the declarations on press...one of the arguments to defend the INMEGEN, and the Mexican HapMap and so on, it is because we cannot buy it from anyone. Because the information coming out from it is only useful for those who create it.... then if we don't do it ourselves we are doomed... then... It would not be useful even if everyone else, end up doing the map of their populations... and then I hear the Director General saying, that this was so important that the other populations in Latin America could benefit from it... and I said how?!! If we could not benefit from them [existing maps], how others are going to benefit from ours...I feel a lot of inconsistency[220].

The first people that wanted to distance themselves from the public representation of their work were the biomedical scientists involved with the MGDP. While these scientists enjoyed the spotlight and the unparalleled attention their work had they were well aware that "The Map of the Mexican's Genome" was telling a story heavily criticised by the academic community; a story they had try to keep out of their laboratories. The way in which Dr. Y took distance from it was by giving funny names to the objects inside the Map of the Mexicans Genome kit; the timeline (cf. Annex C) and the picture of the journeys were re-baptised as the genomic Forrest Gump story, since Dr. GJS appeared in most of the pictures accompanied by known political figures, alongside historical figures of genetics and US scientific celebrities in the circle of molecular biologists (Dr. Francis Collins and Craig Venter 2001).

The image in figure 8(N) became another local joke in the days after the MGDP was published: "have you seen the Aztec warrior with an erection that is announcing the MGDP in QUO magazine…laughter… (Rita & Alma, field notes 15/06/09)" The PGL team made a little dance to accompany INMEGEN´s promoting song and made jokes to Dr. Celina whom appeared as the protagonist of INMEGEN´s promotional video.[221] Mexican scientists deployed a reflexive approach to national celebrations of the "Mexican Genome". INMEGEN's scientists deal with the difficulties of keeping their scientific reputation while supporting a project they think would be very beneficial for healthcare in the country, enveloped by a charged nationalistic rhetoric. So they resort to laughter and jokes to distance themselves from what they see as an unfounded racialised nationalism. In trying to keep the charged vernacular rhetoric out of their laboratories,

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[220] It would be just fair to say that the ambivalence between genomics and the MGDP as a national and/or Latin-American scientific object was present since the IFS (2001), but it is also very clear that this ambivalence was downplayed during ceremonial events, in Mexican congress (1999-2004) or at INMEGEN´s branding campaigns or in its audio-visual production.

[221] They thought that since Dr. Celina was the blonde and blue eyed scientist, she was placed at the centre stage of the promotional video (in my perspective she was the protagonist indeed): "…like in Mexican Telenovelas (soap operas) in which the principal characters are all blond or European looking, and just the service personnel are dark-skinned with indigenous features…it was that or the camera man was in love with you…laughs (PGL joke June 16 2009. This can also be seen in the INMEGEN´s comic strip No. 4)".

those who work in the PGL, the bioinformaticians, and INMEGEN´s other laboratories make a comic reversion of massive ceremonies and nationalistic mediatic flattening. Putting the claims of Mexican uniqueness back into a vernacular and pop-culture background (subway street seller, Forrest Gump, Heroes (the US TV series) and INMEGEN´s promotional song as a Telenovela) was the way in which the distinction between marketing and scientific knowledge endeavours were re-made inside the laboratory in the face of their constant public mixture in mass media and by INMEGEN´s scientific divulgation department.

Figure 8-N- DNA made in Mexico or the "Cosmic Race" genome warrior (with a suggestive weapon on his pants, QUO Barba 2009:34).

8.4.1- Laughing at nationalism and its new genomic robe

> *Poets and philosophers might not agree, but life is a code. At least if we understand it from the perspective of genomics that studies the macromolecule which structure was described by Francis Watson and James Crick in 1953 (Barba 2009)*[222]

Against the backdrop of a constant television framing that talked about "the book of life that will tell us the colour of our skin, our facial features, but most importantly what illnesses are written in our code…and the propensity for Mexicans to suffer diabetes or cancer" (cf. Primero noticias2009; Lopez Doriga 2009, Adela 2009, Lolita Ayala 2009; Vision 40), journalists were asking if "now with the Mexican Genome we can know why we are so corrupt and our political class so inefficient (entre tres 2009)". Most of the interviewers of MGDP authors insisted various times on the unique signature of Mexicanhood in genomics; where was that? ...and how did it look like or how did someone in a hospital could recognise Mexicanhood in the new born? : "Dr. excuse me for insisting but could you please tell us what is the signature of our Mexican genome (Beteta in Vision 40 2009)?"

Accompanying all this media attention was the repetitive script deployed in public venues since the days of the CPMG in the congress, which continued to be repeated in each and every one of INMEGEN´s public interviews and audio-visual productions from 2004 to 2009. There were voices that questioned the ideas of causality and ethno-racial uniqueness put forward in Mexican mass media (Rubio 2009; Guerrero-Mothelet 2005: Guerrero-McManus 2009; www.cuestionableinmegen.blogspot.com; COMPTRA 2009). Figure 8(O) portrays one of the few visual narratives that circulated when the MGDP was celebrated in the presidential residence that was available to mass media[223]. Classical jokes and popular reversions of the practice of pigmentocracy and hidden racism in Mexico are made present in the cartoon by making national symbols speak the common words of everyday whitening-Hispanic ideals and socio-racial distinction: "but my granny had blue eyes (fig 8(O): D)".

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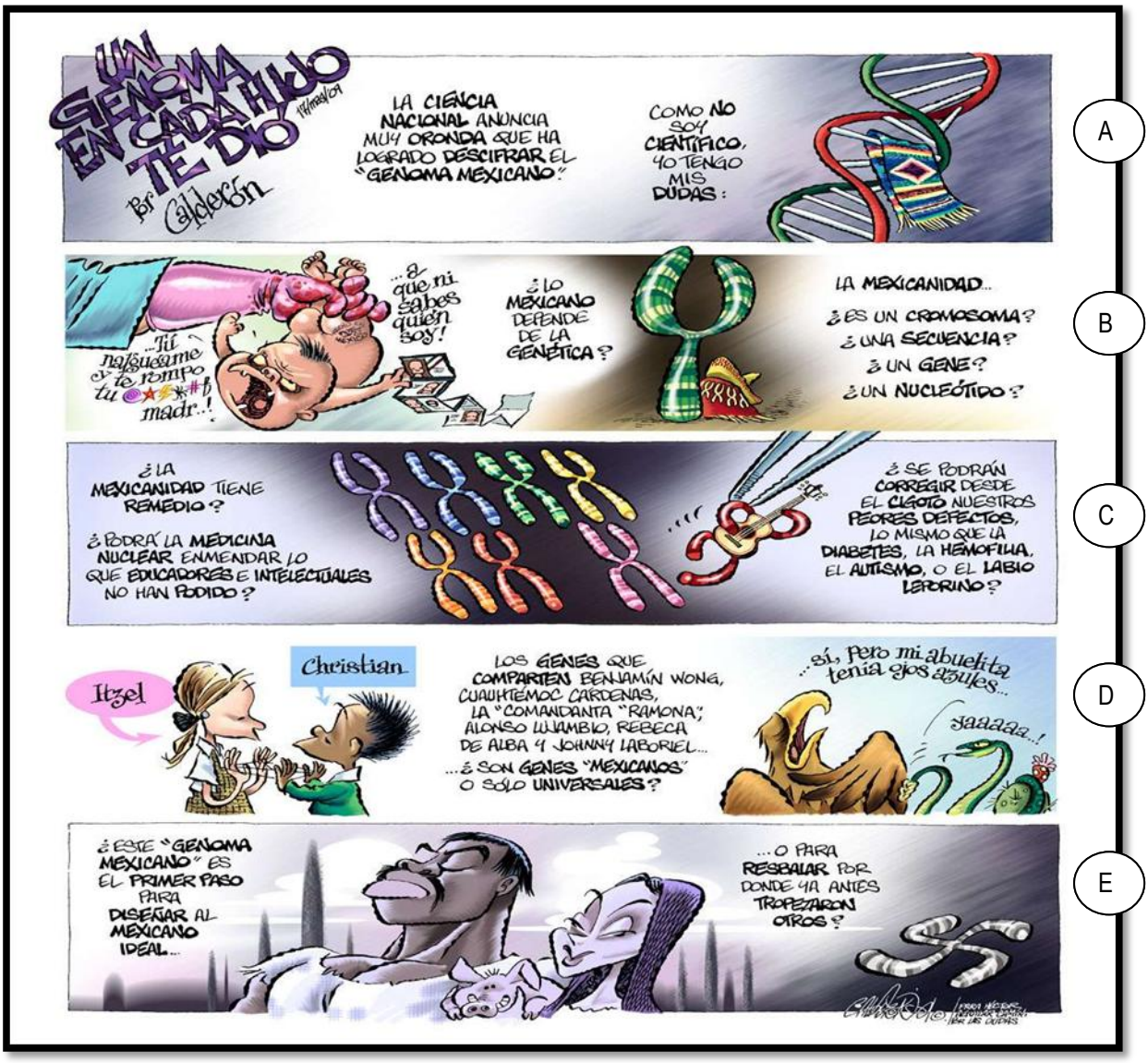
[222] Carlos Lopez Beltran, both a poet and a philosopher, could not disagree more with the claim of life in a code, especially when situated or trying to situate from the perspective of the Macromolecule of DNA (cf. Lopez-Beltran & Vergara 2008).

[223] Critical news-articles or images were rather limited in number if we compare it with the huge positive media attention and nationalistic exaltation around the MGDP. The academy of sciences in Mexico was one of the few expert bodies that was ready to criticise the MGDP, and just timidly said that we should avoid being too deterministic when approaching science (Mexican National Academy communication 2009 also Bonfil 2009)

Figure 8-O-A Genome in each son it gave to you!



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224 **The title**: A genome in each son it gave to you, is a substitution of the word soldier for the word genome as appears in the chorus of Mexican anthem. **A):** National science announces full of itself that it has decoded the Mexican Genome, since I am not a scientist I have my doubts a.../**B)** Newborn: Spank me and you will see, you son of a %&$# /don´t you know who I am / Being Mexican depends on genetics? / Is Mexicanhood: in a gene?...sequence...chromosome?...or a nucleotide?/ **C)** Does Mexicanhood have a cure? Could nucleic medicine correct what generations of intellectuals and educators cannot? Could our worst defects be corrected from the zygote, the same as haemophilia, autism, diabetes and cleft pallet?/**D)**Two kids appear playing with each other: the blond girl has an indigenous name (Itzel) the darker skinned boy is called (Christian)/The genes that are shared by Benjamin Wong, Cuauhtemoc Cardenas, La "Comandanta Ramona (Indigenous EZLN leader)", Alonso Lujambio (Secretary of Education), Rebeca de Alba and Johnny Laboriel...are "Mexican genes" or just universal?/ Eagle and snake talking, symbols of the Mexican flag, and the myth of the foundation of the Aztec city of Tenochtitlan: *Eagle*: Yes, but my granny had blue eyes.... snake: yaaa!..../**E)** This "Mexican Genome" is the first step to design the ideal Mexican or to slip where others have already slipped (quote near swastika).

Reordering and showing stereotypes with negative valences, as the Indian seating beneath a Nopal or Cactus resembling a Y chromosome and Zarape full of chromosome shapes (ibid: B); the Mariachi chromosome (C), and ending with an image parodying one of the most iconic pictures of the "Golden Age" of Mexican-nationalist cinema which present the proud Indian and his wife, just to end with a chromosome looking like a swastika (E). "A genome in each son it gave to you (Calderon 2009)" is indeed the reversal of stereotypes, which in contrast to INMEGEN´s comic strip does not present the principal characters of Mestizaje in all their dignity as warriors or indigenous nobles, instead it brings forth the common tropes of "national sin (Lomnitz 2002, also see: Calderon 2009 b)", Mexicanhood and possible racism in a "nutshell".

Figure 8-P- Mayan with the double Helix: The unpublished cover of the Map of the Mexican´s Genome (INMEGEN 2009: Vol.4)

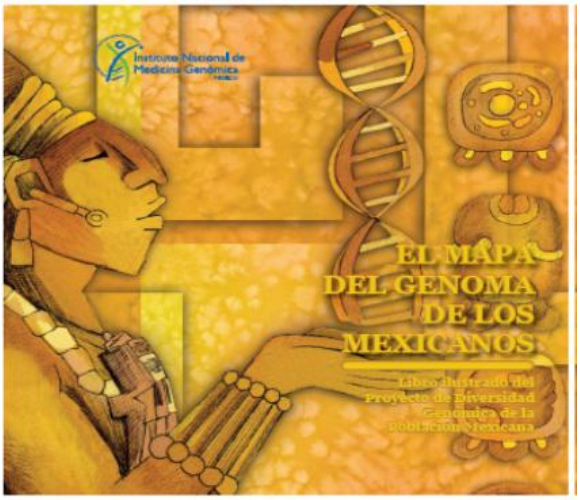
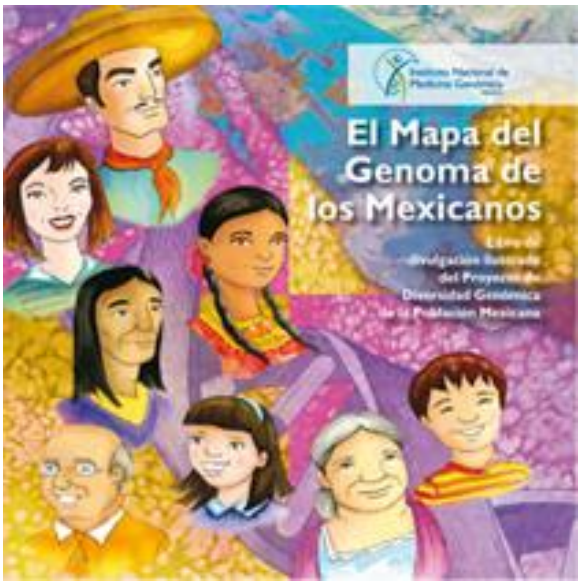


Figure 8-Q-The Map of the Mexican's Genome –published comic strip cover (2009)



Although very few racist comments were done around the MGDP publication in mass media,[225] the idea of Mexican biogenetic uniqueness, and the bombastic revival of post-revolutionary national myths stirred critical tropes and jokes (cf. Calderon 2009 a, b, Rubio 2009). Most of these made evident the dubious vernacular uses of racial difference by the INMEGEN´s public promotion. Since the spaces to have an open discussion about topics such as the relation between genomics, race and nationalism were inexistent, most of these disputes occurred as silent visual responses or changes in the communication of INMEGEN research[226].

During the last days of Dr. GJS's administration the special comic strip issue of "The Map of the Mexican's Genome (Comic Book No.4)" was redesigned in the face of the possibility of creating more controversy around the image of an indigenous holding a DNA double helix: "the director told us to do something about it because Mexican diversity is not solely indigenous, and this cover would generate lots of critiques (Leandro INMEGEN´s science divulgation department director 2009 field notes 16/06/10)". In an exercise of prudence INMEGEN´s communication department redesigned the front cover and instead of the Mayan with a double helix on his hand, they presented a cover in which different faces and age groups, in order to be inclusive of the Mexican republic, were represented against the backdrop of a double helix—this time the helix was spinning in the right direction: that is left to right—.

8.4.2-"The Map of the Knowledge of Mexican Populations"

> *I can understand their critiques; I recognise that dubbing it the Mexican genome can be confusing... (Dr. GJS int. 2009)*

In Mexico the perception of experts in and out of the INMEGEN almost unanimously was that the Mexican Genome served nationalists purposes, mostly exploited by elite groups amongst the already elitist scientific community (including many of my informants). For Dr. GJS the communication and marketing of science were necessary chores of a public institution if it really wanted to communicate with the public: "it has to make itself accessible and understandable

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[225] Anonymous Comment: It is indeed a pleasure to know that going all the way from Maria Felix, through Alvaro Obregon and even, Ana Guevara, we the Sonorenses are different, plus we have the most beautiful women in the country, it shows and now with this study it is a scientific fact why we have race superiority over the rest of Oaxaquitas and other *mexicanitos* (little Mexicans)… Arriba Sonora (Anonymous Cyber commentary on Barba 2009)!!!!

[226] Since there are no forums in which critical and official voices could meet in order to stir policy, spaces for debate are still non-existent (cf. Chap 6); press articles and visual challenges and comic-critical reordering of the new genomic brand of nationalism are what is left , and where disputes are to be followed.

(int.2009)". For him it was this kind of communication which was precisely an ethical move in order to democratise science, to present scientific objects in an attractive way: "The Map of the Mexican Genome" was much more appealing than "giving the public something raw that they would not understand...so should I say [...] The study of genetic variability and diversity of Mexican Mestizo populations of six regions of the country compared to an indigenous sample of Mexican Zapotecs (Jiménez Sánchez, int. 2009)".

The new Director General Dr. Xavier Soberon Mainero came from UNAM; he had occupied various public posts and had a good reputation as a public administrator. As soon as he took office as the new Director General of the INMEGEN, he changed the name of "The Mexican's Genome Map" to "The Map of the Knowledge of Mexican Populations", in order to avoid controversy or misconceptions: "I am going to call it Genomic Knowledge of Mexican Populations, because there has been certain confusion and controversy about "I am Mexican, but my genome is not being studied, since I am from Eskimo origins, but I am Mexican? Well then let's call it populations (Soberon in Saavedra 2009)". The new baptism was not the product of agreement or discussion between genomic scientists and/or bioethicists either; it was a way to give the project "the least problematic category possible (Soberon-Mainero int. 2009)".

Completely unaware of the long discussions around the notion of population, the new director general thought that by erasing the links with nationality (Mexican-in singular) he was clarifying and avoiding problematic connotations around the "Mexican Genome". The same way Dr. Sofia who was now a top officer at INMEGEN, insisted that "...the real name is that [Mexican Genome Diversity Project]... which corroborates what we had seen in classical studies (The ones done by Dr. Sofia, Dr. Elias and the rest of human geneticists in the country)". Substantive debates around the creation of the map remained rather polarised between the representativeness of its claims and the lack of a substantive revision of the procedures that gave rise to the MGDP or the assumptions on which it was founded (cf. Chap 4). It was as if by the restitution of a scientific name and by sending new TV teams (Nov. 2009, TV-UNAM team in the PGL laboratory) into the laboratory to ask the scientific authors about the existence of "The Mexican Genome (which they believed was completely misleading)", the disputes would disappear. Ironically when Dr. Irma Silva Zolezzi who at the time was fully recognised as the authority in population genomics, saw the note about the name change she said: "The Eskimos might not be the best example, since they are a native American group, and probably an important slice of their variability might be shared with indigenous groups in Mexico: groups which have been included in the MGDP (field notes, 13 of Nov 2009)".

8.5-Coproduction as strategic ordering: resemblance and similarity-final thoughts

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"A day will come when, by means of similitude relayed indefinitely along the length of a series the image itself, along with the name it bears, will lose its identity. Campbell, Campbell, Campbell..."
Michele Foucault, This is not a pipe
"...Many years later, as he faced the firing squad, Colonel Aureliano Buendía was to remember that distant afternoon when his father took him to discover ice."
Gabriel Garcia Marquez, One hundred years of solitude.
"You know the Mexican public is a very docile and noble one..."
Marco Aldebaran 2008, INMEGEN´s Top Official

Rene Magritte's astonishing painting "This is not a pipe" in all its simplicity opens up an abyss that the signs, symbols and indexes of our world constantly bridge; we expect certain words to correspond with things and we expect certain promises to be an annunciation of a world to come. Images and visions of the future (21st century genomic medicine), rooted in the ancestral past (national identity and Mestizaje), is the way in which Mexican genomics bridge the distance between political promise and a difficult institutional life (cf.Chap 6), relying on stereotypes to convey their message. I do not need to argue that certain situations or images have the capacity to trigger our memory (for the sceptical reader I recommend to open any family album randomly). Memories have the strange quality of transforming our lived experience, giving us a double perception that mixes past and present in the same emotional and sensory atmosphere. The flattening —of both national history and science— into stereotypes that can travel inside "The Map of the Mexican's Genome" does exactly this kind of "remembrance" work.

My intention in this chapter was not to show how media constructed an illusion, or how through

227 Calderon , Paco (2009b) "El Genoma Mexicano"12/05/09: The falling Mexican has a nucleotide in his hands that bear the phrases (roughly translated):"who cares" and" there is nothing else to be done".

images people simply accept a reality that is not there, nothing farther from my argument; indeed the PGL was the place in which most of the analysis and technical work on the MGDP was done, and it was not false that the MGDP was the first project of that calibre to be done in Latin America. My intention was to show the way in which a set of routinized and repetitive communication practices, designed to make available to lay audiences (including human geneticists) the work of population genomics, constantly mobilised a series of strategic visual orderings: equating genomics with racial and national history, and its promotion and protection with the future of the nation. The 20 pictures I present in this chapter are a visual tour through INMEGEN´s public image construction, which was closely related to the repetitive reactivation of very specific post-revolutionary notions of Mexican ethno-racial identity (cf. Gutierrez 1999; Miller 2004, Lomnitz 2010).

Stereotypes were not only cultivated by INMEGEN´s communication department but through the constant travel and promotion of "the crusades to create the Map of the Mexicans Genome", and the amount of media attention they received until the MGDP publication. These events became a little rehearsal of a bigger public proposition; in which the body of Mexicans was to be linked to its statistical representation in differentials of genetic frequencies and presented to the nation in the mass media as "The Mexican Genome". In regional media this was portrayed as the genome of "Sonorenses", "Mayans," etc., re-constructing imagined communities and ill-defined roadmaps the same way as it did during the negotiations to create the INMEGEN, in which a road map, a world of "as if", opened up the material possibilities to reach sovereignty and construct a national scientific realm(cf. Chapter 3). These roadmaps and imagined communities need to be constantly actualised and reframed under the idioms of Mestizaje and the health benefits to come. None of this would be possible if the idea of resemblance between an object and its name was not constantly and stubbornly transgressed by its enrolment in mass media; just to be later appropriated for critical, ceremonial and comical purposes by those who encountered the audio-visual dimension of Mexican genomics. Finally one published paper, called "The Map of the Mexican's Genome" or the MGDP, becomes the embodiment of genomic sovereignty and medicine (Silva-Zolezzi et. al. 2009)". The reversions and resistances of those who wanted to alter the strategic ordering entailed by the public display of genomic medicine also made recourse to stereotypes in order to alter the valences of discourse, moving elements from the background to the centre stage (for example the reification of Mexicanhood).

In the sphere of Mexican genomics the process of linking abstract national interests with local demands reached its climax in the grandiose presidential ceremony done around the MGDP in the middle of the swine flu crisis AH1/N1 (May 11th 2009); historically the most important event

ever done to promote scientific research in the country, much of which could indeed not be possible without the constant work of strategic ordering and chants around a promise. What to do about the relation between an authoritative object and its representation? Is it that stereotypes convey in a nutshell a message that is more accessible than any authoritative resemblance with scientific practice? Can we restitute the space of authoritative resemblance once the series of images open to similarity are circulating in mass media by recovering a scientific name?

In the end, stating that "this is not a Genome" only makes more visible the bridge that signs and the repetitive geneticised framing of national identity have built over the years in mass media, institutional communication and even law. In what was an unchartered space before today, the Mexican genome is now the principal reference for critiques, comical reversal and sovereign chants. It is in this ritualised space that the probabilistic and relative ontologies of populations coexisted (since the current administration has stopped the constant engagement with media) with the binary and rigid notions of legal sovereignty, and also in which the Mexican nation (singular) was equated with molecularised populations.

9-Discussion and Concluding remarks:

> *I searched into my origins, just to discover that modernity does not lie outside of us, but within us. It is today and is the oldest of the old epochs, it is tomorrow and it's the birth of the world, it is a thousand years old, and has just been born [...] Simultaneity of times and presences; modernity breaks with the immediate past just to recover the millenary past; transforming a fertility clay figurine of the Neolithic into our contemporary (translation made by the author)*
>
> *Octavio Paz, fragment of the speech given when he received the Nobel Prize (1992).*

This PhD dissertation fleshed out the main features of postcolonial biopolitics by paying attention to the way in which natural and social orders are negotiated and coproduced in Mexican human genomics. The process of coproduction has been one of the main focuses of this analysis, as well as how genomic sovereignty operates as a boundary object in this process, circulating amongst legal and scientific social worlds. I purposefully focused on two main processes: the production of the MGDP at different scales and social worlds (laboratory, mass media, policy/scientific rumours and confrontations) and its regulative dimensions (negotiations in the Mexican Congress, ELSI, CNB, and making sense of the law on genomic sovereignty). I have done this in order to question and explore the policy agenda that advances the idea that developing nations have to harness their own public health genomic initiatives in order to bring unparalleled social benefits to their populations, and that in order to do this they must protect and harness their own unique biogenetic heritage from exterior threats in the global market (cf. Seguin et.al 2008, 2009,Singer 6 Daar 2001; Hardy et.al.2008 a, b, c).

The key argument for the construction of the INMEGEN lay in a nationalist policy framing which considered the Mexican genome as a sovereign resource, coupling Mexican "uniqueness" to the very nature of genomic science. In Chapter 3 I showed that the notion of genomic sovereignty was nothing similar to a paradigm, and was not based on shared visions of causality, since the very "nature" of the policy object —the Mexican Genome— was (and still is) a disputed reality. It was through the rhetoric that invoked historical struggles for independence, emancipation and biopiracy, i.e. experiences of dispossession "in archaeology, botany or zoology... (IFS 2001: 25)," that the novelty of population genomics became amenable to be understood as a sovereign question. On the other hand it was through the assertion of a pre-existing natural order, "Mexican biological Uniqueness," that a postcolonial ethos was not only reaffirmed but became the only policy alternative for a developing country wishing to compete in the knowledge based economies put forward by the elites that lobbied the INMEGEN:

> The socio-political history of biotechnology amply demonstrates that natural order sustains and is sustained by social order. Human encounter with the life sciences and technologies repeatedly became occasions for the manufacture or redesign of politically significant institutions, identities, representations, and discourses... The

> coproduction framework, understood in this way, helps account for the stickiness of frames (Jasanoff, 2005: 275).

The strategic reification of Mexicanhood fuelled the whole policy and legal agenda of the INMEGEN, which permitted cooperation without consensus and opened the process of policy innovation. As an example, through the notion of genomic sovereignty classic population geneticists would in principle become capable of mobilising their expertise in order to associate themselves with the HGP and its medical promise. Genomic sovereignty exemplifies the process of cooperation without consensus in its most extreme version: regardless of the fact that scientists considered the "Mexican Genome" to be an exaggeration, they cooperated and even created a new policy and scientific enterprise. In the original lobbying of the INMEGEN Dr. Elias was willing to remain silent when her co-negotiator (cf. Chap 3) claimed that Mexico should defend its uniqueness and concentrated indigenous biogenetic heritage (even when he thought this was nonsense). Another instance of such cooperation without consensus could be illustrated when Dr. Cano Valle preferred not to debunk the idea of genomic sovereignty, even when he thought that such policies were passé, because genomic sovereignty included other notions that were important and "needed careful consideration" (Chap.3).

For the biomedical community at large the creation of the INMEGEN provided a platform to increase the capacity of academic engagement in a realm dominated by highly costly equipment, making it possible to participate in the new field of medical genomics. Therefore the idea of the INMEGEN as a doorway to a global biomedical citizenship was attractive for Mexican scientists. Genomic sovereignty allowed bioethicists to strengthen their vision of a desirable regulatory framework, while genomic entrepreneurs provided the concrete organisational infrastructure to make that possible in scientific, economic and legal terms. Dr. GJS (int. 2008) recognized the importance of a repetitive, coherent and very detailed communication in the creation of the INMEGEN throughout the first years of lobbying (cf. Canal del Congreso 2001, 2002 a, b, c; 2003)[228]. The diverse interests of the social worlds that participated in the lobbying of the INMEGEN were then coordinated, accommodating the various commitments of heterogeneous actors.

Almost 5 years after INMEGEN´s creation, the once fruitful and unproblematic framing of medical/population genomics as a sovereign resource became the battleground for an academic dispute (which the general public seems to be unaware of) about the existence of "Mexican Uniqueness". Such uniqueness has been questioned by many audiences. These various critiques

[228] A style of communication Dr. GJS thinks had important effects on the possibility of creating the first law on genomic sovereignty in the developing world.

can be summarised by the thoughts of Carlos Lopez Beltran and Francisco Vergara, UNAM´s philosophers of science, disconcerted by a simplistic reification of Mexicanhood:

> Among the critical issues which have never been confronted by the proponents of this project [the MGDP] is the need for justifying rationally the pertinence of postulating the existence of a characteristic, peculiar, local (racially admixed) genome shared by most inhabitants of a national State with the complex demographic history of Mexico." (Lopez-Beltran & Vergara 2008: 18).

Most of those that became public critics of the INMEGEN are ex-CPMG members who disagreed with the reification of Mexicanhood, but still cooperated; and now resist the ways in which a specific version of genetic identity serves the interest of genomic entrepreneurs through legal imposition. As an example, nowadays (2011) Dr. Elias, who was originally in charge of the CPMG-ELSI issues during 1999-2004, is now a critical public voice in both the scientific and bioethical realms. Many of INMEGEN´s former allies have distanced themselves from the project or are openly critical about it (cf. Chap 4 &5). This shift of alliances and public posture cannot be explained by the commonsensical trope of loss of consensus, since there was no consensus to begin with. I think it is much better explained by the regulatory efforts to fix genomic sovereignty, trying to make it a legal threshold which not only strategically reifies the genetic heritage of Mexico, but heavily taxes any genomic research independent from the INMEGEN.

Throughout the dissertation I described how this new policy and scientific field was something that can be recognised as distinctly postcolonial biopolitics[229] which schematizes questions about the market, identity politics and science in very different idioms than those of biological citizenship (Rose 2008), racial purity or thanatopolitics (Agamben 2000). I think the case of the INMEGEN and its claim for genomic sovereignty offers a strategic case study of what seems to be an evolving global phenomena by which developing countries —more specifically rising powers (China, India, South Africa, Mexico and Brazil)— want to make sure that they can reap the benefits of new scientific horizons (cf. Benjamin 2009, Hardy et.al. 2008 a, b, c).

Framed as a sovereignty issue in Mexico, India and South Africa (Benjamin 2009; Hardy et.al 2009 a, b, c & Singer et.al 2008, 2008 a, b,c), or as social control in Brazil, these claims have in common the fact that they relate their own past experiences of colonialism to future expectations of global competition in a bioeconomy. However from the existing comparative literature in Latin American genomics, where there is not only the similarity of trying to protect the biogenetic resources of the nation-state but also common national identities built around Mestizaje, existing

[229] cf. Benjamin (2009) for a general comparative overview of genomic sovereignty with South Africa and India.

data warns us against making grand generalisations (Wade 2011). For example in countries such as Brazil the Afro descendants are much more visible than in Mexico in which the Afro-Mestizos are diluted in the public eye almost to the point of invisibility; while in Brazil there is a system of quotas to address racism and related inequalities in Mexico no such system exists (cf. Neto & Santos 2011).

As a synthesis I think that the ethos of postcolonial biopolitics in Mexico is intimately linked with the construction of genomic sovereignty and can be understood as four moments of coproduction closely related to the life cycle of this particular boundary object (cf. figure 9[A]). The social worlds and communities of practitioners that interact and even organise some of its commitments around or against the idea of genomic sovereignty in Mexico are all —in some way— producing a rapidly changing and highly dynamic contact frame: "a space in which national identity is locally and transnationally negotiated"

9.1- Postcolonial Biopolitics

> *"…The human genome is a fact that exists independently from being identified as a research/sanitary priority by a country… (ELSI, April 2008)".*

The ways in which postcolonial horizons are constructed are deeply intertwined with the political mobilisation of *Mestizaje* and nationalism in Mexico. The empirical attention given to Mexico by this dissertation moves the analysis of contemporary biopolitics into postcolonial terrains (cf. Anderson 2007) which have been previously explored in the case of Eugenics and scientific ideas that worked on notions of admixture in Mexico (Stern 2002; Saade 2004, 2011; Stepan 1991). The scientific horizon worked as a contact frame for eugenic discourses which appropriated Mestizaje to assert its anti-racist standings, and at the same time functioned as a way to make internal boundaries and distinctions between the better-off Mexicans and the less "developed" or "backward" poor and indigenous (Lomnitz 2002, chap 6).

The notion of genomic sovereignty based on genetically reified Mestizaje produces a similar contact frame that establishes Mexico´s awareness of the prospects of biopiracy and deepening inequalities in the global stage, reasserting the role of the nation-state in the 21st century. On the other hand it produced a series of legal and practical distinctions within the biomedical and policy elite that instead of creating the promised public good, generated a disciplinary notion to sanction those that challenge the INMEGEN and its nationalistic ambitions, creating a kind of endo-colonisation. In this respect genomic sovereignty indeed ordered the national character of the State in the international and domestic arenas.

Without a doubt one of INMEGEN´s successes was the lawful acquisition of many indigenous

samples as a gift to develop the medicine of the future, without generating a world scandal as happened with the HGP (Reardon 2005). However in the case of Mexico this was not very problematic to begin with, except for the ETC group and a reduced number of indigenous groups (a situation that is very different from other fields of bioprospection and traditional knowledge, in which NGOs have been able to block international cooperative projects dealing with indigenous heritage inside Mexico (cf. Hayden 2003; or internationally cf. Reardon 2001, 2005). One of the interesting characteristics of this postcolonial biopolitics is that it reworks the intimate relation between race, sovereignty and nation without re-enfranchising an imperial and murderous sovereignty of racial-national purity and its fitness (cf. Agamben 2000, 1998; Esposito 2003).

In this other (and othered) postcolonial biopolitics the idioms of autonomy, consent and individual freedom are limited and in constant tension with national discourses on public welfare, national goods and a historical consciousness of dispossession. Participation in Mexican genomics is permeated by a *Caudillo* culture that works by creating a cult around personalities rather than institutional processes. Biological citizenship (Rose 2008; Rose & Rabinow 2006) and ethopolitics are all well, except when applied to systems which, due to cultural, material and/or socio-economic specificities, produce a different form of citizenship and prudence. For example, the comparative work on Latin American genomics (Mexico, Brazil & Colombia) identifies that, contrary to the tropes of individual and autonomous biological citizenship in Mexico, citizenship differences seem to be much more indirect and difficult to assess in terms of individual responsibility over healthcare. Not surprisingly the Mestizo is at the centre of the polis in Mexico leaving little space for multicultural claims of inclusion of ethno-racial minorities or specific patients groups (which were not part of the discussions or scenario of Mexican genomics).

I would say that citizenship in the context of Mexican genomics is built with a global focus in mind: since its beginning it was a question of getting to map Mexicans and Mestizo, who were seen by the biomedical elites as a relegated population in the international HapMap. The arena in which the INMEGEN aimed to construct a logic of responsibility was geared towards international organisations. INMEGEN´s founder & first Director General Dr. Gerardo Jimenez Sanchez participated in high ranked positions in the OECD (Chair of Biotechnology), WHO (Genomics steering committee), HUGO (Board) and the P3G (board), all of which are influential international governance hubs. INMEGEN was the only institution in the developing world to be represented in the P3G, which has as one of its aims to harmonise international policy on biobanks and genomics.

9.1.1- Mextizaje: ambivalence and ethnoracial flattening

> *My recalcitrant scepticism obliged me to read the note. Is it possible to achieve in Mexico what hasn't been possible to achieve anywhere else in any other moment in History? Is it possible that the scientists that possess Mexican birth certificates enhanced with little eagles have found our national identity in a gene?*
>
> ¿El Genoma Mexicano? El Moro, 2006, Septiembre: <http://morisimo.blogspot.com/2006/09/genoma-mexicano.html>

The idea of *Mestizaje* as the core of the Mexican nation-state was not very novel (cf. Basave Benitez 1992; Miller 2004, Vasconcelos 1925), and neither was most of the policy agenda built around it; the continuous desire of Mexico to be sovereign has been an issue since the beginning of the Mexico´s independent life (Lomnitz 2010, 2002: Chap. 2). It was precisely that common ground which allowed for seemingly new objects to reverberate and enrol national identity in their lobbying endeavours. The novelty lay in the way in which *Mestizaje* and "The Mexican Genome" was made available to diverse publics in contemporary Mexico; linking abstract national imaginaries to concrete local events and decisions (Lomnitz 2002). Events such as the presidential celebrations around the "Mexican Genome" in the middle of the swine flu crisis (AH1/N1), or the various massive marketing events that put forward the idea of a genomic medicine for the developing world, in this case genetically tailored for "Mexicans," are the most visible examples of how the genetic materialisation of Mestizaje is put to work for a very specific political agenda (Chap 8).

The visual-material output of the INMEGEN and mass media portrayals of the institute made and remade the MGDP as the national symbol of genomic identity and a medical revolution. This was also a question closely related to ethno-racial flattening: a process by which the divergences, contradictions, disputes and subtle ethnic distinctions disappear from the realm of visibility, providing in its place a stereotype. During the negotiations to create the INMEGEN and its flagship project, "The Mexican Genome Diversity Project", debates on the reality of race were not as acute and problematic, and sometimes not even present. Regardless of the lack of formal or technical debates around the MGDP, disputes were represented in highly ritualised forms, since the fragmentation of the CPMG made it very difficult for dialogue to occur. It was through the reversal of INMEGEN´s public communication and nationalist rhetoric (rather than direct confrontation) that critical voices, and even the scientists inside the institute, tried to interrogate the ethno-racial flattening of mass media and INMEGEN´s marketing, and/or differentiate their uses of ethnoracial categories from highly nationalistic vernacular categories deployed in mass media[230].

[230] Inside INMEGEN's Population Genomics laboratory, the existence of a "Genomic Map of Mexicans" fades away when it comes to talk about the "Diversity Project". Whenever the first name is used, it is to

The common trail of all the chapters was the way in which *Mestizaje* was substantiated, enacted or resisted, and what the implications of such social world tailoring were. What all these enactments of *Mestizaje* shared was an expectation of market mechanisms intervening or becoming the final arbiters of the reality of genomic race: either through clinical trials which would become a barrier for those wanting to profit from Mexican genomics (Chapter 5), or through the production of more efficient ways to diagnose patients, resulting in increased savings (36% of the total cost of diabetes, cf. Chap 3 & 6) for the public system of health. The market and its cost/benefit mechanisms mediated Mextizaje. Ethnorace was not deployed to talk about the fitness of Mexicans, or to contravene a racialised scientific realm, as it happened in post-revolutionary Mexico —visible in the work of Vasconcelos and in the response of Latin American and Mexican eugenic societies to European and American agendas on racial purity (Stern 2002, Stepan 1991)— but as a competitive advantage against those that had more resources, specialists and technological skills and could potentially block or colonise a prospective new medical market and a burgeoning Mexican bioeconomy.

We can think of ethnorace and its genomic production in Mexico as a strategic reification; flattening certain properties and sharpening others to fit the purpose of local political agendas, i.e. "The Map of the Mexican Genome" in the middle of the swine flu crisis. In other settings it can easily be appropriated to become a regional genome (Sonora, Oaxaca, Nayarit), or a proxy for the genome of Latin American countries with a similar history of admixture. However the limits of such strategic reification become more evident when it is translated to law. The question of how flexible is the Mexican genome finds its full stop once it becomes the indigenous genome, or the biocultural heritage of native communities in Mexico, a reification haunted by the ghosts of inequality, endocolonisation and indigenous autonomy; issues that are systematically kept out of the official policy agenda.

9.2-The many faces of coproduction: silencing, strategic ordering, resistance and simultaneity

> *the dilemmas around how you are going to produce some scientific theories as well as political theories to produce the Mestizo… to create an epistemic space for the Mestizo[…] and set out a project to coproduce or gather the necessary political and scientific support to launch their own project… so a coproduction frame would call our attention to the scientific and political dimensions of that project at the same time recognisable for the scientific and political communities (Reardon 2011).*

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make reference to its political or marketing connotations (cf. Chapter 7).

Coproduction is always an empirical issue; the tacit repertoires by which communities, nation-states or social worlds/arenas decide between legitimate and illegitimate knowledge are not fixed, and although they are recognisable through time, an example could be taken from the way in which the UK, USA and Germany decide matters of biotechnology & patenting of DNA and living —genetically modified— organisms (Jasanoff 2005, Chap 7). Despite the utility of thinking in the idioms of coproduction, in Mexico more than one civic epistemology can be recognised. At this moment there are distinct and sometimes contrary arrangements between nature and society which are still struggling to be coupled into a stable national Mexican ethos. It appears that the initial sovereign frames on which the INMEGEN was built are rapidly changing and being left aside by the new administration of the institute (cf. Lopez Beltran & Rios Sandoval 2011; personal communication Dr. Rilke 04/10/11).

Two orderings largely coinciding with the policy-regulatory world and the scientific world can be distinguished: the first is linked with "Mexican uniqueness," and the second works on specific probabilistic, relative and nonetheless racialised molecular populations. Deep distinctions between legal and scientific expertise started to become more visible, as the work of both scientists and lawyers tailored boundary objects to fit their own agendas and local purposes (cf. Chap 5 & 7). My difficulties with coproduction stemmed from realising that at any one point in time there are multiple arrangements or possibilities of social and natural orderings coming into being. As a matter of fact these multiple translations and ways to conceive of the proper relation between nature and society hardly coordinate into creating or reshaping institutions, identities and expectations, or questioning the stability of existing arrangements. These moments of creation are rather scarce. Most of the time various alternative arrangements of nature and society remain "othered," while some relations between genetic science and ethics occupy the centre stage, meaning that in order to explore some of the most problematic issues of Mexican genomics is to move into a realm of simultaneity and fragmentation.

Another of the problems I have with the coproduction idiom is that I indeed experienced a deep division of labour between legal and scientific experts. At least in Mexico[231] it is very common to elicit ideas coming from both legal and biomedical experts who constantly restate this profound division: molecular biologists posit the knowledge about the physical properties (states) of things—in this case genomics— while legal experts deal with the proper ethical use of scientific "consensus" or scientific "evidence" (i.e. according to my informants, proved and certain

[231] I have the feeling this is not an exclusive feature of this country or the developing world; nonetheless in other civic epistemologies might one approach the question of scientific expertise in different ways, one of which could be looking for scientific consensus when there appears to be none.

knowledge of the natural world). Even though genomic sovereignty became nonsense in the laboratory and a legal void when thought of at the level of international cooperation and patrimonial regimes, in its beginning it was the catalyst for the refashioning of both social worlds and the postcolonial vision of genomic science.

As boundary objects travel and are transformed by the social worlds who commit to tailor them for their particular interests, new epistemic standings emerge. Those authors of the MGDP that had little or no contact with software or the dilemmas of organising the millions of SNP's produced in the laboratory had in common that for them variability was simply a reflection of what had been said in the lobbying process: "our genetics are the mirror of our unique history".

By exploring interpretations of genetic variation under the grain of the socio-material practice found in the PGL, chapter 7 offers a detailed account of the way in which ethno-race and time are intertwined with this particular scientific field. I propose that we should think that once Mexican biogenetic uniqueness travels to the laboratory, a new process of categorisation, boundary-making and standardisation occurs; opening up new communities of practice and socio-technical meaning which are slightly different from the dominant national and scientific narratives on genomic science.

In Mexican genomics we should not intend to explore one dispute, but many disputes and conflicts: "possible contact frames" that have shaped the social worlds committed to population genomics, and its promised revolutionary application to health care.

1) **Simultaneity:** policy innovation, the creation of the INMEGEN and genomic sovereignty as an ideal map presents an example in which both natural and social order were indeed produced by an alliance of both legal and scientific experts and in the same set of negotiations (1999-2004). In this alliance scientists could not talk or experience the physical properties of things —since they did not have the equipment and resources to do so— and legal experts could not legally order technical consensus because there was none; and yet genomic sovereignty and the INMEGEN were created.

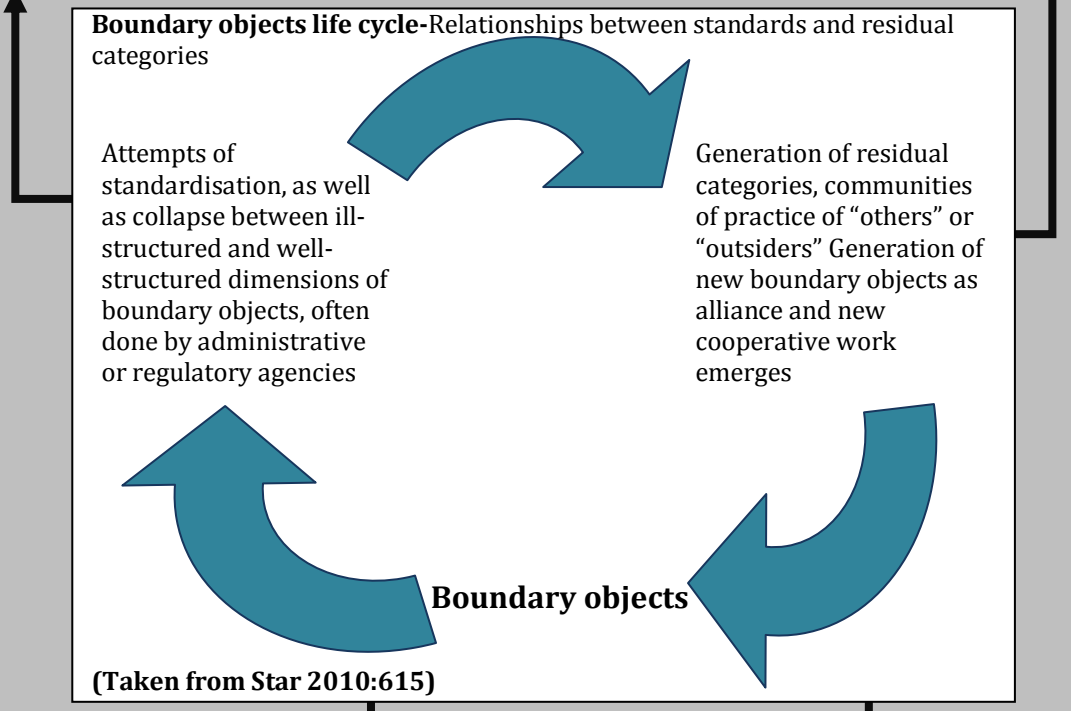
2) **Resistance:** Coproduction as resistance can be tied to the process of creating new boundary objects —redefining the identity of the communities and individuals involved in such processes— that in the face of contradiction rework certain aspects of boundary objects. As genomic sovereignty moves from an ill-defined (roadmap) to a well-defined object (legal sanction, or Mexican biogenetic uniqueness in the laboratory) the statements of genomic sovereignty as a restrictive law become an imposition for the original members of the CPMG (Chap 4 & 5). In the laboratory lots of work of clarification

and mathematical modelling are needed in order to distinguish between the MGDP and the "Map of the Mexicans Genome"(Chap 7).

Figure 9(A)-**Stages of Coproduction and Boundary Objects life cycle**

Silencing as coproduction is paired with the process of standardisation, unilateral decision making and the rupture of the epistemic community (Chapter 6 &3). Natural and social orders are constantly produced by iteration and systematic avoidance of confrontation or dialogue. This type of coproduction makes the contradictory elements of genomic sovereignty more evident, as well as and the rifts between legal and scientific work.

Coproduction as resistance as social worlds tailor boundary objects certain characteristics are erased, and some others are re-elaborated to fit specific needs and commitments. Exoteric and esoteric configurations of natural and social orders are produced (haplotypes in the laboratory and the questioning of patrimonial regimes in the ELSI).



Coproduction as simultaneity truly moments of innovation and emergence; in my own fieldwork these were rather novel fragments of experience. The lobbying of the INMEGEN and its creation and the MGDP project can be seen as larger processes of coproduction as simultaneity, in which boundary objects organise an epistemic community, coordinate interest and chart new territory.

Coproduction as strategic ordering closely related to the work of ritualisation, coproduction as strategic ordering is a repetitive action by which the values, information or promises put forward by a boundary object or a set of boundary objects are represented. In my own case study this was done through a public script of the benefits of genomic medicine, plus the production of a long series of images, chants, audio-visual toolkits and comic books -this work keeps boundary object in circulation.

3) **Strategic ordering:** the repetitive and constant work of promotion, marketing and public

communication of science to key audiences such as volunteers in the MGDP, senators and governors can be linked to a specific boundary work (Gieryn 1995). Between the inside/outside of serious research, as well as a subjunctive world of "as if" in which contradictory propositions coexist, strategic ordering "is work, endless work(Seligman et.al 2008)";

4) **Silencing:** characterised by efforts to control institutional (or national) images and communication, avoiding debate and ignoring that there is dissidence or alternative visions to your own. The everyday ELSI practice ignored ideas and groups opposing certain policies, or simply assumed there was no counter discourses or discontent; the "others (everyone except high status audiences)" would symbolically disappear or desist in their critical intent, and giving ears to these criticisms or disputes was accepting there was discontent in the first place. Despite all these efforts in order to face opposition these silencing tactics seem to fuel dissidence instead of erasing it.

I think there is something potentially misleading about thinking of coproduction as a simultaneous becoming of social and natural orders; or as a civic epistemology that largely coincides with a public reason of democratic nation states (Jasanoff 2003), since in Mexico a democratic spirit of open debate between free standing citizens is a rather rare event. Most of the time confrontations or negotiations happen in highly ritualised and ceremonial forms (cf. Lomnitz 2002, also see: Lopez Beltran 2011; and Lopez Beltran &Vergara 2011; Chap 8). In this civic epistemology, under intense scaffolding, many configurations of nature/culture need to be addressed as well as the practices and deeply asymmetrical power relations that produce them.

Boundary objects can help us go beyond the general idioms of coproduction, providing an entry point into civic cultures going through intense scaffolding, such as the Mexican one, and also addressing the question of epistemological salience. Policy agendas, epistemic communities and socio-scientific works are organised around boundary objects, and by following their movement and life cycles (Star 2010) a more nuanced understanding and account of the relation between natural and legal order can be provided. We have to remember that boundary objects are not needed in spaces in which one vision of the world has primacy over the others, or in which a well-defined version of what types of entities exist in the world has been stabilised or imposed (like with the law on genomic sovereignty, or when genomic entrepreneurs decided to accept the prohibition on cloning and stem cells regardless of the consequences such a decision would have for their allies).

9.3- Weak Sovereignty: from a boundary object to a

monopoly of the "Mexican genome"

> *...The theory of sovereignty then became a weapon that was in circulation on both sides, and it was used both to restrict and to strengthen royal power [...] It was, in a word, the great instrument of the political and theoretical struggles that took place around systems of power in the sixteenth and seventeenth centuries (Foucault 2003[1975-76]: 35).*

The juridico-philosophical theory of sovereignty that Foucault (2003[1975-76]) so clearly recognised as one of the discursive weapons in circulation in the monarchical struggles of the sixteenth and seventeenth century is not at all irrelevant for contemporary politics in Mexico. Claims on sovereignty are still a way to mobilise conceptions and agendas that elaborate on the proper distribution of power and the places from which it should emanate. The postcolonial awareness that emphasises future genetic dispossession and the asymmetries of power in the international biomedical arena is my paradigmatic example to point towards this new biopolitical space and what I call *weak sovereignty*. The awareness of possible dangers —related to a new biocolonialism— substantiates the claim for Mexican genomic sovereignty and this specific type of sovereign claim coming from a position of weakness (Chap.3 & 4).

According to Claudio Lomnitz (2002), the notion and practice of sovereignty, nationalism, and law in Mexico has been informed by "recurring modernizing fantasies and aspirations (110)". Thinking along this genealogy, genomics is not only the latest threshold of sovereignty with all its modernising fantasies —but a rich and informative *milieu* in which we can actually analyse contemporary sovereign practices—. In the first section of this dissertation I described and analysed the terms by which genomic sovereignty resists becoming a well-defined object, or what we could frame as the stubborn vagueness of genomic sovereignty. This tenacious vagueness becomes all the more visible after silencing and fragmentary strategies were put in place in order to shield the scientific and ethical proposition on which the INMEGEN was built from exterior attacks (cf. Section 1).

Contrary to INMEGEN´s foundational narrative (Chap. 3), the kinds of practices that substantiate the translation of the notion of genomic sovereignty into law creates boundaries in a very different way, in which the actors involved in the event know that whatever their input would be, the decision has already been taken without their visions or concerns being included. Imposition and silencing were an integral part of Mexican genomic governance mechanisms. The translation of genomic sovereignty into legal disposition is based on silencing and unidirectional decision making. Authorities in the field systematically maintain silence, "letting the dogs bark". This is one of the expressions used by some informants (mostly top officers) when asked about the silence towards the blog and the other public accusations of corruption. In a way, answering to critical

voices was giving them substance, making the gossiping real; "...let the dogs bark" is a strategy to hide the real anxiety produced by those anonymous confrontations and show the superiority of the official discourse over their inferior antagonists.

Many bioethicists, regulators and the few ELSI researchers with whom I worked recognised that public communication was a mere simulation, since public formalities were not accompanied by an extensive negotiation process like the one done by the CPMG in its lobbying efforts (1999-2004), which was absolutely essential for the successful introduction of genomic sovereignty. The open disputes around Mexican uniqueness appear at a time in which the disciplinary and coercitive dimensions of the reification of Mexicanhood struggle to become an overarching ethical-legal and restrictive ethos. As a consequence of the monopolistic legal approach to population genomics research, the social world that collaborated and even emerged with the creation of the INMEGEN became even more polarised and divided.

In the case of the INMEGEN and the MGDP, the fraught political arena meant that their scientific work was under constant scrutiny from opposing scientific and policy groups. In chapter 6 I presented some of the disputes around the MGDP's representativeness, its economic promises and what I framed as a scientific *caudillismo*. The dominance of socio-political visions based on *compadrazgos* (cronyism) and corruption pervade the discourse of legitimacy in Mexico, providing a constant trope for critical appraisal, attractive to many audiences. The style of questioning public facts, or for this case population genomics, resembles the disputes around a royal symbol. Scientific disagreements in the field were intimately intertwined with the public persona of Mexican Genomics at the time: Dr. GJS.

Techniques of fragmentation like silencing (boomerang effect, Chap 4) or unidirectional renaming —like when the new Director General Xavier Soberon changed the public name from "The Map of the Mexican's Genome" to the "Map of the knowledge of the Mexican populations" without consulting with anyone— in order to avoid debate or "thorny issues" (Soberon int. 2009) are rather common. However even in the face of tight maintenance of discursive limits, there is an ongoing —even if not publicly accessible— negotiation around the objects and relations sanctioned in the law: the response of the ELSI to the law on genomic sovereignty is an example of such negotiations (cf. Chap 5).

I argued that silencing and imposition in Mexico is very different from an imperial coercion, simply because it is unable to achieve the subservience and domination of the other, and that it needs to resort to different techniques of persuasion such as strategic ordering and ceremonial events, and the very claim for sovereignty: "among countries, just the underdogs claim

Sovereignty because they don´t have it. I have never heard the UK, USA or Germany do so [claim sovereignty], because they don´t need to. It is the same as with the constitutional article making explicit the equality of women, it has to be written on the Code of Law, because it does not exist as a social reality...Juan, Bioethicist and Legal Scholar (field notes June, 2010)".

9.3.1- The binary code of law and the tenacious nature of reality

> *We live in a world where the battles and dramas between the formal and informal, the ill-structured and the well-structured, the standardized and the wild, are being continuously fought (Star 2010:614)".*

In Butler's account of sovereignty in Guantanamo Bay —as an example of modern imperial biopolitics and sovereign mechanisms— she states:"...law is not that to which the state is subject nor that which distinguishes between lawful state action and unlawful, but is now expressly understood as an instrument, and instrumentality of power, one that can be applied and suspended at will" (Butler 2004:83). In Mexico and other Latin American countries the instrumentality of law has become a defining national character: "I obey but I do not comply (cf. Chap 5)". What is different from a sovereign imperial will actualised through law is that sovereignty in Mexico was tied to the promise that adequate regulation and the creation of the necessary infrastructure will bring independence from international capitalist interests in a global market. The enthusiastic adherence to international treatises, especially the 1997 UNESCO declaration, came hand in hand with the negotiation of the INMEGEN, the repetitive statements circulated in the Congress, and the reinterpretation of international law to strengthen national interests such as making the Mexican genome the "real" property of Mexicans.

For many informants working in bioethics or the laboratory bench, genomic sovereignty is an antithetical entity based upon a collective genetic heritage that cannot be defended, while sovereignty over the individual genetic information is the only thing that makes sense (cf. Chap 5 & 7). For the congressmen and various regulators, the distinction between an individual or collective will and the right over its genetic information does not seem to be spurious or problematic at all (D.O.F 2008). In Mexico "claiming that the genome is the sole property of individuals and the Mexican genome is a public good of the nation" is not problematic either in technical or in bioethical terms since it is considered to be an intimate element in the biological composition of the person and its human dignity, regardless of the lack of actionability of this legal principle.

The problem of claiming and effectively enjoying individual benefits from our genomic information arises from the fact that such information is generally of no use without an army of scientists,

machines and expectations which make them valuable in a future bioeconomy. The collective nature of such an enterprise already destabilises the idea of individual property. In the biopolitical design founded on certain collective, or so called popular, sovereignty there is a different dilemma. The rule, security and self-determination of the nation-state based on the "Mexican Genome" seems to be a spurious (or at least very suspicious) entity. In this case, when sovereignty is based in the collective it becomes more problematic to define and separate it from other genetic entities in the world, since populations are based on relative frequencies of DNA that don´t obey political borders (cf. Chap 3 & 7).

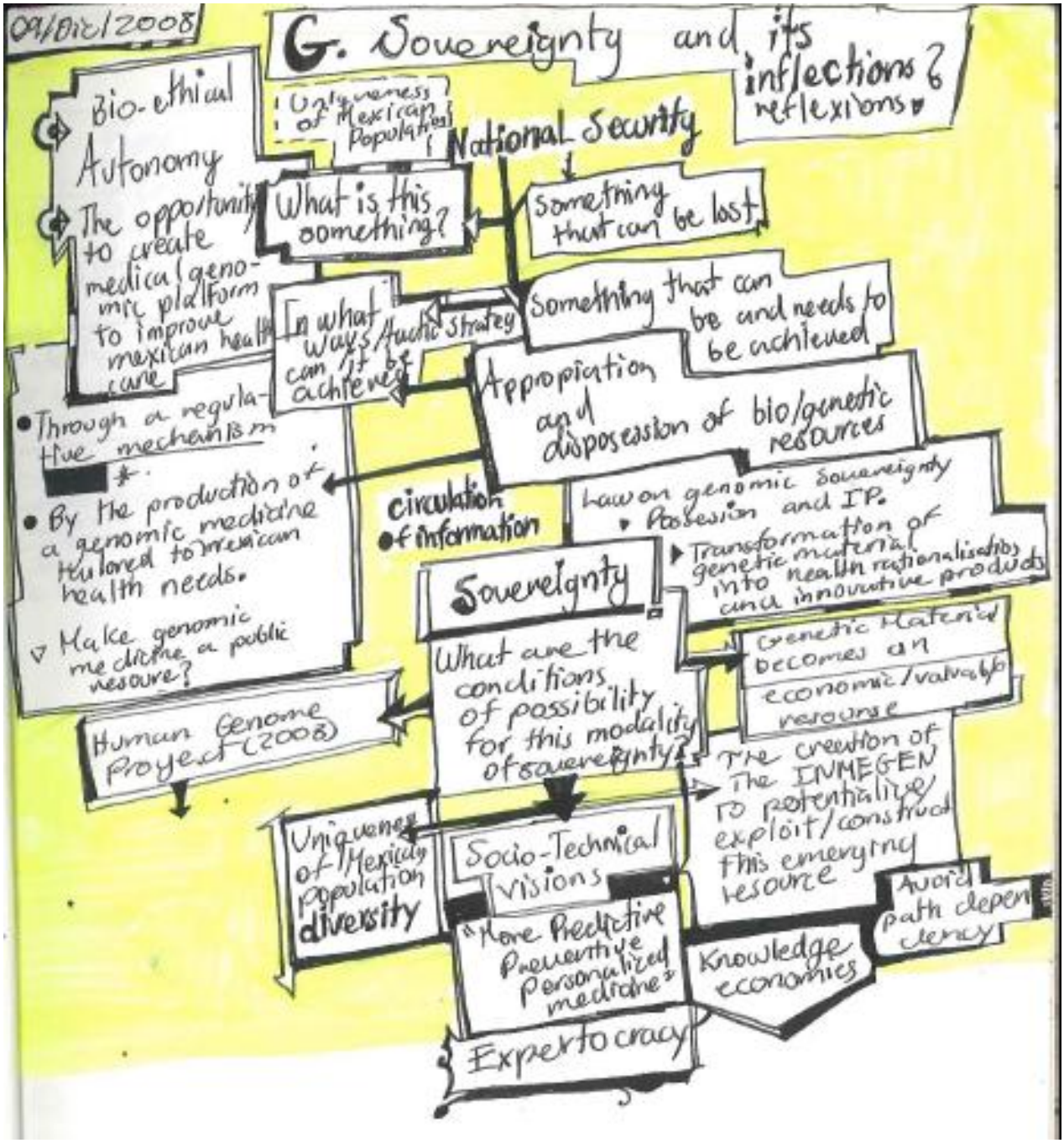
The resistance of the protected object —the Human/Mexican genome— to the existing juridical principles of patrimonial right makes evident the inoperability of the binary code of prohibited/permitted, real/symbolic property, Mexican/Human Genome, or any other division that does not address the polyvalent nature of this "intangible" thing. Although this debate has been kept out of the public sphere by what I have described in chapter 6 as a process of silencing, I think it is a fundamental issue for the policy agenda emerging in the developing world which aims to protect its own biogenetic heritage; whatever that may be. The question that is raised here is not only that law cannot grasp the intricacies of genomic research and practice, but that it lacks the language to do so —our patrimonial conceptions are based in a world that regulates fixed objects rather than polyvalent and fluctuating entities—.

In our insistence to grasp and intervene in the world through those legal categories we only make more visible their lack of actionability. Contrary to the official opinion of the ELSI (28/April/08), I think the genome —especially the Mexican Genome— is indeed deeply connected with its identification as a research and political priority in the country. Without this sovereign political input and historical desire, the massive sequencers, scientists and systematised samples needed to bring "population genomics" and its public health applications into being would most probably not exist at all. It is possible that as Curtis (2002) has shown in his historical recovery of Foucauldian biopolitics, a sovereign medieval intervention was what made it possible to think in terms of populations; today sovereign struggles are part of new biopolitical configurations. We need to rethink the spaces that biological citizenship and ethopolitics have "othered" in order to open up the "multiple politics with inequalities, opportunities, complexities, and dilemmas both individually and collectively (Raman and Tutton 2010:730)." Sovereignty, weak, subaltern and troubled —with a hyper awareness of backwardness— shapes the ethos of Mexican genomics in ways that require us to re-think the relation between race, law and science in the postcolonial scientific horizon.

Annexes

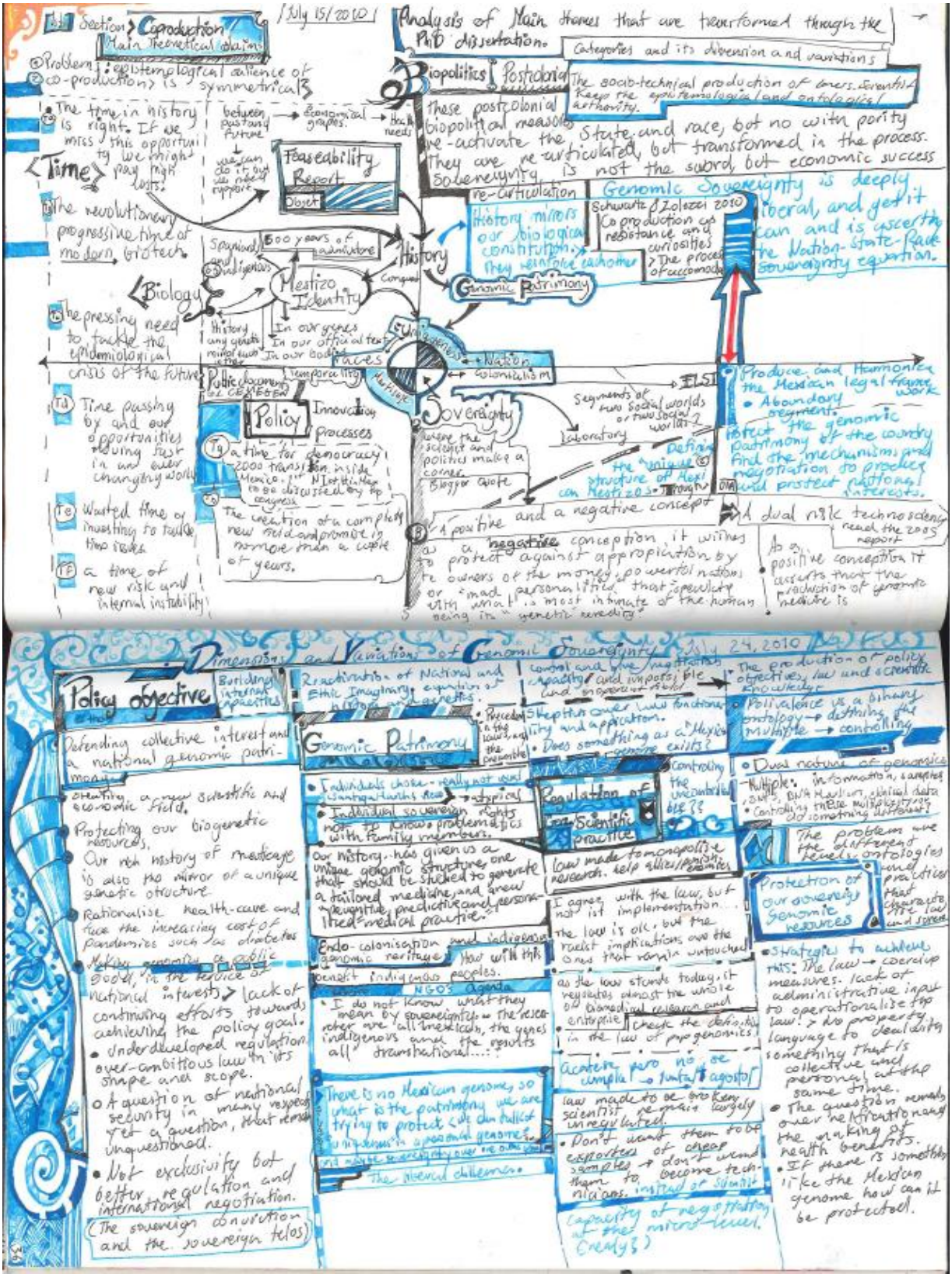
Annex A-Situational Mapping efforts

First Exploratory map-December 9, 2008

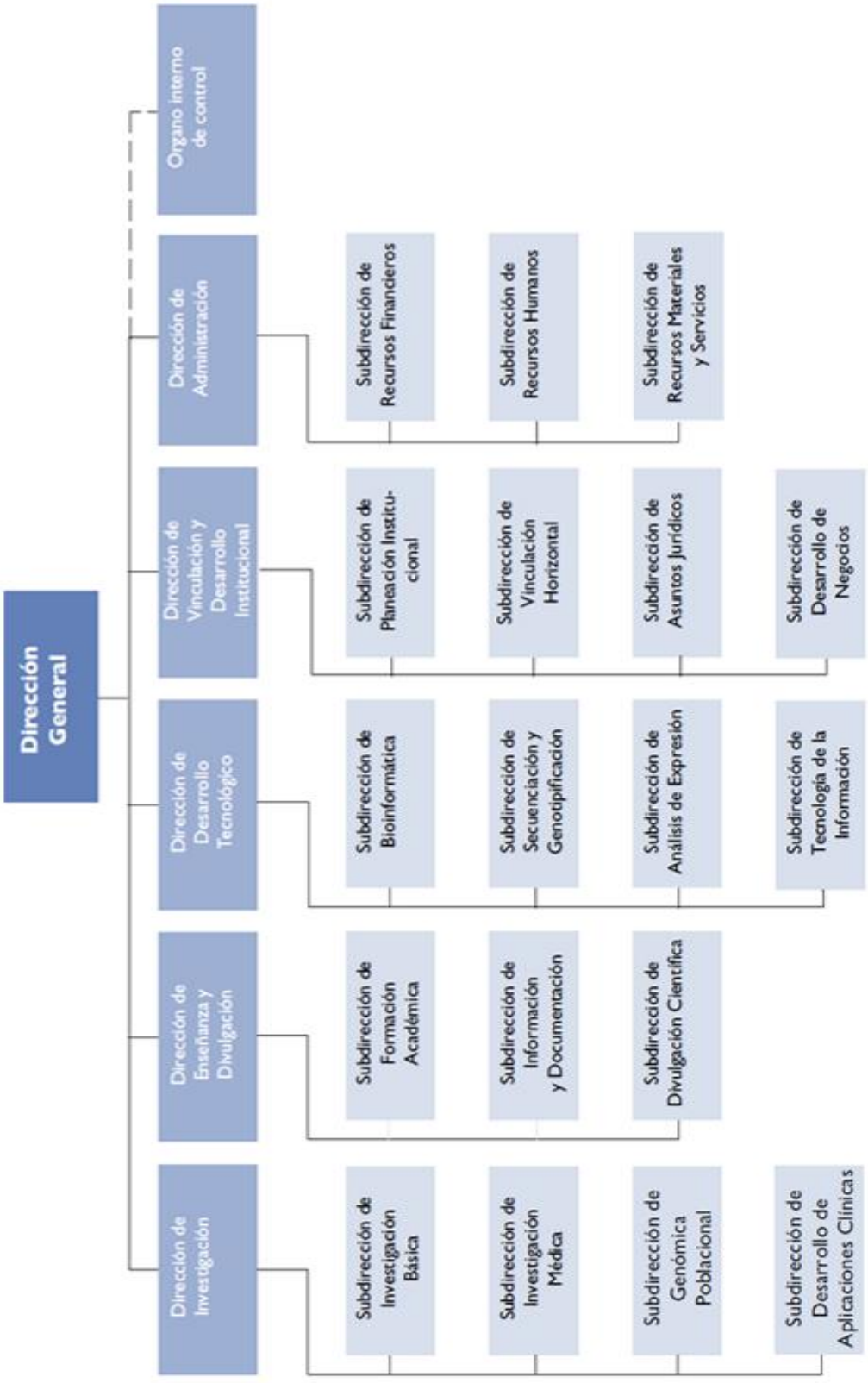


Situational Map, 8 of April 2009

Dimension and Variation on Genomic Sovereignty: July 2010



Annex A.2- INMEGEN´s Organigram



Annex B- "...If scorpions could fly": Opacity and backstage negotiations

Corruption and cronyism permeates public opinion in such a way that both the scientific and political spheres are understood and explained under an original sin perspective, rooted in the very foundations of Mexicanhood. Corruption is said to be originated by the exacerbation of oligarchic interests in a constant struggle to control and appropriate public goods. Yet it is precisely by the invocation and mobilisation of resources toward the construction of a public good, by which the mechanisms of opacity and uneven private distribution of benefits work, according to my informants. All those I interviewed said to despise such culture, but they are well aware that it is the norm rather than the exception; it is "The System (popular way to make reference to it, amongst lawyers and elite policy makers)". In such scenario one never knows, who is saying what, under which conditions and with what interests, so relation of friendship and trust are of principal importance for the way in which affairs are conducted in and out of the laboratories of the INMEGEN.

An example of this ubiquitous culture of corruption or the "System" as my informants refer to it, can be found in one of the commentaries in the electronic version of a newspaper article denouncing the irregularities in the construction of INMEGEN´s permanent building: "Not only buildings, but roads, bridges, medicines, etc. are part of the corruption culture.... What Institute, Agency, Secretary, or any governmental agency, whether Federal or Municipal makes things the way they should be? We all know that any "work" relies on the "mochada" (slice) for "los jefes" (chiefs)... just here [*in Mexico*] things like these happen... (Martin in Cruz Martinez, 2009: electronic version)". In the case of the INMEGEN my interview with Artemio Cruz (the former right hand of Dr. GJS in the process of lobbying) was the most direct reference to the institutional corruption scandal. He told me that his personal disagreements made him "uncover" his boss in front of the highest health authorities. He gives an account of a meeting in which he presented compromising documents and data on the administration of the INMEGEN (int. 2009).

The time frame he talks about coincides with the major disputes amongst policy makers in the field of public health in Mexico. The rumours on the backstage practices of the INMEGEN and its corruption scandal were so overwhelming in the field that it became king of a story behind the story. People from all institutional corners shared with me different stories about the building and the scandalous misadministration-corruption that lead to a huge building that could not be used to propel the field of human genomics as it was originally planned (Jimenez Sanchez 2005): Another source Mr. Uranga, a governmental officer at the SSA (Mexican Secretary of Health) at

the time, until then at the CNB confirmed this narrative, in fact he closely described the way in which different versions of public documents circulated between offices. Basically he described how through a series of official memos, telephonic calls and counter strategies Gerardo Jimenez faced such grave accusations, and finally withheld his positions as Director General (field notes, paraphrasis August 6 2010). A timeline of events (cf. field notes 26/05/09) was given to me by an informant who thought it was his civic duty to reveal what he knew about the confrontation between Artemio Cruz, Dr. GJS and Dr. Angel Cordova Villalobos Mexican Secretary of health of Mexico (2006-2012). The whole time I spent in the field —I have to confess— I was incredibly bored by all the corruption issues and I tried to avoid chats about corruption, but they kept popping in formal and informal chats[232].

What can be followed was that the whole governing body of the institute was replaced by public critics of the project: amongst them were open critics as Dr. Elias, and sceptic bioethicist/biomedical researchers[233]. Ex-Secretary of Health Julio Frenk Mora, who was part of the governing body of INMEGEN, remembers such decision (the destitution of the directive board) as one with no precedent in the history of a M-NHI, in which imposition ruled rather than negotiation (paraphrasis int. 2009), The opacity of the anonymous filtering of information to mass media and the cyberspace was condemned by Dr. Frenk Mora (2009), as another tactic of factious disinformation and struggle in a system mostly ruled by impunity. During the two years of participant observation the only time I could really access such elite backstage practices was when I participated in the 5th Anniversary of the INMEGEN celebrated in the Mexican Senate. This event was organised as a response to the previously "unfriendly" invitation (exigency) for Dr. GJS to explain the irregularities and rumours around INMEGEN´s building.

It was not in the podium, or in the chit-chat of speakers in the hall, but in the meal prepared for the guests, that Teresa —a woman around 50 years old— elegantly dressed and who introduced herself as a political actor acquainted with the highest spheres of policy; interrupted the meal to tell us a story. Basically the story thematised the original national sin of Mexico using the phrase "... if scorpions could fly", to warn us about the undesired consequences of giving voice to

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[232] I think my readers should know that at the time when this happened many of my informants thought that microphones and cyber surveillance devices were placed in their workplace, so they way in which I received this data was through a paper note, left to me in my temporary workplace at the ELSI kindly inviting me to copy it and then destroy it, or return it to him (I took the second option), since my informant did not want his handwriting to be recognised.

[233] The way in which public experts appear and reappear in the political scene is just but one of the signs of the expertocratic and closed membership of knowledge and policy in Mexico. While it made it all easier for my research endeavour it indeed impoverished open discussion and debate.

dissidents. Her dramatic entrance into the private hall of the Senate was accompanied by a denunciation of a complot orchestrated by the absent figure in the celebrations—the Mexican Secretary of Health— (even though elegantly she never said it, she just implied it) and his team of ultraconservative catholic allies[234].

The story of Teresa continued for 30 minutes in which she presented the case of Dr. Gerardo and the building of the INMEGEN. Passionately narrating a story in which different stenographic versions of directive boards meetings, were used to incriminate Gerardo. Citing the unfounded rumours circulating in the presidential meetings as the only basis for such accusations, she finished saying "... the matter they don´t understand is that we don´t have another Gerardo, how scientists of his calibre would like to come back to Mexico... if we criminalise them and damage their reputation... (field notes paraphrasis 09/March/2010)". In the same meeting Senator Francisco Castellon Fonseca, president of the Commission of Science and Technology of the Mexican Senate, said he started to be suspicious of the real intentions of those who wanted Gerardo´s head, since the tone and style of their accusations was "virulent and not very objective (field notes 9th of March 2009)". Ironically what he did was to call an academic political figure of UNAM´s-IIJ (present in the meeting) that he trusted, in order to know what was happening: if it was internal vice or outrageous corruption.

All of the (mostly backstage) debate has been informed by the idea of Mexican national sin, and lack of transparency. The backstage politics I have described possesses no instrument or technology to mediate between rumour, gossip, public evaluation and personal disputes. Rumour can become in question of hours national interest and vice versa (like in the point of agreement made by the Science and Technology commission which was then forgotten D.O.F 4/12/08).This fluidity between rumour and national interest constructs a constant need to evaluate the origin and intention of communication, making it difficult to make decisions based on something different from personal trust and reputation.

[234] Specially Secretary of Health Legal Director: Attorney Fernandez del Castillo, brother of one of the Archbishops in Mexico and a figure amongst ultraorthodox Catholic groups in Mexico.

Annex C- Silencing and censorship in the public realm

The way in which the ELSI tried to administrate conflict and confrontation in the public realm was through elegant censorship and the management of an institutional identity. Both of these were part of the tactics deployed to control ELSI discourse, and it is crucial to understand the way bioethics is ordered in Mexico and the systematic silencing of critical or simply alternative voices. The censorship practice moved between an elegant "let´s get the meaning right", to an open erasure of problematic topics, especially from the text of the law. This management of discourse became (officially) visible to me once I began discussions with Marco Aldebaran about the presentation the ELSI team (Volkovak-Altair was not invited) and I would make in the Mexican Senate to celebrate the 5th anniversary of the INMEGEN (cf. Schwartz-Marin, 9 of March 2009)

Marco Aldebaran wanted to rehearse our presentation so we conveyed the "right" meaning and we could give feedback to each other, I agreed and we did the exercise. In my presentation I wanted to discuss the idea of US researchers looking to enrol minorities for biomedical research in developing countries which lacked regulation on these issues (cf. Epstein 2008). The response of Marco Aldebaran was that I should avoid identifying the origins of the researchers, since we did not want to sound "red (*rojillos*)", "anti-Yankee" or like "old fashioned nationalists" [235,236]. This elegant censorship was a common practice at the ELSI (field notes 26/01/09 & 13/02/09:16-20).

A week afterwards, in a kind of experiment, I tried to open new topics while giving my talk at the Senate (after all this was a one of a kind event which was worth the risk). My talk was about exploring what kind of legal doctrine would be most appropriate for regulating a patrimony that was part of families, individuals and even continents (cf. Ossorio 2004; cf. Schwartz-Marin 9/02/09). Apart from the topic of the talk, which was a subtle challenge to the boomerang effect, the experiment was that I purposefully gave the talk 10 minutes shorter in order to allow time for questions and debate. In the previous 7 months while discussing with Volkovak about the "System", I always questioned whether the extent to which the antidemocratic ethos lived at the ELSI was less the product of stringent and inflexible censorship and more due to a tacit acceptance of institutional order— i.e. lack of challenges to silencing—.

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[235] http://www.senado.gob.mx/comisiones/LX/cyt/content/presentaciones/docs/Ernesto_Schwartz.pdf

[236] The very same day I had my presentation rehearsal at the ELSI I was officially welcomed to the team— after almost 6 months of fieldwork— by both researchers, who told me that now that I was being censored I really knew how it felt to work at the INMEGEN and to be an institutional ELSI researcher (I guess this was my initiation ritual).

The ELSI researcher and I agreed that I would open a space for commentaries, discussion and questions at one of the most important political venues specifically designed for debate, the Mexican Senate, and see what happened (field notes 17/02/11-15/03/11). Even before I accepted the first question, the chair of the panel Dr. Diego Valades very politely and with a smile on his face explained to the audience "that the format of the chats to celebrate the 5th anniversary of the INMEGEN, was not designed for questions"; he continued to praise my talk, made a few remarks and then —again very politely— asked me to take my seat. On the other hand "less elegant" silencing metaphors such as "let the dogs bark (a derogative way to say let them gossip or complain)", became relevant in relation to an everyday system of code words by which institutional communication had to be harmonised (controlled, censored, or erased).[237]This communication and research disciplining strategy was counterproductive in many ways. The most visible to me was that instead of creating the disciplined and loyal body of researchers it aimed for, what this strategy generated was its first critical audience: the two ELSI researchers and a third one who had resigned a couple of months before I arrived to the field (Dr. Belmont).

At the light of these politics of silence Dr. Belmont qualified the ELSI practice of the INMEGEN as "irrational": instead of exploiting their political capital to expand and enrich their idea of genomic sovereignty they preferred to do nothing: "...I always questioned them, why not start moving the idea in Latin America, we had the contacts with the international bioethical organisations, the UN, key policy makers and everything... but they would not let me do any of that...I guess because they wanted to put their name on it before... or something (int. paraphrasis 2009)". Nonetheless the core of the genomic entrepreneurs were capable of reproducing their notions of social, legal and natural causality in almost all the legal corpus dealing with these matters in Mexico. As evidence, I ask my readers to compare the laws that have been created since 2001, they would easily spot that most of them work on the basis of copy paste, and share most of the basic premises se: D.O.F 2001 a, b; D.O.F 2004, D.O.F 2008, Law of Nayarit 2009).

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[237] For example "let the dogs bark" was basically used in the context of outsiders to elite policy circles, such as NGO´s (in this case the ETC) or middle ranked officers that voiced a critique but had no status to challenge any of the top ranked officers. When critical audiences of high status, such as senators, bishops or even the wife of the president (who visited the institute), voiced a critique the strategy was very different, and instead of "letting them bark" they would be invited to an institutional tour and a top level meal with INMEGEN´s Director General and its high officers (cf.Chap.7, also see INMEGEN´s webpage to get a brief summary of their visits and the official photos: www.inmegen.gob.mx, an English version is available). At some point Congressmen, Clergy and the Mexican Conservative party (PAN) have all been amongst INMEGEN´s critical audiences, all of whom visited the INMEGEN and were taken to an institutional tour by the Director General, invited to a meal and generally treated with the pomp expected for such singular characters (the pomp was a bit reinvented every time, but it had certain fixed characteristics cf.Chap.7).

Annex C.1- The power of Genomics in Mexican Law.

Laws in the Mexican Congress

Legislative Creation of the INMEGEN

2004

Gaceta Parlamentaria, Cámara de Diputados, número 1486-II, jueves 29 de abril de 2004

As a consequence of knowing how the human genome is structured, we will really understand the molecular mechanisms of health and illness. With time, we would perfectly understand the action of the genes, their expression, and therefore when, how and why they order the cells to synthesise the proteins, which make possible for the organism to have predispositions to diverse illnesses, and achieving through this new knowledge the medicine in its preventive area, elaborating the pharmacogenetics in order to delay or avoid the development of the illnesses that the individual will genetically present in their lifetime.

The DNA is the genetic archive in which the instructions that a living being needs to be born, and develop from the first cell, are printed....

The rhythm of change will depend fundamentally in the resources available to scientists in order to be able to work, and in the advances of the technology and bioinformatics. It is most certain that in 25 or 30 years the way in which we understand the biosciences and the way we treat illnesses , will make the advances we now consider fantastic, authentic medieval anachronisms for the specialists of the future.

Legislation on the Human Genome

2001-2003

Gaceta Parlamentaria, número 845, miércoles 26 de septiembre de 2001. (208)

Gaceta Parlamentaria, número 902-I, lunes 17 de diciembre de 2001. (389)

The Human Genome Project (HGP) has as an objective not only to know the complete sequence of DNA, but also to know the exact location of each gene, and the function that it has in the construction of a new human being.

One of the most immediate consequences of the HGP is to have at hand techniques to distinguish molecular markers for the diagnosis of genetic illnesses, of cancer, and of infectious diseases. With greater time lapses, it is hoped that genomic research, could give us the possibility to create new generations of pharmaceuticals, which could be more specific and that they will tend to treat the cause and not only the symptoms. Genetic therapy could bring, in a future, solutions to hereditary and infectious illnesses.

Genomics is a new branch of knowledge that studies the group of genes as a whole, in an integral way. It implies new intellectual approaches, a change in the way to address health problems, contemplating holistically the whole, and not the traditional or delimited specialised optics. This integral vision differentiates from genetics, in which specific aspects of heredity are studied, mechanisms of just one gene, or congenital illnesses caused by the deficiency, dysfunction or absence of certain genetic material.

The study of the HGP put us closer to a new type of clinical practice, we will be increasingly more able to detect genetic anomalies, even before the phenotype of the illness is manifested. This will revolutionise the diagnosis and the prognosis, which generates the unsettling problem, of what someone has called the “sick-healthy” or the “still not patient”.

Annex C.2- Nine strategies to develop the National Institute of Genomic Medicine

1. Build an innovative organizational design: The INMEGEN system.

2. Establish the initial infrastructure.

3. Make strategic alliances for the Nationwide Development of

Genomic Medicine.

4. Perform high-quality scientific research in genomic medicine.

5. Apply world-class genomic technology to common health problems.

6. Reach excellence in teaching and training programs.

7. Support scientific research and academic programs.

8. Comply and investigate on ethical, social, and legal issues.

9. Translate scientific knowledge into products and services.

These strategies and specific actions were the basis of INMEGEN's 2004–2009 Work Program. During the first 3 yr., the Institute has been successful in implementing more than
85% of these strategies- Taken from: Jimenez-Sanchez et al., 2008.

Annex D-Indigenous and "Mextizo" Haplotypes: reading time and ethnicity

Events such as genetic drifts and bottlenecks transform the patterns of LD As an example a drastic reduction in population size (bottlenecks), generally make some haplotypes disappear, increasing LD as a result. Therefore haplotype length and diversity are linked to population´s temporality "Haplotype blocks vary somewhat among human populations — they tend to be somewhat shorter in African populations (Slatkin 2008; HapMap 2005, 2007)". Haplotype blocks with less variability[238] and higher LD, are a sign of a younger population, while haplotypes with lower LD, and higher variability are read as a sign of an older population; since recombination necessarily implies more time[239]. Therefore in molecular anthropology, Africans are the ones understood as the oldest population, using as a starting point anthropological and paleontological studies (also see: Sommers 2008).

For many of my informants haplotypes are incontrovertible proofs of continental/ethnic origin, which cannot be misleading or ambivalent. Yet haplotypes and their interpretation remain confusing and distant for many "experts" in the field of genomic medicine, who are not interacting with them on a daily basis (i.e., in the laboratory). Even for some scientists and physicians working inside the INMEGEN, the interpretation and constitution of haplotypes, remains obscure. Dr. Max, told me that: "haplotypes are constituted of little coloured squares, which represent different continental groups... like the red ones are Indigenous, the grey ones are European... and so on.... you know. The computer gives you that information right away!!" As a matter of fact those "red, grey and white ethnic squares" represent linkage disequilibrium (LD or a non-random association of two or more alleles, in this case SNP´s). Of course these squares are not informative of ethnicity or biogenetic identities by themselves. As you can notice in the graphic representation of haplotype blocks, the colour of the little squares are different and have numbers inside them (which report the probability of finding those two SNP´s together). The colours change according to the higher or lower probability of finding any combination of two SNP´s together (e.g. red= high probability; white/grey=low or very low probability). The way in which genetic

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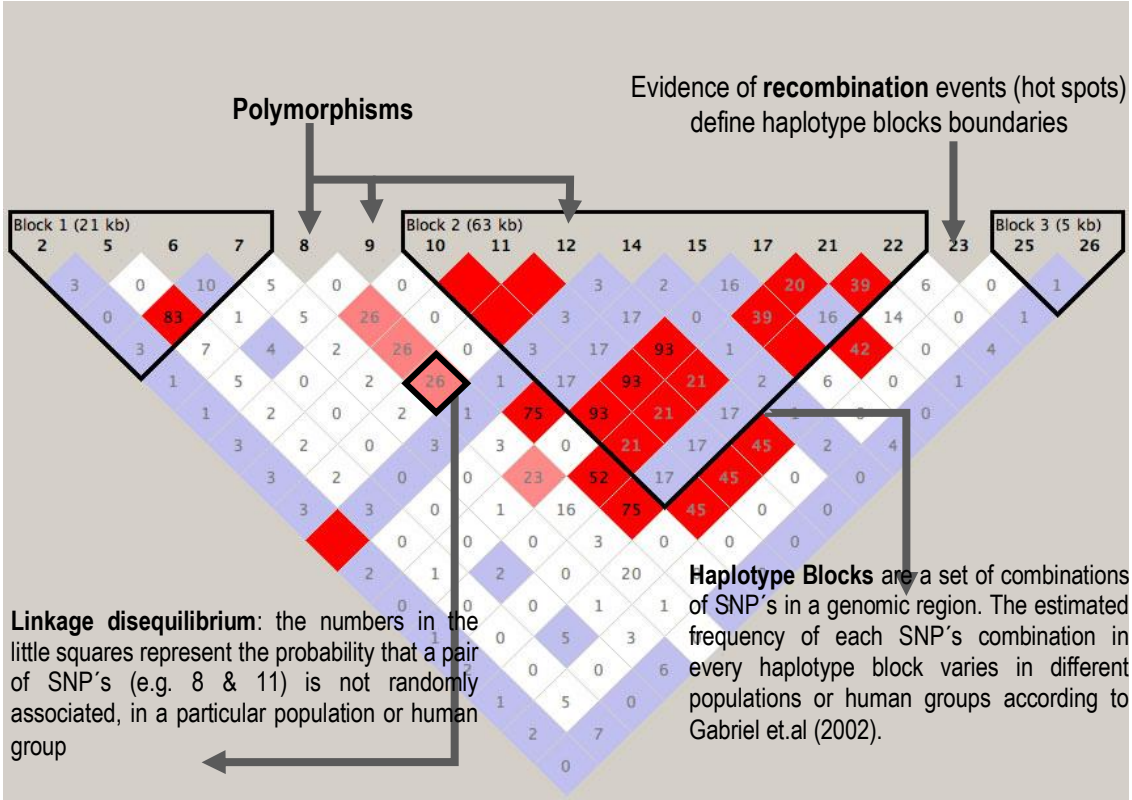
[238] Possible haplotypic alleles or different combinations of SNP´s within a haplotype block.

[239] As modern humans spread throughout the world, the frequency of haplotypes came to vary from region to region through random chance, natural selection, and other genetic mechanisms. As a result, a given haplotype can occur at different frequencies in different populations, especially when those populations are widely separated and unlikely to exchange much DNA through mating. Also, new changes in DNA sequences, known as mutations, have created new haplotypes, and most of the recently arising haplotypes have not had enough time to spread widely beyond the population and geographic region in which they originated (International HapMap: http://www.hapmap.org/originhaplotype.html.en, last consulted August 17 2009, International HapMap 2003)

constructions of variability are used to endorse scientific or political project is closely tied with certain conceptions of history and racial intermixture.

Figure D (1) - Haplotype blocks [240]



These constructions almost invariably conflate genomes with vernacular notions of nation and race. Contrary to these objective readings of variability in which computer software produce incontrovertible and stable genethnicities, in human genomics practice ethnoracial identities are not fixed, they dwell on relative and probabilistic frequencies of certain genotypes; as such they cannot be read as clear markers or underlying structure of a person or population history or identity. The construction and delimitation of haplotypes is mediated through algorithms, probability and statistical tests (Gabriel et.al 2002). The contested boundaries of haplotype blocks (Zhu et.al 2004), and the questioning of their fundamental assumptions (Terwilliger & Hiekkalinna 2006) is one of many examples showing the controversial and fluctuating properties of human variation after the HGP

D.1- Different understandings of Haplotype blocks and ethnoracial identity

As I explained earlier haplotypes play a very important role in both medical and anthropological practice and mediate the interpretation of population's biological history and time out of Africa. I In

[240] Images used with permission of Irma Silva-Zolezzi, Head of the Population Genomics laboratory.

the closing sections of the chapter I present one curious (even anecdotal) piece of information in the laboratory related to haplotypic distinctions between indigenous and Mestizos, that can reveal the tactics to articulate natural and social orders in Mexican Genomics arena. One of characteristic of "Mestizo" haplotypes is their counter intuitive bio-temporality. Even though Mestizos are historically the youngest population in the country[241] if you read their haplotypes alone, they would appear to be an older population than the indigenous one: since their haplotype blocks are more diverse and (LD) areas are shorter than their indigenous ancestors.

Key figures (mainly those that had to produce haplotypes and makes sense of SNP's) in the PGL had always considered this characteristic interesting since according to population genomics idea of migrations and bottlenecks shorter haplotypes mean more time of recombination, and therefore an older population. Inside the laboratory Dr. ISZ explained this curiosity and its relation with the indigenous ancestral contribution, as follows: "It is kind of paradoxical that by the presence of indigenous ancestry, the variability of Mestizo populations is reduced in genomic terms, when compared to European populations".

I found the aforementioned statement daunting—kind of a mystical initiation— since my very first days in the PGL. How come by mixing two things that are very different at the genetic level you have as a product a population that is less diverse than one of its parental populations or predecessors? This was explained to me by showing figure D(2) below; in which one of the two parental populations in the mix has less haplotypic diversity and longer haplotype blocks (ZAP) than the other (CEU); while the Mestizos (GUA) occupy a middle ground between both (CEU & ZAP)[242]. This was commonly used as an example of show how different the genetic landscape of Mexico was when compared to research done in other populations, and that DNA needed to be carefully contextualised before making scientific claims.

For if you assume that genetics and national history are identical mirrors of each other or that haplotypes can be read as more objective record of human history you will find yourself with a very interesting curiosity; which basically is that from the 16 authors of the MGDP that had no contact with the material production of population genomics—whom I identify as the exoteric group— vernacular notions of identity are used to explain and frame population genomics some

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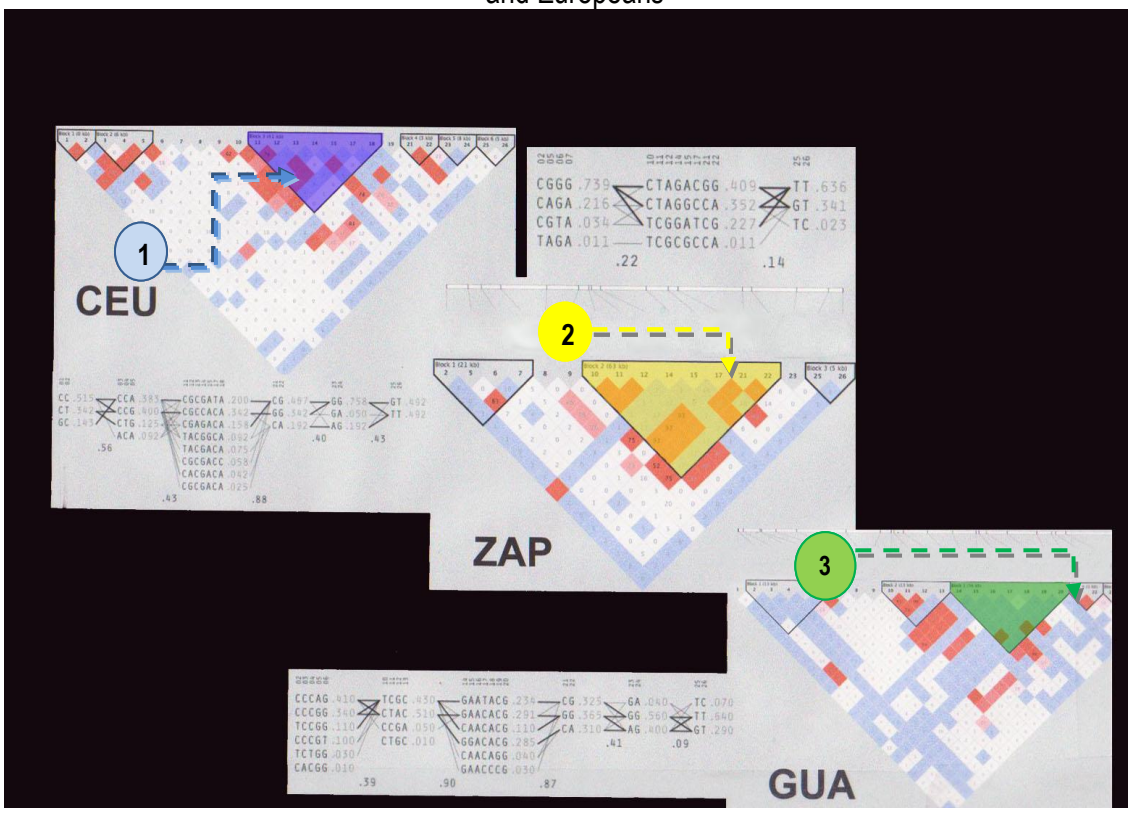
[241] Mestizo genealogy can be roughly traced to five hundred years ago, with the symbolic and reproductive alliance between la Malinche and Hernan Cortes, at the dawn of the New Spain.

[242]The lesser haplotypic diversity and longer blocks coming from indigenous genetic heritage confers some of its specific genetic characteristics to the Mestizo population; like unique allelic frequencies, or the 89 private SNP´s not found in any other population of the International Hap Map (Silva Zolezzi et.al 2009:4).

of which go against most of the literature in the field, this in order to fit (consciously or not) historical and genetic records.

Figure D (2) - Comparison between Haplotype blocks between Mexican Mestizos, Indigenous and Europeans



The map shows a comparison between the haplotype blocks of three populations **1**) CEU- European of the International Hap Map, **2**) Zapotecos- used in the Mexican Hap Map—as the representatives of indigenous diversity—**3**) Mestizos from Guanajuato also used in the Mexican Hap Map. The Zapotecos from Oaxaca (**2**), are the ones that show longer haplotype blocks, while the Mestizos from Guanajuato (**3**) are in between the European and Indigenous diversity. According to Haplotypes alone, the Mestizos are an older population than the Zapotecos (and therefore have shorter haplotypes).

I appreciated this difference in the middle of a discussion in the laboratory on the 15th of May, 3 days after the presidential presentation of "The Map of the Mexicans´ Genome (cf. Chapter 7, section 7.2:16)"; that I really acknowledged the importance of such discordance to understand the articulation of population genomics with the Mestizo identity. That day two of the authors of the MGDP, the postgraduate students working at the laboratory and myself (cf. Chapter 8) were discussing about the implications of sampling and the consequences of categorising human groups. I asked them how 90 Yorubas could be representative of the most diverse population in the world—Irma Silva-Zolezzi a little bit mad—answered to my questioning: "so now you are going to play Dr. Elias game around sampling and representativeness right?"[243] We laughed, and she

[243] The discussion over the Mexican HapMap representativeness, its reification of race and reliability, is one of the fundamental critiques to genomic mapping; coming from geneticist, and philosophers of science specially Carlos Lopez-Beltran, Edna Suarez and Francisco Vergara (all of them from UNAM, and the group of critical genomics in which I participate see Book: The Mexican Genome, Lopez-Beltran (ED)

continued to explain to all of us the difficulties of making a haplotype map of African populations:

> Making a traditional map of African diversity would be incredibly difficult, and might not even cover a good deal of the African diversity...Yet Africans—she emphasized— might become interesting as the new target of commercial/medical genomics, since populations with larger haplotypes have helped researchers to identify genomic regions in which to re-sequence genotypes and refine specific candidate SNP´s; and the smaller haplotypes of Africans could make the search easier.

Leonardo, the bio-informatician interrupted the chat, saying "yes the boxes in the African genome are smaller, and as populations become younger the haplotypes (boxes) are bigger". Irma and I recovered the example of mestizo populations in which the haplotypes are shorter than the indigenous ones, going against the common sense of the mestizo as a younger population. It was precisely in the middle of the conversation that I remembered this piece of the interview; I had with Dr. X (pseudonym) a top Scientist/Politician of the Mexican genomic community almost 10 months before the discussion in Laboratory:

> **Dr. X**-They are, they are... pure indigenous, let's say... how do I know? We already ran their genome, and we could take those that are (pause) let me say... pure... in the sense that...that... they are not mixed. Because you can identify those that are not mixed from the ones that are mixed...
>
> ES- With the Haplotypes...?
>
> **Dr. X-**Of course!!...you say here no, no... **The ones that are already mixed, since they are recent admixtures, then the blocks are very big**, when the genome is mixed (clapping) you find yourself with very big blocks. If many generations have passed and the genome has been recombined, the blocks are very little, so they are very difficult to identify. But 500 years, identifying blocks... but then, if they are mixed, they mixed two or three generations ago, so the admixture is very grotesque (clapping)!!! Imagine that the Indigenous were the brown genome, and the European, Mestizos or whoever is green genome and you mix as they are mixed 50% and 50% (clapping) it is very obvious!!! You notice they are... and if they mixed 4 generations ago, it is the same, the difference is too grotesque!! But if you go with the Africans that have so many generations the blocks are so little that you cannot identify who is who, talking about admixture...

In the previous segment[244], Dr. X is not only inverting or misunderstanding the interpretation of genomes, but using a basic shared knowledge of population genomics -Africans are older- in order to reinforce (consciously or not) the temporal divisions on which "Mestizaje" rests. What is striking and extremely relevant for the relation between vernacular and biogenetic versions of identity is that one top scientist/politician involved with the constitution of medical genomics;

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forthcoming), and lay critics (cf. Chap 4).

[244] The use of words as grotesque or pure in order to qualify —or to visually describe— admixture, are amongst other interesting aspects of this piece (for the time being I am not focusing my attention on the implications of such adjectives).

interprets the genomic boundary between the Mestizo and indigenous following popular historical criteria, that goes against the fundamental logic of molecular anthropology and population genomics (cf. Gabriel et.al 2002; Zhu et.al 2004; Frazer et.al 2009). As if the molecular anthropological stories of admixture (like the Mexican one) followed this pattern (i.e. Mestizos are younger and therefore they should have larger haplotype blocks). Approached through a syllogism the argument makes a lot of sense:

Older populations tend to have shorter haplotype blocks: **basic thesis of molecular anthropology.**
Amerindians are older than Mestizos: **fundamental notion in Mexican History.**
Therefore Amerindians should have shorter haplotype blocks than Mestizos: **alignment of genethnicities to fit Mexican History**

Since recombination is not only a temporal phenomenon in relation to the historic-sexual mating of the "ancestral populations", but also a question of genetic/hereditary time: related to human evolution out of Africa (100,000 years ago: cf. Cann et.al. 1987) there is a constant temporal duality when specialists in the field interpret genetic variability. The way in which both times are read simultaneously is an accomplishment rather than a natural consequence of the incontrovertible evidence of genetics.

When I discussed this piece of interview with my interlocutors, whom have been able to travel from within the construction of haplotypes to the outer rings of medical genomics, the discordance between what public scientist and fellow MGDP authors (Dr. X) declared about haplotypes and what was done in the laboratory was described as a "*borrachazo* (crass mistake: cf. field notes 23-25/06/09)". The way in which my interlocutors explained this discordance was by stating that this was probably a misunderstanding generated by a MGDP meeting in which Jesus Estrada and ISZ showed some of the project preliminary data, illustrating it with coloured genomes. I have a different take on this issue which I think was closely related to the idea of "Mextizaje" widely endorsed by Dr. X and fundamental for the political framing of genomic sovereignty in Mexico.

During my time in the field I encountered that the notion of "Mextizaje (the conflation between Mexican nationhood and genetic patterns= national genetic uniqueness)" informed the way in which various medical and legal specialist approached the ethno-racial dimensions of the MGDP (cf. Altair [Chap 7], Artemio Cruz, Marco Aldebaran, Volkovak-at the beginning of fieldwork) and I don´t consider the case of Dr. X or Dr. Max to be any different from those interpretations of genetic variability put forward by other members of the Mexican human genomics arena. The counter intuitive story told by haplotypes is hard to understand and make sense of in and out of

the laboratory. When discussing this "scientific curiosity" with Elisa —a laboratory technician at Illumina/Population genomics laboratory— she argued:

> No...No Zapotecos are older, how can they be younger. It does not make sense, is endogamy, not temporality. I still think that the Zapotecos are older, than the Mestizos... it relates to endogamy, not time. They are older; they were here before the Mestizos.

In this quote Elisa finds it difficult to explain why the length of haplotypes does not match the historical narrative of Mestizaje, since it is widely known and said in the field, that genetics is the result/mirror of a very particular history of admixture (cf. Chap 4 &7: Jimenez-Sanchez 2002 a; 2002 b; 2005). For example Elisa PGL laboratory technician does not concede that more than one time can be read in genetic patterns, for her the idea of various time frames and identities coexisting in the bodies of Mestizos is an incongruence that needs to be explained and accounted for, and genetics had the upper hand Another example of how time frames intervene in the interpretation of biogenetic identities can be found in Dr. Elias, population geneticist, explanation on how he differentiated between Indigenous and Mestizos individuals in his famous genetic studies: "well indigenous populations have been here for a very long time, before the Spaniards.... and the Mestizos are the new ones... (int. 2008)" Dr. Elias—considered the father of population genetics in Mexico—, endorses this type of explanations.

It has been publicly advanced and endorsed by various scientists and public figures that history can be corroborated in genetic patterns, something we already knew from our demographic records and national narratives. Nonetheless the correspondence between national history and genetic patterns is not simply a mirror of what we already knew, since two times (according to the esoteric group of the PGL) coexist in the bodies of Mestizos. The first time is that of human evolution and migration out of Africa with a 100,000 years story; and the other temporal frame is the story of 500 years of ethno-racial and cultural admixture formation in what is now called Mexico. The little nuisance I have just described is a puzzle reserved for those that have dealt with high throughput technology, the production of haplotypes and massive sequencing; for the rest of the experts in the field indigenous are simply those that were here before, and Mestizos are their offspring: product of the Spanish conquest.

Conversely we have to admit that "scientific curiosities" such as the counterintuitive length of Mestizo haplotypes are the product of a constant work that has made *Mestizaje* a privileged interpretative repertoire to understand ancestry and heredity in Mexico. The social-political template, on which Indigenous and Mestizo identities are built, definitely permeates the approach and understanding of population genomics. Discordances or "curiosities", as the time story told by haplotypes, render visible the continuous efforts to make sense of population genomics, in not so

new, and apparently, not so problematic terrains[245]. Haplotypes cannot and should not be read alone since by reading their sole structural properties as loyal reflections of time, you could be misled, or enfranchise a vernacular ethnoracial notion of Mexican into scientific practice. As you read in the previous quotes, MGDP authors who were not in contact with the material production of genetic variability —and even some laboratory technicians who were— resorted to a common sense approach to Mexico's ethnoracial identities in order to make sense of DNA information. The third and final example of what I call the probable, relativistic and complex character of population genomics was exemplified by showing how popular assumptions of ethnicity deeply solidified in the imaginary of scientists (and probably of various Mexicans) are not only deployed in order to sell the benefits of genomic science (cf. Chapter 3, 4 &7) but are intertwined with the way science is understood and communicated by some of the MGDP authors and very public scientist as Dr. X.

[245] Reinforcing" what we already know" about demography, folk categories or ethnicity, would seem to be a safe way to avoid critiques or disagreement. Even though since its design the project of the Mexican Genome diversity project has been heavily criticised (Ribeiro 2005, 2008); now with its public announcement, critique and praise has dramatically increased (cf. Cristobal Medina at: < www.cuestionableinmegen.blogspot.com>).

In depth Semi-structured interviews:

Artemio Cruz, interview- Former ELSI head: Designer of the law of Genomic Sovereignty and lobbyist of the INMEGEN, ex-CPMG member and part of the board of private sponsors of the INMEGEN in its first 5 years. 2010

Marco Aldebaran, Chief Bioethicist, ELSI Department INMEGEN, 2008 and 2009

Dr. Elias, Biomedical Researcher, Mexico City 2008

Dr. Gerardo Jimenez- Sanchez, Former Director General and co-founder of the INMEGEN, August 2008, and October 2009

Dr. Guillermo Soberón, Former Mexican Secretary of Health, Ex Rector of UNAM, Former Executive President of FUNSALUD, and Former President of The National Commission of Bioethics in Mexico and co-founder of the INMEGEN, 2008

Dr. Julio Frenk-Mora, Former Secretary of Health and Dean of Harvard School of Public Health Harvard-Mexico City, 2009 (telephonic interview)

Dr. Laura, National Bioethicists, Mexico City 2009

Dr. March, former Director of Research of the INMEGEN, and former director of public communication of science, Mexico City 2008

Dr. Max, INMEGEN´s top official, Mexico City 2009

Dr. X, Mexican Genomic Scientist, Policy Maker and public expert in the field, Mexico City 2008.

Dr. Xavier Soberon Mainero, Mexico City 2009

Dr. Elias, Population Geneticist and Biomedical researcher

Dr. Sofia, Geneticist and Top Scientific/medical administrator

Heladio Verver, Congresman Commission of Health, Mexico, 2011

Silvia Ribeiro, ETC Researcher in Mexico, 2008

Prof. Abdalla Daar, Mc-Laughlin Centre, 2009

Dr. Belmont, former member of the ELSI in the INMEGEN, top officer of the Mexican Secretary of Health

Dr. Irma Silva Zolezzi February and March 2009

Barba, Science communicator and journalist, May 2009

Blogger, Cristobal Medina March 2010

Dr. Y, Medical Genomicist July 2010

Dr. Daniel, Medical Geneticist September 2010 (Telephonic interview- not recorded)

Volkovak, ELSI Researcher INMEGEN, 2008, 2010 and February 2011

Focus Groups and recorded meetings:

Haplotypes and Science in Mexico, Crash course on how to use Haploview® and software in an informal meeting at the PGL, March 2010 part 1

Haplotypes and Science in Mexico, Crash course on how to use Haploview® and software in an informal meeting at the PGL, March 2010 part 2

Focus Group (05/July/2010), Race, Genomic and the audio-visual production of the INMEGEN communication strategy. Conducted by Ernesto Schwartz, with the participation of Vivette Garcia Deister and Mariana Rios Sandoval. Pseudonyms as Pietro are used for the members of INMEGEN.

References

Abrantes,R and Almeida, C (2002). Theory and practice in health systems reform in Brazil and Mexico. *Cad. Saúde Pública* [online]. 2002, vol. 18, no. 4 [cited 2008-01-10], pp. 971-989. Available from: <http://www.scielosp.org/scielo.php?script=sci_arttext&pid=S0102311X2002000400006&lng=en&nrm=iso>. ISSN 0102-311X. doi: 10.1590/S0102-311X2002000400006

Abu El-Haj, N. (2004) "'A Tool to Recover Past Histories": Genealogy and Identity after the Genome'. Occasional Papers of the School of Social Sciences (No.19, December) Institute for Advanced Study, School of Social Science, Princeton New Jersey. Available at: <www.sss.ias.edu/publications/papers/paper19.pdf> (accessed 26 of January 2010).

Abu El-Haj, N. (2007) The genetic reinscription of race, *Annual Review Of Anthropology*.

ACI (2002), Médicos Católicos rechazan centro de manipulación genética, México, 20 de Septiembre.

Agamben, G. (1998). Homo Sacer: Sovereign power and bare life. Stanford: Stanford University Press.

Agamben, G., (2000) Means without end: notes on politics. University of Minnesota Press, USA.

Aguilar, A (2010) Discutamos Mexico, with Enrique Florescano, Channel 22, TV program, Mexico February.

Alcántara, L. (2007 a) Genes mexicanos, mezcla de 35 razas, El Universal, Friday 9 march

Alcántara, L. (2007 b) Listo, el mapa genómico de los mexicanos,El Universal Friday 9 march

Alkes, P., et.al. (2007) A Genome wide Admixture Map for Latino Populations, The American Journal of Human Genetics, Volume 80, Issue 6, 1024-1036

Alonso, A., (2005) Territorializing the Nation and "Integrating the Indian": "Mestizaje" in Mexican Official Discourses and Public Culture in Sovereign bodies: citizens, migrants, and states in the postcolonial world / edited by Thomas Blom Hansen and Finn Stepputat.

Alya Saada y Valadez Diego (2006) Panorama sobre la legislación en materia de genoma humano en América Latina y el Caribe, 2006. Universidad Nacional Autónoma de México. Instituto de Investigaciones jurídicas

Anderson, W (2007) Pramoedya's chickens: postcolonial studies of technoscience." In: *The Handbook of Science and Technology Studies*, 3rd ed., 181-204. Ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman. Cambridge MA: MIT Press.

Anderson, W.,(2002) Postcolonial Technoscience, Social Studies of Science special edition of Postcolonial Technoscience. Introduction

Ángeles-Llerenas, A., Wiirtz, V., and Lara, C.(2008) The role and responsibilities of witnesses in the informed consent process, Developing World Bioethics ISSN 1471-8731 (print); 1471-8847 (online)

Anon (2003) Acta de la reunión de trabajo de la comision de relaciones exteriores organismos internacionales, celebrada el 23 de abril de 2003, en la sala miguel ramos arizpe, a las 15.00 hrs.

Anon. (2007), Los genes de México, Tecnología del genoma en Revista Día siete, Suplemento dominical, México. pp. 60-69.

Anon. (2009) El Elefante Blanco, in: www.cuestionableinmegen.blogspot.com, last consulted: 2010-08-13

Anónimo, (2007), Los genes mexicanos, la pasión de Gerardo Jiménez Sánchez,

Anonimous (2009) Presenta Ney González iniciativa de ley que establece como un derecho la investigación del genoma humano, available at: http://www.nayarit.gob.mx/notes.asp?id=18208, last consulted 02/07/11

Appadurai,A.,(1999) Modernity at Large. University of Minnesota Press, 1996

Arias, J & Restrepo,R(2010) Historizando raza: propuestas conceptual es y metodológicas. Crítica y Emancipación, (3): 45-64, primer semestre 2010.

Aristegui, Carmen (11 of May 2009) El Mapa del Genoma Mexicano, CNN en Español

Arroyo Santos , A., (2011) Causalidad y variables subrogadas; la frágil epistemología de la construcción genética del mestizo mexicano pag- 273 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

ASF (2008) Informe del Resultado de la Revisión y Fiscalización Superior de la Cuenta Pública 2006. Sección T5V4: Sección 5.5

Ayala Lolita (12 Mayo 2009) Noticieros Televisa en La tarde, 3pm

Bakhtin, M. M.(1988) *The Dialogic Imagination.* Ed. Michael Holquist, trans. Caryl Emerson and Michael Holquist. Austin: University of Texas Press.

Barahona A, Susana Pinar, Francisco J. Ayala (2005) Introduction and Institutionalization of Genetics in Mexico, Journal of the History of Biology, Vol. 38, No. 2 , pp. 273-299

Barba, A. (2009 a) El Genoma Mexicano: Los secretos de la raza cósmica, Revista QUO, May 2009.

Barba, A. (2009b) Genoma destapa diferencias de mexicanos, available in: http://www.cnnexpansion.com/actualidad/2009/06/04/genoma-destapa-diferencias-de-mexicanos, last consulted January 19, 2010.

Barbour, C., (2010) Sovereign Times: Acts of Creation, Law, Culture and the Humanities, 6(2) 143–152

Barnes, B (2010) On the legal regulation of scientific research: Or how to co-produce knowledge without knowing what you are talking About, unpublished manuscript.

Bartra, R (2001) Anatomia del mexicano, México, Ed. Plaza y Janés.

Basave Benitez, A.,(1992) Mexico Mestizo: *Análisis del nacionalismo mexicano en torno a la mestizofilia de Andrés Molina Enriquez*, México, D.F, F.C.E

Bauman, Z(1989) Modernity and the Holocaust, Ithaca, Cornell University Press.

Beezley, William H. (1969): "Caudillismo. An Interpretive Note", Journal of Inter American Studies,. XI, n.3, 345-352

Bell, Catherine M. (1992), *Ritual Theory, Ritual Practice*. New York: Oxford University

Benavides, C (2009) SSP descifra "genoma" del secuestrador, Agosto 02, El Universal. Available at: http://www.eluniversal.com.mx/notas/616401.html

Birckhead, J (2004) "And I can't feel at home in This World anymore": fieldwork in two settings in Hume, L., & Jane Mulcock, Anthropologists in the field: cases in participant observation. Columbia University Press, US

Bliss, C. (2009) Genome sampling and the biopolitics of race. In *A Foucault for the 21st century: governmentality, biopolitics and discipline in the new millennium*, edited by Samuel Binkley and Jorge Capetillo. Boston, MA: Cambridge Scholars Publishing.

Bliss, C. (2011) Racial taxonomy in genomics. *Social Science & Medicine* 73 (7):1019-1027

Blumer, H. (1954). What is wrong with social theory? *American Sociological Review*, *18*, 3-10.

Bonfil M. 2009 (May 20) "¿Cuál genoma de los mexicanos?" Milenio Ediciones Impresas.

Braun, B. (2007). Biopolitics and the molecularization of life. Cultural Geographies 14 (1):6-28

Brenna, et.al (2009) Characterizing the Time Dependency of Human Mitochondrial DNA Mutation Rate Estimates, Mol. Biol. Evol. 26(1):217–230.

Brubackers, R (2009) Ethnicity, Race, and Nationalism, Annual. Rev. Sociology. 2009. 35:21–42

Burchard, E (2005) Latino Populations: A Unique Opportunity for the Study of Race, Genetics, and Social Environment in Epidemiological Research, *{Am J Public Health.* 2005;95: 2161-2168. doi:10.2105/AJPH.2005.068668

Butler (2009), *Precarious Life: The Powers of Mourning and* Violence (London: Verso)

Cadena tres 2009 (May 11 2009) Programa de discusión, Nocturno TV AZTECA

Canal del Congreso (2001) El 10 de octubre de 2001, se presento en el H. congreso de la Unión el vídeo: "Genoma Humano", en donde se expone la necesidad de legislar en dicha materia. Sobre dicha reunión existe constancia audiovisual, en el acervo televisivo del H. congreso de la Unión, en formato VHS y DVD, con número; HCD-58-SA-0559.

Canal del Congreso (2002 b) El 10 de abril de 2002, se organizó un ciclo de conferencias, las que llevaron el nombre de "El Genoma Humano Retos y Oportunidades", en estas participaron la Mtra. Marcia Muñoz de Alba Medrano, Dr. Rubén Lisker, Dr. Octaviano Domínguez Márquez, Dr. Gerardo Jiménez y Dr. Guillermo Soberón. Sobre dicha reunión existe constancia audiovisual, en el acervo televisivo del H. congreso de la Unión, en formato VHS y DVD, con número; HCD-58-SA-1001 y HCD-58-SA-1002.

Canal del Congreso (2002a) El 25 de Junio de 2002, en la Cámara de Diputados se efectuó la mesa "El Derecho a la Vida: El Genoma Humano"; en dicho evento se reunieron diversos especialistas, entre los que se puede mencionar la participación del Dr. Gerardo Jiménez Sánchez, Dr. Guillermo Soberón, Lic. Laksman Sumano (periodista) y diputados de las diferentes fracciones parlamentarias.Sobre dicha reunión existe constancia audiovisual, en el acervo televisivo del H. congreso de la Unión, en formato VHS y DVD, con número; HCD-58-SA-1136.

Canal del Congreso (2003) Durante el 2º Periodo Ordinario de de sesiones, el 02 de diciembre de 2003, diputados del Partido Acción Nacional, (Dip. José Ángel Cordova Villalobos, Dip. Juan de Dios Castro Lozano, Dip. Maki E·sther Ortiz Dominguez) Partido Convergencia por la Democracia (Dip. Jesús González Schmal), Partido de la Revolución Democrática (Dip. Salvador Pablo Martínez Della Rocca, Dip. Jorge Martínez Ramos, Dip. Pablo Gómez Álvarez) Partido Revolucionario Institucional (Dip. Jaime Fernández Seracho, realizaron una reunión, en el cual el tema principal fue las iniciativas legislativas para regular el genoma Humano.Sobre dicha reunión existe constancia audiovisual, en el acervo televisivo del H. congreso de la Unión, en formato VHS y DVD, con número; HCD-59-SA-0281.

Canal del Congreso (2004 b) El 14 de agosto de 2004 se inauguró el foro "La Clonación y sus Implicaciones", el cuál contó con la participación del Dr. Roberto Ovilla Martínez, Dr. David Gómez Almaguer, Dr. Luis de la Barreda Solórzano, Dra. Clara Godorezky, Dr. Luis F. Covarrubias Robles, Dr. Rubén Lisker, Dr. Gerardo Rendon Balandra y Dr. Misael Uribe. El material de consulta es: HCD-58-SA-1248, HCD-58-SA-1249, y HCD-58-SA-1250..

Canal del Congreso (2004a) El 08 de septiembre de 2004, se realizó el seminario "Clonación y Células Troncales", convocado por la Comisión de Ciencia y Tecnología de la Cámara de Diputados.El material videográfico esta clasificado con el número; HCD-59-MA-1368, HCD-59-MA-1369 HCD-59-MA-1370.

CEM (2004), Declaraciones episcopales y del comité de médicos católicos, México, 13 de mayo.

Clarke, A & Star, S (2007)The Social Worlds Framework: A Theory/Methods Package In: The Handbook of Science and Technology Studies, 3rd ed., 113. Ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman. Cambridge MA: MIT Press.

Clarke, A., (2005) Situational Analysis: Grounded Theory after the postmodern turn(thousand oaks, ca: sage).

Colic-Peisker, V (2004) Doing ethnography in "One´s own Ethnic community": the case of an ackward insider in Hume, L., & Jane Mulcock, Anthropologists in the field: cases in participant observation. Columbia University Press, US

Contreras AV et al (2011) "Resequencing, haplotype construction and identification of novel variants of CYP2D6 in Mexican Mestizos", Pharmacogenomics Mar 11 (epub).

CPMG (2002) Memos of the meeting of the Consorcio Promotor de la Medicina Genomica. Designation of Committess and responsibilities.Not publicly available-unpublished document.

CPMG (2003) Committes discuss the pertinence of the laws and final meetings before the INMEGEN is accepted by the Congress. Meeting in what are now the offices of the CNB in Pichacho-Ajusco. Unpublished document.

Cruz-Martinez (2009) Sede del Inmegen, inconclusa ante sinfín de anomalías en las obras, Jornada 1ero de Junio de 2009

Curtis, B., (2002) Foucault on Governmentality and Population: The Impossible Discovery, Canadian Journal of Sociology 27, 4: 505-533

D.O. F (2005) Decreto por el que se crea el órgano desconcentrado denominado comisión nacional de bioética. 7 de septiembre.

D.O.F (2001a), número 845, miércoles 26 de septiembre. (208)

D.O.F (2001b), número 902-I, lunes 17 de diciembre. (389)

D.O.F (2004), Cámara de Diputados, número 1486-II, jueves 29 de abril.

D.O.F (2008), número 2475-I, martes 1 de abril. (1551)

De la Piedra Matute, A (2010) Entrevista con Julio Frenk Mora, Revista- AAPAUNAM, Academia, ciencia y cultura: 152-155

Delgado, G.(2002) Biopiracy and Intellectual Property as the Basis for Biotechnological Development: *International Journal of Politics, Culture and Society, Vol. 16, No. 2*

Doing, P. (2006) 'Lab Hands' and the 'Scarlet O': Epistemic Politics and (Scientific) Labor, Social Studies of Science. Volume: 34, Issue: 3, Pages: 299-323

Doing, P. (2009) Velvet revolution at the synchrotron: biology, physics, and change in science. MIT Press, Cambridge, Mass

Duarte, M., (2004) 'Biopolitics and the dissemination of violence: the Arendtian critique of the present', in *Pasajes de Pensamiento Contempotaneo,* No. 13,

Duster, T(2005) Race and Reification in Science, Policy Forum Medicine, Sciene Magazine, Vol. 307, Is Race Real: http://raceandgenomics.ssrc.org/

Edu (2006) ¿El Genoma Mexicano? El Moro, September, available in:http://morisimo.blogspot.com/2006/09/genoma-mexicano.html, last consulted in January 2010.

Edwards, A., (2003) Human Genetic diversity: Lewontin´s Fallacy. Bioessays 25.8, Wiley periodicals

ElSI, México, D.F., a 22 de abril de 2008, Oficio No. INMG/DG/---/2008, Asunto: Opinión a diversas iniciativas de reforma a la Ley General de Salud en materia de Genoma Humano y Soberanía Genómica

Entre tres(May 12 2009) Discutiendo el Mapa del Genoma de los Mexicanos, Canal 7 y 13

Esposito, R., (2003) *Bios: Biopolitics and Philosophy,* (London: University of Minnesota Press)

Fausto-Sterling, A (2008)The Bare Bones of Race. *Social Studies of Science*; 38; 657

Fausto-Sterling, Anne. 2004. Refashioning race: DNA and the politics of health care.. differences: A Journal of Feminist Cultural Studies 15 (3):1-37.*differences: A Journal of Feminist Cultural Studies* 15 (3):1-37.

Foucault, M. (2003[1975-76]) Society Must Be Defended. New York: Picador.

Foucault, M. (2003a) This is not a pipe. Quantum books

Foucault, M. (2007[1977-78]) Security, Territory and Population. New York: Palgrave Macmillan.

Foucault, M. (2008[1979-80]) The Birth of Biopolitics. New York: Palgrave Macmillan.

Frazer Kelly, Sarah S. Murray, Nicholas J. Schork and Eric J. Topol (2009) Human genetic variation and its contribution to complex traits. Nature Reviews. Volume 10/ April: 241-251

Frenk-Mora, J. (2001) México en el umbral de la era genómica. Impacto en la salud pública, cuadernos FUNSALUD.

Frenk-Mora, J. (2005) Inauguración de la unidades de alta tecnología del inmegen, instalaciones del Instituto Nacional de Medicina Genómica.

Frenk-Mora, J., (2004) Entrevista en el marco de la creación del instituto de medicina genómica, Abril 24 de 2009.

Fujimura, Joan H., and Ramya Rajagopalan. 2011. Different differences: The use of 'genetic ancestry' versus race in biomedical human genetic research. Social

Fujimura, Joan H., Troy Duster, and Ramya Rajagopalan. 2008. Introduction: race, genetics, and disease: questions of evidence, matters of consequence. Social Studies of Science 38 (5):643-656.

Fullwiley D., (2008) The biologistic construction of Race: "Admixture" technology and the new genetic medicine, *Social Studies of Science* 2008; 38; 695

Fullwiley, Duana. 2007. The molecularization of race: institutionalizing human difference in pharmacogenetics practice. *Science as Culture* 16 (1):1-30.

Gabriel, S. et.al., (2002). Science, New Series, Vol. 296, No. 5576 pp. 2225-2229.

Gannet, L (2003) Making Populations: Bounding Genes in Space and in Time, Philosophy of Science, 70 (December 2003) pp. 989–1001

Gannett, L.; Griesemer J., (2004), Classical genetics and the geography of genes, Rheinberger, H. J.; Gaudilliere, J. P. (eds.). *The Mapping Cultures of Twentieth Century genetics*, New York, Routledge.

García Deister, V (2011) *Laboratory life of the Mexican mestizo. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

García Deister, V(2011a) Mestizaje en el laboratorio, una toma instantánea, pag-1 4 3 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

García-Canclini, N. (2004) Diferentes, desiguales y desconectados. Barcelona, Ed. Gedisa.

Garduño, G and Nava de los Reyes, A.(2008) Derechos humanos y el mapa genético, de poder a poder, diario electrónico . Entrevista con el Dr. Santiago March, 11 de marzo de 2008.

Garfinkel, H (1967) Studies in Ethnomethodology. Englewood Cliffs, NJ: Prentice- Hall.

Geertz, Clifford (1973), *The Interpretation of Cultures*. New York: Basic Books.

Gibbon, S., Joseph, G, Kalender, U. Kampriani, E., Mozersky, J., zur Nieden, A. and Palfner, S (2010). (eds)Special Section: Perspectives on Globalizing Genomics: the case of 'BRCA'

breast cancer research and medical practice in Journal of Biosocieties 5 407-414 doi:10.1057/biosoc.2010.36

Gibbon, S., Ricardo Ventura Santos, and Mónica Sans (2011) Racial Identities, Genetic Ancestry, and Health in South America: Argentina, Brazil, Colombia, and Uruguay. Palgrave Macmillan ISBN: 978-0-230-11061-8, ISBN10: 0-230-11061-4

Gieryn, T, F. (1983) "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists," American Sociological Review 48: 781–95.

Gómez, A., (2009) Opacidad y corrupción en la construcción del inmegen. Milenio Diario

Gonzalez-Sobrino et.al (2010) Estampas de historia y genética en México. En Miradas sin rendición celebraciones del Bicentenario Ed. Santiago Oria.

Guerrero Motherlet, V., (2006), ¿Existe un genoma mestizo? Perspectiva del Doctor León Olivé, *Andamios*, revista de investigación social, junio, 2(4), pp. 263-267

Guerrero, McManus, F., (2009), El genoma mexicano, la dislexia genética y otros males posmodernos, *La Crónica*, 23 junio.

Guerrero-McManus, F(2011)Cerca del ge(no)ma mexica(no): Ensayo sobre el valor del origen y el origen del valor, pag-188 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

Guston, David H. (2001) "Boundary Organizations in Environmental Policy and Science: An Introduction," Science, Technology & Human Values 26(4): 399–408

Gutierrez, N (1998) What Indians say about *Mestizos*: A critical view of a cultural archetype of Mexican nationalism, Bulletin of Latin American Research, Volume 17, Issue 3, pp.285-301

Hacking, I (1990) *The Taming of Chance*. Cambridge: Cambridge University Press.

Hammersley, M and P. Atkinson, (2003). Ethnography: Principles in Practice. London and New. York: Routledge

Handley LJ, Manica A, Goudet J, Balloux F., (2007).Going the distance: human population genetics in a clinal world. Trends Genet; 23(9):432-9. Epub.

Hardy, B.-J., Se´guin, B., Goodsair, F., Jimenez-Sanchez, G., Singer, P.A. and Daar, A.S. (2008a) The next steps for genomic medicine: Challenges and opportunities for the developing world. Nature Reviews Genetics 9: Nature Suplements S5- S9

Hardy, B.-J., Se´guin, B., Ramesar, R., Singer, P.A. and Daar, A.S. (2008b) South Africa: From species cradle to genomic applications. Nature Reviews Genetics 9: 19–23.

Hardy, B.-J., Se´guin, B., Singer, P.A., Mukerji, M., Brahmachari, S.K. and Daar, A.S. (2008c) From diversity to delivery: The case of the Indian genome variation initiative. Nature Reviews Genetics 9: 9–14.

Hayden, C.,(2003) When nature goes public: the making and unmaking of bioprospection in Mexico. Princeton University Press.

Hechos de la Mañana 2009, Noticiero Nacional, TV AZTECA, Canal 13

Hernandez, R., Negrete, L., & Smith, G (2011) makers of "Presunto Culpable", Documental on the Mexican juridical system and impunity, available at: http://www.presuntoculpable.org , last consulted June 21, 2011

Huijer, M., (2003) *Reconsidering Democracy: history of the Human Genome Project*.*Science*

Hume, L., & Jane Mulcock (2004) Anthropologists in the field: cases in participant observation. Columbia University Press, US

IFS (2001) INMEGEN Feaseability Study: Estudio de Factibilidad para el Establecimiento y Desarrollo del Centro de Medicina Genómica, UNAM, SSA, CONACYT, FUNSALUD (2001).

Inda, J, (2005) Anthropologies of Modernity: Foucault Govermentality and life politics. Blackwell Publishing, US.

INMEGEN, Mexico (2009, May 12). Landmark Study Reveals Significant Genetic Variation Between Mexico's Population And World's Other Known Genetic Subgroups. Science Daily. Retrieved January 30, 2010, from: http://www.sciencedaily.com /releases/2009/05/090512081744.htm

Irwin, A., (2007)STS Perspectives on Scientific Governance In: The Handbook of Science and Technology Studies, 3rd ed., 583. Ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman. Cambridge MA: MIT Press.

Jasanoff, S (2007) Making Order: Law and Science in Action In: The Handbook of Science and Technology Studies, 3rd ed., 761. Ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman. Cambridge MA: MIT Press.

Jasanoff, S.(2005) Designs on Nature: Science and Democracy in Europe and the United States, Princeton University Press.

Jasanoff, S., (2003) "Breaking the Waves in Science Studies," Social Studies of Science 33(3): 389–400.

Jiménez- Sánchez (2009), Reporte de Resultados de los primeros cinco años del INMEGEN (2004-2009).La plataforma inicial para la medicina genómica en México. www.inmegen.gob.mx

Jiménez Sánchez G, Valdés Olmedo J, y Soberón G.(2002) Desarrollo de la medicina genómica en México. Este país. 139, octubre, pp. 17-21.

Jiménez Sánchez G, José Cuauhtémoc Valdés Olmedo, y Guillermo Soberón (2002). Instituto Nacional de Medicina Genómica. Este país. 141, diciembre.

Jiménez Sánchez, G., (2007) Hacia la regulación de los medicamentos biotecnológicos en México, INMEGEN

Jiménez- Sánchez, G., Silva-Zolezzi, I., Hidalgo, A., March, S. (2008) Genomic medicine in Mexico: Initial steps and the road ahead, Genome Research, Vol. 14, Number 4, pp.1191-1198.

Jiménez, Sanchez G., (2002a), Hacia el Instituto Nacional de Medicina Genómica, Informe de Actividades, Consorcio Promotor del Instituto de Medicina Genómica.

Jiménez, Sanchez G., (2002b), *Áreas de oportunidad para la industria farmacéutica en el Instituto de Medicina Genómica de México*, Gaceta Médica de México; 138, pp. 291-294.

Jiménez, Sanchez G., *et ál.*, (2002c), En el umbral de la medicina genómica, *Este País*, septiembre, pp. 21-30.

Jiménez, Sanchez G., *et ál.*, (2002d), El Instituto Nacional de Medicina Genómica,

Jiménez-Sánchez G (2006), Informe de autoevaluación del director general sobre las actividades realizadas (Del 1 de enero al 31 de Diciembre de 2005), y avance del programa de trabajo.

Jiménez-Sánchez G, Valdés JC & Soberón G. (2003) Nueva dimensión en el cuidado de la salud. El Instituto Nacional de Medicina Genómica, una alianza pública, académica y privada. En: Futuroscopio de la Salud. Caleidoscopio de la Salud: De la investigación a las políticas, y de las políticas a la acción. México.

Jiménez-Sánchez G. (2003) La medicina genómica como un instrumento estratégico en el desarrollo de México, Ciencia y Desarrollo. XXIX (172): 33-35.

Jiménez-Sánchez G. Hacia el Instituto Nacional de Medicina Genómica. First Edition. ISBN 968-5018-77-5. México. (2002 b)

Jiménez-Sánchez G. Programa de Trabajo para dirigir el Instituto Nacional de Medicina Genómica 2004-2009 (2005). Available at: www.inmegen.gob.mx last consulted october 2009.

Jiménez-Sánchez G., (2003b) La medicina genómica como un instrumento estratégico en el desarrollo de México, Ciencia y Desarrollo. XXIX (172): 33-35

Jiménez-Sánchez, G (2004) Programa de Trabajo para dirigir el Instituto Nacional de Medicina Genómica 2004-2009. Available in: www.inmegen.gob.mx

Jimenez-Sanchez, G, Childs, B, & Valle, D (2001) Human disease Genes, Nature |vol.409 | 15 February:853-855

Jimenez-Sanchez, G, Frenk-Mora, J & Soberon, G.,(2011) El poder transformador de la genómica. Este país 244/03.08.2011

Jimenez-Sanchez, G.(2007) La medicina Genómica como prioridad en el sistema de salud Mexicano, en La Bioética Social, Prioridades en Salud y Salud intercultural.

Jiménez-Sánchez, G., (2002) Opportunities for the pharmaceutical industry in the Institute of genomic medicine of Mexico, Cuadernos funsalud. Vol.38. First Edition. México.

Jimenez-Sanchez,G.(2003a) Developing a Platform for Genomic Medicine in Mexico. Science, 300 (5617): 295 DOI: 10.1126/science.1084059

Kahn, J., (2008) Exploiting Race in Drug Development: BiDil's Interim Model of Pharmacogenomics, *Social Studies of Science* 2008; 38; 737

Kelly, Susan E. (2003) "Public Bioethics and Publics: Consensus, Boundaries and Participation in Biomedical Science Policy," Science, Technology & Human Values 28(3): 339–64.

Kent, M (2011) *"The Charrua are alive": the resurrection of extinct indigenous peoples in southern Brazil Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

King, R & Stone, D (2008) Hannah Arendt and the uses of history imperialism, nation, race, and genocide. New York, Berghahn Books, 2008.

Knorr-Cetina, K (1999) Epistemic Cultures: How the Sciences Make Knowledge. Cambridge Mass.: Harvard University Press

Koenig, B, Sandra Soo-Jin Lee and Sarah S. Richardson (2008) *Revisiting race in a genomic age*, (Editors). New Brunswick: Rutgers University Press

Krieger, Nancy (2005) 'Stormy Weather: Race, Gene Expression, and the Science of Health Disparities', *American Journal of Public Health* 95: 2155–60.

Kurotany, S.,(2004) Multi-sited transnational ethnography and the construction of fieldwork, in Hume, L., & Jane Mulcock, Anthropologists in the field: cases in participant observation. Columbia University Press, US

Kuziak, S (2010) Instrumentalized rationality, cross-cultural mediators, and civil epistemologies of late colonialism. 2010 40: 871 *Social Studies of Science*

Latour (1987) Science In Action: How to Follow Scientists and Engineers Through Society, Harvard University Press, Cambridge Mass., USA.

Latour (2003) We Have Never Been Modern (tr. by Catherine Porter), Harvard University Press, Cambridge Mass., USA.

Latour, B. (2004) Politics of Nature: How to Bring the Sciences into Democracy (Cambridge, MA: Harvard University Press).

Lewontin, R., (1972), The apportionment of Human Diversity, *Evolutionary Biology*, pp. 381-98.

Lindee, S (2011) *Comments on presented papers. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

Lisker, R., (2004) Declaración universal sobre el genoma humano y los derechos humanos en La revolución genómica: orígenes y perspectivas, México DF: UAM-X, CSH, Depto. de Relaciones Sociales.

Lomnitz, C (2010) Los orígenes de nuestra supuesta homogeneidad: breve arqueología de la unidad nacional en México. Prismas, Revista de historia intelectual, Nº 14, 2010, pp. 17-36

Lomnitz, C(2002)Deep Mexico, Silent Mexico: An Anthropology of Nationalism. Duke university Press.

Lomnitz, C(2003) Times of Crisis: Historicity, Sacrifice, and the Spectacle of Debacle in Mexico City. Public Culture, Volume 15, Number 1, pp. 127-147

López Beltrán C & Mariana Rios Sandoval (2011) *Negotiating the Mexican mestizo: on the possibility of a national genomics. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

López, A., (2008) México, en busca del mapa del genoma, Revista Expansión, Mayo 2008.

López-Beltran C, (2007) 'Hippocratic bodies. Temperament and Castas in Spanish America (1570-1820)', Journal of Spanish Cultural Studies, 8: 2, 253 – 289

Lopez-Beltran, C, Vergara-Silva, F.,(2010/ 2011) INMEGEN and the construction of the National Mestizo Genome, Manuscript, and then it appeared in Genes & Mestizos edited by Lopez Beltran.

Lowell-Banks, T (2006) Mestizaje and the Mexican Mestizo Self: No Hay Sangre Negra, So There is No Blackness, USC Law Journal, Volume 15:199-234

M´charek (2000) Technologies of Population: Forensic DNA Testing Practices and the Making of Differences and Similarities. Configurations, 2000, 8:121-158

M´charek (2005) The Human Genome Diversity Project: An Ethnography Of Scientific Practice (Cambridge Studies In Society And The Life Sciences)

M'Charek, A (2011) *Familial searching and racial profiling: on the materiality of race and other differences in genetic policing. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

Mallon, F.(1995) Peasant and Nation: The Making of Post-Colonial Mexico and Peru.Los Angeles: University of California Press.

Martin Alcoff, L., (2000) Mestizo Identity," in American Mixed Race: The Culture of Microdiversity in The Idea of Race eds. Robert Bernasconi and Tommy Lott, Hackett.

Mccann-Mortimer P, Martha Augoustinos and Amanda Lecouteur (2004) 'Race' and the Human Genome Project: Constructions of Scientific Legitimacy. Discourse Society; 15; 409

Mendoza, L. (2007) Bio-organización y genonautas en México, UAM - Iztapalapa, México. Tesis de Doctorado.

Meyer, L (2009) in Carmen Aristegui, MVS Radio Morning news, 29th of June, 2009, 9:10 A.M.

Miglierini, J (2011) Drug related deaths rising in Mexico. BBC News, Mexico City

Miller, D (2009) 'Theories of Things' from Stuff, (Cambridge: Polity, 2009)

Miller, M. G., (2004), *Rise and fall of the cosmic race. The cult of mestizaje in Latin America*, Texas University Press USA.

Mistretta, A (2008) EL Genoma en un chip, Infoweek, Mayo 2008.pag-22-25

Monsivais, Carlos (2000). *Aires de Familia. Itinerarios convergentes y divergentes de las culturas hispanoamericanas.* Barcelona, Editorial Anagrama

Moreno Figueroa MG (2007). 'En México no hablamos de racismo': Mujeres, Mestizaje y las Practicas Contemporáneas del Racismo. Programa Interdisciplinario de Estudios de la Mujer 2007. Ciudad de México: El Colegio de México.

Morris, D.S (1999) The New Politics of Corruption, *Third World Quarterly*, Vol. 20, No. 3. pp. 623-643

Müller-Wille, S., (2010) Claude Lévi-Strauss on race, history and genetics, BioSocieties (2010) 5, 330–347. doi:10.1057/biosoc.2010.17

Navarrete, F (2005) Relaciones Interétnicas en México, publicado por el autor en el Programa México Nación Multicultural de la UNAM, México, 2005. Last consulted 2/02/2009, Available in:http://www.nacionmulticultural.unam.mx/Portal/Izquierdo/BANCO/Mxmulticultural/Elmestizajeylasculturas-unnuevomapa.html.no. 36, pp. 283-300.

Noticiero con Lopez Doriga (11-12 de mayo 2009) Canal 2, Noticiero Estelar 9pm

Notimex (2009) México, DF. Herencia no es destino, aclaró la presidenta de la Academia Mexicana de Ciencias (AMC), Rosaura Ruiz. Last consulted 14/07/11, Available at: http://ntrzacatecas.com/secciones/salud/2009/06/05/herencia-genetica-no-es-destino-academia-mexicana-de-ciencias/ I

Novembre, J., *et ál.*, (2008), Genes mirror geography in Europe, *Nature*, vol. 456

NRC (2005) An International Perspective on Advancing Technologies and Strategies for Managing Dual-Use Risks: Report of a Workshop. THE NATIONAL ACADEMIES PRESS Washington, D.C (Chapter 2 INMEGEN).

Ocampo (2005) Autonomia Indigena y Constitucionalismo Mexicano, Revista electrónica, Razon y Palabra, ITESM-CEM.

OECD, (1996)The Knowledge-based economy, Paris.

OECD, (2006) International Futures Programme, The Bioeconomy to 2030: Designing a Policy Agenda.

Olarte Sierra, M & Adriana Díaz del Castillo (2011) *Beyond the Human Expedition: what often gets obscured when talking about human genetics in Colombia. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

Oliva, P & Schwartz E., (2010) La medicina genómica en las políticas de salud pública: una perspectiva entre la investigación y su aplicación futura. Presentación en el Congreso de la Sociedad Mexicana de Salud pública, Oaxaca 2009.

Ossorio, P., (2007) The Human Genome as humanity common heritage: Common Sense or legal non sense? Genetics and groups rights

Palsson G; Rabinow P(1999)The Case of Iceland: a National Human Genome Project Anthropology Today, Vol. 15, No. 5. pp.14-18.

Parfitt, T. and Egorova, Y. (2005) Genetics, history, and identity: The case of the Bene Israel and the Lemba. Culture, Medicine and Psychiatry 29: 193–224.

Pascacio Montijo, Y(2011) ¿De cuántas maneras podemos dividir a los mexicanos? Sobre clases naturales y clases relevantes, 259 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

Paz, O., (1981[1950])El laberinto de la soledad.Posdata y Vuelta al laberinto de la soledad. Mexico City: Tezontle, Fondo de Cultura Económica.

Pensar Mexico (2009) Mesa de debate en toron a la medicina Genomica Canal 22

Pickering (2006) conference paper present in Gulbenkian Foundation conference on Challenges to Dominant Modes of Knowledge: Dualism*, SUNY Binghamton, 3-4 November 2006.*

Plows, A., and P. Boddington. 2006. Troubles with biocitizenship? Genomics, Society and Policy 2 (3):115-35.pp. 98-101.

Pratt, M.,(1992) Imperial Eyes:Travel Writing and Transculturation. New York: Routledge.Press.

Price, Alkes, *et. ál.*, (2007), "A genomewide admixture map for Latino populations", The *American Journal of Human Genetics,* vol. 80, pp. 1024-1036.

Programa Nacional de Salud 2006 -2012, Secretaría de Salud, México.

Prokhovnik, R., (1999) The state of liberal sovereignty, British Journal of Politics and International Relations.

Rabinow, P (1999) ‘‘Artificiality and Enlightenment: From Sociobiology to Biosociality,’’ in Mario Biagioli (ed.), The Science Studies Reader. New York: Routledge, pp. 407–416

Rabinow, P, & N. Rose. (2003). Foucault today. In The essential Foucault: Selections from the essential works of Foucault 1954-1984, ed. P. Rabinow and N. Rose, vii-xxxv.

Raman, S., and Tutton, R.,(2010) Life, Science, and Biopower. Science, Technology, & Human Values 35(5) 711-734

Reardon, J (2005) Race to the finish: identity and governance in the age of genomics. Princeton University Press, New Jersey.

Reardon, J (2011) *Comments on presented papers. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

Reardon, J.,(2001) The Human Genome Diversity Project: A Case Study in Coproduction, Sage

Redfield, F (2005)Foucault in the Tropics: Displacing the Panopticon in Ida (ed) Anthropologies of Modernity: Foucault, govermentality and life politics. Blackwell Publishing, US

Ribeiro Silvia,(2005) El mapa genómico de los mexicanos, La jornada, México, 31 de julio.

Ribeiro Silvia,(2007) México: Genómica, biopiratería y pueblos indígenas, 14:49. http://www.servindi.org/archivo/2007/1897

Risch, N., E. Burchard, E. Ziv, and H. Tang. 2002. Categorization of humans in biomedical research: Genes, race and disease. Genome Biology 3 (7):1-12.

Rojas Aréchiga, C & Marcela Montellano Arteaga (2007) El papel de los museos ante la globalización Proyecto Museo del Palacio - Espacio de la diversidad, Cd. de Oaxaca, Oaxaca. X Reunión de la Red de Popularización de la Ciencia y la Tecnología en América Latina y el Caribe. (RED POP - UNESCO) y IV Taller “Ciencia, Comunicación y Sociedad” San José, Costa Rica, 9 al 11 de mayo.

Romeo; et al . S., (2008) Genetic variation in PNPLA3 confers susceptibility to nonalcoholic fatty liver disease. Nat. Genet. 40, 1461

Rose & Rabinow (2006). Biopower today. BioSocieties 1 (2):195-218.

Saade M (2011) México mestizo: de la incomodidad a la certidumbre. Ciencia y política pública posrevolucionarias, pag-2 9 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

Saavedra, D (2009) Entrevista con el Doctor Xavier Soberon Mainero, Periódico el Reforma, 13 de Octubre.

Salter, B & Ren-Zong, Q (2009) Science and Public Policy, 36(1), pages 47–59; DOI: 10.3152/030234209X410381; http://www.ingentaconnect.com/content/beech/spp

Saro-Boardman E (2008) Intervención del senador Ernesto Saro Boardman, quien fundamentó un dictamen de Comisiones Unidas de Salud; y de Estudios Legislativos, con proyecto de decreto por el que se reforman los artículos 100 y 461; y se adicionan los artículos 317 bis, y 317 bis 1 de la Ley General de Salud. Segundo periodo ordinario del segundo año de la LX Legislatura | Sesión del Jueves, 27 de marzo de 2008.

Schwartz, E. (2008). Genomic Sovereignty and the Creation of the INMEGEN: Governance, populations and territoriality. Masters Dissertation in Genomics and Society: University of Exeter.

Schwartz, E. (2009). *Embedding Sovereignty: Awakening the Mexican Genetic Leviathan and the bioethics of DNA Cartographies*. Conference Paper. London School of Economics, *Vital Politics III*.

Schwartz, J & Pollack, A.,(2010) Judge Invalidates Human Gene Patent, New York times, March 10. Available at: http://www.nytimes.com/2010/03/30/business/30gene.html

Schwartz-Marín, E (2011) Protegiendo el "mextizaje": El inmegen y la construcción de la soberanía genómica pag-1 5 5 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

Schwartz-Marín, Ernesto, and Irma Silva-Zolezzi. 2010. "The Map of the Mexican's Genome": overlapping national identity, and population genomics. *Identity in the Information Society*:1-26.

Scott, D (2005) Colonial Governmentality in Ida (ed) Anthropologies of Modernity: Foucault, govermentality and life politics. Blackwell Publishing, US

Séguin, B, et al (2008) Foreword: Human genomic variation initiatives in emerging economies and developing countries, *Nature Reviews Genetics*, Octubre, S3-S-4.

Seguin, B. (2009) in the Mexican Senate. 9 March 2009. Available in: http://www.senado.gob.mx/comisiones/LX/cyt/content/presentaciones/docs/Beatrice_

Séguin, B., *et ál.*, (2008a), Human Genomic variation Studies and Pharmacogenomics are critical for Global Health, *Landes Bioscience*.

Séguin, B., *et ál.*, (2008b), Genomic medicine and developing countries: creating a room of their own, *Nature Reviews*, 9 Junio, pp, 487-494.

Séguin, B., *et ál.*, (2008c), Genomics, public health and developing countries: the case of the Mexican National Institute of Genomic Medicine (inmegen),

Seguin.pdf

Seligman et.al (2008) Ritual and its consequences : an essay on the limits of sincerity. Oxford ; New York : Oxford University Press.

Shani, G (2010) Decolonising Foucault, International Political Sociology. Pag 10-13

Shapin, S. (2007) *Science and the Modern World,* in Hacket, E. et.al (Ed) Handbook of Science and Technology Studies (MIT Press. Cambridge Massachusetts USA).

Sigurdsson, Skúli (2001) 'Yin-yang genetics, or the HSD deCODE controversy', New Genetics and Society, 20:2, 103 – 117

Silva-Zolezzi Irma, et.al (2009) Analysis of genomic diversity in Mexican Mestizo populations to develop genomic medicine in Mexico. Proceedings of the National Academy of Sciences, 2009; DOI: 10.1073/pnas.0903045106

Silva-Zolezzi, I., in Sapiens (2009) La huella genética de la historia mexicana, available at: http://www.sapiensideas.com/noticias/saberes/la-huella-genetica-de-la-historia-mexicana/

Singer, P. A., & Daar, A. S. (2001). Harnessing Genomics and Biotechnology to Improve Global Health Equity. Science, 294(5540), 87–89

Siqueiros et.al (2011) "Complexity, Genomics and Science Regulation," accepted to be presented at the 2011 ELSI Congress: Exploring the ELSI Universe, April 12-14, at the University of North Carolina in Chapel Hill, NC

Slatkin, M (2008) Linkage disequilibrium-understanding the evolutionary past and mapping the medical future, Nature Review Genetics, Volume 9, June. pp. 477-485

Sloterdijk, P (2000) "The Operable Man: On the Ethical State of Gene Technology," trans. Joel Westerdale and Günter Sautter, lecture at UCLA conference Enhancing the Human: Genomics, Science Fiction, and Ethics Collide, Goethe Institute, Los Angeles, *peter sloterdijk.net*, January 2007:<http://www.petersloterdijk.net/international/texts/en_texts/en_texts_PS_operable_man.ht>

Sommers, M (2008) History in the Gene: Negotiations between Molecular and Organismal Anthropology, Journal of the History of Biology, DOI 10.1007/s10739-008-9150-3

Sommers, M.,(2010)DNA and cultures of remembrance: Anthropological genetics, biohistories and biosocialities. BioSocieties (2010) 5, 366–390. doi:10.1057/biosoc.2010.19

Star, S.(2010) This is not a boundary object: reflections on the origin of a concept. Science Technology Human Values 2010 35: 601

Star, S., and Griesemer, J.,(1989) 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-3.Social Studies of Science, Vol. 19, No. 3. pp. 387-420

Stepan, N (1991) The house of Eugenics: race, gender, and nation in Latin America, Cornell University Press. Ithaca, NY

Stern A., (2000), Mestizofilia, biotipología y eugenesia; hacia una historia de la ciencia y el Estado, *Relaciones*, 21.

Stewart R. Clegg, Tyrone S. Pitsis, Thekla Rura-Polley and Marton Marosszeky (2002) Governmentality Matters: Designing an Alliance Culture of Inter-Organizational collaboration for managing projects, Organization Studies; 23; 317

Stoler, A., (1995) *Race and the Education of Desire*. Durham: Duke University Press.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage.

Suarez, E & Barahona A (2011) La nueva ciencia de la nación mestiza: sangre y genética humana en la posrevolución mexicana(1945-1967), pag-6 5 en Lopez-Beltran (ed) Genes y Mestizos. Ed. Ficticia México

Taracena, E; Jimenez-Sanchez, G., (2005) INMEGEN, innovación en la ciencia de la vida aplicada en la salud, IPADE, Mexico City.

Tenorio Trillo, M.,(2010) Discutamos Mexico, with Enrique Florescano, Channel 22, TV program, Mexico February.

Terwilliger, J.D. & Hiekkalinna, T. 2006. An utter refutation of the 'Fundamental Theorem of the HapMap'. *European Journal of Human Genetics*, 14, 426–437.

Thacker, E. (2005). *The Global Genome: Biotechnology, Politics, and Culture*. Cambridge: MIT Press.

The International HapMap Consortium. 2003. The International HapMap Project. *Nature*, 426, 789-796.

The International HapMap Project: http://www.hapmap.org/originhaplotype.html.en, last consulted August 17 2009)

Thomas, G., Skorecki, K., Parfitt, T., Bradman, N., Goldstein, D., (1998) Origins of Old Testament priests, Scientific Correspondence, Nature, Vol. 394, pp. 138-139

Tian C et. al (2010). Variant in PNPLA3 is associated with alcoholic liver disease. Nat Genet. Jan; 42(1):21-3

Tian C, Stokowski RP, Kershenobich D, Ballinger DG, Hinds DA (2010) Variant in PNPLA3 is associated with alcoholic liver disease. Nat Genet 42:21–23.

Tresch, J (2001)On Going Native: Thomas Kuhn and Anthropological Method, *Philosophy of the Social Sciences* ; 31; 302

UNAM (2009), Official Webpage available in: http://www.unam.mx/acercaunam/es/identidad/himno.html. last consulted Sept, 03, 2010

Underiner, T., (2004) Contemporary Theatre in Mayan Mexico, Death-Defying Acts, University of Texas Press. USA

UNESCO (1950), The Race Question, *The* UNESCO *and its programme*. UNESCO publication 791

UNESCO (1997) Universal Declaration on the Human Genome and Human Rights

Valadez, D., (2009) Derecho comparado del genoma humano en América Latina, Senado Mexicano V aniversario del INMEGEN: Retos y Logros en materia legislativa del Genoma Humano.

Vasconcelos, J., (1925) La Raza Cósmica: Misión de la Raza iberoamericana, Agencia Mundial de librería, Barcelona. electronic versión available at:http://www.filosofia.org/aut/001/razacos.htm

Ventura Santos & Verlan Valle Gaspar Neto (2011) *Human biological diversity studies in Brazil from the late 19th to the early 21st century: a historical-anthropological analysis. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011*

Villar, S (2009) Medicos de Mexico, Edicion Especial, 5to aniversario INMEGEN.

Viqueira, J., (2010) Discutamos Mexico, with Enrique Florescano, Channel 22, TV program, Mexico February.

Vision 40 (May 2009) Jun Antonio Beteta, Noticiero independiente Canal 40

Wade P., (2011) Introduction: Race, genomics and mixture in Latin America. Paper in Race, genomics and mestizaje (mixture) in Latin America: a comparative approach Chancellor's Conference Centre, University of Manchester7-8 July, 2011

Wade, P.,(2004). Images of Latin American mestizaje and the politics of comparison. *Bulletin of Latin American Research* 23 (1):355-366

Walker, Wyndham L., (1945) Territorial Waters: The Cannon Shot Rule ; available at: http://heinonline.org/HOL/LandingPage?collection=journals&handle=hein.journals/byrint22&div=12&id=&page=

Wall, J & Pritchard,D (2003)Haplotype blocks and linkage disequilibrium in the human genome, Nature Reviews Genetics, Volume 4. Pp. 587-97

WHO (2002) Genomics and World Health: Report of the Advisory Committee on Health Research. Geneva

Wilson, G,G., (1928) Territorial Waters; Proceedings of the American Society of international Law.

Yuan et.al (2008) Population-Based Genome-wide Association Studies Reveal Six Loci Influencing Plasma Levels of Liver Enzymes.The American Journal of Human Genetics 83, 520–528, October 10

Zhu, X, S. Zhang, D. Kan, and R. Cooper (2004) Haplotype Block Definition and Its Application. Pacific Symposium on Biocomputing 9:152-163.

Zolla C. (2007) La salud de los pueblos indígenas de México, en: www.nacionmulticultural.unam.mx/.../Salud/LA%20SALUD%20DE%20LOS%20PUEBLOS%20INDIGENAS-DEFINITIVO(1).pdf