The Role of Behaviour in the Recurrence of Biological Processes

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Introduction

My rather cumbersome title embodies some presuppositions I bring to the topic of the evolution of behaviour, though perhaps not very controversial presuppositions. First, I believe we should think of the biological world as most fundamentally and generally composed of processes rather than of individuals or organisms. I shall say a little about this below. Second, I take the central explanandum of evolutionary theory to be the recurrence of such processes. That is to say, what evolve are not just adult organisms, still less genomes but, rather the full development cycles that connect sequences of such things. These developmental cycles are processes of which adult organisms are time slices, and genomes are parts of time slices. The topic of this paper, then, is the way behaviour is integrated into, and contributes to the reproduction of, developmental processes. An enormous topic, of course; I shall offer no more than some general ideas on ways of thinking about it. The paper will mainly focus on the specific application of these ideas to the understanding of human behaviour.

The paper will begin by providing some more detailed discussion, first, of the nature and importance of processes, and then of the developmental systems perspective on evolution. This will provide the background for a consideration of special issues that arise in considering the evolution of behaviour. A particularly important aspect of this question is the potential rate of behavioural evolution. In opposition to popular arguments in Evolutionary Psychology, which place the core of human behavioural evolution in the Pleistocene, I shall argue that behavioural evolution is likely to proceed at a rate that provides much greater importance to more recent human history. One of the most significant insights that derive from a focus on the processual character of evolution is the attention it draws on the very different rates of processes that may nevertheless coincide in the same entity[1]. I will conclude with some brief remarks about the endlessly puzzling concept of human nature.

Processes

I shall introduce this discussion of process with something of a philosophical platitude, though perhaps one the significance of which is not always properly appreciated. The aim of science is not to find the complete truth about everything, which is just as well as this is a goal of dubious intelligibility, and one that would surely be impossible to reach. Scientific descriptions are, rather, grounded in abstractions from the massive complexity of nature, and scientific progress is possible when these abstractions are sufficiently well-chosen to allow the scientist to address particular kinds of questions[2]. There is certainly no unique scientific truth about something as complicated as an organism, a paradigmatic instance of the kind of entity that is open to multiple possible descriptions; mistaking the abstractions embodied in a particular description for a full description of the whole is a potent source of misunderstanding.

Biological systems are hierarchies of processes. From the quantum mechanical noise that drives many cellular processes, to metabolism, development, and ultimately evolution, everything in life is in flux. I won't attempt here to enter into the notoriously problematic philosophical analysis of process[3]. The simple intuitive idea is that a process is an entity that could not be an entity of that kind without underlying processes of change. A rock, we suppose, could remain precisely as it is for any length of time, without ceasing to be a rock. To remain a mouse, on the other hand, a host of changes must be occurring to the system at multiple levels. A more sophisticated account would allude to the different time scales at which an object is stable or change-dependent—a mountain,

[1] For elaboration of this point, see Bapteste and Dupré (2012).
[2] A less platitudinous and much more detailed elaboration of these claims is provided in Dupré (1993).
[3] The locus classicus is Whitehead (19xx). The notorious difficulty of that work is one reason why the general topic has often seemed inaccessible. A much more approachable treatment is Rescher (xxxx).

for instance, is highly stable at a mundane human time scale, but a process from the perspective of tectonics—but this sophistication can safely be ignored for present purposes[4].

Despite the indisputably dynamic and processual nature of biological systems, biological ontologies are frequently formulated in terms of objects with stable properties. Taxonomies for instance are often presented as a set of adult phenotypes with fixed and determinate properties; genomes are represented as sequences of nucleotides; even something as plainly dynamic as a metabolic network is represented as a set of boxes connected by arrows. These representations are perfectly legitimate abstractions from the underlying processes and they may serve important scientific purposes. They also have potential to mislead. Perhaps no one will be misled by the metabolic chart into thinking that the cell contains a fixed and stable inventory of chemicals; indeed this is very much intended as a representation of process. But it is much easier to forget the highly dynamic aspects of the genome. Not only is its sequence maintained by a variety of editing processes, but it is constantly changing its configuration in response to epigenetic signals that determine, in turn, the levels of activity at different loci within it. The static abstraction here can readily encourage the unidirectional model, made famous in the Central Dogma, which sees a static and unchanging genome determining biological form from generation to generation.

The processual character of living systems is essential to a proper formulation of the ontology of animal behaviour. Organisms move about the world doing many different things. Saying what an organism is doing is more or less of an abstraction from the dynamic stream of interaction between organism and environment. This point should bring into focus a familiar point in the philosophy of action, that the characterisation of movements in terms of the actions they constitute is often not fully determinate. While cooking the dinner I move my hand up and down. I am also, by virtue of that hand movement, chopping an onion and, in this case unintentionally, distributing bacteria over the chopped onion. From an ecological perspective that connects my behaviour to the behaviour of

[4] And similarly, no doubt a rock or a mountain depends for its coherence on atomic processes at extremely short time scales.

many other organisms, I am feeding my family. At the most theoretical level I am, perhaps, increasing my fitness. The point of course, is that different interests and different perspectives determine a whole range of true but partial characterisations of what I am doing. The selection of a description of a biological system is never wholly straightforward; in the case of animal behaviour it is most strikingly underdetermined.

Evolution and Developmental Systems

Questions about evolutionary history include, at least, questions about the sequence of different kinds of organisms, questions about the ancestral relations connecting extant kinds, and questions about the causal processes resulting in the differences between ancestral kinds and their descendants. Behaviour is of most obvious relevance to the last question, both as an aspect of difference—behaviour evolves—and a cause of changes in all aspects of the evolving biological kind.

Developmental systems theory (DST) provides, in my view, the best framework for answering questions about causal processes in evolution (Oyama 1985; Oyama et al 2001). It also makes a possible a broad understanding of evolution according to which any somewhat stabilised change in the distribution of traits in a population should count as an evolutionary change. This is, of course, in sharp contrast with the still widely accepted definition of evolution as (just) change in gene frequency. There is nothing inherently wrong with the latter definition. But it will by definition exclude any changes over time in the character of populations that do not consist in, and are not caused by, changes in gene frequency. Since it is well established that behavioural changes over time are often stabilised not through genetic causation but through cultural processes such as imitation, the narrow definition is quite ill-suited to investigation of the evolution of behaviour.

Developmental systems theory takes as its object the problem alluded to above, the explanation of the recurrence of developmental cycles. In doing so it tries to take account of the whole range of resources that are deployed in the recreation of the developmental cycle. For the case of many animals, these will include, minimally, the fertilised egg (including all the cytoplasmic resources as well as the constituents of the nucleus), the complex resources provided by the uterine environment, a highly variable amount of postnatal parental care, and an equally variable infrastructure of resources (nests, warrens, dams, etc.) that are provided by older conspecifics who may or may not be close kin. The input of parents or other conspecifics will also be crucial in many species for the development of the characteristic behavioural repertoire of the species—foraging strategies, mating behaviour, communication, etc., and, very importantly, acquisition of the skills necessary to transmit this repertoire to one's own descendants. The developmental system also includes the facilitation of the recruitment of the array of symbionts, typically microbial, that are essential for the successful completion of the life cycle, and there is growing evidence that these symbionts can be crucial determinants of behaviour (Al-Asmakh et al. 2012; Cryan and Dinan 2012). It should be obvious that the resources required for the recreation of human life cycles, including infrastructure such as schools and their associated activities, constitute a uniquely complex developmental niche.

Behaviour

We evolved, we behave, therefore our behaviour evolved. I take this simple argument to be basically sound (given the broad concept of evolution), but it does need a little refinement. In stating the broad concept of evolution I suggested that to be accounted as evolutionary, changes in a population should be 'somewhat stabilised'. This is intentionally vague, but it is clear enough that not all behaviour satisfies it. Transient responses to unusual events or, in the human case, all manner of fads and fashions, will not be sufficiently stabilised to count as, or anyhow to be usefully conceptualised as, evolutionary change. Human behaviour is also highly polymorphic, and this may result in different variants of a stabilised trait being stabilised in different populations or subgroups of the species. The various physiological and psychological capacities that make human speech possible are certainly evolved and stabilised aspects of the human phenotype; so is the behaviour, generally described of speaking a language. Speaking French or Swahili, or talking about football, are local applications of those capacities, not stabilised species-wide traits, though of course stabilised within a local more or less open population. But this distinction is not a reflection of something inherent in the nature of the behaviours. If all languages except, say, Mandarin eventually died out and the human species became uniformly monoglot, then learning Mandarin would have become a stabilised part of the phenotype, and the processes of learning it would have become part of the general human developmental niche. And there are even imaginable if improbable circumstances under which playing and talking about football could become a stabilised part of the human behavioural repertoire. As the present example illustrates, it is often useful to keep in mind the distinction between an item of behaviour, a general category of which that item is an instance, and the capacities that make that kind of behaviour possible.

The central questions that we need to ask about the evolution of behaviour, in so far as behaviour is sufficiently stabilised to come within the scope of an evolutionary study, should now be clear enough: What causes particular forms of behaviour continuously to recur at particular points in the life cycles of particular organisms? How do these recurrent behaviours contribute to the maintenance and evolution of the series of cycles of which they are part? Answering these questions for the human case is an integral part of the general project that can be describes as the characterisation of the human developmental niche.

One precondition of productive engagement with these questions will be choosing the right way of describing behaviour, not simply finding the behaviour; a crucial aspect of this problem, in turn, is selecting the right scope of the description. To follow up the example of language, speaking a language is part of the evolved human behavioural repertoire, speaking French is a more specific instantiation of the relevant behaviour. The capacities that underlie speech are species typical evolved characteristics, their application to speaking French is a local application of these capacities. Note that there is room here for overlapping classifications. It might be that, say, gossiping was a stabilised aspect of the human behavioural phenotype. But particular gossips would necessarily employ a particular language. A functional classification of linguistic behaviour (gossiping, telling stories, planning co-ordinated ventures, etc.) will certainly cross-classify a taxonomy of the languages in which these activities are performed. And aspects of the former may turn out to be stabilised features of the human phenotype. Similarly, and famously, it is debated whether syntactic aspects of different languages might be stable aspects of the human phenotype though plainly the individual languages are not.

The upshot of all this is just that while the simple argument at the beginning of this section shows us that there are important facts to discover about the evolution of behaviour, these may involve multiple different classifications of behaviour and multiple different levels of abstraction. Those, like myself, who have criticised major programmes that study the evolution of human behaviour, notably socio-biology and its offspring, Evolutionary Psychology, have not claimed that there is some aspect of the human that is somehow mysteriously outside the realm of evolution. It is rather that these projects have used conceptualisations of behaviour that are inappropriate for evolutionary study. One thing that has made these inappropriate conceptions especially contentious has been their connection with the issue of the flexibility of human behaviour. By describing behavioural evolution with an inappropriately narrow scope, in terms of quite specific behavioural patterns, Evolutionary Psychology identifies these as what have been evolutionarily stabilised. More abstract characterisations of the underlying capacities as what has been stabilised imply that a wider range of actual behaviour may be possible. For example, it is possible that we have evolved a specialised and stabilised capacity to detect violations of social rules (Cosmides and Tooby 2005), but it is equally possible that this is just one application of the capacity to analyse social relations. A good deal is at stake in getting the right descriptions of evolved behaviour.

The Fixity of Human Behaviour

How flexible is human behaviour? This question needs some unpacking. We need, to begin with, to be careful to distinguish capacities to behave in certain ways, dispositions to behave, and actual behaviour. Stabilisation of the capacities that underlie most behaviour is almost certain to exist, though only at certain levels of abstraction. On the other hand it is not a foregone conclusion that there are *any* dispositions to behaviour, though no doubt it is likely that there are some at least at fairly abstract levels of description such as 'raising children' or 'seeking resources'. And finally at the level of actual behaviour, though there may be numerous behaviours that are highly stable features of the human phenotype—crying in infancy, smiling, laughing, etc.—though interesting in mnay ways, these do not seem likely to be central to the project of delineating the distinctively human.

Returning now to the human developmental process, I shall next consider how capacities for behaviour might figure in an account of human evolution. A first crucial point is that capacities are not merely intrinsic feature of humans, but relations between intrinsic properties of humans and features of the environment, social or material. The capacity to speak a language depends on having the right kind of brain, but equally on living within a linguistic community. The linguistic community is essential for acquiring a language, but is equally necessary for using it[5]. It is not easy, perhaps not possible, to separate the internal and external prerequisites. The features of the brain that are required for speaking do not just develop willy-nilly in the hope that they will find themselves in a speech-laden environment. Without linguistic inputs they do not develop at all. This is a reason for the necessity of thinking in terms of the full developmental niche: the parts of the niche are highly interdependent. To take a quite different example, consider the capacity to move around multi-storey buildings. The capacity to climb stairs is entirely lacking in paraplegics. However the capacity to move around multi-storey buildings depends, for such people on whether there are lifts or ramps. If there are only stairs they lack the capacity; if there are lifts they have it as much as anyone else[6].

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[5] Here I interpet and endorse—both controversially—Wittgenstein's famous, or notorious, private language argument (Wittgenstein 1953). Nothing in the resent paper depends heavily on this endorsement, however.
[6] This issue is discussed further in Dupré 1998.

In this case the external and internal features seem more separable; but the capacity depends on the proper combination of both.

But it will be said that questions about the internal amenities of buildings have little or nothing to do with *evolution*, unless perhaps in predicting long term changes in human evolution if those changes remain in place for long enough—perhaps atrophy of no longer needed limbs. The common assumption that they are not part of evolution is generally grounded in the idea that they are too transitory, too shallowly rooted in the history of the species lineage, to qualify as evolved. In anticipation of this complaint I have several times mentioned the idea of the *stabilisation* of a trait as a condition of its being properly counted as evolved. But how much stabilisation is necessary? Clearly less than total, or evolution would be replaced by stasis (compare Richard Dawkins's (1976) genes, somewhat ironically described as 'immortal'). Part of the answer must be that without being totally stabilised, for a trait to count as evolved it must have features that potentially stabilise it, that at least have the ability to entrench it in the wider developmental system. Germ-line mutations, of course, have this potential by virtue of their familiar ability to be transferred to the next generation through reproduction, and so do a host of other cytoplasmic elements that can, in principle, be passed indefinitely from mother to daughter in cellular divisions. But so do elements of behaviour that could be taught, for instance by parents, or learned by imitation. So what distinguishes an item of behaviour, or for that matter a mutation, that for a period of time becomes prevalent in a population, as part of the evolutionary history of that population? Here it may be impossible to do better than just to insist that the element of behaviour have some minimum significance, some sufficient impact on the overall pattern of behaviour.

That the preceding proposal is vague is probably to its credit. After all any trait that appears in an evolving population is part of its total history, and any behavioural trait has a possible mechanism (intergenerational teaching or imitation) for becoming entrenched. So ultimately we should not expect more than principled judgements about whether a trait that appears with some frequency at some point in the history of a lineage is a part of its evolutionary history worth mentioning. Recalling the point with which this essay began, science does not aim to provide the whole truth.

But there is a more substantive practical point in the background of this discussion. We are inclined to think of evolved features of humans as immutable and therefore not subject to normative evaluation, whereas non-evolved ones may be seen as providing the proper domain for ethical or political debate. Conceptually this is just a mistake (Griffiths 2002). But the connection of the evolved with the stabilised does point to an important related truth. If we are interested in the mutability of behaviour we should certainly be concerned to understand the processes by which behaviour is stabilised and entrenched in the developmental niche. And this is equally a crucial topic in understanding evolution, behavioural or otherwise.

An especially important aspect of these stabilisation processes is their very diverse time scales, and this is an essential topic for understanding behavioural change. Evolutionary psychologists, as I have mentioned, suppose that the slow rate of genetic change is such that our basic behavioural capacities and indeed dispositions, must have evolved in the Pleistocene, and are now essentially the same as those that originated then. Our behavioural tendencies are deeply atavistic: we are apes in skyscrapers[7]. But even if one accepts that there is some level of description of human behavioural descriptions at which this is true, an ape in a skyscraper is a quite different animal from an ape in a tree. The skyscraper is part of a developmental niche that will produce an animal with quite different capacities and, for that matter, a quite different brain. Many animals drive their own evolution by manipulating their environments including, as Darwin described in great detail in his final book, the humble earthworm (Darwin 1881). But humans have taken this to a quite different level from any other animal. Evolving wings takes many millions of years; yet humans have evolved the capacity to fly in a few decades. So even if evolutionary psychologists are right about some

[7] For a detailed critique of the assumption of atavism, see Dupré 2009.

underlying capacities that are stabilised over very long periods, actual behaviour is enormously flexible.

Is a behavioural capacity such as flight an insufficiently stabilised trait to belong to the evolved human phenotype? And if so, what is the basis of this judgement? The first question is, in the standardly derogatory sense, purely semantic. As I have just explained, there is no sharp distinction among traits that distinguishes those sufficiently stabilised to belong in an evolutionary account of the species history. But what is important is that we recognise the flexibility of human behaviour that gives rise to questions of this kind. Recognising this flexibility is not to endorse the 'blank slate' so derided by evolutionary psychologists, but merely to note the empirical fact that human behaviour changes, sometimes very rapidly. And of course the capacity of behaviour to change thus rapidly is something that cries out for explanation, and explanation in terms of remarkably adapted cognitive capacities. What can be quite obviously inferred from the empirical observation of flexibility is that the relevant adapted structures are not adaptations for very specific forms of behaviour, as evolutionary psychologists often seem to suppose. Similarly the wonderful versatility of the human hand shouldn't lead us to suppose that it lacks any structure; but it may very reasonably encourage the thought that the versatility implicit in its structure was part of the adaptive advantage that drove its evolution.

Whatever one may think of the human capacity to fly, there is no reason why technology should not be stably embedded in the human developmental niche, and much of it surely is. No one should seriously question whether agriculture, clothing, and tool use are established evolved features of the human developmental repertoire. To take a slightly more contentious and relatively recent achievement, think of the capacity to eat a variety of hard or fibrous foods that require chewing. Not long ago this was the prerogative of the young, an aspect of the developmental cycle that was lost as inevitably the teeth rotted and fell away in mid-life. Now, where there is access to good dentistry, this capacity extends throughout the life cycle. It is, of course, possible to exclude technology by fiat from figuring in an account of human evolution, most obviously by insisting on defining evolution in terms of changes in gene frequency. But the price of this move is to make evolutionary theory largely irrelevant to changes in the human phenotype or, worse, to motivate a bizarre thesis of systematic human maladaptation.

Most technologically mediated changes in human capacity have little obvious impact on physiology, yet they may result in well stabilised changes in behavioural dispositions. Examples are legion. The advent of televisions brought it about in many human populations that the typical daily behavioural pattern involved several hours at the end of the day sitting silently staring at a rectangular screen; the growth of personal computers has extended a broadly similar behaviour into large chunks of many peoples' diurnal routine, sometimes punctuated by rhythmic tapping of the area immediately in front of the screen. And in fact these behavioural changes do have a quite systematic affect on developed human physiology. Humans who spend much of their life in front of these screens tend to become obese, incapable of strenuous activity, and sometimes dependent on sophisticated medical technologies to mitigate the adverse fitness consequences of these changes. No doubt there are more subtle though equally important changes to their brains. It remains to be seen whether these behavioural changes (or the related physiological changes) will prove to characterise a few human populations for a matter of decades, or whether they will become increasingly stably entrenched in species typical behavioural patterns. The point is only that the latter is entirely possible, and in that case they would become as much a part of our evolutionary history as parallel non-human examples such as the maintenance and occupation of beaver dams and termite mounds, or in the human case such fully entrenched aspects of behaviour as wearing clothes and growing crops.

There is, anyhow, a deeper biological reason for insisting on the inseparability of nature and environment, and one that extends far beyond the special human case. It is also a biological development that makes the traditional understanding of evolution as ultimately about gene frequencies completely and finally untenable. This development is the growing appreciation of the importance of epigenetics. Epigenetics can most generally be understood as referring to whatever explains why cells with the same genomes express different genes and perform different functions. It is now understood that much of this is determined by chemical and physical modifications of the structure of the chromosomes, for example through methylation and histone modification. The important point here is not the details of these processes, but the fact that environmental stimuli are now known to trigger epigenetic changes to the genome. Thus any idea of some set of genetically grounded dispositions entirely free of environmental influences must be rejected. The genome is a fully interactive part of the whole system of causes that produce organismal development, even the development of capacities and dispositions to behave[8].

The most famous example of behavioural epigenetics is found in the work of Michael Meaney and his associates on rodents. Specifically, Meaney found that grooming of rat pups by mother rats led to the development of the pups into less fearful and cautious adult rats. It was claimed that this was mediated by the demethylation of a gene for the receptor of glucocorticoid in the brain, increasing the sensitivity of the developing rat's brain to this transmitter. There is a good deal of controversy surrounding this research and its interpretation. Critics point out that there is no established mechanism connecting maternal care to the alleged demethylation events, and that the results are quantitatively fairly small. Particular controversial is the question to what extent epigenetic changes, specifically methylation patterns, can be transgenerationally transmitted, though there seems to be a growing consensus that this happens more than had until recently been thought. A nice point about the Meaney example, however, is that it illustrates that transmission at the molecular level is not necessary for evolutionary change. Transgenerational transmission is, of course, important in arguing that a change is sufficiently stabilised in a population to count as evolutionary. But this stabilisation doesn't have to involve transmission through the gametes. In the case of the rats, the behavioural changes in the well-groomed rats are such as to make it likely that

[8] For a detailed treatment of the importance of epigenetics to evolution, see Jablonka and Lamb 2005.

they will, if female, provide similar care to their own offspring. Thus methylation of cells in the brain is a link in the process that connects the behavioural phenotype of one generation to the next, but a link entirely bypassing the germ line.

Even if many of the postulated mechanisms connecting environment and behaviour through epigenetic mechanisms turn out to be wrong, the empirical evidence that something of this kind must be happening is increasingly overwhelming. Particularly impressive are correlations between parental environments and physiological traits of descendants at some generation's remove[9]. Although the mechanisms are poorly understood in this case, it seems irrefutable that they must involve some heritable change to a physical feature of the organism, since the missing generation removes the possibility of behavioural transmission.

The fact that germline cells are not the only connection between generations is a fundamental point about the DST perspective. Behaviours can be learned; physiological development can be affected by all manner of inputs from the environment, whether or not directly provided by parents or other conspecifics. What epigenetics adds to this expansion of modes of transmission is a potential link between environmental inputs and biological inputs at the deepest genetic level. The conceptual significance of the absorption of epigenetics into the main streams of both molecular and evolutionary biology is that the separation of genes form environment, or nature form nurture, is no longer tenable at any level. There is, therefore, no privileged role for genes in evolution, as DST advocates have long insisted, and there is no coherent argument for attaching a unique importance to the capacities underlying behaviour that evolved a million or two years ago in the Pleistocene.

Human Nature

Where does all this leave the concept of human nature? I think there is much to be said for trying to get rid of the concept altogether, since it is almost inevitably going to be misinterpreted as

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[9] See especially the work of Marcus Pembrey and associates with the ALSPAC longitudinal study. See, e.g., Pembrey et al. 2006.

something static and largely immutable. But as a second best alternative, we can make an effort to be as clear as possible about what sorts of general statements about the nature of humans can be supported.

The first point, perhaps very obvious, but certainly insufficiently recognised, is that human nature must be seen as a cycle not the description of any stage in that cycle. Of course, a typical description of the organism at early maturity, say, could be a part of the description of the cycle. But even aart from the danger of taking this part for the whole, emphasis on the cycle makes it much easier to see that a particular state at a particular stage in the cycle may be liable to a good deal of variability both between individuals and, more importantly, over time. And this, in turn, reflects the fact that many inextricably intertwined factors are responsible for the production of the cycle, many of these may undergo changes that can be stabilised within the cycle, and therefore, finally, many evolutionary processes are possible at a variety of time scales.

It is, however, a gross error to confuse this individual diversity and evolutionary malleability with the total amorphousness of the blank slate. On the contrary, there are extremely complex and impressive states of the human, especially the human brain, that make possible this malleability. To repeat an earlier analogy, the fact that the human hand is capable of manipulating multiple entities in the environment in many different ways depends precisely on its having a very reliably reproduced structure that facilitates these diverse manipulations. The problem with enterprises such as socio-biology and evolutionary psychology is that they have looked for stable features of the human life cycle at the wrong level of abstraction. Diversity of human behaviour is not something to be explained away as a noisy overlay on a standard underlying behavioural *disposition*, but should be sees as revealing a reliably reproduced *capacity* to acquire behavioural dispositions suited to the cultural and other exigencies of a specific human developmental niche.

The problem is that this correct level of abstraction offers something that may seem quite unsuited to answering traditional questions about human nature. Certainly for many areas of science, for example neurobiology and much of psychology, explaining the diversity and versatility of human behaviour is naturally seen as a central part of their agenda. And to many interested in human evolution, the rapidity of human behavioural change may seem a central explanandum. But more everyday uses of the concept of human nature, uses that identify specific kinds of behaviour as in accordance or discordance with human nature, often even carrying a strong normative implication, will be difficult to get rid of. It is for this reason that I think there is much to be said for trying to get rid of the expression altogether. If, nonetheless, it were possible to convey the idea to a wide audience, that diversity, flexibility and adaptability were at the core of the human, and indeed what constituted the very special and remarkable achievement of human evolution, this might be the best possible outcome.

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