CHAPTER 9

Regions in Geography:
Process and Content

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1 INTRODUCTION

The concept of regions has nearly always been of central importance to geography and other disciplines that study earth-referenced phenomena (Linton, 1951; Kostbade, 1968; Richardson, 1992; Martin and James, 1993). From the Classical period to the Modern and Postmodern, the identification, description, and explanation of regions has played a critical role in attempts to understand and control the earth and its phenomena. "Understanding the idea of region and the process of regionalization is fundamental to being geographically informed" (Geography Education Standards Project, 1994, p.70). Although geographers' relative emphases on idiographic description of unique places versus nomothetic explanation of abstract truths has varied greatly over time (and still varies greatly over university space), regionalization understood broadly has remained important. A travel log describing the cultures and climates of distant lands organizes the earth into regions; so too does a computational model of migration flows based on census data (see Hargrove and Hoffman, 1999, for evidence of the continued importance of regions to quantitative and scientific geography). Regionalization operates somewhat differently in regional and systematic (special and general) approaches to the study of geography, but regionalization is important either way. Even today, there is warrant to the traditional claim (Kimble, 1951) that geography is the "study of regions."

In this essay, I revisit the regional concept in the light of some recent philosophical and technical advances that have been made in geography. I contrast the concept of geographic regions with that of regions generally and of spatial objects even more generally. What makes geographic regions a cogent idea, related but not identical to other entities that make up a complete ontology of space and place? To refine this ontology, I propose a taxonomy of geographic regions based on their contents and the processes by which they are formed. The taxonomy consists of four types: administrative, thematic, functional, and cognitive regions. These four types represent an elaboration and clarification of existing taxonomies, such as those discussed in the literature of geography, including many textbooks. Among other refinements, I differentiate formal regions into adminis-

trative and thematic regions, and explicitly consider the individual vs. social nature of cognitive regions. I then consider the important issue of boundaries, including boundary vagueness and how it applies to the four region types. The special status of administrative regions is noted, and the ability of Smith's fiat/bona-fide distinction to account for them is examined. I consider many of the ontological issues surrounding regions as part of an apocryphal lunchtime conversation over one of the classic and still enduring puzzles of philosophy—the mind-body question. The essay concludes by arguing for the continued meaning and relevance of the region concept in the current and future world of digital geography.

1.1   What are geographic regions?

Regionalization, the creation or identification of regions, is a subset of *categorization* (Kostbade, 1968; Goodchild, 1992). Categorization is the identification of discrete sets of entities, physical or conceptual. Categories delimit entities which share one or more properties from entities which do not share the properties. These "properties" vary widely in their characteristics—their abstractness, their functional importance, their conceptual importance, and so on (Smith and Medin, 1981). The essential aspect of a category is that it contains entities grouped together as similar in some way and distinguished from entities in some other category. Thus, at minimum, the shared property may simply be that entities in the category have been capriciously assigned to have the property "members of that category"; other entities have been assigned the property "not in that category." Such a minimal property is not often of interest but does serve to establish a baseline definition for categorization. These considerations also hold for spatial categories—regions. The necessary and fundamental spatiality of regions distinguishes them from most other category systems. Other category systems are often spoken about or depicted "spatially," but this is metaphorical. For example, the words *pretty*, *beautiful*, and *attractive* may be depicted as located in a common region of a space of word meanings, but that is not a literal region nor a literal space but a metaphorical "semantic space" (hence the quote marks).

I focus in this essay on *geographic regions*, pieces of (near) earth surface. Geographic regions, as a subset of regions more generally, have certain shared properties. Spatially, they are prototypically 2-dimensional, at or near the earth surface, though exceptions exist (e.g., volumetric regions underground or in the atmosphere are sometimes identified). Geographic regions are usually (but not always) defined not only spatially but according to what is there, the "content" or "theme" of the region. The contents are human and natural entities or processes, the thematic components of geography's subject matter. If thematic dimensions are added to the spatial dimensions, geographic regions are always 3 to N dimensional. Also characteristic of geography, as the "study of the earth as the home of humanity" (Martin and James, 1993), is its concern with phenomena at some spatial and temporal scales more than at others (Montello, 2002). Although advances have occurred and will continue to occur when geographers stretch the scale of their subject matter, few would argue that molecular or interplanetary scales are properly of concern for geography. But aside from this modest (from the perspective of human experience) scale restriction, I do not favor the traditional constraining concept of a specific "regional scale" of analysis (e.g. Meyer et al., 1992) when considering the fundamental ontology of regions. Such a regional scale would restrict our focus to areas that are something like larger than local

communities and smaller than continents. Nor does it seem principled in this context to distinguish sharply between *places* and *regions* (e.g. Richardson, 1992); the first may be considered a subset of the latter.

Geographic regions are thus examples of spatial regions in general. Similarly, geographic regions are also instances of geographic *features* or *objects*. At small cartographic scales (i.e., large areas of earth), some small regions need to be understood as point-like or line-like features rather than extended pieces of earth surface. The application of the concepts of regions and objects as abstract ontological entities (Smith and Varzi, 1997; Casati and Varzi, 1999) to the concept of geographic regions is an important and ongoing concern for geographic information scientists (e.g. Frank et al., 2001; Mark et al., 2001). Even given my focus on geographic regions, as opposed to regions and geographic features more generally, the conception of geographic regions I consider here is broader than that discussed by many writers in the geographic literature. Some, for instance, consider regions solely as the expression of possibly discontinuous natural and human reality (Kimble, 1951); others focus exclusively on regional creation as an expression of socially-constructed reality (Aitken, 2001). The taxonomy I introduce below incorporates both of these conceptions and more.

Geographic regions (henceforth *regions*) need not be contiguous, wholly interconnected pieces of earth area, but usually they are. In fact, not only are they usually unfragmented but fairly compact, not very elongated or prorupt in shape. There are several reasons why regions are usually spatially contiguous and compact areas. One is that structures and processes are not randomly distributed over the earth—they cluster together, reflecting *spatial autocorrelation*. Spatial autocorrelation on a fairly isotropic 2-dimensional surface creates compact regions. A second reason for compactness is that people tend to group things together that are closer together in space (and time)—there is a perceptual and cognitive penchant to see the world this way, as proposed in the organizing principles of Gestalt psychologists such as Wertheimer in the early 20th C. (Kaufman, 1974). Yet a third reason for contiguous and compact regions is their utility. They help people organize their understandings of the world in an efficient manner; they also help various activities in space occur more efficiently. A good example of the consequences of ignoring the latter rationale is provided by administrative regions that are quite noncontiguous or noncompact. They force complex and repeated boundary crossings, or indirect and expensive networks of interaction, as part of activities like commerce or migration. Such irregular regions are typically created to serve a political purpose that intentionally violates "geographic rationality" in order to serve some other rationality. A fascinating case in point is racial gerrymandering of voting districts in the U.S. (Forest, 2001), where courts have sometimes recognized geographic rationality by ruling against "bizarre" districts that are extremely noncompact. Of course, regional fragmentation is sometimes geographically rational insofar as it gives locational presence to a political entity at the farthest reaches of its desired territorial influence; Hawaii and Alaska both provide such a benefit to the U.S., and thus rationally constitute part of the country in spite of the high costs of living (and the cartographic nuisance) engendered by their noncontiguity.

1.2   Regions in thought

Above, I referred to the centrality of region concepts in geography, historically and currently. We can go further—there is every reason to believe that the first geographic musings of our Paleolithic brothers and sisters made plentiful use of regional thinking (particularly of the cognitive variety discussed below). That is because regionalization, and categorization in general, universally characterizes human thought. Humans organize knowledge categorically. Neither logic nor evidence suggests there is any place or time where this does not hold, at least as a characteristic of "common sense" cognition (see, for example, any historical or anthropological text that documents the universal characteristic of humans to label geographic features in the world, including regions). Furthermore, categorization is universal though it produces distortions in thought. We group partially similar things together, ignoring many differences. We distinguish between things that share many similarities. In doing this, we minimize intra-category variation and exaggerate extra-category variation (see Tajfel and Wilkes, 1963, and the copious research it has generated in the areas of decision-making and stereotyping). Many of us are familiar with the inflated distinctions border residents draw between themselves and "those people over there." An apocryphal tale recounted by Muehrcke and Muehrcke (1992) nicely exemplifies categorical reasoning about regions. A man living near the Canadian-Alaskan border wasn't sure on which side of the border he lived. So he hired a surveyor, who determined that the man lived in Canada. "Thank God!", the man cried, "now I won't have to live through another of those terrible Alaskan winters!"

Anecdotal and apocryphal evidence aside, many empirical studies have demonstrated the regional organization of geographical knowledge, including its effects on judgments, whether based on maps or direct experience (Stevens and Coupe, 1978; Maki, 1981; Hirtle and Jonides, 1985; McNamara et al., 1989; Friedman and Brown, 2000). It appears clear that humans think in discrete pieces of truth or reality, even if that way of thinking is in fact false or distorted. But like categorization in general (Smith and Medin, 1981), regionalization has its definite analytic and communicative utility. It simplifies complexity and avoids unnecessary precision, both in thought and in speech (Talmy, 1983; Freksa, 1991; Landau and Jackendoff, 1993). It contributes greatly to the efficiency of our interaction with the world, making it unnecessary to learn properties of objects and events anew each time we encounter another instance. Discretization of the world may be especially valuable because it allows us to integrate or combine the separate views of the world we experience from our local perspectives into internal representations that go beyond local truth (Tversky, 2002).

2   PROCESS- AND CONTENT-BASED TAXONOMY OF REGIONS

A great deal has been written about regions in geography, including various taxonomies of regions. In this section I review traditional taxonomies of region types, and propose a new taxonomy based on the content of regions and the processes by which they are formed. The taxonomy I propose refines some traditional distinctions commonly made among types of regions (see below) and provides more meaningful labels for the types. The taxonomy consists of four types: administrative, thematic, functional, and cognitive regions. *Administrative regions* are formed by legal or political action, by decree or ne-

gotiation. These include regions based on property ownership (cadastral regions) and on political and administrative control, such as census tracts, provinces, and countries. *Thematic regions* are formed by the measurement and mapping of one or more observable content variables or themes. They show where some entities or properties exist; the entities may be natural (rainfall, pine trees) or human (languages, crops) in origin. *Functional regions* are formed by patterns of interaction among separate locations on the earth. Spatial interaction is fundamentally the movement of matter or energy from place to place: people, commodities, water, seeds, earthquake tremors. Pattern in energy flows can encode information, the basis for communication, which is thus a form of spatial interaction. Finally, *cognitive regions* are produced by people's informal perceptions and conceptions (downtown, the Midwest).

It is useful to recognize explicitly that both thematic and functional regions may be based on single variables or multiple variables—they may be *univariate* or *multivariate* regions (Burrough, 1996 refers to *polythetic* regions). A univariate thematic region is based on a single theme, such as average temperature; a multivariate thematic region is based on combinations of themes, such as culture regions or ecological biomes. Similarly, a univariate functional region is based on a single process of interaction, such as seed dispersal; a multivariate functional region is based on combinations of interactions, such as media reception that includes radio, newspaper, and television. The distinction between univariate and multivariate regions is not often made explicitly (e.g., in textbooks), but it is very important. For one, multivariate regions are potentially vague in ways that univariate regions are not, as discussed below. However, one should distinguish the idea of multivariate regions from the idea that any type of region may be identified differently at different spatial scales, whatever the basis for regionalization. These different region sets often overlap in space, producing the popular geographic notion of a hierarchy of regions based on scale (e.g. Golledge, 1992). Countries contain provinces, climates contain micro-climates, downtown contains subregions varying in hipness.

As stated above, several region taxonomies have been proposed by geographers in the past. A very influential taxonomy was proposed by Hartshorne (1959), who distinguished *formal, functional,* and *general* regions (I describe these below). Many textbooks in both human and physical (natural) geography present taxonomies of regions quite similar to Hartshorne's (Table 1 lists several representative texts). All texts liberally use the concept of region. Nearly all explicitly define region. Like my definition above, the texts generally refer to the internal similarity and external dissimilarity of regions. It may be significant, however, that texts of human geography are much more likely to elaborate the concept of regions by describing a taxonomy of two or three types than are texts of physical geography. Here are some likely reasons for this:

a. Administrative regions are clearly human creations. Although physical features often help mark these boundaries, they are generally not the boundaries, and in no sense does the administrative region exist in the least without humans (if a national border is crossed and no agents are there, does it arouse anti-immigrant sentiments?)—thus no administrative regions in physical geography. Of course, administrative regions have great consequences for human management of the natural world, but that has not traditionally been a concern of physical geographers.

b. Physical geographers believe that as scientists, only "objectively" measurable constructs may be countenanced—thus no cognitive regions. As the Accountant and the Swineherd discover below, this is an overly dualistic attitude that falsely impugns beliefs as unreal, exaggerates the objective-subjective distinction, and fails to recognize that natural scientists (in many disciplines anyway) regularly think and communicate in terms of cognitive natural regions, though they may hold up the eventual objectification of the region as an ideal. Bog lands, for example, are frequently referred to without formal measurement or precise definition.

c. Spatial interaction is defined, at least in human geography texts, as referring to *intentional* contact among people, including transportation, communication, and commodity exchange—thus no functional regions in physical geography. But many instances of human interaction are not intentional. Furthermore, contact among separated locations via the movement of matter and energy occurs constantly in the natural world, and plays a central role in the ideas of natural scientists; Kostbade (1968) identified river systems as functional regions.

Human

Bergman, E. F. (1995). *Human Geography: Cultures, Connections, and Landscapes.* Englewood Cliffs, NJ: Prentice Hall.

de Blij, H. J. (1999). *Human Geography: Culture, Society, and Space.* New York: John Wiley & Sons, 6th edition.

Fellmann, J., Getis, A., and Getis, J. (1995). *Human Geography: Landscapes of Human Activities.* Dubuque, IA: Wm. C. Brown Publishers, 4th edition.

Knox, P. L. and Marston, S. A. (1998). *Places and Regions in Global Context: Human Geography.* Upper Saddle River, NJ: Prentice Hall.

Kuby, M., Harner, J., and Gober, P. (1998). *Human Geography in Action.* New York: John Wiley & Sons.

Rubenstein, J. M. (1996). *The Cultural Landscape: An Introduction to Human Geography.* Upper Saddle River, NJ: Prentice Hall, 5th edition.

Physical

Christopherson, R. W. (1997). *Geosystems: An Introduction to Physical Geography.* Upper Saddle River, NJ: Prentice Hall, 3rd edition.

de Blij, H. J. and Muller, P. O. (1996). *Physical Geography of the Global Environment.* New York: John Wiley & Sons, 2nd edition.

Gabler, R. E., Sager, R. J., and Wise, D. L. (1993). *Essentials of Physical Geography.* Fort Worth: Saunders College Pub, 4th edition.

Marsh, W. M. and Dozier, J. (1981). *Landscape, an Introduction to Physical Geography.* Reading, MA: Addison-Wesley.

Wallen, R. N. (1992). *Introduction to Physical Geography.* Dubuque, IA: Wm. C. Brown Publishers.

Table 1: Introductory geography textbooks examined for this essay

Likely following Hartshorne, geography textbooks that offer region taxonomies all differentiate formal and functional regions. A *formal region* is defined as "distinguished by a uniformity of one or more characteristics" or "an area in which the selected trend or feature is present throughout." Examples given include soil regions, dialect regions, topography regions, and often, political regions like Ecuador. This concept of formal regions, and its definitions, is problematic. Formal regions include what I call thematic regions, but many writers also include as formal regions what I call administrative regions. In fact, thematic and administrative regions share very little conceptually. Administrative regions are an important and distinct type, and certainly deserve separate recognition. Failing to recognize administrative regions as a type is acceptable in a dehumanized earth science but not in geography. But setting aside the lack of recognition of administrative regions, what is meant by saying that climate or language regions are "uniform" or "homogeneous?" Even univariate thematic regions are rarely uniform throughout with respect to the relevant theme. Multivariate thematic regions are anything but uniform or homogeneous. The coastal sage-scrub ecosystem contains characteristic plants, rainfall, soil, and distance from the ocean to varying degrees across its extent. Furthermore, there is not complete agreement among experts as to what and how themes should be combined in order to define this ecosystem. The standard definition of formal regions in geography seems quite misleading.

Again following Hartshorne, *functional regions* are "defined by the particular set of activities or interactions that occur within it" or "an area in which an activity has a focal point." This is essentially the same functional region I include in my taxonomy. Definitions of functional regions frequently offer *nodal region* as a synonym. The idea here is that interaction emanates from a node, a point-like feature from which movement comes. This is often true but not always. The region that receives sirocco winds in Mediterranean Europe is a functional region, but the winds emanate from a fairly large area in North Africa, not a point. The region of the U.S. that receives fruits and vegetables from California has a similarly non-punctate source.

Hartshorne listed *general region* as his third type, which means something like a region that "stands out in one's mind" or is "distinctive." This type label has not found widespread usage in geography, probably because its definition as a separate type is not coherent. Instead, texts in human geography often refer to perceptual regions. A *perceptual region* is defined as "a region that only exists as a conceptualization or an idea and not as a physically demarcated entity," "a region perceived to exist by its inhabitants or the general populace," or "an area defined by subjective perceptions that reflect the feelings and images about key place characteristics." First, beliefs, concepts, attitudes, and memories are more properly termed *cognitive* rather than *perceptual*, perception being a subset of cognition that technically refers only to the acquisition of knowledge of local surrounds via the senses. The geographers' broad use of the term *perception*, as in the subdiscipline of "environmental perception," has been questioned before; to be fair, using it this way has precedence in the common-sense metaphorical extension of the word, as in "I see what you mean." Another difficulty is that standard definitions of perceptual regions typically state or imply that such regions are not "real" like other regions are. The Accountant and the Swineherd consider that point below. Finally, an important aspect of many definitions is the degree to which they imply that perceptual regions are socially

shared. Examples of perceptual regions always focus on widely held conceptions such as "the South" or "the Bible Belt." In fact, it is useful to recognize that cognitive regions may be idiosyncratic to one or two individuals (such as "our meeting place in parking lot 12") or shared among members of some social or cultural group. When cognitive regions are shared among members of a cultural group, geographers speak of *vernacular regions* as a subset of cognitive regions (for some reason, they never speak of "elitist" cognitive regions). I think the blurring of individual and cultural cognition is unfortunate, though one clearly blends into the other. However, the long-debated question of whether aggregated individual cognition makes culture, or instantiated cultural cognition makes individual minds, is beyond the scope of my discussion here.

Perhaps four region types are unnecessary—maybe fewer will do the job. For instance, one could argue that all regions in geography are actually variants of just one of the four types. Thus, all regions are thematic, insofar as they are regions of earth surface defined by the presence of one or more themes: the region over which the Chinese government claims sovereign rights, the region where a particular newspaper is read, the region that people say is their homeland. On the contrary, all regions are functional. Libya represents the migratory and military interaction of Libyan peoples over space and time; the high desert region results from the movement of continental plates, winds and clouds, and seed dispersals; downtown is the area where tourists go shopping. Finally, it is well known that all regions are cognitive, insofar as every recognition of a region can be considered fundamentally to be a cognitive act, an act of intent or belief. Cognitive systems create realities and include external knowledge technologies such as cluster-analysis software. Thus, one can apparently define all four types of regions in terms of one of the others. The apparent exception is administrative regions; only then does this paragraph's exercise in taxonomic parsimony appear to fail seriously—it does not appear that one could redefine all regions as being administrative. In spite of the success of our efforts at parsimony, though, I believe there is value in making taxonomic distinctions among region types like those I propose in this essay. The ability to use thematic, functional, and cognitive regions to subsume the other types argues against the favored status of one of them. I believe a reduction into one or two types would obscure important process and content distinctions among thematic, functional, and cognitive regions. The difficulty of trying to define all regions as administrative regions points to their special status as a type, and the issue of boundaries we consider in the next section provides further rationale for recognizing the uniqueness of administrative regions.

One final point in this section deserves comment. In applying the taxonomy, it is critical to recognize that people use the same region label at different times to refer to different regions; they also use it to refer to different *types* of regions. This is common. For example, *California* is most often thought of as an administrative region but could also be a thematic region, a functional region, or a cognitive region (a "state of mind"). As an administrative region, Bakersfield is just as much in California as is Los Angeles. But for most people, Los Angeles is more clearly in the cognitive region of California than is Bakersfield. As another example, *France* suggests everything from nasal vowels to fine cuisine, but as a thematic, functional, or cognitive region, not as an administrative region. I do not assume there is anything unique about this polysemy to the region concept; any concept of great richness and wide applicability probably displays this flexibility.

3 INSIDE, OUTSIDE, AND THE GREAT DIVIDE

Regions may be considered from two perspectives: what is inside or outside the region, and what is the divider between inside and outside. Of course the two perspectives are complimentary, necessarily implying each other. But the perspective of the divider or *boundary* is the more problematic of the two and has attracted a great deal of attention in the last couple decades from several of the disciplines that make up geographic information science. For one, boundaries are prototypically thought of as lines but are often not lines. That is, they are 2-dimensional rather than 1-dimensional. The 2-dimensionality of region boundaries is usually due to their vagueness (Mark and Csillag, 1989). *Vagueness* here simply means that a divide between inside and outside a region is not as precise as it could be in theory, so it is a band of nonzero width instead of a (near) geometric curve of little or no width. Common synonyms include *imprecision, indeterminacy, ill-boundedness, gradation, error, uncertainty*, and *fuzziness*.   These are in fact only near synonyms. For example, vagueness is not always due to a mistake or error, vague boundaries are often certainly vague, and fuzzy logic provides only one specific model of vagueness (Fisher, 1996). There are cases where the 2-dimensionality of a boundary is not due to vagueness (or any of the related concepts), but these are rare; an example might be the Demilitarized Zone in Korea, a precisely delimited 2-dimensional boundary of uniform status, at least as a political entity. Interestingly, although administrative boundaries are the most precise boundaries of any region type, they may be 2-dimensional because of their extension into the vertical, that is, above and below ground.

One or more of the following reasons can explain why a particular boundary is vague:

a. measurement error or imprecision (measurement vagueness)
b. alternative variable combinations in multivariate regions (multivariate vagueness)
c. boundary changes over time (temporal vagueness)
d. disagreement about boundary locations (contested vagueness)
e. fundamentally vague concepts of reality (conceptual vagueness)

These are quite distinct causes of vagueness, with very different philosophical and practical implications (some of which are discussed in Burrough and Frank, 1996). With respect to a core understanding of the region concept (its ontology), two distinctions suggested by this list are most critical. One is between contested vagueness, which allows single persons or groups to identify regions with precise boundaries (just not the same ones) and the other causes, which produce "universally held" vagueness. A second critical distinction in the list is between the last cause, conceptual vagueness, and the first four causes. The first four may always or typically lead to vagueness in practice even though they need not in theory. Conceptual vagueness, in contrast, necessarily leads to vagueness even in theory.

The four types of regions from the taxonomy tend to differ in the extent and nature of their boundary vagueness. All but cognitive boundaries may have measurement vagueness (cognitive regions are not the product of measurement, though they can be measured). Thematic and functional boundaries may have multivariate vagueness (Gray's 1997 proposal for a disaggregate approach to biogeographic regions was inspired by the pervasiveness of multivariate vagueness in that domain). All four boundary types may

have temporal or contested vagueness (though only contested vagueness over administrative boundaries tends to create war). And all but administrative boundaries may have conceptual vagueness.

This last point is important insofar as it helps to show the special status of administrative regions. For the other three types, the degree to which places on earth have the property or properties in question typically varies more or less continuously and only a partially arbitrary decision can fully determine boundaries. For example, precisely delimiting an ecosystem region cannot generally be done even in theory. It would be impossible in practice to ever measure all of the natural variables at every location at the same moment in time with perfect accuracy and precision, and if you could, you would not get a completely contiguous region. But fundamentally, the ecosystem region is simply not defined precisely enough as a concept to produce crisp boundaries, whatever the measurement fantasies entertained. Similarly, cognitive and functional regions are typically fundamentally vague, with every crisp representation a fiction to some extent. There is not in principle or in fact a precise boundary around the Bible Belt or the region where people receive the London Times (there must be at least one person in almost every corner of the world, not just the Commonwealth, that receives that paper). None of this is to say there is no transition in reality corresponding to the boundary, only that the transition which really exists is really not sharp. Indeed, the utility of such systems of regions depends in part on their correspondence to states of the real world. Boundary vagueness in no way nullifies this.

Administrative regions are thus unique in being the only one of the four types that typically has the potential for precise boundaries. Couclelis (1992) referred to the crisp boundaries of "regions of social control." Frank (1996) pointed out that precise boundaries come from the "legal objectification" of the earth surface for the purpose of ownership. Smith (1995) discussed the special property of "infinite thinness" that geopolitical boundaries have. However, the uniqueness of administrative boundary precision can be debated. Instances of the other three region types sometimes have thin boundaries, and exceptions to the preciseness of administrative boundaries can be identified (such as that due to contested vagueness). But the special status of administrative regions becomes especially clear when we consider another of their properties, not unrelated to boundary precision: the uniformity of their membership functions. Every place inside of California is completely in California; no places outside of California are in California at all (this holds only for California as an administrative region). Uniform membership functions are generally characteristic of administrative regions, but quite unusual among other region types.

3.1 The fiat/bona fide distinction

Some time ago, Hartshorne (1950) provided an interesting classification of the genesis of administrative boundaries. Among other things, his classification made evident the distinction between administrative boundaries that correspond to real discontinuities in the world and those that do not. Geographers sometimes call this a distinction between "natural" and "artificial" boundaries. In the former case, rivers or mountains or even transitions between cultural group territories provide a basis for the placement of admin-

istrative boundaries. In the latter case, boundaries are surveyed in the world or "drawn on a map" in a manner that does not directly correspond to any real transition in the world.

In a series of provocative and influential papers, Smith (e.g. Smith, 1995; Smith and Varzi, 1997) presented this distinction between boundaries that correspond to real discontinuities and boundaries that do not as the basis for a key ontological distinction in the study of regions: *bona fide* vs. *fiat* boundaries. "Bona fide boundaries are boundaries which exist independently of all human cognitive acts—they are a matter of qualitative differentiations or discontinuities in the underlying reality" (1995, p. 476). "Fiat boundaries are boundaries which exist only in virtue of the different sorts of demarcations effected cognitively by human beings" (p. 477). Importantly, at least in his 1995 paper, Smith intends the dichotomy to be "exhaustive and exclusive," though he admits that some boundaries may not fit neatly into one of the two categories (and he allows for mixed cases, as I discuss below).

The distinction between bona fide and fiat boundaries does not map well onto that between administrative and non-administrative regions (which in and of itself does not provide support for or against either dichotomy). In the domain of *geographic* regions, only administrative regions are recognized by Smith to have fiat boundaries. He and Varzi (1997) give as examples of fiat boundaries: "national borders..county- and property-lines..postal districts" (p. 104). But importantly they restrict these examples to: "..those cases where..they lie skew to any qualitative differentiations or spatial discontinuities..in the underlying territory," i.e. fiat boundaries are administrative boundaries not defined by features. Thus, Smith (1995) points out that some administrative boundaries are all fiat, some are mixed bona fide and fiat, and others are entirely bona fide pieces which are "glued together..fiat fashion."

I believe the distinction between bona fide and fiat boundaries is overdrawn, at least with respect to geographic regions. Although physical features often help mark these boundaries, the features are generally not the boundaries, only markers for the boundaries. As I stated above, administrative regions do not exist in the least *as administrative regions* without human intentionality, whether their boundaries are fiat or bona fide. In the southwestern U.S., there is a place where the administrative boundaries of four states come together (Arizona, New Mexico, Colorado, Utah) known as Four Corners. There is a plaque on the ground there that innumerable tourists have gleefully straddled with their four limbs (depending on the time of day you are reading this, it is happening now). But the plaque is not the boundary in the least, and a muscular plaque thief could not modify the administrative boundary in the least. Another example is provided by the American town of Carter Lake, Iowa (discussed in the physical geography text by Christopherson, 1997). It was originally founded within the crook of a meander of the Missouri River, with the center of the river providing a marker for the boundaries of the states of Iowa and Nebraska. When the meander became an oxbow lake, as they are wont to do, the town found itself on the Nebraska side of the new river course. But the town did not become part of Nebraska; the boundary stayed put, leaving a seemingly odd protuberance of Iowa into what is otherwise Nebraska.

On its face, the distinction between fiat and bona fide boundaries appears valid. In the previous section, it turned out to be quite difficult to reduce region types below a dichotomy of administrative and non-administrative regions, but that is not the same as

fiat and bona fide. When pushed further, it appears that the fiat/bona-fide distinction is less fundamental. Even Smith has recognized the ultimate lack of distinction between the two. In his 1995 paper, he pointed out that fiat boundaries are in fact always related to bona fide entities. The surveyor establishes fiat boundaries with the use of coordinate systems defined by physical features. In many current contexts that is the earth's shape and rotation, and the observatory marker at Greenwich. In metes-and-bounds systems, it is rocks, tree lines, and rivers. Is there a profound difference between using a river as a border vs. using some number of meters from the river as a border?

4 THE MIND-BODY PROBLEM REARS ITS UGLY HEAD

A dialogue between the Accountant and the Swineherd, over lunch at the Café Earth.

Accountant: I've been reading the new National Geography Standards. They talk about regions, and they say that regions aren't real, they're just mental fictions. Here on page 34, they call them "those human constructs called regions." Could you pass the pepper mill?

Swineherd: That's silly. Anyone who has actually looked around would know that regions are real, they exist. We raise pigs here but they don't raise them up north. This is a pig-raising region, sure enough. Are you saying my pigs aren't real?

A: Your pigs are real enough, I can smell them. But Farmer Jones next door raises chickens, not pigs. And there must be at least one or two farmers up north who have pigs. So the region isn't real, it's just a way of organizing our impressions of the world around us. I could make the region of pigs anywhere else I wanted to.

S: You could but you'd be wrong. Everyone knows this is where most of the pigs are, and if you counted all of the pigs and put that on a map, you would see that there really is a pig-raising region. There are more pigs per hectare here than up north, and that's a fact. Any parsnips left there?

A: Sure, here you go. But your pig region is not full of pigs, and there are more of them in some places than others. How do you decide where to put the boundary? That's not real, it's a subjective decision. What about Scots Grove, where we used to go after school to drink beer? I've never seen that on any map, it was just someplace we all made up. Heck, nobody even remembers who the Scottish guy was.

S: Yeah but we always talked about it like it was real. My mom and dad first met there over 40 years ago. Should I tell them they didn't really meet anywhere, they just thought they did?

A: No no, you've got it confused. They really met, and there really is a physical place where they met. Just calling it Scots Grove is a human invention. I mean if it's a real region, it has to have boundaries. Where are the boundaries?

S: Most people around here know just where they are. As soon as you get over the top of the hill, where you can see the old well, but you're on this side of the swamp, you're there. You're in the Grove. You can "measure" it by asking folks, their answers will tell you.

A: But people just invented that.

S: So? Cars were invented by people, aren't they real?

A: Well only people around these parts know about the Grove. It's not real to anybody else. You can't tell somebody to go there if they aren't from these parts. It's only in our minds, not anybody else's. Are your lamb chops overdone?

S: Not at all, a perfect pink. Again you've got your ontology all messed up. I plan to be rich one day. It's something I think about while I'm slopping my pigs. My plan is real, it exists. I'm not rich yet but I sure as heck am really thinkin' about it.

A: So mental states are real after all. They're not tangible like a pig but just as real.

S: I'll do you one better. How about Goodman County, is that real?

A: Why sure it is, you can see a map with the boundaries of the County on it down at the administration building. I know that's real because my clients have to pay those high property taxes if they live inside the County. Don't tell me something isn't real if you have to pay for it.

S: Now there I will have to differ with you. Hmm, these double-baked new potatoes are delicious. The County is just made up by people, there's nothing real in the world that marks Goodman from McMaster County.

A: Are you kidding? The English River runs right along there, that's where the border is. Have some more broccoli, your hollandaise sauce is getting cold.

S: Have you read the philosopher Smith? He says some boundaries physically exist independently of human cognitive acts. Your river would be an example. He says other boundaries exist only because of human cognition.

A: Yeah, I've read him. He helps to pass the time between tax seasons. I remember at one place, he said that the horizon is a boundary created by cognition. I don't get that, the horizon results from a geometric relationship between a physical earth surface and a physical human body with eyes of a certain sort. That doesn't seem like a cognitive act really. I mean the horizon would still be defined even if the observer was unconscious or dead—she just wouldn't know it!

S: But you know, it's kind of funny. After all Smith's claims in favor of at least two fundamental types of boundaries, he ends up recognizing that even political boundaries involve measurement coordinates based on physical features in the world.

A: As Smith says, it's very difficult to disentangle epistemological from ontological indeterminacy! I don't know what that really means but it sure sounds good. How is your crème brulée?

S: Delightful. At least Smith isn't one of those silly idealists who think all regions are just human conceptions.

A: But are you one of those silly physicists who thinks that all boundaries are in the physical world, as long as you look with a strong enough microscope?

S: Garçon! May we have the check? My friend here won't mind picking it up, since he can just pretend it's not real.

Waiter: How was everything?

S: Everything was really great, except the wine. We don't like our wine with too much oak in it around here.

A: I guess we're really in a region of non-oakies!

Waiter: Mind-body interactionism rules!

S: Say, that reminds me, you heard the one about what time means to a pig?

A: No, but I have to run. Same place next week?

5 CONCLUSION

Would it be possible to do without the concept of regions in geography, particularly when carried out digitally? What alternative is there to the regional organization of geographic information? One is a description or model consisting of continuous functions that cover the entire planet. Another is a dense raster representation in which each small cell contains the values of all the measured variables relating to the entities and processes found in the cell. In either case, individual variables would be left unassociated or independent; they could be described after the fact as correlating spatially in various highly complex fashions. Neither of these approaches is useful for administrative or cognitive regions, however, and the possibility of describing the complex variation of most variables over the entire earth with continuous functions seems remote or impossible. It is true that some global modeling in physical geography, such as climatology, treats the earth as a field (or a fine discrete approximation thereof). Do trained experts think continuously about these phenomena? This is an interesting question that deserves research. My intuition is that relative discontinuities in continuous fields are thought of as vague boundaries by these experts, and that vacant areas in the fields are understood as regions with the presence or absence of some content. Though a computer model may not organize data regionally, displaying it for humans, and thinking and talking about, still falls back on the familiar region.

The importance of regions will continue with the advent of digital geographic information systems and science. Similarly, the enthusiasm in some quarters for a scientific and quantitative approach to geography may modify the role of the region concept, but it does not do away with it. This is true not only because our data processing and analysis methods contain the vestige of pre-digital regionalization, but because regionalization still has great utility. Regionalization is still efficacious and practical for human cognition, no matter the extension of geography to digital representation and analysis in computational systems. Geographic education, when understood in the traditional sense of a concise description of the human and natural earth surface differentiated over space, will always require some form of the region concept (Kostbade, 1968). Visualization of geographic information will always benefit from thoughtful regionalization. Data often comes in regional units, but even when it does not, it is often most effectively communicated via choropleths or isolines that display a regionally organized earth. Attempts to depict only continuous fields on displays will not, in any case, circumvent the human tendency to organize information into discrete units; perceptual grouping and clustering occurs even as continuous fields are being viewed. Furthermore, regionalization is efficacious, even necessary, for the administration of earth space; this echoes Frank et al. (2001), who claimed that administrative regions (they called them *socio-economic regions*) are "necessary for human understanding of space and its administration, despite their shaky ontological foundation" (p. 9).

The conceptual and practical problems of regionalization are considerable; they have long been recognized. It is certainly misleading to speak of one "true" regionalization, and certainly true that the discipline of geography should not content itself with an exclusively regional, as opposed to systematic, approach to understanding its subject matter (Kimble, 1951). But the fact that the regional concept has an imperfect correspondence with measured reality, and the fact that an exclusive focus on regional identification is

an inappropriate job for an entire discipline, does not require we dispense with the concept or entertain the fantasy that one day we will be able to do geography without it. An attempt to cleanse regions from geography would be equivalent to throwing out the baby with the bath water. Such an attempt is not required to certify the scientific credibility of the discipline. Regionalization is just an attempt to parsimoniously characterize the earth's surface, to identify the most general truths possible about it. The attempt to identify general truths is highly characteristic of a scientific approach.

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