Embodied, extended, and distributed cognition in Roman technical practice

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1. Introduction.

Moving beyond the information-processing model of cognition characteristic of the classical computational theory of mind in philosophy, cognitive psychology, and 'good old-fashioned artificial intelligence' (Haugeland 1985: 112), the second-generation cognitive sciences emphasize the central – and even constitutive – role that the body and environment play in human thought.[1] Theories of embodied cognition posit that reasoning in abstract as well as in concrete domains is underwritten by conceptual structures and cognitive processes arising from our sensory and motor interactions with the world. These structures include image schemas and their metaphorical projections.[2] Some theorists claim that cognition in fact always happens at the interface of brain, body, and world.[3] Andy Clark and David Chalmers have articulated one of the strongest forms of this 'transcranialist' claim in their extended mind hypothesis, according to which the mind is literally comprised of both neurological and environmental components.[4] Theories of distributed cognition similarly highlight the ways in which human beings tend to offload cognition onto structures in their physical and social surroundings, taking advantage of whatever affordances the environment may provide for structuring and co-ordinating action or information.[5] One aspect of this 'new science of the mind' (Rowlands 2010) that has received less attention, however, is how

[1] See Rowlands 2010, 2003; Shapiro 2010; Boden 2008; Gallagher 2005.
[2] See esp. Kövecses 2006, 2005; Lakoff and Johnson 1980, 1999; Lakoff 1987; Johnson 1987, 1990.
[3] E.g., Stewart et al. 2010; Thompson and Stapleton 2009; Thompson 2007; Varela et al. 1991.
[4] Arnau et al. 2014; Menary 2010; Chemero 2009; Clark and Chalmers 1998; Clark 1997.
[5] Through what has been called 'cognitive niche construction': see Clark 1997; cf. Estany and Martínez 2013; Hutchins 2001, 1995; Hollan et al. 2000.

such embodied, extended, and distributed cognitive processes co-operate in shaping behaviour in differing cultural contexts.

In this paper, I explore several ways in which members of ancient Roman society exploited the social and, above all, physical environment as a scaffold for cognition in their technical practices, where 'technical' is meant to indicate practice within defined arenas of expert activity. Focusing on memorisation and on calculation and on the special challenges these activities presented within a specifically Roman cultural framework, I argue that in Latin speakers' performance of such activities the environment did not serve merely as the 'passive background' against which their cognition unfolded (paraphrasing Malafouris 2013: 72). Rather, it often constituted the functional architecture upon which their cognitive processes were built. I suggest, moreover, that in carrying out some memorisation and calculation tasks, Latin speakers' distributed cognitive strategies were mediated by the particular embodied metaphorical conceptualisations made available by their language and culture: very specifically, a system of conceptual metaphors, widely detectable in the semantics of Latin, according to which thoughts are conceived as locations and mental activity is conceived in terms of movement in space. This entrenched spatial metaphorics, I contend, provided a sort of motivating context that suggested certain ways of utilising the physical environment in support of cognition as more salient and more 'meaningful' than others. I conclude by considering some implications of this study both for classical studies and for the cognitive sciences.

2. Extended and distributed cognition in ancient memorisation strategies.

The human memory faculty consists of several interlocking cognitive subsystems. Generally, cognitive neuroscience recognizes four or five different types of memory, distinguished mainly by

their temporal persistence: viz., modality-specific sensory memory (retaining information for only several milliseconds); transient short-term memory (including a visuo-spatial 'scratchpad' and 'phonological loop' for storing and manipulating visual images or verbal information, lasting about 10–15 seconds); working memory (which serves a central executive function for integrating, processing, and transferring information between memory stores); intermediate-term memory (storing select information from short-term memory over a period of two to three hours); and long-term memory (where synaptically-consolidated memory traces or 'engrams' can be stored potentially indefinitely).[6] Long-term memory is theorised to consist of several separate, specialised stores for explicit declarative ('episodic' and 'semantic', 'know what') knowledge and implicit procedural ('know how') knowledge.

Each of these memory systems exhibits certain definite limitations. Short-term memory is severely constrained both in terms of its capacity and duration: its capacity is limited by George Miller's 'magical number seven, plus or minus two', although 'chunking' – encoding spans or sequences of related information into groupings at a higher level of organisation, especially through salient associative links – can permit the amount of information stored in memory to be quite large.[7] Under normal conditions, its duration is between 10 and 30 seconds.[8] Conscious phonological rehearsing (that is, repeating verbally encoded information to oneself subvocally) may aid retention of information over a somewhat longer period, but the effortful attention required

[6] Cf. Craik and Lockhart 1972. Atkinson and Schiffrin's 1968 'multi-store' model of memory consisted only of sensory, short-term, and long-term memory. Baddeley and Hitch 1974 later proposed a revision to the model of short-term memory, specifying its constituent subsystems (phonological loop, episodic buffer, visuo-spatial scratchpad) and incorporating the executive function of working memory. More recently, experimental studies have distinguished between intermediate-term and long-term memory as a function of neural activity in the hippocampus: e.g., Rosenzweig et al. 1993; Parvez et al. 2005; Eichenbaum et al. 2010; see also Cowan 2001 and Kesner and Martinez 2007.

[7] Miller 1956; cf. Broadbent 1975 and Schneider and Detweiler 1987. Capacity varies by task and information type, however: cf. Alvarez and Cavanagh 2004.

[8] Rubin and Wenzel 1996; Cowan 1988; Peterson and Peterson 1959.

for such rehearsing inhibits most other cognitive as well as many kinds of motoric activity.[9] Long-term memory is instead generally capacious and lasting; in fact, it is thought to be unlimited and some memories may endure an individual's lifetime.[10] However, voluntary transfer of naturally-fading memories from the short- to the long-term store requires special attention and effort. Declarative information stored over the long-term may also require periodic 'maintenance rehearsal' in working memory and can sometimes be difficult to bring into conscious awareness: searching within, and retrieving information from, the long-term memory store may entail considerable costs in cognitive effort and time – and may nevertheless fail, especially if a subject is fatigued, distracted, inebriated, or otherwise impaired.[11] The organisation of information in memory – for instance, into conceptual or associative categories, hierarchies, matrices, or episodes – as well as explicit encoding ('I know that I know . . . ') therefore bears crucially on the success of recall.[12] At the same time, though more lasting and automatically available, procedural knowledge can be difficult to articulate verbally.

This is not to say that human beings everywhere and at all times are equal in respect to memory (or cognitive capabilities more generally). Memory abilities sometimes vary with age: so-called 'eidetic' memory, or the ability to recall detailed images after only limited exposure (not to be equated with the 'photographic memory' of popular mythology: see Minsky 1988), is usually connected with early childhood, although some adults have an abnormally capacious long-term memory store regarding details of their own lives ('hyperthymesia'). More generally, the capacity and efficiency of working memory (and thus the ability to consolidate memories long-term) can vary significantly between individuals, at least within certain limits (cf. Conway et al. 2007). Some

[9] See Baddaley 1998: 63–4 and 98–101, and Atkinson and Schiffrin 1968 on the effects of phonological rehearsal.
[10] Martinez 2010; Conway et al. 1992; Bahrick 1984, 1983.
[11] Baddeley et al. 1984; Cermak and Craik 1979; Hasher and Zacks 1979.
[12] Rabinowitz and Mandler 1983; Hasher and Zacks 1979; Battig and Bellezza 1979; Tulving and Donaldson 1972.

research indicates that memory differences also exist between the sexes: for example, women have been shown to have superior recall in verbal episodic memory tasks (remembering words, objects, pictures), whereas men have superior recall of symbolic, non-linguistic, visuo-spatial information.[13] Furthermore, a long tradition of scholarship in cross-cultural psychology,[14] as well as in anthropology (cf. Lévi-Strauss 1962) and indeed in classical studies has suggested that the cognitive capacities of members of non-literate and historical societies may have differed greatly from those of modern societies, particularly as regards various aspects of memory.[15] Certainly, as depicted in Plato's *Ion* (537a–e), the ability of an ancient Greek rhapsode (a professional performer of epic song) to learn and recall long passages of poetry would seem to far outstrip that of probably any present-day individual, even perhaps one specially trained in mnemotechnics. In *Hippias Maior,* the rhapsode Hippias claims to be able to learn fifty names after hearing them only once (285e7, ἅπαξ ἀκούσας πεντήκοντα ὀνόματα ἀπομνημονεύσω), a feat of immediate recall that today we would probably associate only with autism spectrum disorders (cf. Bennetto et al. 1996).

If some cultural variation in memorisation strategies can be found at the local, individual level what are probably innate biological features of the human memory system seem historically to have encouraged certain 'large-scale' strategies aimed at the formation, preservation and recollection of memories both individual and collective.[16] Maurice Halbwachs and Martin Bommas have stressed how in many traditional societies the monumentalisation of the urban landscape – the artistic or architectural building up of the environment that anchors collective

[13] Cf. Burton et al. 2004, Speck et al. 2000, Loftus et al. 1987.
[14] Luria 1979 stressed the cultural basis of cognition and experimental studies have demonstrated sometimes significant differences in cognition across cultures, in particular in children: see Mistry and Rogoff 1994, Rogoff and Mistry 1985, Rogoff and Waddell 1982, Cole and Scribner 1974, and Berry and Dasen 1973. A distinction is often seen between 'Western' societies where memory is object- and self-focused and constructed associatively, and 'Eastern' societies where memory is scene- and group-focused and constructed narratively. For a survey of more recent studies, see Gutchess and Indeck 2009.
[15] For the idea in classical studies, see Harwood 1976; Small 1997: esp. 4–10; Minchin 2001; Calame 2009.
[16] Cf. Olick 2008; Olson and Cole 2006.

rituals to specific places – helps preserve 'cultural memory'.[17] Paul Connerton has noted the importance of material objects and also of the body itself as 'containers' for shared memories, the contents of which become recapitulated or, to use his term, 'silted' not only in manufactured items like photographs or tape recordings, but also in habitualised bodily performances like handshakes or table etiquette. Meanwhile, Walter Ong, Jack Goody, Ruth Finnegan, Jacques Le Goff and Jan Assmann (among others) have emphasised that the invention of writing has been perhaps the most powerful instrument for exteriorising and thus preserving memory.[18] Indeed, writing has come to pervade modern Western conceptions of memory to such a degree that, as Maurizio Bettini (2008: 3) remarks, memory is now imagined primarily in terms of written or electronic 'archives'. Yet already in archaic Roman culture writing was so linked to the preservation of memory that it provided the dominant metaphor for this faculty, as implied by, for example, the derivation of Latin *oblivio*, 'forgetting, forgetfulness', from *ob-lew-,* that is, 'smooth (out)' (as in erasing the writing on a wax tablet or inscribed surface)[19] and, perhaps more pointedly, usage of *oblitterare* (< *ob-* 'against, over' + *littera* 'letter, writing') in the sense of 'cause to be forgotten' (as in Liv. *AUC*. 21.29.7, *nondum oblitterata memoria superioris belli*, 'not-yet forgotten memory of the previous war').[20]

Yet even in their most textual phases, the societies of ancient Greece and Rome were still predominantly oral societies, as Rosalind Thomas (1992) and Thomas Habinek (2009) remind us. Storytelling therefore represented a crucial vector for the preservation of shared memories in

[17] See Bommas 2011. For the 'spatial writing' of history in a Roman cultural context, see De Sanctis 2014; Larmour and Spencer 2007; Jaeger 1997; Edwards 1996; and Kraus 1994.
[18] See, for example, Ong 1982; Goody 1988; Finnegan 1988; Olson 1988; cf. Assmann 2006: 85, 'Its task was to safeguard and store data that are too complex or haphazard for human memory'. Writing has produced a number of different strategies for preserving memory: cf. Bolzoni 2001. More generally on the cognitive implications of literacy, see Olson 1996.
[19] Cf. also *memoriam eradere, delere, obliterrare* in the sense of 'forget'. The conceptual contiguity of memory and writing may also be captured in expression such as *mandare memoriae* and *mandare litteris*. English tends to metaphorise the memory in term of a 'container': see esp. Armstrong 2009.
[20] On this metaphor, see Bettini 2011b.

antiquity, especially in ritual contexts (cf. esp. Chaniotis 2011). Greek society's oral tradition certainly seems to have functioned as, in Eric Havelock's (1963: 27) definition, 'a sort of encyclopaedia of ethics, politics, history, and technology': according to Plato's *Ion* (537–41), it served as an enduring source of practical knowledge about fishing, medicine, prophecy and horsemanship. Many scholars have shown that certain linguistic features of the Homeric epics in fact seem designed expressly for ease of memorability.[21] Alessandro Vatri (2015) argues that certain characteristics (metre, conciseness, repetition and recapitulation, topicality and thematic organisation) even of Greek literary texts normally not considered part of an oral tradition were explicitly aimed at facilitating memorisation. Similarly, Roman culture's mythistorical tradition offered the behaviour of figures such as Horatius Cocles and Titus Manlius as models for imitation, and the stories that make up this tradition exhibit narrative features such as repetition and symbolic condensation that suggest they were part of an oral tradition in which 'texts' would have been memorised for preservation, if not necessarily for performance (cf. Bremmer and Horsfall 1987).

But the safeguarding of culturally valorised beliefs and practices was not the only context in which memory would have been a task-critical asset. Many kinds of undertakings required memorisation, and several extended and distributed cognitive strategies were developed in the ancient world to enhance memory. For instance, long distance trade required the careful inventorying of goods and recording of the prices at which transactions occurred. In archaic Greece, a functionary known as a *mnemon* served this requirement (Gernet 1968 and Vernant 1965). According to a scholiast of Homer's *Odyssey*, the *menmon* was the member of a ship's crew who 'memorises how much each thing is worth' and 'keeps the cargo in memory on account of

[21] Esp. Minchin 2001 and 2007, Watson 2001, Mackay 2008. Rubin 1995 argues that features such as formulaic epithets are in fact fully consistent with Miller's 'magical number 7' rule.

not knowing letters'.[22] This term was sometimes also used of civic magistrates charged with learning a city's religious calendar of feasts and sacrifices, or facts related to important juridical matters (see Carawan 2008).[23] In these settings, the *mnemon* functioned just as a written text or computerised databank would in later societies: namely, as a passive repository of knowledge, indeed acting as a human (*livre de comptes*) 'account ledger' (to use Gernet's (1968: 285) image) or 'living archive' (to use Thomas's (1996: 19)) to be consulted or queried by others. At the same time, Greek mythographers record that *mnemones* were also assigned to some heroes of the epic tradition to serve as 'rememberers' whose task it was to remind the hero to – or, just as usually, not to – perform a certain action.[24] For example, Eresios is reported to have written that Protesilaus was accompanied by a *mnemon* whose job was to remind him not to be the first to set foot on the shores of Troy on account of an omen that 'he would be killed if he jumped before.'[25] Similarly, Antipater of Acanthus is said to have mentioned a *mnemon* whose task it was to remind Hector 'not to kill anyone dear to Achilles.'[26]

Even if these *mnemones* are an invention of the mythographic imagination – as Cameron (2004: 138) asserts – their stories reveal that Greek society envisioned the human 'rememberer' as potentially serving a very different function than a mere 'archive': that is, to actively and directly increase the capacity of another individual's memory. In Roman society, the notion that one individual's memory could be amplified or enlarged by another's appears deep-rooted as well. In aristocratic practice, for instance, slaves known as *nomenclatores* served a memory-enhancing

[22] Schol. ad Hom. Od. 8.163, ὁ μεμνημένος πόσου ἐστὶν ἕκαστον ἄξιον . . . τὰ ἐγκείμενα κατέχειν διὰ τὸ ἀπείρως ἔχειν γραμμάτων; cf. Dindorf 1855: 366ff.
[23] See also Gernet 1968: 286–7; cf. Ar. *Cl.* 615–26; Plut. *Quaest. Graec*. 4.
[24] See esp. Bettini 2011a: 33–35.
[25] Eustath. in Hom. *Od.* 11.521, Ἐρέσιος δὲ ἱστορεῖ καὶ Πρωτεσιλάῳ δοθῆναι μνήμονα Δάρδανον Θετταλὸν, δοθέντος χρησμοῦ Φυλάκῳ τῷ πατρὶ, ἀναιρεθῆναι εἰ προπηδήσει.
[26] Eustath. in Hom. *Od*. 11.521, Ἀντίπατρος δὲ ὁ Ἀκάνθιος φησὶ καὶ τῷ Ἕκτορι Δάρητα Φρύγα δοθῆναι μνήμονα, μὴ ἀνελεῖν φίλον τοῦ Ἀχιλλέος.

function very much like that of the *mnemones* of Greek myth (even if the consequences for memory failure were decidedly less severe) (cf. Plut. *Quaest. Graec.* 28). Seneca the Younger reports (*Ep. mor*. 19.11) that *nomenclatores* were employed to memorise the names of their masters' clients and to remind them proactively of the correct forms of address to use in the course of the daily morning greeting.[27] Cicero notes derisively (*Mur*. 77) that some candidates for official magistracies would employ *nomenclatores* to accompany them as they canvassed for votes, thus permitting them to affect some degree of familiarity with members of the electorate by supplying names and titles in an opportune fashion: 'Why is it that you have a *nomenclator*? In this you are indeed tricking and deceiving people. For if it is honourable that your fellow-citizens be addressed by name by you, it is shameful for them to be better known to your servant than to yourself.' Latin authors indicate that a similar role was fulfilled by the *monitor* in oratorical practice, as well as perhaps in the theatre: to stand nearby to a speaker and to remind him what he should do or say at a certain moment, in the case that his own memory should somehow fail.[28]

Judging by this evidence, the Roman *nomenclator* or *monitor* appears to have played very much the same role that the notebook does for Otto in Clark and Chalmers' famous thought experiment.[29] This figure is called upon not only to store and to produce information on demand, but also to do so in such a way that this information appears effectively to belong to his master (or the orator or actor). Though external to the subject, the 'rememberer', like Otto's notebook, is treated as a simple extension of biological memory (cf. Michaelian 2012). An exaggerated case of this kind of social extension of memory may be that of Calvisius Sabinus. As described by Seneca the Younger (*Ep. mor.* 27.5), Sabinus had a terrible memory but was surpassingly wealthy, so he

[27] *Nomenclator* was also apparently used of a slave employed to remember the names of a master's other slaves, when the size of household slave retinues had grown unmanageably large: cf. Plin. *Nat. hist.* 33.26.
[28] Cic. *Div. Caec.* 52; *De orat.* 2.24.99; Quint. *IO*. 6.4.8-9; Fest. *De verb. sign.* p. 122 Lindsay.
[29] Clark and Chalmers 1998; cf. also Sutton et al. 2010.

trained a group of slaves 'one to memorise Homer, another Hesiod; and then assigned each of the others one of the nine lyric poets' (*unum qui Homerum teneret, alterum qui Hesiodum; novem praeterea lyricis singulos adsignavit*). Sabinus kept these slaves ready at dinner parties to prompt him with verses for recitation ('He kept these slaves at the foot of his couch, from whom he could request verses to cite', *habebat ad pedes hos, a quibus subinde cum peteret versus quos referret*). The role that Sabinus contemplated for these living memory aids thus goes far beyond the 'convenience' or 'shortcut' (*compendiaria*) that Seneca suggests it is. Because 'he believed that he himself knew everything that anyone in his household knew' (*ille tamen in ea opinione erat ut putaret se scire quod quisquam in domo sua sciret)*, for Sabinus his slaves were not mere cue cards or memory crutches; he trusted them to provide him with accurate information in appropriate circumstances and at appropriate times, and they presumably did so without instigation on his part. In this sense, their memories collectively *just are* his memories.

In historical settings where writing was not widespread, and where other memory-aiding technologies – teleprompters, personal digital assistants, iPhones – were still unknown, 'rememberers' therefore afforded an adaptive solution to the challenges presented by human memory. As a more-or-less constantly and immediately accessible, as well as automatically endorsed source of information, the *mnemon, nomenclator*, or *monitor* would have helped mitigate any potential deficits of learning and recall an individual might experience. Yet this solution to the problem of memorisation could only ever be a partial one, as it failed to address the fundamental problem of human memory. If the living 'rememberer' is again similar to Otto's notebook in constituting an implicitly trusted source of information, it is dissimilar in that it replicates the very fallibility of its 'user', since there is no guarantee that the *mnemon*'s (or *nomenclator*'s or *monitor*'s) memory will not also succumb to the inherent weaknesses of this faculty. This

deficiency of a strategy that distributes the memorisation task across 'devices' of the same kind (i.e., socially, to another individual or group of individuals) is emblematised by so many mythic *mnēmōnes* who themselves – ironically, and usually tragically for their heroic charges – suffer bouts of forgetfulness (see Tümpel 1894: ii. 2, 3075) or by the seemingly almost proverbial 'old slave *nomenclator*' who makes up names to give his master when he cannot remember them (Sen. *Ep. mor.* 27.5). This is likely why *mnemones* and *nomenclatores* were employed mostly in situations where discrete, discontinuous information seems to have been concerned (a register of goods, stage directions, warnings, names) and why a different strategy altogether was developed in ancient rhetoric for learning and recalling lengthy, continuous stretches of discourse.

To assist the orator in memorising an oration (or any sequence of utterances or ordered series of items), ancient mnemotechnics developed a sophisticated procedure through which symbolic associations were created between a given structure of physico-spatial reality and the information to be recollected, which could later be recalled during performance through a sort of virtual scanning of mental space: the so-called 'house' or 'palace of memory'. Though usually treated uniformly by modern (and some ancient) handbooks, the Greek and Roman practices actually appear to have differed considerably. In the (less well-attested) Greek system, normally attributed to Simonides of Ceos, the orator seems to have been encouraged simply to visualise the text of the oration in the mind's eye. In Cicero's account of the Simonidean method, memorisation thus proceeds by imagining a series of 'places' and 'shaping' in the mind 'images' of the information to be recollected, which are then 'set in order' in the imagined places:

> itaque eis, qui hanc partem ingeni exercerent, locos esse capiendos et ea, quae memoria tenere vellent effingenda animo atque in eis locis conlocanda; sic fore, ut ordinem rerum

> locorum ordo conservaret, res autem ipsas rerum effigies notaret atque ut locis pro cera, simulacris pro litteris uteremur. (Cic. *De orat.* 2.354)
>
> And so for those who would train this part of the mind, places must be imagined and those things which they want to hold in memory must be reproduced in the mind and set in order in those places: thus it comes about that the order of the places preserves the order of the things, but the images of the things represent the things themselves; and that we use places instead of a wax tablet, images instead of letters.

Some features of Cicero's description reveal the generically topological character of the visualisation process in the Greek system. First, the imagistic character of the 'places' constituting the structural element of the visualisation is left unspecified: use of masculine *loci* ('single places') rather than neuter *loca* ('a physical region') to gloss, presumably, Greek τόποι implies that these were to be understood in quite abstract terms. Likewise, *effingere,* a term drawn from the artistic vocabulary of moulding, suggests that the 'images' were not understood as rich visual images or scenes, as Latin employs the language of art to metaphorically characterise something as being worked out in the mind in a highly detailed and intricate fashion (Short 2012: 115–16). Second, the spatial dimension of the visualisation amounts to little more than a serial ordering of words as they are pictured in the mind. This is made explicit by Cicero's affirmation that 'we use places instead of a wax tablet, images instead of letters' – where a direct correspondence is set up between the 'mental scratchpad' and the writing space of a wax tablet. It is also suggested implicitly by his use of *conlocare,* a term conventionally used in regards to arranging words in a sentence, to refer to the process of 'setting in order' the images in their respective places.[30] Furthermore, the mental

[30] *Conlocare verba:* cf. Cic. *De orat*. 3.171, 3.172; Quint. *Inst. orat.* 9.4.58, 10.1.4; Front. *Ep*. 4.3.1; Gell. *Noct. Att.* 11.13.2.

images of the ‘things’ to be remembered are here simply iconic: the written form of the text is visualised in mental space in a correspondingly form.

If, as may be gathered from Cicero’s description, the Simonidean technique for memorising an oration proceeds through simple textual visualisation and is ‘spatial’ to the extent that the words of a written text have a certain topology (i.e., their own verbal sequencing), the mnemonic technique as developed in Roman rhetoric appears instead to have made thoroughgoing use of the physico-spatial environment as a device for structuring memory and assisting recall. The general procedure can be reconstructed from the *Rhetorica ad Herennium* (3.16.29–19.32) and Quintilian’s *Institutio Oratoria* (11.2.19–21): To memorise a speech, the orator was first to ‘construct’ (*constituere*) or ‘furnish’ (*comparare*) the representation of some place – the *Rhetorica ad Herennium* advises, for instance, the image of ‘a house, an intercolumniation, a corner, an arch’ – in mental space (*cogitatione*). The orator could ‘build and design’ (*fabricari et architectari*) this mental representation through a purely imaginative process, but the Latin texts recommend modelling it after some real geographical location. Not just any place would do, however; the features of the location had to be taken into account. As Quintilian writes:

> loca discunt quam maxime spatiosa, multa uarietate signata, domum forte magnam et in multos diductam recessus. in ea quidquid notabile est animo diligenter adfigunt, ut sine cunctatione ac mora partis eius omnis cogitatio possit percurrere. et primus hic labor est, non haerere in occursu: plus enim quam firma debet esse memoria quae aliam memoriam adiuuet. (Quin. *Inst. orat*. 11.2.18)
>
> They learn places of the greatest possible spatial extent, distinguished by considerable variety, such as a large house divided into many apartments. Whatever is remarkable in it is carefully fixed in the mind, so that recollection may traverse every part of it without

> hesitation or delay. Indeed, the first challenge is not to get stuck in your progress, for a memory that is supposed to help another ought to be more than certain.

The *Rhetorica ad Herennium* (3.32) similarly advises that the orator choose a setting that provides 'the most appropriate arrangement of suitable places' (*idoneorum locorum commodissimam distinctionem*), as these 'places' will afford a structural anchoring for the memorised text.

Once an appropriate location has been selected (taking into account the organisation of the oration), the orator is instructed to walk repeatedly through this location, to carefully 'learn' (*discere*, *commeditari*) the contours of the physical terrain and at the same time to 'arrange images' (*conlocare imagines*) or 'attach labels' or 'marks' (*mandare notas, signa*) to the various features of its mental counterpart, corresponding to different parts of the oration. Importantly, unlike in the Greek technique, the 'images', 'labels', or 'marks' – that is, schematic or richly elaborated pictures or words – are not of themselves the information the orator wishes to memorise: rather, they are signs intended to evoke previously learned material. That is, each image arranged in the mentally represented 'place' is a symbol, an indexical sign that points to something else already committed to memory by the orator. In this way, by later imagining himself walking through this location in the course of delivering the oration, the orator would be able to recall the text of the oration when these signs 'return' (*reddere*) the memory of that text in a sequence determined by their topographical arrangement. Differently from Greek practice, then, where the 'images' arranged in 'places' apparently correspond to the words of the oration following their linear textual order, in the Roman system these images are symbols re-presenting (in the sense of providing mental access to) other parts of the memory store, and the places constitute a relational structure defining a global address map. In this light, the Roman technique of *loci* is not so much a method for memorising

the text of an oration (which would otherwise need to be committed to memory) as for learning its overall organisation.

As a strategy for memorising (the organisational structure of) long sequences of text, the Roman technique of *loci* thus stands out in construing the generically topological 'places' of the Greek system in explicitly architectural and topographical terms.[31] But the cognitive process that characterises this technique goes beyond 'literal interpretation of the term "places"', as Jocelyn Penny Small (1997: 100) explains it. To begin with, the mental representation of space the orator relies upon during recall is not a literal location. Being modelled upon (the orator's perception of) physical reality, this representation derives some of its visual and spatial characteristics from a 'literal' location, but is itself a figured imagistic space. Furthermore, when the orator goes about 'arranging images' within or 'attributing signs' to this mental image during the process of memorisation, he sets up a complex semiotic relationship between the location as it exists in his mind and the location as it exists in the world. If, on the one hand, the logical structure of the oration determines, in part, the character of this representation (by suggesting what is or is not an appropriate space to be modelled), on the other hand the topographical features of the real location determine the structure of the orator's memories (by anchoring them to a determined spatial arrangement). Tightly integrating spatial setting and mental representation, the orator brings about memorisation by extending his internal visualisation out into the world, so that his movement in and interaction with the external environment have organising effects on his subjective knowledge. Beyond merely aiding memorisation, this movement and interaction actually constitutes the process of memory formation, yielding exactly the kind of 'elaborately encoded' memories needed for long-term retention (Schacter 1996: 44–71).

[31] Cf. Carruthers 1990: 16–23; Small 1997: 96–116; and Draaisma 2000: 24–30.

It is worth emphasising exactly what is distributed about this memorisation strategy, though, since it may appear to involve only the orator's mental image of a place and thus to be compatible with an entirely internalist view of cognition. According to the *Rhetorica ad Herennium*, the orator does in fact have the possibility of utilising some purely imagined spatial configuration as the basis for his visualisation and of placing his indexical *imagines* within this space through a purely mental imagistic process. In this case, because the orator would be relying on exclusively neural resources, it would probably be fair to object to any characterisation of this technique as a distributed cognitive process. For precisely this reason, the Aristotelian method of memorisation as described by Small (1997: 87–94) – in which, it appears, stretches of mentally visualised text were arranged sequentially in equally mentally visualised (but sketchily pictured) 'containers' or 'bins' – probably cannot be considered 'distributed.' However, this is not the favoured Roman practice. As the Roman rhetorical writers make clear, in their native practice the structural arrangement of an oration is to be memorised, instead, through a process that combines the elaboration of a mental image with the physical activity of moving through space: not only is the mental image to be modelled directly off spatial reality, but it is also the orator's movement through this space (in the course of which he 'assigns' referential symbols to his mental image that correspond to features of the spatial environment) that actually serves as the mechanism of memory consolidation.

3. Externalising calculation onto the social and physical environment.

Arithmetical calculation represented another cognitively demanding activity benefitting from distribution to the external environment in the Roman cultural context.[32] As Roman numerals constitute a cumulative (additive) notational system rather than a positional value system (as do

[32] See Chrisomalis 2009 for a cross-cultural survey of artefact-use in calculation; cf. also Miller and Parades 1996.

Arabic numerals with zero provided), the challenges this presented to members of Roman society in performing calculations were not insignificant.[33] As Schlimm and Neth (2008) argue, the basic difficulty with Roman numerals is the additional number of processes steps required for resolving symbols into numbers, which can make even simple addition tasks cumbersome and inefficient. Consider, for instance, the problem of adding 14 to 27. Using Arabic numerals, the solution is trivial, as it involves merely summing the numerals in each place (any inefficiency will rest in the necessity of carrying the remainder of the sum of 4 and 7 to the tens-place). Using Roman notation, by contrast, the solution requires considerably more processing steps, since the numeral symbols would need to be converted (mentally) into number concepts and this process is not at all straightforward. In the complex symbol XXVII, the ones-value is represented by three characters which require an internal summation (5 + 1 + 1); the tens-values is represented by a digraph which also must be summed (10 + 10); in XIV, on the other hand, the ones-value is represented by two characters, whose resolution requires subtraction (5 - 1) and the tens-value is represented by a single symbol. Then the two numbers must be added, and the result encoded in the correct notation. It is theoretically possible that some arithmetic problems could be solved more quickly through hierarchical redistribution and concatenation of symbols (thus eliminating the need to convert to numbers, as proposed by Detlefsen et al. 1976), but this procedure would still have required several steps of decomposition and recomposition and no evidence exists suggesting it was used.[34]

[33] See Maher and Makowski 2001; Crosby 1997; Kennedy 1981; Murray 1978; Glautier 1972; Taisbak 1965; Menninger 1969, and Turner 1951.

[34] Very little evidence at all exists for the practical conduct of calculations using Roman numerals. Some papyri from Roman Egypt present very basic arithmetical problems (e.g., P.Mich. III, 145.3.6, including the conversion of the length of a field measured in σχοινία to a measurement of area in ἄρουραι), but these are all using Greek numerals. A Latin treatise of Marcus Junius Nipsus (second century CE) gives instructions (300.11–301.5) for finding the area of any triangle using Roman numerals in a series of about eleven or twelve distinct steps of addition, subtraction, and multiplication. The final calculation, involving a square root, is given as a single step, which may suggest the availability of arithmetical tables. See Cuomo 2001: 170–6.

To obviate the challenges that a cumulative notational system presented to mental calculation, several externalisation strategies were used in Roman society. For instance, a system was developed for representing numbers with the fingers (and perhaps additional hand gestures). Augustine reports that the left hand was used for indicating the numbers 1–99 and the right hand for indicating the value of the hundreds place: *Serm*. 175.1, *nonaginta enim et novem in sinistra numerantur; unum adde, ad dexteram transitur*.[35] Literary and archaeological evidence suggests this system was used primarily for indicating integer sums: Pliny the Elder (*Nat. hist.* 34.33), for example, describes the ancient statue of Janus in the Roman Forum as having 'fingers shaped so that they indicate the sign of 365 days (*digitis ita figuratis ut CCCLXV dierum nota . . . indicent*)', while a tomb relief from Isernia (now in the Museo della Civiltà Romana in Rome) appears to depict two standing figures stretching out their hands to indicate different sums with their fingers, apparently negotiating the price of lodging at an inn. Some authors imply, however, that the system could be used for computation as well, ranging from simple additions – Suetonius (*Cl.* 21.5) recounts that Claudius would 'count out the gold coins offered to victors . . . both vocally and on his fingers' (*oblatos victoribus aureos . . . voce digitisque numeraret*) – to fairly complex calculations involving recursive sums, as when Augustine leads his congregation in a finger-counting exercise to add all the numbers from 1 to 17 (yielding 153, the number of fish caught by the disciples of Jesus when he returned to the Sea of Tiberius after his resurrection): *Serm*. 248.5 and 270.7, *apud vos numerate . . . si vero computes ab uno usque ad decem et septem et addas numeros omnes . . . sic pervenis usque ad decem et septem, portans in digitis centum quinquaginta tres.* This system would have been limited to sums up to 1,000, however (Williams and Williams 1995; Alföldi-Rosenbaum 1971), and was apparently prone to mistakes even by experts: cf. Apul.

[35] Cf. also Juv. *Sat.* 10.248–9, *felix nimirum qui tot per saecula mortem / distulit atque suos iam dextra computat annos.*

Apol. 89, *posses videri pro computationis gestu errasse, quos circulare debueris digitos aperuisse,* 'you could seem to have erred in gesturing your calculation, since you opened the fingers which you ought to have formed in a circle.'

Calculations could also be performed using the hand or table abacus, or the sand 'reckoning board', which in their most sophisticated forms could represent any number from 1 to 9,999,999 (cf. Schärlig 2001; Taisbak 1965). The simplest (and probably earliest) of these devices consisted of a small wooden board covered in sand, on which parallel lines were drawn with the finger or stylus; on, or between, these lines the user would then place stone counters to represent the number in each place (cf. Pers. *Sat.* 1.131–2, *qui abaco numeros et secto in pulvere metas* / *scit risisse vafer*, 'A clever fellow who knows how to laugh at numbers on an abacus and the boundary-lines in the divided sand'). More elaborate were the hand-held counting boards made of bronze, with vertical slots cut for increasing powers of ten usually up to 10^6 (marked with a mixture of Roman and Etruscan numeral symbols, viz., I = 1s, X = 10s, C = 100s, (I) = M = 1000s, ((I)) = 10,000s, (((I))) = 100,000s, |X| = 1,000,000s) and round beads for counting.[36] Some extant examples have additional columns, probably for weight calculations with fractions (in units of twelfths and thirds).[37] Yet these were highly inefficient technologies. A trained account-keeper (*calculator*) might perform addition and subtraction quickly (as quickly, in fact, as he was able to set pebbles down on the board or move beads on the frame). Calculations of multiplication and division, though, would have been quite laborious and time-consuming, since these operations could be

[36] On a typical Roman abacus, each 'column' is actually divided vertically into two sections: the top section would have two beads each counting for 5, and the bottom section five beads counting for 1: so, e.g., 9 would be represented by one active bead in the top section and 4 in the lower section. Unlike the Roman system, where the 'counters' in each vertical section were identical and represented equal values (obviously according to their columnar placement), the evidence presented in Netz 2002 suggests that in Greek arithmetical practice, pebbles (ψῆφοι) of different sizes and shapes were used to represent different numbers and place values.

[37] Almost all Roman measures of weight and land were based on a division of ⅟₁₂ (*uncia*): e.g., as the basic unit of weight, the *uncia* was ⅟₁₂ of an *as* or *libra*. Used in combination, the two additional abacus 'columns' could thus represent any land measurement from the *scripulum* (a plot ten feet wide by ten feet long) to the *iugerum* (288 *scripula*). See Maher and Makowski 2001.

accomplished only through repeated additions or subtractions. Furthermore, since these technologies could represent only a single amount at any given time, complex calculations probably required the support of written note-taking, as suggested by visual depictions like that on the so-called Darius Vase from Canosa in Puglia (probably fourth century BCE) in which a figure holds an abacus in one hand and a writing tablet in the other (see Figure 1).

<Figure 1: Detail after an artist's rendition of the Darius Vase (South Italian red-figure vase found at Canosa, Puglia, dating to about 340 to 320 BCE, and now housed at the Museo Archaeologico Nazionale in Naples, Italy). The seated *calculator* manipulates a mounted counting board while also holding a hand-abacus.>

The Roman senate faced a special challenge in computing vote tallies. Senate procedure permitted any member to express his opinion when voting on a given question. However, because the senate operated under strict time constraints – all sessions had to close at sunset, and if business had not been completed, voting would have to begin anew – in a body possibly as large as 900 members by 45 BCE, it would have been impractical for each senator to speak personally at any length (or even at all). Furthermore, though the senate was in theory a body of equals, a hierarchy based on institutionally ascribed and personally achieved authority meant that when voting by roll call, most members would be expected only to give their assent or dissent to an opinion (*sententia*) already expressed by one of the senior magistrates (Ryan 1998: esp. 64–87). Therefore, the practice of 'voting with the feet' (*pedibus in sententiam ire*) was devised as a more expedient method of vote counting. There appear to have been two procedural possibilities.[38] In *discessio* (literally, 'a walking apart'), the curial space would be divided into two regions (*partes*) and senators would be invited to indicate their agreement or disagreement with a particular opinion by physically moving

[38] See O'Brien Moore 1935. There has been much dispute over the applicability of *pedibus ire* to the senate's different voting procedures: cf. Taylor and Scott 1969 with, for example, Scullard 1973: 26.

to one or the other, as the formula recorded by Pliny the Younger (*Ep*. 8.14.19) suggests: 'Those who vote for these things, go into this part; those who vote all other ways, go into that part according to your opinion' (*qui haec censetis, in hanc partem, qui alia omnia, in illam partem ite qua sentitis*). During *interrogatio,* on the other hand, the curia was notionally divided by reference to the spatial positioning of individual senators, the general zone around whom came to stand for a verbally expressed opinion; thus, as Herbert Nutting (1926: 426) explains, other members of the senate could indicate their agreement or disagreement with one or another stated opinion 'by merely joining the party or man whose speech they supported'.[39] (This is in part why no senator would sit near Catiline after his denunciation by Cicero: cf. Plut. *Cic.* 16.4. In isolating Catiline physically, the senators register their social rejection as well as political abandonment of the conspirators).

In whatever procedural context it was practised, 'voting with the feet' followed the same symbolic principle. To facilitate the counting of votes, specific areas within the senate house would be treated as corresponding to specific *sententiae*, through a figurative mechanism in which the physical location where a senator verbally expressed his opinion operated as a signifier metonymically and metaphorically standing for what existed as a purely mental representation – an idea in some senator's mind. Effectively transposing a privately held belief onto a publically available feature of the world, this process permitted others to signal their own subjective beliefs by physically moving themselves in relation to this feature. In this way, the problem of efficiently computing vote counts could be solved by, as it were, transforming the floor of the senate into a reckoning board and the senators into pebbles – but perhaps this is not so surprising a development in a cultural context where, as Reviel Netz claims (2002b: 327), 'the abacus is not an artefact; it is a state of mind.' The tallying of votes would then be achieved through gross physical comparison,

[39] Lintott 1999: 79–82; Ryan 1998; Taylor and Scott 1969: 534–5.

as a direct outcome of the physical interactions of the group of senators. In other words, it is in the senators' bodily behaviour that the process of calculation actually takes place. Indeed, the process of 'voting with the feet' seems altogether to obviate the need for calculation and for representing the vote in numerical terms (of whatever form). Because the senators themselves functioned as the 'numbers', in most situations where the count on each side would not be very close, a simple visual reckoning between places in the senate house would suffice to indicate the outcome.

4. The metaphorical basis of Roman distributed cognitive strategies.

In the orator's technique of *loci* and the senator's practice of *pedibus (in sententiam) ire*, the environment serves as an immediate resource for the scaffolding of cognition. But is the way in which Latin speakers made use of the physical environment in such contexts of technical practice simply to be attributed to the kind of spatial thinking Yuri Lotman (1990: 250–53) deemed characteristic of traditional societies? Or is there some dimension of Roman culture that specially motivates the forms their distributed cognitive strategies tend to take when tackling problems of memorisation and calculation? In my view, the basic symbolic principle according to which these strategies unfold, though based in experiences shared by presumably all human beings (namely, that the particular thoughts, feelings, or memories consistently evoked by a place come, involuntarily and unconsciously, to be associated with that place), actually emerges from a distinguishing feature of Roman society's signifying order. Very specifically, I believe that the semiotic mechanism underpinning these behaviours – that mental representations are treated as having a physical reality of their own – was conditioned by Latin speakers' conceptualisation of mental phenomena in terms of an embodied spatial metaphorics, which, though partially paralleled

in other languages and cultures, appears to constitute their 'preferential' or 'privileged' conceptual model for comprehending the mind and its various operations.

An abundance of linguistic and literary evidence indicates that for Latin speakers 'thinking' – broadly construed to include cognitive operations of all sorts – was in fact a conceptual domain pervasively structured by metaphor (see generally Short 2012). In particular, cognitive processes having to do with the 'contents' of mind were construed in terms of a set of systematically interrelated images of movement through space relative to a location. In this system, the metaphorically defined concepts – 'acquiring', 'having', and 'relinquishing' thoughts – represent general categories of mental activity at a high level of abstraction, each image delivering a core conceptualisation that underwrites a whole network of conventional expression in Latin. Thus, as examples (1) to (6) show, mental operations that involve 'acquiring' ideas – in other words, that involve thoughts either entirely new to the thinker, or to which the thinker newly turns his or her conscious awareness – are expressed metaphorically in Latin as MOVEMENT TOWARD a location in space: e.g.,

(1) *qui consilium **iniere**, quo nos victu et vita prohibeant / is diem dicam, irrogabo multam*, 'To those who formulated (literally "entered into") a plan to prohibit us from vital nourishment, I will name the day and stipulate a fine' (Plaut. *Capt*. 493–4);

(2) *ni **occupo** aliquid mihi consilium, hi domum me ad se auferent*, 'Unless I come up with (lit. "occupy") some plan, they'll carry me off home' (Plaut. *Men*. 846–7);

(3) *ipse quoque huic sententiae **accedo***, 'I agree with (lit. "approach") this opinion, too' (Just. *Dig*. 36.2.12.6);

(4) ***veniamus ad** bonorum malorumque notionem*, 'Let us consider (lit. "come to") the idea of Good and Evil' (Cic. *Luc*. 128);

(5) *ne* ***in cogitationem*** *quidem* ***cadit*** *ut fuerit tempus aliquod nullum cum tempus esset*, ‘It is not even possible to conceive (lit. “fall into the thought”) of a time when time did not exist’ (Cic. *ND*. 1.21);

(6) ***ire in cogitationem*** *iubet et dispicere quid ex hac tranquillitate sapientiae debeam*, ‘[Old age] tells me to consider (lit. “go into thought”) and examine how far I owe this serenity to philosophy’ (Sen. *Ep. mor*. 26.3).

As these examples show, Latin speakers normally talk about formulating plans, agreeing with opinions, considering ideas, conceiving notions, and so on, as ‘entering’, ‘occupying’, ‘coming to’, ‘returning to’, ‘moving to’, and even ‘falling’ or ‘slipping into’ a location. This metaphor constitutes the entirely regular way for Latin speakers to talk about such experiences, moreover. For instance, Latin expresses the concept of ‘paying attention to’ (that is, ‘acquiring’ something as the focus of mental attention) as, literally, ‘turning the mind toward’ (*animum advertere*), ‘directing the mind toward’ (*mentem intendere*), or ‘causing thought to go toward’ (*cogitationem conferre ad*), where mental attention is construed as directionality of thought toward a location.

At the same time, words denoting POSITION IN a location (‘being’ or ‘standing in’) regularly structure the concept of ‘having’ an idea in mind – that is, the concept of any sort of mental activity that involves either the contents of an individual’s system of beliefs or thoughts constituting the object of conscious reflection: cf., e.g.,

(7) *eum* ***defixum in cogitatione*** *esse sensisset*, ‘He realised that he was deep in (lit. “completely fixed in”) contemplation’ (Cic. *De orat*. 3.17);

(8) *nec mihi* ***in cogitatione*** *tum lex* ***fuit***, ‘Nor was the law in my thought at the time’ (Quint. *Decl. min*. 270.25);

(9) *quod eis respondi, ea omnes* ***stant sententia****,* 'Whatever I tell them, they all hold (lit. "stand in") that opinion' (Plaut. *Curc*. 249–50);

(10) *quamquam* ***in*** *falsa* ***fuerit opinione****, demonstrandum erit neminem tantae esse stultitiae, qui tali in re possit veritatem ignorare*, 'It must be shown that, even though he was mistaken in that opinion (lit. "was in a false opinion"), no one can be so foolish as to be ignorant of the truth in such an affair" (Cic. *Inv*. 2.27);

(11) *adhuc* ***in*** *hac* ***sum sententia****, nihil ut faciamus nisi quod maxime Caesar velle videatur*, 'I still am of (lit. "in") the opinion that we should do nothing but what Caesar seems most to want' (Cic. *Fam*. 4.4.5);

(12) *qua* ***in sententia*** *et Vergilium* ***fuisse*** *video,* 'I see that Virgil, too, held (lit. "was in") this opinion' (Plin. *Nat. hist*. 18.35).

Again, this metaphor organises the Latin vocabulary in a systematic fashion. For example, while the ancient etymological tradition derived *considerare* from *sidus*, taking the act of mental deliberation as a kind of metaphorical 'star-gazing', Greenough (1890) has suggested a derivation from *sedes* ('seat, location'), which is not only more plausible phonetically, but also provides a motivated explanation for the verb's meaning: if 'being in' means metaphorically 'thinking over', then by inference 'completely being in a location' (*con*-) will convey the sense of 'completely thinking over'.

Finally, expressions denoting MOVEMENT AWAY from a location ('standing away', 'departing from') consistently convey the concept of 'relinquishing' an idea from mind – that is, giving up some idea that is under current consideration or abandoning some closely held belief, as in, e.g.:

(13) *necessario* ***sententia desistunt*** *legatosque ad Caesarem mittunt*, 'Of necessity they abandon (lit. "stand away from") this idea and send legates to Caesar' (Caes. *BG*. 6.4.2);

(14) *perterriti Galli, ne ab equitatu Romanorum viae praeoccuparentur,* ***consilio destiterunt***, 'The Gauls, fearing that the passes were already occupied by the Roman cavalry, gave up on (lit. "stood away from") this design' (Caes. *BG*. 7.26.5);

(15) *aiunt ipsum sapientem . . . si ita rectius sit . . .* ***de sententia decedere*** *aliquando*, 'They say the wise man sometimes changes his mind (lit. "departs from his opinion") when it is better to do so' (Cic. *Mur*. 63);

(16) *ille vir . . . de civitate* ***decedere*** *quam* ***de sententia*** *maluit*, 'That man . . . preferred to depart from his city than from his belief' (Cic. *Balb*. 11).

And again the metaphor is systematic. That is why *digressio/digressus* and *egressio/egressus*, for example, are used in the sense of a departure from the idea that forms the main subject of some discourse – a digression being viewed metaphorically as temporary movement away from a certain thought-location.

As may be seen, Latin's metaphors of mental activity are both consistent, in the sense that they organise the figurative meanings of whole lexical fields (rather than belonging to the semantic structure of individual words) and coherent, in the sense that in organising Latin's vocabulary of mental activity they operate as a system that preserves the inferential structure of spatial motion through metaphorical abstraction. The metaphors, that is, fit together in a structured way, each conveying a mental operation that is logically related to the others. What defines their logical relation is a central – but mostly implicit – metaphorical correspondence between the thought over which the mental operation occurs and the location in relation to which the physical motion occurs,

and thus the systematic interrelations that hold in the spatial domain between MOVEMENT TOWARD, MOVEMENT FROM, and POSITION IN (a location) as schematised bodily experiences, which are mapped to mental activity as metaphorical entailments. Overall, the mappings from the domain of physical spatial experience to that of abstract mental experience that constitute this metaphor system can be represented as in Table 1.

Table 1: Metaphorical correspondences in 'THOUGHTS ARE LOCATIONS'

SPATIAL MOTION	⇒	MENTAL ACTIVITY
the location in space	→	the thought
movement toward (the location)	→	'acquiring' the thought in mind
position in (the location)	→	'having' the thought in mind
movement from (the location)	→	'relinquishing' the thought from mind

In the perspective of Lakoffian conceptual metaphor theory, the consistent as well as coherent metaphorical structuring of Latin speakers' expressions of mental activity in terms of spatial images suggests that these metaphors actually constitute their conceptualisation of this domain. In this theory, metaphor is claimed to be not merely a linguistic or literary device, but a crucial structuring device of the conceptual system.[40] Cognitive linguists posit that the clustering of metaphorical linguistic expressions around many (mostly abstract) concepts in fact reflects inherently metaphorical understandings that speakers of a language possess of those concepts. Speakers of a language talk about abstract concepts metaphorically, that is, because they actually conceive of them in terms of other (mostly concrete) concepts. Under this view, the meanings of many concepts are said to correspond to 'image schemas', gestalt structures of experience deriving

[40] Kövecses 2006 and 2005; Lakoff 1987; Johnson 1987; Lakoff and Johnson 1980.

from sensory and motor interaction with the world.[41] Metaphors are regular projections or mappings of image-schematic structure that occur as a way of mentally representing *abstracta*. Moreover, it is the systematic nature of these mappings – that is, that they involve the projection of structured systems of concepts and a defined cognitive topology – that allows people to think and reason meaningfully about experiences that may be difficult to comprehend in and of themselves.[42] It is through the metaphorical mapping of bodily-based image schematic structure onto concepts not directly grounded in experience that human abstract thought is in fact possible.

Let me emphasise, then, that in my view it is these metaphors *per se* that deliver meaning to Latin speakers' conceptualisation of mental processes. That is, as I see it, it is the image schemas of MOVEMENT TOWARD, MOVEMENT FROM, and POSITION IN a location (as depicted in Figure 2) in and of themselves that, in being metaphorically projected to the mental domain, constitute Latin speakers' understanding of 'acquiring', 'having', and 'relinquishing' a thought in mind.

<Figure 2: Schematic images metaphorically underlying Latin's expressions of mental activity.>

Furthermore, while spatial metaphors of mind are identifiable in a large number of the world's languages and may well be universal,[43] these mappings clearly constitute a sort of privileged model of conceptualisation for Latin speakers. This emerges from the fact these metaphors represent Latin's most conventionalised, most systematic, and most potentially elaborated way of understanding and hence communicating about mental phenomena. Although an exhaustive statistical analysis is probably not practicable, even a cursory comparison with Latin's other

[41] See also Hampe and Grady 2005; Lakoff 1987 and 1993; Lakoff and Johnson 1999. On the experimentally demonstrated psychological reality of image schemas, see Gibbs and Colston 1995; Gibbs 1994.
[42] Cf. Lakoff 1993: 215, 'Metaphorical mappings preserve the cognitive topology (that is, the image-schema structure) of the source domain, in a way consistent with the inherent structure of the target domain.'
[43] Spatial metaphors of mind are prevalent in English (see esp. Ryle 1949; cf. also Kövecses 2002: 98–101 and 2005: 210–15; Lakoff and Johnson 1999: 236–8 and Jäkel 1995: 222), but also in many typologically distinct languages: Yu 2003: 143–9 reports that Chinese speakers, for example, employ combinations of certain words referring to spatial orientation and motion – left (*si*), right (*you*), through (*tong*), coming (*lai*), going (*qu*) – with the generic 'thinking' verb *xiang* to define a whole range of mental processes.

metaphors of mind (see Short 2012: 112–22) suggests that this one system of metaphorical understanding accounts for a larger number by far of conventional linguistic expressions. What is more, it is perhaps the only such metaphor characterised by a strict internal coherence of imagery, in the sense that logically interrelated spatial concepts define correspondingly logically interrelated mental concepts.[44] The basic mappings of this metaphor system are also easily extended through the use of Latin's highly articulated vocabulary of spatial motion, yielding complex metaphorical entailments and thus richly connotated expressions vis-à-vis the mental domain.

In constituting Latin speakers' preferential conceptualisation of mental activity, these spatial metaphors can therefore be expected to play an important role in guiding the kinds of behaviours they elaborate in relation to their own cognitive activity (including, or especially, memorisation and calculation, which stand out as perhaps prototypical processes of knowledge acquisition). Of course, in suggesting this, I would not wish to imply there is any kind of determinative relationship between these metaphors as an aspect of Latin speakers' language and thought and their behaviour in certain arenas of technical practice. While deeply entrenched in Latin speakers' conceptual repertoire and indeed a defining feature of the Roman worldview, these metaphors are by no means the only ones Latin speakers had available to them in understanding the mind (see again Short 2012: 111–26). Thus, the operation of the 'LOCATIONS' metaphor in Latin speakers' conceptual system cannot be said strictly to *require* any particular way of behaving vis-à-vis the mental domain. Nevertheless, it cannot be coincidental that this metaphor system's central mapping – viz., 'THOUGHTS ARE LOCATIONS' – is effectively operationalised in their strategies for tackling cognitively demanding tasks through the use of the social and physical environment. In Roman rhetoric's 'topographical' memorisation technique and the Roman senate's 'spatial' calculation of

[44] For the most part, the other metaphors making up Latin speakers' overall conceptualisation of mind are 'one-shot image metaphors' that afford single images to figurative understanding: see again Short 2012: 136–7.

votes, this metaphor system actually appears to serve as a ready-made plan for action for extending and distributing cognition out into the world – a symbolic model that picks out salient aspects of experience, orients awareness toward their relation, and even suggests a directionality to this relationship.[45] Indeed, the practices of other cultures in similar contexts of cognitive performance suggest that this kind of spatial thinking vis-à-vis memorisation and calculation represents a real cultural choice on the part of Latin speakers: why not, in fact, simply adopt the Greek practice of voting with pebbles, as they had adopted so many other things from this prestige culture? Or why not obviously extend the practice of finger-counting to the other parts of the body for more complex calculations, as for instance many native societies of Papua New Guinea do?[46]

5. General discussion.

Facing certain challenges presented by the nature of human memory (especially in terms of the limited capacity and rapid decay of short- and intermediate-term memory) and given certain cultural features like the Roman numeral system, Latin speakers resorted to extended and distributed cognitive strategies as a means of supporting and indeed implementing memorisation and calculation in their technical practice. These strategies exploited both the social and the physical environment as a scaffold for cognition: for instance, the difficulty of remembering the names and titles of one's many *clientes* could be mitigated through use of a *nomenclator* – a slave whose job was to learn certain minutiae of social life and to proactively remind his master of these

[45] For metaphors functioning as generic 'sign-images' that may take various 'tropic' forms when transposed into different representational (visual, behavioural, gestural) codes, see Fernandez 1991 and 1986. More generally, this system constitutes a shared context of meaning in which some forms of behaviour will 'make sense' more than others. At the same time, these forms of behaviour also, to some degree, warrant or license Latin speakers' particular ways of thinking and ways of speaking about mental phenomena (namely, in terms of locations) through a sort of semiotic feedback loop. In this sense, the metaphors – as a part of Latin speakers' conceptual system made use of both in interpreting and in guiding behaviour – function precisely in the way that Geertz 1973: 93 characterized the operation of cultural symbols, as both 'models of' and 'models for' reality. On the role of metaphor in motivating many problem-solving behaviours, see Sarbin 1986.

[46] See Save and Esmonde 2012 and Rauff 2003.

details in such a way that the master appeared to know them himself. In circumstances calling for memorisation of a lengthy text, meanwhile, the orator could rely upon a symbolic process in which his movement through the physical terrain or some architectural setting was used to provide structure to his memory. For arithmetical calculation, a number of different body-based and technological devices (finger-counting, the abacus, the sand reckoning board) were employed to circumvent the inefficiencies of the Roman numerals. In the Roman senate, where above all a timely and efficient method of tallying was needed, the calculation of votes was implemented as a function of the senators' bodily positioning in space relative to one another. I have claimed, moreover, that what often motivates the particular (not to say peculiar) form of these practices is Latin speakers' all-pervasive metaphorical conceptualisation of thoughts in terms of locations. These have only been hints. Nevertheless, they offer several points for general reflection.

For scholars of ancient societies, this study suggests the need for an approach that considers not only how universal aspects of human embodiment contribute to abstract conceptualisation in Latin, but also how embodied metaphorical understanding underpins specifically Roman forms of practice. As I have argued elsewhere, the study of metaphor along cognitive linguistic lines becomes anthropologically revealing when it permits us to highlight *differences* in metaphorical conceptualisation, and above all when patterns of conventionalised figurative meaning in language can be linked to patterns of representation in a society's symbolic activity at large.[47] Thus, the orientational metaphors that Francisco García-Jurado (2000) has shown to be present in the language of Plautus ('GOOD IS UP', 'GOOD IS HOT', and so on), in being grounded in what is probably a universal human experience (the correlation of physical and emotional well-being with bodily uprightness and warmth), are interesting to the degree that they confirm the commonality

[47] See in particular Short 2012, 2013 and 2014; cf. Deignan 2003.

across societies – including historical ones – of certain experience-based conceptualisations. Likewise, the ontological metaphors that Chiara Fedriani (2014) has shown to structure much of Latin's grammatical system – 'STATES ARE CONTAINERS', 'EVENTS ARE MOVEMENTS', 'EXPERIENCES ARE THINGS POSSESSED' – in reflecting the operation of a very high order metaphorical conceptualisation known as the 'Event Structure Metaphor' known to be widespread across even typologically unrelated languages, helps substantiate the universalising claims of some cognitive linguists. However, these metaphors are less relevant to the characterisation of what is unique about Roman culture than where Latin's metaphors seem to coalesce around concepts in idiosyncratic ways or play out as ubiquitous themes of the signifying order.[48]

Latin's 'LOCATIONS' metaphor of thoughts very likely also has its grounding in a universal dimension of human embodiment: namely, that we perceive the patterns of thinking we find ourselves engaged in in certain environments as directly linked to those environments. Yet comparison with the 'same' metaphor in English (as reflected in expressions like 'come to an understanding', 'arrive at the end of an argument', 'take a position') or in Greek (as manifested in, for instance, uses of προσβιβάζειν, 'cause to approach, bring near' in the metaphorical sense of 'persuade' or of spatial prepositions like δια-, ἐκ-, ἐν-, ἐπι- and παρα- in certain compound verbs referring to mental activity)[49] suggests its sociocultural situatedness is equally relevant. While in English the metaphor focuses narrowly on the conceptualisation of rational thought (the broad

[48] On metaphorical themes, see esp. Goatly 2007; cf. also Shore 1996 on the role of cognitive models more generally in shaping cultural artifacts. Danesi and Perron 1999: 294 refer to such culturally pervasive cognitive structures as 'macrosignifieds', that is, 'signifieds that underlie the specific forms that various signifying structures assume across the signifying-order'.

[49] E.g., Ar. *Eq.* 35, εὖ προσβιβάζεις μ'; Xen. *Mem.* 1.2.17, πάντας δὲ τοὺς διδάσκοντας ὁρῶ αὐτοὺς δεικνύντας τε τοῖς μανθάνουσιν ᾗπερ αὐτοὶ ποιοῦσιν ἃ διδάσκουσι καὶ τῷ λόγῳ προσβιβάζοντας. Forms like διανόησις, ἔννοια and ἐπίνοια, where the process of 'thinking' is construed as somehow 'through(out)', 'in', or 'on', suggest Greek has a spatial metaphor very much like Latin's; however, these usages appear to imply an image of thought as static locationality, whereas Latin's metaphor is based on the image of movement (along a path) in respect of a determined thought-location. At the same time, usages like ἄντικρυς, literally 'straight' = 'true' (as in Thucy. *Hist.* 8.64, ἡ ἄντικρυς ἐλευθερία) or διορθόω, διόρθωμα, literally 'making straight' = 'correcting' (as in Plu. *Alex.* 8.2.1, τὴν Ἰλιάδα . . . διορθώσαντος), and conversely, σκολιός, 'crooked' = "unjust" or ψάγιος, 'askew' = 'blundering' – where the metaphor is of spatial linearity – have to do with the 'correctness' of thought (see Short 2013: 143–4) or the 'intricateness' or 'difficulty' of thought (as when ἀγκύλος, σκολιός, καμπύλος mean 'wily, crafty'), more than with notions of the contents of the mind, which is the main meaning focus of Latin's 'LOCATIONS' metaphor.

categories of ‘acquiring’, ‘having’, and ‘relinquishing’ ideas more commonly figured through images of object possession or manipulation, as these labels suggest: cf. esp. Jäkel 1995), and in Greek it is elaborated linguistically to a far lesser degree (limited largely to prepositional semantics), for Latin speakers it delivers a very basic part of their understanding of the mind – namely, how conscious attentional processes work – and structures perhaps the largest portion of their vocabulary of mind. Indeed, it is probably fair to say that the images of the ‘LOCATIONS’ metaphors provided Latin speakers their principal means of comprehending the mind and its various operations. Not only does this one system of metaphorical understanding account for a larger number by far of conventional linguistic expressions than other metaphors, but the internal coherence of the images that make up this metaphorical system – that logically interrelated spatial concepts define correspondingly logically interrelated mental concepts – and the complex ways in which its basic mappings are extended and elaborated, indicates it was of paramount importance in Latin speakers’ metaphorical understanding of mind.

Frequent comment by authors on the close linkage between physical locations and thoughts implies that space was in fact inextricably bound up with how mental activity was understood in Roman culture. Quintilian (*Inst. orat.* 11.2.17), for instance, notes the commonly occurring experience that ‘when we return to a place after a considerable absence, we do not simply recognise the place itself, but we also remember things that we did there, we recall the persons whom we met there, and even the unspoken thoughts which passed through our minds when we were there before’. Cicero (*De fin.* 5.2) expresses a similar notion through the mouth of Piso: ‘I myself, looking upon the old senate house of Hostilius, used to think of Scipio, Cato and Laelius; but most of all, of my grandfather – so great is the power of suggestion residing in places (*tanta vis admonitionis inest in locis*).’ This notion is stated more explicitly in *De oratore* (2.358), were

Cicero seems to suggest that thought is not possible unless somehow spatialised: 'Forms and objects, like all things . . . require being situated (*sede opus est*), for an object cannot be understood without a place (*corpus intellegi sine loco non potest*).' Recent scholarship has shown just how much Latin speakers in fact conceived of the mental in terms of the spatial, utilising images of landscape and topography to, for example, provide logical structure to arguments (Leach 1988), describe characters' mental and emotional states (Vasaly 1993), or represent different stages of philosophical development (Henderson 2006).[50] Florence Dupont (1992: 73) claims that 'The Romans lived and thought in spatial terms'. In this sense, while Latin speakers' metaphorical conceptualisation of thoughts as 'LOCATIONS' may be based on universal bodily experiences, their privileging of such experiences in understanding the operations of the mind as well as in the elaboration of extended and distributed cognitive strategies constitutes a distinctive feature of their ways of representing, understanding and being in the world: in a word, of their culture.

At the same time, for theorists of extended and distributed cognition, this study suggests the need to consider empirical connections between aspects of cognition that are normally treated apart. Indeed, though the different strands of research tied together under the moniker of '4E' theory have some common ground – in particular, their rejection of any view of cognition as abstract symbol manipulation, and their commitment instead to treating the human body's sensory and motor capacities as directly relevant to forms of thought – to my knowledge, at least, very little attention has been paid to the ways in which cognitive processes that are extended, embedded, enacted, or embodied may interact, and especially to the ways in which generally situated cognition may be bootstrapped to embodied semantic knowledge. But if the distributed cognition

[50] Even if an author like Seneca is translating a Greek idiom (*proficiens* = ὁ προκόπτων) that figures philosophical development as spatial advancement (i.e., 'cutting one's way forward': cf.. e.g., Epict. *Diss*. 1.4.1.1), the Roman Stoic elaborates this metaphor as a (sea or land) journey *tout court*: in his letters, as Gunderson 2015: 41 writes, the metaphor is 'dramatically re-staged for the eyes of the reader'.

claim is that human beings naturally take advantage of material artefacts or other structures of the external environment in their thought processes, what different *types* of artefacts and structures they tend to use in thinking and why different social groups go about utilising different artefacts and structures would seem to be relevant questions.[51] Metaphorical conceptualisation may provide a partial answer. To be sure, the bartender who arrays glasses of different shapes on the bar in front of him does so to ease the burden of memorising a diverse set of drink orders (Beach 1988). But the spatial arrangement he uses will very probably be determined by the particular metaphorical construals his culture provides vis-à-vis space (such as 'IMPORTANT IS CENTRAL') and time (e.g., 'BEFORE IS BEHIND', 'AFTER IS IN FRONT').[52] Likewise, when we imagine Otto choosing to rely on a notebook for recording his memories, this is again because his (our) culture conceives of memory above all in written terms.[53]

Relatedly, Roman technical practice can remind us not to over-emphasise the importance of mechanical and digital technologies in the history of distributed cognition – technologies like iPads, navigational charts and plotting tools, or networked computers and web search engines – or at any rate to be more aware that the use of technologies like these in extended and distributed processes of cognition are historically and culturally conditioned. No doubt technologies like these have been important innovations permitting human beings to extend and distribute our cognition out into the environment and thus enhance it in significant ways. Yet, as we have seen, in historical societies where such technologies could not even be contemplated, still human beings naturally and effortlessly extended their thinking beyond skin and skull – not only to facilitate thought, but

[51] Heersmink 2013 attempts to formulate a 'taxonomy' of artefacts used in situated cognitive systems.
[52] For these metaphors, see Lakoff and Johnson 1980: 92; Boroditsky 2000; Alverson 1994; for their effects on nonlinguistic spatial tasks: Gentner et al. 2002.
[53] Perhaps like Leonard Shelby, the protagonist of the Christopher Nolan's *Memento* (2000), he could also have tattooed significant information on his skin in place of memory. But this choice would probably also be motivated by culturally defined notions of the body as 'text'.

to realise new forms of thought. This reminds us that human beings may be 'natural born cyborgs', or in Clark's (2004: 7) terms, 'creatures whose minds are special precisely because they are tailor-made to mix and match neural, bodily and technological ploys.' More fundamentally, however, we are – to recall Edwin Hutchins' (1995: 172) formulation – 'cognitive bricoleurs', assembling thought out of whatever is at hand: other people, an arch or aqueduct, a floor.

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