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Terminology in the Wild: Enactive Meaning-Making in the Roman Surveyors

Abstract: The Roman land surveyors (*agrimensores*) engaged with a rich and variable set of terminological systems defined the technical and legal aspects of how land was divided and allocated in the Roman Empire. Their extensive vocabulary for the varied types of land was encoded in media like the bronze maps in the imperial *tabularium* and bound to the systems of material boundary markers the surveyor would need to identify and differentiate in the landscape, which might exhibit considerable local variations. The surveyor could not master these terminological systems merely from text; only direct and active experience allowed the surveyor to negotiate the terminological systems that organized the Roman landscape. In this chapter, I use cognitive science theories of embodiment and enaction to trace the role the surveyors' lived experiences would have played in the ongoing construction of the terminological systems that guided their work.

1 Introduction

The Roman land surveyors (*agrimensores*) spent their days negotiating semantic boundaries both material and legal, seeking to read rules for ownership, land use, and taxation not only out of a body of legal guidelines but out of the landscape itself. Both domains were subject to slippage, as boundaries crept from their appointed locations through natural causes or human intervention, while legal disputes arose over land granted in many different ways, under a range of legal statutes, to owners whose identities could shift over time or who might themselves make illicit interventions in land assignments.[1] Developing a clear, fixed terminology for the wide range of land allocation types the surveyor would encounter (or create) in the landscape proved impossible, as agrimensorial techniques and statutes changed over the centuries.[2] Instead, the writings of the Roman land surveyors emerge as a lively site of terminological transformations and adjustments based on the surveyors' lived experiences.

Most of the extant writings of the Roman land surveyors are collected in the *Corpus Agrimensorum Romanorum*, a compilation perhaps dating to the fifth century CE

1 Surveyors' techniques for addressing disputes between landowners both public and private are outlined at Cuomo 2007, 103–130. More detailed treatments of the topic include Brugi 1968; Moatti 1993; Maganzani 1997.

2 On specific elements of agrimensorial terminology, and the religious, legal, and other questions those terms raise, see the papers in Conso et al. 2006.

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but incorporating texts from as early as the first.[3] Many of the texts are accompanied by images, from map-like drawings to representations of the inscriptions found on the boundary stones the surveyors used to demarcate divisions of land.[4] The markings on these stones ranged from simple signs like a letter or number situating them in a grid, to images of animals or other symbols that carried detailed information about the location of features like mountains or springs to those educated in their language. These inscriptions are themselves a fascinating wrinkle in the surveyors' terminological system, which was not merely verbal but visual as well.

Many contemporary studies of terminology bear the mark of the 'Vienna school' associated with Eugen Wüster. In a volume dedicated to studies of terminology, I do not need to replicate here the details of Wüster's approach.[5] Very briefly stated, Wüster viewed terminology as emerging from an array of extralinguistic concepts, which must be clear-cut and clearly delineated from one another. Terminological definitions can then be derived from the concepts in three ways: intensionally through specifying their characteristics, extensionally by collecting exemplars, or by defining a composite concept by enumerating its parts; the first of these is strongly preferred. The terms thus assigned should be univocal (i.e., each term should map onto exactly one concept) and should remain stable once assigned. The highly ordered terminological system that results from this process reflects Wüster's own background as an engineer rather than a linguist.

Highly desirable in theory, in practice it turns out to be more difficult to establish such a clear, orderly, and univocal terminological system in many domains. These difficulties emerge not just from the complexity and ambiguity of the real-world objects of study but also from features of how humans actually use language. As Roelcke points out, empirical studies of technical terminology indicate that in practice these terms are often polysemic, not completely clear-cut, and subject to metaphorical transfers between domains.[6] Such attributes are pathological within the Vienna school's highly constrained hierarchy of precise and univocal terms. But studied from

3 The *Corpus Agrimensorum Romanorum* is available in Lachmann's 1848 edition. More conveniently for English speakers, the *Corpus* has been lightly edited and translated into English by Brian Campbell, and supplemented with useful notes, diagrams, texts from inscriptions, and other helpful materials: Campbell 2000. *The writings of the Roman land surveyors: introduction, text, translation and commentary*. London. For an introduction to the techniques of the surveyors, see Dilke 1971. For a more comprehensive guide to the surveyors and their practices, as well as the texts of the *Corpus* and other surviving evidence like maps, see Chouquer & Favory 2001.

4 For a good introduction to these images, see Dilke 1967. For more detailed analysis of the images in the principal manuscript of the *Corpus*, see Carder 1978. On the caution necessary in labeling these images as actual maps, see Dilke 1961.

5 An overview of the principles and aims of the 'traditional Terminology' thus defined is given by Temmerman 2000. *Towards New Ways of Terminology Description: The Sociocognitive-Approach*, Amsterdam, 2–15.

6 Roelcke 2018, 178–179.

the perspective of linguistic pragmatics, with a focus on how terms are actually used, these features are interesting and worthy of study in and of themselves. A pragmatics approach might study how terms are *understood* in the context of use by technical practitioners, how their meanings change as disciplines develop, how terms are transferred metaphorically from one domain to another, and so on.

Other recent approaches to the study of terminology build on the pragmatists' interest in how terms are actually used by humans to inquire more deeply into the cognitive processes that result in the formation of the categories of concepts that the Vienna school's approach rather takes for granted.[7] Cognitive linguistic approaches to terminology often draw on prototype theory to explain how conceptual categories are built up around entities experienced as exemplary ('prototypical').[8] The prototype-based schema can accommodate additional entities that may not perfectly match the prototype but still have sufficient features in common to qualify as a category member. As Temmerman notes, some such categories may in fact display logical or ontological structure rather than prototype structure without being excluded.[9] The crucial factor is a focus on the *process* of category construction, regarding meaning-making as an experientially based activity rather than the discovery and interpretation of classical 'objective' categories. Geeraerts proposes replacing the image of meanings as "chunks of information that are contained in and carried about by word bags" with an active schema in which 'words are searchlights' that illuminate an area of their domain of application *upon that application*.[10]

Reinterpreting the 'meaning' of a term from an objective attribute out in the world to an active, experientially based creation recalls some of Gärdenfors's principles of cognitive linguistics. Whereas the 'realistic' approach to cognitive semantics locates the meaning of an expression 'out there in the world', where sentences are assessed as mapping on to truth values (or not), the cognitive semantics view instead identifies meaning as a 'conceptualization in a cognitive model', a model that is itself largely determined through perception and experience.[11] Like Temmerman, Gärdenfors focuses on the development of concepts through experientially derived prototype effects rather than an 'Aristotelian' theory of necessary and sufficient conditions. He likewise emphasizes the social aspects of making and changing meanings of terms, particularly in technical domains: meaning-making is a fluid process influenced by actors who for culturally contingent reasons are endowed at any given moment with particular social, technical, and linguistic power.

7 Roelcke 2018, 182–183.

8 On prototype theory's relationship to the formation of terminological categories, see for example Taylor 1995.

9 Temmerman 2000, 43.

10 Geeraerts 1993, 259–260.

11 Gärdenfors 1999, 19–22.

In emphasizing the importance of lived experience for forming terminological systems, cognitive linguistic approaches to terminology draw on related branches of cognitive science. Most relevant here is perhaps the 'enactivist' approach championed by Gallagher, Hutchins, and others.[12] While enactivism includes a very wide range of views and approaches, they share a common commitment to the idea that cognition depends on (or, in some of the more radical views, is constituted by) a feedback loop between perception and action. Given the inextricability of perception and action to cognition in the enactivist model, these approaches automatically entail a commitment to embodied cognition. 'Embodiment' here labels a set of viewpoints, again quite varied, that insist on the central cognitive roles of proprioception, bodily affordances, and the body's context within a (culturally marked) environment.

To close the loop back to questions of terminology: in what follows I will examine how the embodied, lived experiences of Roman surveyors in the field informed the ways in which they created and adapted their suite of terminological tools. These tools allowed them to navigate and shape anew a landscape marked by a complex lexicon of verbal and visual signs, which were themselves subject to disruption by natural forces as well as human interventions (legal and otherwise). While some of the texts in the *Corpus Agrimensorum* hint at a clear-cut, fixed system of labels that would find itself right at home in an ISO standard manual of terminology, many others sketch out the complications, irregularities, and polysemic variations that seem to have marked many surveyors' actual experiences with land boundaries. The markers themselves were inscribed in stone or bronze, scarred into trees, or written into the land itself as ditches, walls, and hedgerows; the *media* of the surveyors' terminological systems were themselves an important aspect of their lived experience. Exploring, applying, and refining the *agrimensores'* terminological lexicon meant physically grappling with stones and other markers to resolve ambiguities that elude purely textual study. The complex categories evolved in the course of those explorations reflect a long and never-ending process of enactive meaning-making, where the surveyors wring their terminologies from the land itself.

2 The Letter of the Law

Several short texts in the *Corpus Agrimensorum* are attributed to Julius Frontinus who is likely to be identified with the first-century consul who governed Britain and also composed a *Strategemata* and *De aquis urbis Romae*. If this identification is correct, his texts are among the earliest surviving texts of the *Corpus*, and they are writ-

12 For enactivism's place within the spectrum of 'extended cognition' theories, see Rowlands 2009, 53–62. A collected volume that demonstrates the breadth of enactivist views is Stewart et al. 2011. For connections between enactivism and phenomenology, see Gallagher's work, particularly Gallagher 2017.

ten in an uncomplicated style that reflects a relatively simple typology of land and land disputes compared to the more elaborate taxonomies of the later texts. His *De agrorum qualitate* gives a neat hierarchical overview of types of land. At the top level, land may be "divided and allocated (*agri divisi et adsignati*)," "contained by measurement from end to end (*[agri] mensura per extremitatem conprehensi*)," or peripheral, informally occupied land not included in a survey (*[agri] arcifini*).

Frontinus then redefines the first two categories in terms more closely linked to the practicalities of the survey itself, as (on the one hand) land bounded by *limites* and (on the other) land which is allocated differently for some reason. For the second category, Frontinus gives the example of Suessa Aurunca, where because there was no woodland near the allocated land, the colonists were instead assigned land on a nearby mountain. Land demarcated by *limites* (themselves differentiated into *decumani* and *kardines*, which typically ran east-west and north-south, respectively) is then allocated by *strigae* (longer than they are wide) or *scamna* (wider than they are long). The third category is redefined in practical terms of its own: this is land marked by long-standing informal boundaries like rivers, mountains, or trees. Such informal holdings are, unsurprisingly, hotbeds of territorial disputes, and Frontinus cites Varro's explanation that *ager arcifinius* derives from the act of 'driving off (*arceo*)' enemies.

Frontinus is careful to add that *ager arcifinius* is subject to different legal rights than the 'leftovers (*subseciva*)' from the process of dividing land into *centuriae* (a rectilinear grid of sectors of land 20 *actus* on a side).[13] These scraps of land, either lying on the periphery of the centuriated land or irregular unallocated bits of land inside *centuriae*, are themselves subject to constant disputes over ownership. Frontinus does not discuss them in much detail, but in a work written some centuries later, Agennius Urbicus fills in the details that while *subseciva* were not allocated at the initial founding of a colony, later waves of settlers were allocated *subseciva*. The newly minted owners then found themselves in conflict with the owners of land in the adjacent *centuriae* who had encroached on the formerly unallocated land at their borders.[14] Finally, Frontinus acknowledges that there is another kind of land as well, which like *subseciva* is not allocated or enclosed, and neither given to the *res publica*, nor to the colony, nor given up as sacred territory; this land remains under the jurisdiction of the colony's founder. All this is to say that even Frontinus's apparently simple and straightforward categorization of land turns out to conceal terminological complexities that emerge as the surveyor's neat theoretical categories are entangled in legal disputes, political acts like sending additional waves of colonists, and timeless human behaviors like stealthily expanding one's holdings into unprotected adjacent territory.

13 On centuriation see Gabba 2003.

14 Campbell 2000, 38.

Another short text from the *Corpus Agrimensorum*, this one anonymous, gives a more complex typology of land right from the start.[15] The list once again begins straightforwardly: allocated (*adsignatus*) land, centuriated land, *subseciva*, and land on either side of the *decumanus* and *kardo* (*dextratus*, *sinistratus*, *citratus*, and *ultratus*). But as the list goes on, the taxonomy burgeons into a more multifarious collection of terms, since it turned out sometimes to be necessary to classify land by its shape (the author lists, for example, the terms *ager tetragonus*, *tessellatus*, or *normalis*, all for rectangular areas of land), by the ruler under whom it was distributed (*ager triumviralis*, *Syllanus*, *Caesarianus*, and even *ager commutatus ex beneficio Augusti*), by its topography (*ager epipedonicus* and *cultellatus*), or by the units in which it was allotted (*ager iugarius in quinquagenis iugeribus*).

The follow-up companion text that defines the various types of *limites* ends up ranging over a still broader set of possible axes of definition, at times reminiscent of Borges' *Celestial Emporium of Benevolent Knowledge*. Clear-cut categories include *limites* running east or north (*orientales* or *septentrionales*) or facing south (*austrinales*), the principal *decumanus* and *kardo* (*limites maximi*), continuous (*perpetui*) *limites*, and so forth. But the categories must also reflect peculiarities of certain types of land, such as those demarcated by *limites Gallici*, *limites maritimi*, or *limites colonici*. Others reflect the practicalities of the specific acts of observation that created a given *limes*, like *limites nonani*, *sextanei*, and *undecumani*, all of which are defined by the hour when these north-south lines were measured. Still further criteria for categorization include temporary *limites*, *limites* defined *per antica et postica* (i.e., using antiquated terminology), and stand-alone (*solitarii*) *limites*. The fragmentation of terminological strategies in these texts reflects the rich experiential contexts of the land defined by seemingly simple surveying techniques. Potentially interesting attributes differentiate land divisions from the very moment of measurement (was it at noon or in the afternoon?), and continue to accrue as the land thus measured out presents obstacles like mountains or seas, takes a particular shape once divided, and is allocated to successive waves of owners by political authorities at different levels.

Another short text, aptly labeled *De paludibus*, addresses some of the murkiness of the surveyor's classificatory work:

> Boundary markers have not been totally described (*perdescribantur*)(. . .) This system should be expounded with legal abbreviations in accordance with the lex, and in line with the art of grammar, philosophy, and geometry. (. . .) But *leges* should be expounded according to the art of geometry, with reference to relevant written material in accordance with the report on the place which is to be analyzed, and also in accordance with observation on the place, whether it has ditches, *subseciva*, straight lines, *centuriae*, or boundary stones.[16]

15 Campbell 2000, 242–244.

16 Campbell 2000, 268. Translations here are adapted from Campbell.

The multiple approaches – mathematical, legal, and experiential – suggested here are needed to combat the varied axes of classification suggested by the many types of land and *limites* the surveyor might confront, to say nothing of the local variations in topography or materials, cases of boundary sabotage by acquisitive neighbors, and all the other local peculiarities the surveyor will grapple with. The lack of complete description or definition of boundary stones the text's author mentions at the start is not so much a complaint about incomplete classification as it is a realistic reflection of the fact that there are some disorderly aspects of the surveyor's craft that cannot be fully captured in neat terminological categories or by any one analytical strategy.

Some of the texts in the *Corpus Agrimensorum Romanorum* attempt to sweep the complexities and ambiguities the surveyors faced in the field under the rug, suggesting instead a cooperative world of clear-cut boundaries and rules that would define a perfect set of operating procedures if only they were followed scrupulously. Chief among these is the *De controversiis agrorum* transmitted under the name of Agennius Urbicus, about whom virtually nothing is known other than that this rather didactic text is cited in the *Commentum*, which may be dated to the fifth or sixth century CE, which provides a very loose *terminus ante quem*.[17] The text we have is heavily interpolated, and Lachmann's typographical differentiation of the parts of the text he deemed most likely to have been written by Urbicus himself from the interpolation has influenced later treatments (though Thulin's edition does not follow such a convention). As we shall see, the 'voices' of Urbicus and the interpolation appear to suggest somewhat different priorities and possibilities for distinguishing and naming categories of land and disputes.

The surviving text of the *De controversiis* begins with a programmatic statement (which Lachmann identifies as an interpolation) about the relationship between signified and signifier, revealing an idealized image of the connection between a term and its meaning. The author argues that if speech (*vox*) is natural and defined in terms of the various meanings of words (*varia verborum significatione*), then it requires its own educational method (*institutio*). Even the basic ability to read written words relies on a system of agreed-upon conventions about how to interpret a given shape made from lines (*linearum illam figurationem*), which must be consistently deployed in order to be interpreted in the first place. Likewise, reckoning with numbers only becomes possible once 'one,' 'two,' and so forth are defined. These demands remain even when one moves on to more realistically complex affairs:

> If we introduce related discussions into our treatment of the subject and examine them in order, very many preliminaries are necessary (. . .) for we are subject to the working of nature in such a way that all things with which we have an affinity, or which have an affinity with us, are of-

17 Campbell 2000, xxxi. On Urbicus see also Chouquer & Favory 2001, 26–27; Castillo Pascual 1998, 95–108.

> fered to our senses in a rather confused way, and we have learned to distinguish these very things with our minds (. . .).[18]

In this model, semantically active speech (*vox*) is defined as a natural system relying on semantic elements with fixed defining features (both formal and semantic). The relationships between those features and the concepts they define are initially a matter of agreed-upon convention, but once one 'buys into' the system by accepting the rules for interpreting letters, words, and numbers, those meanings appear fixed and intensionally defined.[19] These fixed definitions of concepts labeling referents in the world are then located within the orderly epistemological system suggested (though not explored in any depth) in the *De controversiis*. Finally, the distinction between the natural 'confusion' of sensible objects in the world and the 'discerning (*dinoscere*)' performed by the mind suggests the author believes it is possible to establish necessary and sufficient conditions for defining concepts without ambiguity. The system optimistically suggested here might fit quite well into the strictures of the Vienna school.

The learning process the author recommends relies above all on delimitation: categorizing and defining small areas of investigation so that the inquiring mind is not baffled by the distracting task of trying to comprehend everything at once. He defines the mind as an instrument that must be shaped for inquiry just as iron is shaped for cutting (*nec ferrum in genere secare potest, nisi ad secandum habilem acceperit figuram*), and the mechanism of that shaping is a 'fixed order of learning (*certo disciplinae ordine*).'[20] The particular order prescribed here for surveyors proceeds from the nature of the cosmos, to the division of the Earth into *oecumene* and other, and finally the division of the *oecumene* into regions.

At this point in the text an authorial voice deemed by Lachmann more likely to be Urbicus's own takes over, moving from the conceptual musings on division in the preface to more specific questions of the differences between the various categories of land ownership (*condiciones possidendi*) and the kinds of disputes that affect them.[21] The variations between geographical regions reappear here in a more practical context. It emerges that the categories of land ownership differ in Italy from the conventions of the provinces, where land may be tax exempt, or belong to non-Romans, or be subject to different terms of legal ownership but nevertheless treated as though privately owned. Moreover, the climatic differences between regions complicate matters still further, as for example water disputes in Italy tend to focus on rules for preventing landowners for diverting rainwater to neighboring land, whereas the opposite is true in Africa. Another interpolation celebrates the potential for geom-

18 Campbell 2000, 16.21–24.

19 That is to say, defined by their properties rather than by listing objects matching the term. On the role of intensional definition in traditional terminology, see Temmerman 2000, 6–16.

20 Campbell 2000, 18.4–8.

21 Campbell 2000, 20.1.

etry, 'delightful in its order (*delectabilis ordine*),' to bring reason and proportion to these disputes, though to be sure geometry encounters challenges of its own when put to the test in the world of surveying practice.[22]

The *De controversiis* is thus itself the site of an unfolding dispute between a 'theoretical' voice emphasizing rigorous order and definition, and a more practical voice (attributed to Urbicus himself) that paints a messier picture of legal and material variations and human interventions. The interplay between the two voices is neatly captured later in the text, in a discussion of how to manage disputes over land allocation under the *status effectivus*: "(. . .) there is a distinction depending on how it is heard by a judge. In this dispute the surveyor will need to pay attention to (boundary) lines *until some inconsistency obtrudes on consistency. For no truth can be demonstrated if even the tiniest morsel of falsehood obtrudes. For the truth should have self-similarity under all circumstances.*"[23] The 'practical' voice emphasizes the sociocultural context and the need for physical observation of the particular site, while the 'theoretical' voice insists that an unambiguous, consistent, and permanent truth can be discovered for every disputed arrangement of land ownership. The 'practical' voice does insist at the end that truthfulness is a vital virtue of the surveyor himself, while acknowledging that the human weaknesses of inexperience and poor judgment can interfere with its expression. However, this is a far cry from the 'theoretical' voice's idealistic appeal to the possibility of discovering permanent objective truths through eliminating inconsistencies.

The two voices overlap as well in the tricky case of defining the term *rigor*. The various terms for straight lines used by the surveyors (principally *finis*, *limes*, and *rigor*) might be thought of by laymen as interchangeable. However, the *agrimensores* made finer distinctions: *limes* typically refers to the *decumani* and *kardines* as defined in the landscape by roads or paths, while *finis* is a more general term that can refer to various types of boundaries as well as the physical structures like roads or hedgerows that mark them. Balbus's *Expositio et ratio omnium formarum*, which probably dates to the first or second century CE, gives the shapes of land areas the surveyor must deal with a Euclidean treatment. In this work, Balbus defines *rigor* as "whatever is seen (*perspicitur*) to stretch straight between two points in the form of a line" and as "whatever occurs on land as part of the work of measuring to establish a straight boundary."[24] Balbus here distinguishes the *rigor* from the *linea* that represents it on the map, apparently by defining it as something visible in the landscape. Does that mean the *rigor* has breadth like the principal *limites*? Not necessarily; the act of sight-

22 Campbell 2000, 22.7. These challenges are addressed elsewhere in the *Corpus*; see Roby 2014, 9–52. For comparable issues in Hero of Alexandria's *Dioptra*, the principal surviving Greek text on surveying, see Roby 2018, 67–88.

23 Campbell 2000, 32.30–32. Roman type here indicates the text associated with Urbicus himself, and italics the interpolation.

24 Campbell 2000, 208. On Balbus see Campbell 2000, xxix–xl; Santini 1990, 137–142; Roby 2014.

ing that reifies the *rigor* in the field could refer to the surveyor's establishing a straight line using sighting-poles and a sighting instrument like the *groma* rather than seeing a pre-existing boundary ditch, road, or some other structure visible because of its breadth.[25] Moreover, Balbus elsewhere defines a road as a breadth delimited by two parallel *rigores*.[26]

Balbus thus appears to regard the *rigor* as breadthless, like a Euclidean line, but this definition was not universal. The 'practical' voice attributed to Urbicus calls the discussion over the term 'nuanced (*subtilior*),' alluding to attempts at defining the *rigor* under the *lex Mamilia* and acknowledging that jurists are still arguing the matter.[27] Some of the difficulty, he says, results from the opaque archaic terminology of the law itself (*antiqui sermonis sensus*): it is ambiguous whether the 5-foot width of the boundary defines the space on each side, or the total width (so 2½ feet on each side). Urbicus leaves the matter with the current legal argument, which favors the latter. The 'theoretical' voice, however, here breaks in to enhance the precision and philosophical heft of the question. The author suggests that a boundary on the Earth cannot be treated the same way as a single line without substance: "whatever earthly thing is divided (*quidquid terreni est divisum*), it follows that it is agreed that in its entirety it has solidity."[28] The author argues that even a very finely traced line in the Earth inevitably acquires some physical bulk as it is drawn, because air is added in as the dirt is scraped and heaped up along a furrow (*in modum tamen sulci per supplementum aeris conspicitur*).[29] This is in itself a quite practical approach to the debate, but the author appeals to unnamed 'philosophers and geometricians' to support the stronger claim that the same would hold for an imaginary line traced (somehow) in thin air. Transferring the analysis from the surveyor's domain of the Earth, where *rigores* actually occur, into the air is characteristic of this author's tendency to extend any term's definition as far as logically possible, regardless of its practical applicability.

Even the 'practical' voice of the *De controversiis* is, in the final analysis, not especially practical. The primary aim of the text as a whole is categorizing and labeling different types of disputes. Urbicus bases his analysis on the 'progressions (*transcen-*

25 On the surveyors' instruments, see Lewis 2012, 129–162.

26 Campbell 2000, 204. For these and other instruments used by surveyors, see Lewis 2001.

27 On the *lex Mamilia Roscia Peducaea Alliena Fabia*, see Fabricius 1924; Hardy 1925, 185–191. Fabricius attributes this law to C. Mamilius, tribune in 109 BCE, arguing that it was a response to the elitist *lex agraria* of 111 BCE, while Hardy argues that it was more likely part of Caesar's agrarian legislation, dating most likely to 59–52 BCE. None of the surviving three chapters offers any insight into the *rigor* question.

28 Campbell 2000, 24.

29 Campbell translates this section somewhat differently: "when it forms a boundary at the lower level with something earthy, even though it is very thinly traced, nevertheless, in the manner of a furrow, it is seen by its (imagined) extension through the air above." However, I think it is easier to comprehend without supplementing 'imagined': the earth dug up from a furrow is less compacted and literally easier to see since it is 'fluffed up' with air.

dentiae)' by which disputes may move from obscurity to clarity – *if* the correct statute is applied. The *transcendentiae* themselves are classified as "necessary, or possible, or impossible, and often ephemeral."[30] Urbicus gives a few examples to clarify what he means here. A dispute that changes from being about boundary markers to being about a *rigor* is impossible under the *status generalis assumptivus*, which just pertains to boundary markers, while a dispute about a boundary with no discernable demarcation is classified as both impossible and ephemeral. Disputes over boundary markers are not a class of their own, but rather "preliminary and a kind of threat of litigation, indicating that the dispute will be over either site or area."[31] Campbell notes of one of the principal passages defining these procedures that "Urbicus's theoretical approach in this section, which seems over-schematic and artificial, is divorced from the reality of land survey as it appears in Frontinus and other writers."[32] Indeed, Urbicus includes very few practical details on how they are to be resolved; the most detailed advice is "no one readily moves a boundary stone for just a small quantity of [land]. It will be part of the surveyor's skill to decide, according to the position of the neighboring angles, how far a marker has been moved and by what principle it should be restored to its proper place."[33] Urbicus's focus remains on his complex hierarchy of types of disputes and their associated statutes and conditions.

Contrast this typology of disputes with Frontinus's *De controversiis*, where disputes are classified topically and matched to observable features in the landscape: disputes over boundary markers (between two neighbors along a boundary, or three or more at the *trifinium* or *quadrifinium* that mark corners), disputes over *rigores* that stretch from one boundary marker to another (or similarly over the 5-foot breadth mentioned above), disputes over alluvial land, over sacred places, and so forth. Granted, the legal complexities governing land allocation had multiplied spectacularly between Frontinus's time and Urbicus's. Still, sensitive though the 'practical' voice associated with Urbicus is to the social and legal complexities of the surveyor's work, the text's aim to create a complete typology of disputes often seems to reflect an idealized, abstract view of that work rather than a system of practical knowledge derived from experience in the field.

Urbicus optimistically promises that "the angles at which boundaries meet one another (. . .) are never without some system. If we do not turn a blind eye, we shall through our skill easily restore to this system whatever unskilled people have disturbed."[34] Other texts of the *Corpus Agrimensorum*, however, indicate that restoring order to the landscape requires a wealth of experiential and local knowledge so that the surveyor can read the complex and shifting language of markers in the field. In-

30 Campbell 2000, 26.

31 Campbell 2000, 28.12.

32 Campbell 2000, 337, n. 17. This passage (Campbell 2000, 24.32–26.15) is identified by Lachmann as an interpolation, but by Campbell as Urbicus's own work.

33 Campbell 2000, 26.32–28.2.

34 Campbell 2000, 28.6–9.

deed, the surveyors' unfolding experiences in the landscape spark the creation of new systems of taxonomy and terminology, which in some respects may match up to idealized abstractions like those Urbicus describes, and in others reflect an entirely different approach to meaning-making, as we will see in the next sections.

3 Stone and Bronze Language

The terminological system the surveyor engages with in the field is in fact a hybrid of verbal and material signifiers. The taxonomic and logical systems explicated in instructional texts like those collected in the *Corpus Agrimensorum*, plus the in-person verbal instruction fledgling surveyors surely received (though we know almost nothing about their education), represented only part of the picture.[35] The surveyor's work required him to leave books behind and head out into the field, to be confronted with an unpredictable assortment of material and visual signifiers that would complement (and sometimes conflict with) the verbal terminology that gave taxonomic structure to types of land and disputes over them. The stones themselves presented a terminological challenge of their own, even apart from the question of their significance as indicators of land types. One glossary of stone types in the *Corpus Agrimensorum* lists stones defined by shape (*isosceli* and *exagonus*), position or orientation (*terminus quadrifinius* and *terminus in inversum positus*), era of installation (*Augusteus*), and several other factors.[36] Terminology like *Augusteus* conceals a wealth of historical and cultural associations as well as communicating a host of technical details to the expert's eye. The text attributed to a certain Latinus and Mysrontius reports that round stones are called 'Augustan',

> because Augustus re-assessed this land, and where there were stones in existence, set up new ones, and had all the land surveyed again in his day and allocated to veterans. These stones of Gaius Caesar are round stones made from flint or volcanic rock, 1.5 feet underground and 2.5 feet above ground, or sometimes 4 feet; they are 2400 feet apart from one another.[37]

The text mentions as well 'Neronian, Vespasianic, and Traianic' stones, but gives no further details; nonetheless, it seems likely that these terms indicated a typology of stones at least as complex in the technical details of composition, shape, and situation in the landscape, even if the story behind their allocation was not so famous as the land grants of Augustus.

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35 While it remains very difficult to conjure up ancient contexts of imparting technical knowledge through non-textual means, an exemplary inroad into the possibilities of mining texts for clues to the tacit knowledge they entail is Cuomo 2016, 125–143.

36 Campbell 2000, 244–246.

37 Campbell 2000, 254.

The complexities multiply when these categories of stones are mapped on to categories of land. The *Corpus Agrimensorum* includes several lists of the meanings of these stones, which give a taste of the difficult definitional work the surveyor would have faced in the field. A text attributed to an unknown Latinus (whose relationship to the above-mentioned Latinus is equally unknown) notes a range of possible significations of stones, some more cut-and-dried than others. Lead on the top of a stone or attached to a tree signifies a cistern or pool; a hollow on top means that a nearby well marks a boundary; a hollow underneath indicates a washing area.[38] Meanwhile, a boundary stone laid on its side signifies a *limes* – but how is one to tell in the field whether the stone was placed on its side deliberately or just fell over? Another text, this one attributed to an equally mysterious Vitalis and Arcadius, notes that a washing area can itself be a boundary marker even without having the stone there, and that if it is marked by an *arca* (a chest-shaped marker with four sides and a hollow), it marks a *quadrifinium* (four-way intersection).[39] The latter case, however, applies only if the *arca* is encountered on the last of a chain of three hills (*monticelli*) along which a boundary extends from a *limes*. The stones' language is far from simple!

Moreover, stones are just one tool for surveyors to mark boundaries: ditches, trees, streams, walls, roads, and other manmade and natural objects may indicate them as well. Siculus Flaccus delves into the uses of trees as boundary markers, observing that practices vary regionally and depend on the owners of neighboring properties to abide by certain standards.[40] Almost any type of tree can indicate a boundary: pine, cypress, ash, olive, and many others are mentioned by authors in the *Corpus Agrimensorum*. Some property owners leave only trees of a single type standing to create a more distinctive boundary, while others plant distinctive new trees.

It is obviously convenient to use already grown trees as markers rather than waiting for new ones to grow, but how does one demarcate the 'marker' trees from others in the area? If the trees fade out on one side of the boundary, they can be left intact, but if similar trees grow on both sides of the boundary, the trees on the border must be scarred on both sides to differentiate them from their surroundings and indicate that they separate two different properties. These scars have a language of their own; for example, a 'decus (X)' or gamma indicates that the tree stands at a bend in the boundary. Trees, unlike rocks, have immediate commercial value of their own, and so boundary trees are subject to being cut down by unscrupulous neighbors not just to adjust the apparent property boundaries, but for their own wood.

The 'X' and other symbols carved on trees echo a more complex vocabulary of letters and other symbols that are found on boundary stones or label them in other ways. A few texts in the *Corpus Agrimensorum* use letters to link informational do-

38 Campbell 2000, 226.
39 Campbell 2000, 248.30, 250.34–35.
40 Campbell 2000, 110.

mains ranging from signs in the landscape, to typologies of lands, to verbal and visual indicators in the texts themselves. The first, a brief anonymous text simply labeled *Item expositio terminorum*, is an abecedarium of facts that letters inscribed on boundary stones might signify.[41] For example, A indicates a nearby boundary or spring; B is the same but marks a boundary or spring branching in two. Some are iconic, for example G, which 'denotes a curving *limes* like its own letter' or L, which 'indicates a right angle, like its own shape'. K is for *kardo*: "you will find that this boundary stone is very carefully made and elegant, indeed beautiful" – though no such promise is made for D for *decumanus*. So far, so good: just an alphabet of indicators, many of them tied to their symbols with mnemonic devices like these.

But then again, in a text attributed to 'Latinus P. Togatus', the letters of the alphabet instead stand for distances between markers: A for 250 feet, B for 350, Z for 1900, etc. Yet another set of alphabetic associations is found in the text known as the *Casae litterarum*, which maps (literally) the letters of the alphabet onto a set of descriptions of prototypical property types. For example, B represents a farmstead (*casa*) with a large parcel of land in front of it that includes a brook to the south, while O signals a *casa* on a mountain surrounded by land extending radially from a spring. The descriptions of the *casae* are accompanied by small maps where a large letter stands in place of the *casa*, with the other important features of the estate depicted iconically; the alphabetic cues would thus have been acquired visually through the included images at least as much as through the verbal description. Hence, a surveyor encountering lettered stones in the landscape might activate any of these networks of associations, or indeed others that have not been passed on in the *Corpus Agrimensorum*. Assigning a meaning to the marked stone would require sorting through a polyvalent web of possible meanings, informed by the surveyor's foundational technical training and more recent lived experiences.

The marked stones and trees in the surveyor's landscape are only one part of the network of material supports defining patterns of the land's ordering and ownership. They were complemented by a host of separate technologies, like maps and tablets listing land allocations, that provided a check against the markers in the landscape by setting down the surveyor's terrestrial definitions in a centralized and abstract form. Hyginus Gromaticus reviews in his *Constitutio limitum* the range of material documentation surveyors and the imperial bureaucracy had at their disposal, recommending that:

> We shall write down all the mapping definitions (*aeris significationes*) on the maps and bronze tablets: given and allocated, granted, excepted, returned, exchanged for his own property, returned to the previous possessor, and whatever other abbreviated notations may have been in use and remain on the map. We shall place in the emperor's record office the mapping registers and a map of the entire territory.[42]

41 Campbell 2000, 264–266.

42 Campbell 2000, 158.26–30.

The terminology in the surveyor's maps and tablets complements the language of the boundary markers by creating a dynamic record of ownership. The imperial records are meant to include the necessary information not only to record the current state of ownership, but to help the emperor make decisions about future allocations; so Hyginus recommends that they should include a list of all *subseciva* ('leftovers'), "so that whenever the emperor wishes he can find out how many men can be settled in that area."[43] The terminology defining types of land and its allocation comes alive in the imperial record office, as those terms become levers for further acts of land allocation made in the emperor's name.

Surveying maps were produced on a variety of materials, including wooden tablets, parchment, and monumental stone inscriptions like the cadastral map of Orange, but the bronze maps are mentioned most often in the agrimensorial texts.[44] Very few fragments survive of inscriptions that seem to correspond to the bronze maps. One maps three *centuriae* of the Roman settlement of Lacimurga in what is now Spain, including a section of the river Ana and a road, while another, discovered in the Capitoline complex at Verona also includes parts of three *centuriae*, which do not have distinctive topographical features.[45] The Verona map, like the Orange cadastral map, labels the positions of the *centuriae* with respect to the *decumanus maximus* and *kardo maximus* and includes information on how much territory was allocated to named owners. The Lacimurga map shares its inclusion of rivers and roads with the Orange map, and labels the area of the three *centuriae* (all 275 *iugera* versus the usual 200), but includes no information about their position (though this can be deduced since the fragment is a corner) or ownership.

The fragmentary material evidence seems in keeping with the textual descriptions in the *Corpus*, though these descriptions add considerable detail about information that is not well represented in the few surviving fragments. The tablets could include not only a visual representation of the mapped territory but also a wealth of information about its ownership and allocation, which could occur in various ways as land was given to veterans in the emperor's name, by a military commander to his friends or influential people, and so on. Annotations (*inscriptiones*) tracked the quantities of land granted, allocated, restored, or exchanged, as well as names of those to whom the land was given. Keeping strict records of the quantities of land thus allocated was important, among other things, for calculating the area of the irregular *subseciva*: the difference between the total quantity of allocated land and the total area of the *centuriae* covered by that territory gave the area of the *subseciva*. Siculus Flaccus argues that the evidence contained in the bronze map should be considered an authoritative tool to settle any

43 Campbell 2000, 158.22–23.

44 For detailed analysis and plates of the Orange cadastral map, see Piganiol 1962.

45 On these fragments see Sáez Fernández 1990, 205–228; Gorges 1993, 7–23; Cavalieri-Manasse 2000, 198–200.

disputes, but that if there is an objection to it, the surveyor can turn to the copy kept in the imperial record office (*sanctuarium*) for arbitration.[46]

Siculus Flaccus expands the terminology of the map to draw a parallel between map-making and the surveyor's work of gathering the information that the map itself represents:

> although the map is one element, some refer to the *pertica*, others *centuratio*, others *metatio*, others *limitatio*, others *cancellatio*, others *typon*, which, as I said above, constitutes one element, the map.[47]

The first four of these are measurement and division activities that happen in the field. The last two, although their meaning is less clear, seem to refer to record-keeping activities of stamping or crossing out writing, which might refer to the cumulative record of land passing through various owners.

The close connection between the surveyor's fieldwork and its representation in the bronze maps suggests a kind of translation process: the typology of land the surveyor's hands-on measurements create in the field is fused, in the map, both to its visual representation and to the legal realities behind it. The maps juxtapose a miniaturized, simplified visual representation of areas of land alongside annotations that bear information about the patterns of ownership that define the land in the legal domain. The legal situation defining a given piece of land can then be manipulated remotely by members of the imperial bureaucracy, as Hyginus mentions, so it is not merely a passive representation but an active site for adjusting the surveyor's definition of terrestrial space. The maps and other surveying records draw together several different experiential domains: the landscape itself, the overlay of meaning-bearing markers left on the landscape by the surveyors, and the matrix of legal information those markers signify. They translate into new media the terminological categories defining types of land and ownership, and their associated textual and visual explanations, carried within the texts of the *Corpus Agrimensorum* and other textual sources now lost to us.

Those media are themselves a crucial element of how the surveyors construct meaning out of the landscape. As we saw above, Siculus Flaccus identifies the bronze tablets, and in particular the versions held in the imperial *sanctuarium*, as the highest authority for resolving ambiguities and disputes over the allocation of land. The monumental size and stony permanence of maps like the cadastral map of Orange likewise convey a sense of immutable authority. The inscribed stones and trees in the landscape draw their own kind of power from their media: the intransigence of a row of marked trees, the cryptic inscriptions on stones decodable only by those trained to read them, and other stones marked with more broadly accessible inscriptions, all

46 Campbell 2000, 120.30–32.

47 Campbell 2000, 120.24–26.

make claims to authority and permanence in their own right. Just like the varying 'linguistic power' Gärdenfors observes that certain kinds of people have to create and adjust systems of terminology, the *agrimensores'* inscriptions controlled flows of technical expertise and political power, thanks in part to the very media where they were inscribed. While terminology is usually considered from a media-agnostic perspective where the semantic content is all that is considered important, these inscriptions are an opportunity to reflect on how the material supports of systems of terminology can themselves invest the system with power.

4 Enactive Meaning-Making

The material supports – bronze maps, carved rock, and written book – upon which the surveyors' definitions in the landscape depend are of course closely bound up with the physical work of producing and reading them. The surveyor's *termini*, and their associated terminologies, cannot be determined purely on the basis of textual definitions; the surveyor's definitional work relies crucially on activities carried out in the world. Many of the texts in the *Corpus Agrimensorum* indeed feature an authorial voice that emphasizes the personal, experiential activity that links the surveyors' panoply of definitional terms to semantically active objects in the landscape. So, for example, the short text attributed to an unknown 'Gaius and Theodosius' is framed as personal experience:

> I buried squared boundary stones in the earth; they are used by surveyors in Italy to mark the hypotenuse. I put a vertical line on the leading boundary stone at a *trifinium*. I also established other four-sided stones as *cursorii*. Those who do not know their dimensions, do not understand whether they are placed at a *trifinium* or on the line of an internal boundary; and they make mistakes over many *limites*.[48]

Campbell suggests that 'Gaius' and 'Theodosius' may be names chosen to stand for a legal writer and an emperor. Indeed, the 'I' does all the fieldwork in this text, leaving 'you' only to 'discover' the system 'I' set up, which fits the relationship between a technical expert and an administrative authority. In other texts, however, the convention of representing surveying work as personal experience includes an 'I' and a 'you' who both do hands-on work in the field. The most common structure for these texts combines statements about what "I established (*constituere* or *ponere*)" and what "you discover (*invenire*)," suggesting roles of teacher and student.[49] The sense of collaboration is similar to the 'Gaius and Theodosius' text except that 'you' are explicitly situated

48 Campbell 2000, 252.22–26.

49 Several examples of such texts are found at Campbell 2000, 260–266.

out in the field, not only observing boundary markers but performing other tasks of the surveyor as well, such as swearing an oath to ratify the boundary.

A few comments in the 'Gaius and Theodosius' text link the forms of boundary markers to a system of distance relationships; for example, "I dedicated a small star above stakes daubed with pitch. And so that you can discover the system followed, they are 411 feet apart from one another." In fact, in several texts the distance between certain types of boundary stones is itself an important part of their meaning (e.g., what kinds of intersections they sit between), as are other factors that must be observed on-site, like having pottery shards or other objects buried beneath them. While some of the texts in the *Corpus Agrimensorum*, as we have seen, contain 'dictionaries' of the meanings of stones of different kinds, the surveyor's array of terminological definitions can only be fully assessed by embodied interactions with the stones themselves. Important as these in-person, active observations are to the surveyor's definitional work, the texts do not discount the value of learning the definitions of markers from books. The 'Gaius and Theodosius' text begins with an instruction that if one discovers a series of same-colored boundary stones at a *quadrifinium*, there is no shame (*nec enim verecundum sit*) in referring to textual authorities to find their meanings – and indeed, promises that "you will become more skilled at establishing *termini* (*artificiosius terminabis*)" if you familiarize yourself with textual explications of features like the inscriptions on stones.[50]

The blend of formal textual definitions and experiential assessments that create meanings in the world for the surveyor's symbols is reminiscent of Zawada and Swanepoel's work on the terminology developed and used by mineralogists. Their study suggests some explanatory shortcomings of the classical terminology theory espoused by Wüster and others.[51] In their analysis of the mineralogists' work, classical terminology's emphasis on binary features in clearly demarcated categories was found particularly wanting. Instead, they found, mineralogists relied on fuzzier concept categories, structuring those concepts as prototype clusters with a sliding scale of similarities rather than binary inclusion or exclusion.

Crucially, membership of minerals in the categories was determined and adjusted primarily through experiential assessments. For example, the hardness test used to identify some minerals relies not on an 'objective' measurement yielding numbers on a display (problematic as claims for 'objectivity' are even for such parameters, I leave the issue aside), but on a very bodily activity performed by the mineralogist, who scrapes at the mineral with a file, assesses the amount of noise and powder produced in that process, compares them mentally to those of known minerals like diamond and talc, and finally assigns a number on the Mohs hardness scale. Even the other types of identifying test available for minerals, like tests for their chemical composi-

50 Campbell 2000, 252.5–8.

51 Zawada & Swanepoel 1994, 254–257.

tion or crystal structure, are procedures established by routine and convention that rely on the mineralogist's experience of sensible properties like color, smell, or touch.[52] As Zawada and Swanepoel point out, the classical aim of developing 'necessary and sufficient conditions' for category membership hardly explains this process well.

Zawada and Swanepoel note several characteristics of mineral species' defining features which may seem familiar to readers of the *Corpus Agrimensorum*. Minerals vary widely along several axes (color, hardness, crystal structure, etc.), and those variations must themselves be evaluated according to functional and contextual considerations. These parameters are only defined according to conventional norms (i.e., they are not natural kinds 'out there' in the world), and assessing their features relies on the scientist's embodied observations. Finally, the features themselves depend on experts' interpretations of complex theories. The 'experiential' approach Zawada and Swanepoel suggest for analyzing the terminological work of mineralogists seems like a more realistic template for the context-rich, bodily experienced world of surveyors' markers than the clean-cut categories of 'classical' terminology, or the texts in the *Corpus Agrimensorum* that suggest a neatly manicured taxonomy of types of land and their material markers.

The surveyor's sensory, embodied experiences of identifying boundary markers in the landscape begin, like the mineralogist's identifications, with learning how to navigate an existing system of terminology for the stones and the different types of land that contain them. The basic process of placing markers at the intersections of *limites* mentioned by Frontinus among others quickly expands to include a wide range of possible variations. So, for example, the text attributed to 'Vitalis and Arcadius' introduces the *epetectalis*, denoting boundary stones grouped more than four together to set off a *quadrifinium*, separated from one another by 400 or 900 feet, and so called from its extra importance (these were the stones that marked the spot where a survey began or ended).[53] A *reprobus* stone is not, as its name might suggest, a false marker, but rather a stone featuring a 'non-equal' line which is placed on a boundary – but never at a *trifinium*, where only a stone with an obtuse angle on it should go.[54] Meanwhile, the type of stone shaped like a flask (*lagena* and *laguenaris*) or small cask (*orcula* and *orcularis*) may be separated from its neighbor by a wide range of distances: 53 feet, 150 feet, 355 feet, and perhaps other intervals as well, if the region has a variant practice of its own.

Regional variations, both in terrain and surveying practices, are indeed one of the principal reasons the surveyor's experience is so important in creating and interpreting *limites*. Hyginus Gromaticus spells out a relatively straightforward way of set-

52 Zawada & Swanepoel, 265–266.

53 Campbell 2000, 250.7–9.

54 The *acies reproba* is so defined in the text of "Gaius" (Campbell 2000, 228.14; n.b. this is a different text from "Gaius and Theodosius").

ting out *limites* in his *Constitutio limitum*, but then concedes that one can stick to his method only if the nature of the region happens to permit it.[55] For example, a community located near the sea or a mountain cannot be laid out so as to expand equally from the central intersection of the *kardo maximus* and *decumanus maximus* since it will run into those intransigent natural boundaries. Hyginus is indeed quite sanguine about the possibility of local variations in terminology, observing that even in settlements where the *kardines* and *decumani* have been completely swapped, no harm (*iniuria*) is done. The colony is still marked out by lines at right angles to one another and no particular complaints arise either at the colony or the individual level. Even if everyone adopts their own personal set of measurement units, he says, "nothing will be missing from the work except a system (*ratio*), and it will still have credibility among *professores*." A far cry is indeed from the insistence on systematic consistency in Agennius Urbicus's *De controversiis*. But indeed, it is reasonable to expect that in at least some parts of the empire settlements would be laid out using non-standard terminology and procedures that reflected the peculiarities of the local terrain, and surveyors dispatched there must be prepared to deal with those variations more flexibly than the *De controversiis* might suggest.

The extremely local level of the individual boundary stone offers still more possibilities for variations that must be teased out by the surveyor in person, often through direct physical manipulation. Stones, intended to be immobile markers, can nevertheless be moved around in the landscape by unscrupulous landowners. The surveyor may, however, be able to verify the authenticity of a stone's placement by looking underneath to find objects placed there at the time of the stone's initial installation. Siculus Flaccus addresses the matter of signifying tokens buried under boundary stones at some length in his *De condicionibus agrorum*, commencing with the caution that the act is neither mandatory nor governed by a consistent set of rules, given that the same tokens are not found underneath all boundary stones.[56] As it is, stones may conceal deposits of potsherds, broken glass, low-value coins, lime, gypsum, ash, charcoal – or nothing at all.

Siculus Flaccus traces the practice back to a practice *apud antiquos* of performing a burnt sacrifice to Terminus before anointed and garlanded boundary stones, which were then placed atop the still-glowing embers. In those days, one could expect a kind of material univocity: a stone with charcoal and ashes underneath was a correctly situated boundary stone. In his own time, however, the range of possible signifiers has radically increased. He notes as well the possibility of local variations in how trees, ditches, and walls may be used to mark boundaries.[57] In some regions, trees are planted as boundary markers beyond ditches, so it cannot be assumed that the ditch

55 Campbell 2000, 144.10–12.
56 Campbell 2000, 106.22–108.8.
57 Campbell 2000, 114.13–35.

itself signifies the boundary, and the surveyor must rely on an examination of local practices. Likewise, a stone wall might suggest a boundary, but it might also simply be an artifact of cleaning up stony ground, so "something can be deduced from the practice of the regions, and something from the nature of the site." The surveyor's investigation takes him far from any prescriptive universality of signifying objects, down to the level of regional practices and even the specific topographical features of a given site.

Hence, with markers of all kinds, the surveyor must remain sensitive to the signifying power of local variants in practice – a material *parole* rather than a *langue*, as it were. There are norms for boundaries, as Siculus Flaccus notes – stones, bushes, etc. established along a *rigor*, but non-standard practices should also be recognized: "those unusual examples that are done deliberately ought to have authority, inasmuch as it is recognized that they are done with a purpose and with the agreement of landholders."[58] These might include wooden stakes, heaps of stones (*scorpiones*), wall-like piles of stones, lids of wine jars, markings on rocks – no limit is set on the kinds of objects that could signify a boundary. The surveyor should accept the significance of whatever appears to have been set up as a boundary marker, based on similarities to other such indicators in the vicinity or broader region.

The unstable signifying power of stones and other potential markers set up in the landscape can ultimately be resolved only through embodied investigation into the particulars of each case. In order to discover whether a tomb signifies a boundary, for example, the reader of the compilation *Ex libris Dolabellae* is instructed that

> You can recognize in the following way boundaries associated with tombs or receptacles for ashes, where straight lines run between holdings, since you should find near the tomb either box-trees, or also ashes, or cooking-pots, or broken earthenware vessels, or indeed intact ones. In order to discover if a tomb marks a boundary, look five feet away from it or turn the earth over with a plough. If you find the signs mentioned, then the tomb marks a boundary. If you do not, go round to the other side.[59]

The textual definition of the tomb's significance can only take the reader so far: in order to certify its meaning, the surveyor must get out there with his tools and dig for meaning in the earth. Similarly, shrines may mark the intersection of different properties' boundaries; according to the same text, the sign of such an intersection will be the presence of multiple altars and entrances corresponding to the different properties. But even this apparently straightforward indicator may break down, since shrines may be abandoned. If that happens, the surveyor will once again have to scrutinize the site for himself, searching for 'anything that resembles foundations' about 15 feet away from the shrine.

Like the mineralogists Zawada and Swanepoel study, the *agrimensores* work with a complex cluster of terminological categories that strongly resist attempts to define

58 Campbell 2000, 108.21–23.

59 Campbell 2000, 222.26–30.

some items' membership in a clear-cut, binary way. The prototype theory Zawada and Swanepoel observe as a classification strategy for the mineralogists appears to be an important component of the surveyors' toolbox as well. A boundary stone with a deposit of charcoal and ash underneath is prototypical of a properly placed and ratified marker, but for every such stone the surveyor uncovers, he will also confront many more stones with other indicators underneath, and many more still with no buried tokens at all. A stone with a vertical line marked on it could be the primary marker of a *trifinium* – unless it is in fact the 'unequal line' of a *reprobus*, or the obtuse angle that could still mark a *trifinium*, only with part of the inscription scuffed off. A ditch with a row of nearby trees may likewise be a prototypical boundary, unless local practices make the trees themselves the typical signifier of a boundary – to say nothing of cases where the trees have simply grown up along the ditch because it carries water.

Like the mineralogists estimating the effort required to shear shavings off a stone or assessing whether a specimen falls within tourmaline's dazzling spectrum of colors from green to pink, the surveyors must appeal to their past training experience as well as more recent experiential encounters with local practices to assess the meaning of markers in the landscape. The 'experiential realism' that Zawada and Swanepoel (drawing on past work by Lakoff and Geeraerts) identify as a crucial component of the mineralogists' mapping of specimens to a terminological system suggests that concepts emerge in large part from bodily experience, and that new experiences are interpreted by means of those existing concepts. Experience and epistemology are intimately entangled. The conceptual mappings the surveyors use to interpret the landscape (and to categorize it anew) are likewise, crucially, products of gradually acquired experience. The theoretical taxonomies imposed upon potential signifiers in the landscape may apply only to the most prototypical elements; beyond that, the surveyor's interpretation, local knowledge, and embodied experience are absolute necessities.

The surveyor's boundary-defining work is extremely *active*: he must follow traces of boundaries throughout the landscape, skillfully deploy instruments like the *groma* to read and write *limites* on the land, and use his expertise to resolve cases where those boundaries have been tampered with. But even the parts of the surveyor's work that might seem purely observational, like scrutinizing the remains of pottery or ashes below a boundary stone to verify its reliability, can themselves be viewed as skilled bodily activities that shape the surveyor's conceptual analysis. The surveyor's embodied work to extract definition from objects in the world recalls Hutchins' argument that from the perspective of embodied cognition, "bodily practices including gesture are part of the activity in which concepts are formed."[60] The surveyor's fieldwork is not merely a stepping stone toward establishing a permanent, unmistakable material and verbal signifier for each type of land which can be written down somewhere to obviate

60 Hutchins 2011, 428–429.

future investigations. Instead, it is a vital part of an ongoing terminological negotiation that must remain sensitive to local variations in naming conventions as well as terrain.

As such, the surveyor's terminological work in the world in fact corresponds well to Hutchins' description of 'enacted representations':

> Enacted representations are dynamic, integrating memory for the immediate past, experience of the present, and anticipation of the future. They are multi-modal, in the sense that they may involve the simultaneous coordination of any or all of the senses and any modes of action. They are saturated with affect.[61]

Hutchins focuses on the dynamic *act* of apprehending material representations, as "to apprehend a material pattern as a representation of something is to engage in specific culturally shaped perceptual processes."[62]

Particularly notable in Hutchins' characterization of enacted representations is his assertion that they are 'saturated with affect'. To be sure, the surveyor's landscape is itself far from neutral emotional ground, given that arbitrating disputes over boundary placement and land use was a central part of the surveyor's work. But an additional dimension of affect, more closely bound to questions about terminology, emerges from recent work by Faber on the neural manifestations of specialized terminologies and the conceptual domains of specialized knowledge they refer to. Faber et al. performed an fMRI study on a group of geologists and a group of laymen, who were monitored as they performed the task of associating a word with a target terminological stimulus. The terms used as stimuli were names for tools both specialized and common, so a successful association might mean linking 'angle' with the prompt 'goniometer' or 'cut' with 'scissors'.[63]

There were considerable differences between the activated regions of the laymen's brains and those of the expert geologists. The most striking feature of the experts' response was the activation of the amygdala and the parahippocampal gyrus leading to it, which are linked respectively to emotional processing, and to the creation and recall of autobiographical memory using contextual associations.[64] Faber et al. note that "even though terms for scientific instruments are not typically regarded as having emotional valence," in this case, the terms may have been processed affectively because of their resonance with the experts' layers of past experience with the instruments the terms refer to. For the experts whose very professional lives are built upon lived experiences manipulating these tools and concepts, the technical terminology itself sparks a meaningful cognitive event. It seems likely that the complex webs of terminology the Roman *agrimensores* internalized, learning not merely from books but from lived experience, would have generated similar patterns of neural ac-

61 Hutchins 2011, 434.

62 Hutchins 2011, 429–430.

63 Benítez et al. 2014, 15–32. The prompts and responses were in fact in Spanish, the native language of the participants.

64 Benítez et al. 2014, 27.

tivity. Far from remaining inert signifiers of abstruse information, invoking technical vocabularies, in the minds of experts, reignites networks of concepts inextricably bound to lived experience.

5 Conclusion

The *Corpus Agrimensorum* is an extraordinarily valuable set of texts, providing insights into the complex legalities and physical practicalities that guided the surveyors' peripatetic work in the Roman landscape. Both the legal and practical sides of the surveyor's work demanded the development of extensive specialized technical terminologies. As we have seen, however, those terminologies were developed and deployed in quite different ways as they were subjected to various pressures, like philosophical demands for precision and uniformity, or sociological needs for flexible terminologies that could account for differences in surveying practices across the empire. Complicating the picture still further is the integration of purely verbal terminologies with other semantic systems, from the images in the texts of the *Corpus Agrimensorum* to the images found on boundary stones, scarred trees, and the maps that connected surveyed land to the imperial record-keeping apparatus. Indicators in the landscape and the *tabularium* formed terminological systems of their own, calling into question the relationship between such systems and the affordances of the media in which they are embedded.

Ultimately, in the case of the surveyors it appears useful to stray from the rigid boundaries of the discipline of 'classical terminology' established by Wüster and others, to explore the situational flexibility afforded by approaches inspired by cognitive linguistics. We may acknowledge the difficulty, even impossibility, of developing precise and univocal terminological categories for a complex system like the surveyors dealt with, infused throughout with human variation and emotion. To be sure, some of the surveyors themselves appear to aim for univocity and precision in much the same way Wüster advocated. However, much more often we see the terminological systems in the *Corpus Agrimensorum* devised with flexibility and polyvalency in mind, often built on prototypes but allowing for far-ranging excursions from the prototypical. The ambiguities in these working systems were not a fatal flaw – far from it, as they granted to surveyors steeped in practical, embodied knowledge the flexibility needed to account for regional and diachronic variations in terminological practice, as well as the pathological variations sparked by human error and mischief. Ultimately, the surveyors' terminological structures were largely created through practice out in the landscape, and re-created as that practice developed, a compelling example of Hutchins' enactive 'cognition in the wild'. Like the expert navigators Hutchins describes, or Zawada and Swanepoel's experienced mineralogists, the Roman surveyors were empowered by their embodied experience to navigate not only the irregularities of the landscape, but the complexities and ambiguities of their own polyvalent terminologies.

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