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Geography: De Facto or De Jure

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ABSTRACT—The acceptance of the Kantian classification of geography among the sciences as the science of space carries with it certain methodological obligations. Geographers who advocate a macroscopic approach to research are especially bound by Kantian strictures to employ mechanistic models of gravity, equilibrium and potential force fields in their studies. The limitations of such functional models in formulating hypotheses and the underlying assumptions these models make in causal explanations are examined in detail. Reference is made to a number of studies in the post-war period, culminating in the programmatic statement for the macroscopic method in geography published by the *Geographical Review* in April, 1958.

Within the past decade various articles have been published in the professional geography journals advocating a new approach to the study of geography — *the macroscopic.*[1a]

The word may be new but the problem is old. Whatever the titular rubric may be, methodology of description is the moot point of all geographic research. Thus, the research published by the *Geographical Review*, although filled with exemplary suggestions of what could and should be done "to permit the discipline to assume a status at least equal to that of the other social sciences," basically asks a simple question: how to observe, what to observe, and how to generalize what has been observed?

The article cited above from *Economic Geography,*[1] while concerned primarily with the general interdisciplinary relations of economics and economic geography, raises a similar question, that is, how and what kind of data from discrete observations can be extrapolated into aggregate theory?

The more specific discussions in *The Professional Geographer* are examples of the difficulties that are encountered when one tries to answer this basic question in *order to explain* events studied by geographers. The discussions arose from a specific problem of location and the solution proposed by a mechanical model that was originally constructed according to what was called the generalizing or macroscopic approach. The balance of this paper is the extension of those discussions to the much broader contention, implicit and explicit in the literature cited above, that the study of geography, in general, is best carried out by a *macroscopic* approach instead of the *microscopic* approach that prevails in geographic research.

Macroscopic/Nomothetic — Microscopic/Idiographic

The macroscopic *versus* microscopic argument, as we have noted, is not entirely new. Basically, the present fencing between disputants is but a continuation of the nomothetic/ideographic duels that were carried on in all the sciences in the late nineteenth and early twentieth centuries. Geography was deeply involved in that controversy as can be readily seen in the English, German, and French geographic literature of the time, and for proof that the argument is still normal in the cultural sciences one need but scan the professional journals, yearbooks and *Festschriften* of today.

With this general background in mind we may turn to the current discussion in geography with but one digression, to note that the late nineteenth-century arguments structured the nomothetic/idiographic dualism as, essentially, a distinction in the study of the *general* as opposed to the *unique.* Currently, the same basic dualism is emphasized but the phrasing is different. The present methodological distinction between macroscopic/microscopic can be summarized as a difference in the level of abstraction, or, more precisely, in the size of the descriptive unit. In geography, macroscopic refers to group or aggregate descriptive relations, i.e., to the description of wholes rather than fragmented phenomena.

A further note concerning the earlier viewpoint is important, in passing, although the present macroscopic "school" does not entirely agree on it. Scientific dualism, as it emerged, was essentially Kantian in origin; the interest of geographers largely centered on Kant's classification of the field of knowledge, as experienced, among "science," history and geography.[2] Most modern macroscopic geographers make some reference to this particular segregation of the field of knowledge but their own classifications in part diverge from it. Two variant views may be cited.

(a) One view is concerned primarily with the implied dichotomy between "science" and history/geography, i.e., general *versus* unique. Yet, the further division between history and geography (time and space) is recognized. Geographers, admitting no other kind of geography than the generic, would deny, insofar as the "law-giving" denotation of "nomothetic" is concerned, the study of process and process laws. They concede that the generic approach necessarily involves a concomitant search for "process laws" — but not by geographers. This methodological position poses problems for the macroscopic geographer who is attempting to state regularities or laws about group variables, such as regions, struc-

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tural wholes, and functional statistical aggregates. He is asked to construct generic concepts and variables in areal wholes, to define their lawful composition in temporal cross section, but without direct reference to the process of their integration. The question arises, therefore, of how it is possible to generalize about group or functional relations among areally distributed phenomena and yet ignore the sequential character of their occurrence?[3]

(b) The other view apparently chooses to ignore the traditional emphasis given to the Kantian classification. In quoting Kant, "Geography and history fill the entire span of our knowledge: geography that of space, history that of time," the major concern of this group seems to be solely in the establishment of the spatial nature of geography and not in the separation of geography and history from "science." Further, this view would avoid Kant's explicit separation of time and space – for good reasons, as we will see later, but not, necessarily, logically consistent ones.[4]

Common ground for the two views is found only in the Kantian expression of the spatial nature of geography. The corollary, that geography is a generic study without basic reference to time, is apparently not an absolutely necessary macroscopic tenet; nevertheless, it will reappear as an important element in our later argument. Initially, our concern is with the more general spatial definition of the field. It is based on the assumption that in one way or another geographers are concerned with the study of phenomena *in space*. With but few exceptions, modern geography, both descriptive and scientific, agrees with this assumption. However, since it is chiefly the macroscopic geographers who contend that scientific (model-level) laws explain or can be vividly used in explanations of empirical events, the discussion here is limited to their work.

The Mechanistic Macroscopic Meaning of "Space"

If one takes the writings of F. Schaefer, W. Warntz, J. Q. Stewart, and W. Isard as undoubted instances of the macroscopic approach, one is struck immediately by their common terminology and phraseology. But more importantly, their basic approach to the study of geography, is, however explicated, grounded on a singular concept of space: *Space is independent of the phenomena it contains.* Seemingly the concept has been fundamental to science since Newton, to philosophy since Kant and, therefore, is predicate to a modern scientific geography. It is in the validity and applicability of this concept of space that the answer lies as to whether geography is a science in the macroscopic sense. The logical proof of causality and explanation is inextricably entwined with the concept of space for all classical mechanics and, consequently, as we will show, for most of the geographic applications of equilibrium and structural-functional theory.

Without specifying at length all the instances of this concept of space in the work of the above mentioned writers, and with the understanding that the concept is not limited to their geographical writings, we may cite some provocative examples.

(1) . . . geography had to be conceived as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the surface of the earth. The latter limitation is essential. For with the successful rise of geophysics, astronomy, and geology, geography can no longer deal with the whole earth, but only the earth's surface and "with the earthly things that fill its spaces." (quotation from Ritter: ". . . *der irdisch erfüllten Räume der Erdoberfläche.*")

Humboldt and Ritter thus recognized as the major concern of geography the manner in which the natural phenomena, including man, were distributed in space. This implies that geographers must describe and explain the manner in which things combine "to fill an area."[5]

(2) The mere assembling of more and more areas, even with an increase in detail, does not mean a shift in point of view from microscopic to macroscopic. A heightening of the level of abstraction is the significant thing, an insistence on the functional consistency and organic unity of the whole, a recogition that no part of a true system can be thoroughly understood without reference to the whole.

A sufficiently abstract and subtle measure of position has for the most part eluded geographers, and this fact has precluded the development of a macrogeography capable of producing generalizations about space-occupying systems.[6]

The income-potential concept treats the units of income as parts of an economic system in a spatial continuum in which all the units are inter-related. From the microgeography of income is created a spatially continuous macroscopic variable. . . . if the phenomenon of price is to be regarded as occurring in a space continuum, then demand must be quantified as a spatially continuous "field quantity." Potential, in general, is just such a field quantity.[7]

(3) . . . we must recognize the obvious fact that economic activity takes place in a time-space continuum. In general, to minimize effort or factor services in producing a given social output or to maximize social output with a given amount of effort and factor services, is not to choose a path of action with respect to the time axis alone, or to the space axis alone, but rather with respect to both axes.[8]

Some comment on the reason for the selection and the general context of the above quotations is necessary to rationalize the order of argument that follows.

The excerpt from Schaefer was chosen primarily because of his emphasis on the nomothetic approach to explanation in geographic studies. Within this same article he makes a special point of emphasizing the *morphological* character of geographic research which, within modern methodology, is equivalent to the insistence that geographic study be generic and structural-functional in nature rather than genetic and concerned with process.

Schaefer thus represents one perspective of the macroscopic position, albeit not necessarily a mechanistic one.

The selection from Stewart and Warntz is from a late publication in which their previous work is summarized to a large extent. Their perspective is *mechanistic* and *organismic*; and, strange as that combination may seem at first glance, it is quite logical within the operational context of their terminology — e.g. "functional consistency," "organic unity," "space continuum," "field quantity." The particular point to be examined is the logical relation between "generalizations about space-occupying systems" and the "spatially continuous field quantity." Immediately, the analogue of the gravitational field in classical mechanics is brought to mind, and from that position it is but a short step to a field theory and the organic whole's determining its parts through functional consistency. What we have, in short, is a full range of borrowings from the physical and biological sciences to handle conceptually the "generic" content of geography: (a) the concept of a field; (b) the concept of a structure (morphology); and (c) the concept of function.

The quotation from Isard is a selection based, not on the fact that he is a geographer, but, rather, on the fact that he represents a macroscopic approach to the problem of space in economics. As one of the major investigators in the field of "location theory," he must necessarily deal with what he calls the space "factor" or "variable" which, operationally, means the introduction of a "distance variable" (of greater than zero dimension) into equilibrium formulae. Our specific interest, however, is not with that problem but with the relation, if any, of the concepts "time-space continuum" and "time axis . . . space axis" within the concept of space held by geographers who use a macroscopic approach. Clearly we have no real quarrel with Isard in that: (a) he states categorically the unreality of his constructs; (b) he makes no attempt to "explain" events; (c) space is simply the measured distance between economic variables; and, consequently, (d) "location" as it is implemented in his theory has no relation with geographic "place."[9] Only on points (c) and (d) is there a possible geographic issue and then only insofar as we suspect that the mechanistic geographers are not capable of dealing with geographic location either — and for the same reasons.

Five questions for discussion have been formulated from the preceding material. They are:

(1) Is the concept of space held by geographers that, (a) space exists prior to and independent of the phenomena that it contains — and is, therefore, *a priori*; or is it that, (b) space is nothing more than the order and relation of phenomena — and is, therefore, *a posteriori?*

In geography, as practiced, this may be stated more clearly as, a given point in the first concept of space has only position, i.e. is fixed by, or is relative to a given grid of coordinates of the whole. A given point in the second concept of space has *location*, i.e., is fixed by, or is relative to vicinal phenomena. In this context, the above question about space may be restated as a question of place: Is *place* in a meaningful geographical sense referent to position, to location, or to both?

(2) Is the concept of *causality* and scientific *explanation* derivative from a particular concept of space (and time)?

(3) How is the *whole* specified so that it encompasses its functional *parts* alone — and makes analysis (explanation) of its parts possible?

(4) How do these concepts operationally affect the use of: (a) *field theory*: (b) *structural* (morphological) *correlation*, and (c) *functional analysis* in geography?

(5) What do we mean by explanation in geographical studies?

The remainder of this article examines briefly these issues in their geographical context.

(1) The Space of Newton and Kant

The two concepts of space cited are, of course, conterminous with literate man. We may legitimately label them Newtonian/Kantian and Leibnizian only insofar as our modern understanding of the terms were definitively formulated by them. Thus, Newton, in his attempt to explain the distribution of planetary masses, specified an "absolute space" in order to determine analytically the position of the planetary masses. His mechanical model, postulated on Euclidian geometry and the hypothesis of a force field pervasive in empty space, accounted for the planetary mass positions–without significant error. However, because space independent of phenomena could not be observed, Newton conceived of his absolute space as an *a priori* perception of the mind.

Kant, following Hume and Newton and still bound by Euclidian constructions, considered space (and time) as forms of our intuition, i.e., space and time could be "visualized" but not directly observed. It follows, in his famous characterization of history and geography, that "empirical knowledge" is ordered by time and space, but it is clear that time and space are not empirical perceptions and must, therefore, be *a priori*.[10] It was Kant's further contention that his concept of space, although being *a priori*, was nevertheless synthetic. This contention supposedly followed from the fact that geometric theorems were "built up" from a few self-evident axioms. With the formulation of nonEuclidian geometries, however, it has been established that geometric theorems are, in fact, analytically derived from a conceived structure of space. The space of mathematics is purely relational and deductive and not a matter of physical measurement and synthesis.[11]

The importance of these developments for geography are two fold. (A) The Kantian view of geography is framed in concepts which are admittedly non-empirical, but, nevertheless, are considered to be nature's direct language. The mechanical model of the universe is considered to be isomorphic with reality. Number and figure are, therefore, not only logical but intuitively self-evident. The mechanical model directly explains reality if it accounts for empirical observations. (B) Accepting the Kantian definition of space and time as a framework for geography and history, without qualification, ignores practically all the developments of nineteenth- and twentieth-century physics and mathematics. In that century and a half it was shown that Kantian/Newtonian space was in fact neither synthetic, intuitive, nor self-evident, but, rather, logical and abstract. In essence, modern science had conceptually shifted from the intuitive three-dimensional space of Kant, directly apprehending reality, to logical n-dimensional manifolds of mathematical space – models without direct reference to reality.

This shift from intuitive space to logical space cannot be over emphasized as it changes the basis of scientific explanation from supposed direct reference to observed reality to a constructed model independent of observed reality. This new orientation is evidenced in the method of relating a model to empirical data. A model has value only to the degree that the consequences of its hypotheses account for observed phenomenal occurrence. Correspondence of either the model or the assumptions underlying the hypotheses of the theory with observed reality are important only in that they control the character of the predictions. The sole test of a scientific model as to the relevance of its explanatory power rests on its predictability.

In short, the Newtonian theory of gravitation has heuristic value not because it explains the planetary system but merely because it accounts for our present empirical knowledge of that system. When our empirical observation *falsifies* the predictions of Newtonian theory we change or discard the model and our explanation – we do not weight the observed facts to correspond to the predictions of the model.

Geographers are involved, then, in two kinds of space: (a) mathematical space which is logical and abstract – the parametric system of their models; and (b) descriptive and statistical space which is physical and directly observed. We need not concern ourselves immediately with this second kind of space, but need, rather, concentrate on the first kind of space which is the explanatory space of mechanistic macroscopic geography, as currently practiced. It is the space of the space-time continuum, of the time axis and the space axes, of the potential, of the field quantity, of the spatial factor; in short, the true system of an organic unity of the whole – the realm of the spatially continuous macroscopic variable.

Mechanistic geographers, dealing in aggregates equivalent to masses, find that the presumed "forces" and "resistances" of these aggregates must be situated in a continuum in order to be effective. The problem so stated is directly analogous to the problem that faced Newton. A force of resistance field is hypothesized in order to explain action at a distance. This involves a necessary assumption of a continuum. Too often we phrase the problem as merely that the force field is an effect of the masses. Insofar as the explanation of the field is to be found in the distribution of the masses *in a continuum* we must assert the primacy of the conceptual space. The position of the masses is determined by the nature of the space manifold. Thus, for any gravity model the position of the parts is analytically determined from the *whole* (the continuum with its masses).[12]

(2) What is Causality?

At this stage of the discussion we may go on to a consideration of the second question: the problem of causality and scientific explanation. Accepting the position of Hume that cause and effect are neither empirically perceived nor inductively testable, it is evident that causality, as far as science is concerned, is "proved" only within a logical analytic framework. Modern science, in thus insisting on a deductive explanation of the causal process, has made the logico-mathematical model its operational instrument. The use of the model in establishing causality and giving explanation to empirical events in this scientific sense, has been elaborated in the article on a specific problem of location, previously cited.[13] The conclusion there, as in this discussion on space, is that causality and explanation in science have reference only to its models.

We have shown up to this point that the model of the mechanistic macroscopic geographers is mathematical, that the predictions of the model are analytically determined and that the explanation, or cause, of the resultant pattern is deductively derived. Therefore, in so far as the geographer's space context is mathematical, the meaning of causality and explanation for him, as other scientists, follows from the tautological nature of that model.

(3) What is a Whole?

The third issue, the specification of the *whole*, emerges out of the preceding discussion as the crucial problem for the macroscopic geographer. Thus far, we have specified two wholes, of which neither is of much use to the working geographer. The whole of *a priori* space hardly seems applicable given the subject matter of traditional geography; the whole of *a posteriori* space (all phenomena) seems even more meaningless from an operational viewpoint. Nevertheless, the methods used in formulating both these conceptual wholes are instructive. The *a posteriori* concept of space is obviously an empirical, synthetic formulation, but the *a priori* concept appears to be the result of an antithetical procedure. Reflection on Newton's problem and solution, however, reveals the procedures to be intially identical: one of microscopic (idiographic) research, inductive and synthetic up to the point of hypothesizing for the model. At that point, the break with empirical reality is made. From the inductive generalizations a *particular case* is hypothesized, a mathematical space postulated, and the model formulated. The return to reality is, thereafter, a matter of deduction and the continued verification of the predictions.

This is the answer to question three. Admittedly, there is only one way to prove that a whole contains its functional parts — by the logico-mathematical model. This is also, tautologically, the only method of explaining the parts of the whole. Thus, we are confronted with a lacuna between scientific truth and empirical reality. Only through experience can we gain knowledge of the world; yet only through logic will we accept the "truth" of that experience. We specify the whole inductively from our observation of presumed functionally related parts; we prove or explain the whole and its parts by the construction of a deductive model.[14] What is the point of all this unless we look upon the model solely as an aid to discourse on our empirically contingent world?

If we are constructing models for discourse, whether they be mechanistic or probability models, it behooves us to make sure that our inductive generalizations are about a possible universe, or whole, of which the predictions of our model will be a part. This is the most serious problem of the macroscopic approach. The solution is in the microscopic acquisition of data and the description of a possible universe. As we have seen, that is a synthetic procedure, which always involves data of "duration" as well as of "extension." The predictions of the model are for some whole, and it would help if we had an inkling of what that whole was before we constructed the model. There is one way — empirical and synoptic.[15]

(4) Structural-Functional Analysis

(a) It is now clear that the whole-part problem is basically an empirical one and sums up under one heading the questions of, how do we operationally use mathematical space, and how do we scientifically explain? The problem is most apparent in those fields of geography concerned with statistical data and their manipulation. In structural-functional analysis, for example, the problem has become so critical that we have reached a methodological impasse as to the meaningfulness of our procedure.

The other social sciences have long been uneasy over many aspects of structural-functional analysis, particularly in the interpretation of results. The dangers of teleological bias, adaptation-adjustment "determinism," etc. in the explanatory use of the method are only too well known. But since these are not necessarily innate characteristics of the procedure, they can be avoided by careful research technique.[16] Our concern is with the intrinsic problem — the specification of the whole that sets the relative value of the parts. Here it is not a matter of being careful, it is a matter of knowing the universe or throwing out the method.

An example of the problem from so-called macroscopic field theory may serve as an introduction to the more common structural-functional problem. Stewart and Warntz, over the years, have discussed at length the predictive value of the population potential model in accounting for geographical distributions of "national" college and prep-school students in the United States. A typical case study concerns Phillips Exeter Academy.[17] The authors felt that the model predicted the distribution in the Northeast and Midwest accurately, but for the South and West there were significant discontinuities. Their solution to such variations was to adjust the "molecular weight" of people by 0.8 in the South (1.0 for whites, 0.333 for colored), and by 2.0 in the West. Several implications followed from this procedure: (1) people are not a "population"; thus, (2) the summed "influence" or "accessibility" of people is either greater, the same, or less than the "influence" or "accessibility" of the population mass; consequently (3) the distribution of "masses" in the universe "national" is not accounted for by a single model; and, therefore, (d) the "national drawing power" force field is not a spatially continuous macroscopic variable in a space continuum in which all the units are functionally interrelated. Without comment about the grossness of the calculations or the "mischief of the isopleth," it seems fair to assume from this research that there are several spatial continua, that wholes or universes overlap, and that possibly the United States is not a consistent functional unit — as the model assumes. Given their own research, the failure of the macroscopic geographers to comprehend the problems of "scale" in geographic generalizations, and the necessity for limited areal generalizations, is difficult to understand.[18]

Field theory, more properly equilibrium theory as explicated above, is nothing more than structural-functional analysis applied to an *a priori* continuous space. The intrinsic problem is the same: how does one specify the continuum or whole? The only answer which as yet seems to make sense is a microscopic synthesis.

(b-c) The use of structural correlation and functional analysis is so widespread in geography that the specific research techniques and conclusions drawn from such studies need not be examined here. We shall, rather, discuss, very briefly, the general underlying assumptions of the structural-functional whole.

First, let it be understood that by function we mean a simple Pythagorean definition of the term: of quantities varying proportionately without ceasing to be bound by a fixed relationship.[19] The application of this principle in geography is best exemplified in occupational analysis, particularly in the urban-economic classification of cities. In attempting to classify (or explain?) cities by structural correlation, the structural-functional whole of the "economic city" inevitably comes into discussion, which in turn generally resolves into the question of which activities (parts) are basic or nonbasic. In that we are defining a city in its whole/part occupational structure analytically, however, the question should be what is the whole, not what is the basic or nonbasic part? A functional model absolutely forbids any part from being considered as more "basic" than another. Possibly, this is not what the terms basic, nonbasic refer to in the geographer's mind. If so, in order to use the functional concept, he must switch his thinking from the "city" as an integrated whole to a search for the economic whole of which elements *in* the city and *outside* the city are the functional parts. In geography, the viewing of cities as an organic unit, or as a kind of phenomena in which the parts are so integrated that they are amenable to functional analysis and, thereby, to structural correlation, has led to almost total confusion.

As has often been pointed out, it is the size or order of area unit that is critical. Functions (specifically, their structural-correlation values) are determined by the specific space context of the study, by the scale of the investigation.[20] There are functions going on in the city, without doubt, but the city has no functional consistency. The city is not an organism; it is neither part of a homologous series nor is it in mechanical equilibrium. The city in this case is people; and people are not a *given* statistical population to be manipulated by the law of numbers.

Populations or universes are selected. As in field theory, so in functional analysis the "space context" should be arrived at through microscopic synthesis of described relations, not by throwing an arbitrary *a priori* net. Geographical space is nothing more than the order and relation of the phenomena of the earth's surface. Thus, geography is concerned with "local conditionality" — and precisely that; but local conditionality always requires definition. Geographic place is defined and given relation with reference to the abstract case as well as by being described in its unique matrix. The argument has never been that the abstract case, or more specifically, the *particular case* which is the scientific "model," the statistical "curve," the morphological "type," the "ideal," et al., is not important in geography. The contention is that only in so far as we limit the criteria of our generalizations, or the hypotheses of our models, to particular cases *subordinate* to our inductive generalizations, will we be able to make classifications or predictions pertinent to reality. Only then will we have "explanations" in our universe of discourse.

(5) How Do We Explain?

Thus, we see scientific explanation as far removed from the context within which the macroscopic geographers would have us put it — the end product of geographic research. Science does not explain reality, it explains the consequences of its hypotheses. If we are willing to accept the particular case as representative of a class of observed events, we have what may be called a *model-level* explanation of those events; but only as long as the particular case remains representative, and is not falsified by continued empirical investigation. It is doubtful whether many models will be forthcoming from the contingent world of geography, but that is not to say they should be either denied or shunned.

The descriptive world of traditional geography, be it unique or general, cannot attest to any such explanatory power. Nevertheless, it seems difficult to deny that most of the world of our experience is "explained" descriptively to our evident satisfaction. The answer to the question "why/how" does not often involve a full model-level explanation, and the contention that a model-level explanation is "understood" in such answers is more wishful thinking than fact. However, to avoid an argument on "what is meant by satisfaction," etc., we would also contend with the macroscopic geographers that mere *object-level* description and classification is intellectually if not academically enervating and cannot properly be equated with what we mean by *explaining* an event or occurrence.

There remains one last level of understanding, which does bridge the gap between object and model, but it presents difficulties of interpretation if we accept a "no process" qualification in geography. Perhaps this is a complete misinterpretation, but, if by process is meant "a series of actions or events," it is very hard to see how geography can avoid an interest in process.[21] Evidently the denial stems from Kant insofar as process is taken to involve passage in time, and only history is properly concerned with phenomena *in time*. It can be shown, however, that history is no more concerned with phenomena as to *a priori* time than geography is with *a priori* space. The question of the right of eminent domain for either, in the ordering of phenomena in empirical space-time, is patently illogical.[22]

More specifically, how can generic categories be ascertained without recourse to the study of process? Existence is composed of, and composition involves, duration as well as extension. The serial nature of phenomena and events is a fact that we must take into account. It cannot be generalized out of our subject matter unless we wish to deny the entire backlog of our discipline. Geography has always studied the human *situation*. From the Ionian logographers to Fleure and Sauer this has been the most consistent road taken.

Only in accepting process as an integral part of empirical investigation in geography do we finally make possible the relation of the particular to the general. It is in carrying through this relation that we really attain what may be properly called an explanation that directly involves the factual content of the discipline. In combining the object-level description and model-level explanation in a speculative but probabilistic schema, geography achieves what is best described as a *discourse-level* narrative.[23] Unfortunately, being somewhat short on models and rather long on descriptions, geography is more possibilistic than probabilistic at the moment. On the other hand, there really seems to be a wider gap than most of us are willing to admit between our "chancy" world and that of Newton or Comte. To fill this gap of understanding we turn, and not reluctantly, to the explanatory narrative which alone integrates our categorized subject matter into the scope of human experience. It is in relating the circumstances of the particular that we make use of the generic content of science and create a geography.

Footnotes

[1a] W. Warntz, Contributions Toward a Macroeconomic Geography: A Review, *Geographical Review*, Vol. 47: 420-424, July 1957; also p. 266, April 1957; J. Q. Stewart and W. Warntz, Macrogeography and Social Science, *Geographical Review*, Vol. 48: 167-184, April 1958.
M. B. Ballabon, Putting the "Economic" into Economic Geography, *Economic Geography*, Vol. 33: 217-223, July 1957.
W. Warntz, Transportation, Social Physics, and the Law of Refraction, *The Professional Geographer*, Vol. IX: 4:2-7, July 1957; F. Lukermann, Toward a More Geographic Economic

Geography, *The Professional Geographer*, Vol. X: 4:2-10, July 1958.

[2] See footnote 10 for extended quotation.

[3] F. Schaefer, Exceptionalism in Geography: A Methodological Examination, *Annals of the Association of American Geographers*, Vol. 43: pp. 243-245, 248-249, September 1953. Compare with R. Hartshorne, The Nature of Geography, *Annals of the Association of American Geographers*, Vol. 29: 3, p. 145; and 4, pp. 378-391, 417-418, September-December 1939; and G. Tatham in T. G. Taylor (ed.) *Geography in the Twentieth Century*, pp. 38-40, New York, Philosophical Library 1951. Interestingly enough, Wilhelm Dilthey's major counterpoint is not considered: that the nomothetic-idiographic dichotomy is a spurious distinction in cultural studies. Dilthey denies that the mind deals with matter in only two ways—lawful generalization and object description. The special task of students in the cultural studies is to relate the development of an event (or events) in its (their) experienced context. Dilthey's thought is most easily accessible in H. A. Hodges, *Wilhelm Dilthey, an Introduction*, New York, Oxford University Press 1944; and H. A. Hodges, *The Philosophy of Wilhelm Dilthey*, London, Routledge and Kegan Paul 1952.

[4] See Hettner's comment on Ratzel: A. Hettner, *Die Geographie ihre Geschichte, ihr Wesen und ihre Methoden*, Zweites Buch, #3, C. Dreslau F. Hirt 1927. Also R. Hartshorne, *op. cit.*, pp. 134-135, 142ff; and citations in footnotes 5, 6, 7, and 8 below.

[5] F. Schaefer, *op. cit.*, pp. 227-228. Compare with R. Hartshorne, *op. cit.*, p. 57, who interprets Ritter's phrase as meaning ". . . which fill the areas," or p. 142, as "the earth spaces filled with earthly contents," and further comment in Exceptionalism in Geography, "Re-Examined," *Annals of the Association of American Geographers*, Vol. 45, p. 212, September 1955. Also J. Leighly, (Methodologic Controversy in Nineteenth Century German Geography, *Annals of the Association of American Geographers*, Vol. 28, p. 251, December 1938) who interprets Gerland's "quote" of Ritter's phrase as meaning "the science of space-filling terrestrial objects."

[6] J. Q. Stewart and W. Warntz, *op. cit.*, p. 168.

[7] *Ibid*, p. 175.

[8] W. Isard, *Location and Space-Economy*, New York, The M.I.T. Press 1956, pp. 77-78.

[9] W. Isard, *op. cit.*, (a) Preface; (b) pp. 221, 251-253; (c) pp. 79 ff., 91-93, 119 ff; (d) pp. 251-253. Isard, along with other location theorists, including the mechanistic geographers cited herein, has seemingly confused space with dimension (measurement), in that space is equated with metrical distance in almost all instances. As one might expect, the research of the mechanistic geographers has become almost entirely a study of the effect of the spatial variable alone, (i.e., distance *qua* distance) on the distribution of phenomena. All other variables are immobilized under the clause "other things being equal."

[10] F. Schaefer, *op. cit.*, pp. 232-233; R. Hartshorne, The Nature . . ., pp. 134-135. The translations given in the above references are essentially the same but vary on specific points. Kant's important first paragraphs as given in the Rink edition of 1802 follow:

> *"Was den Plan der Anordnung betrifft, (:) so müssen wir allen unsern Erkenntnissen ihre eigenthümliche Stelle anweisen. Wir können aber unsern Erfahrungs (-) kenntnissen eine Stelle anweisen, entweder unter den Begriffen, oder nach Zeit und Raum, wo sie wirklich anzutreffen sind.*
>
> *"Die Eintheilung der Erkenntnisse nach Begriffen ist die logische, die nach Zeit und Raum aber die physische Eintheilung. Durch die erstere erhalten wir ein Natursystem (Systema naturae), wie z. B. das des Linné, durch die letztere hingegen eine geographische Naturbeschreibund. (Physische Geographie-Physische Erdbeschreibung,* Einleitung: 4).

On Kant's early discussions of the concept of space see J. Handyside, *Kant's Inaugural Dissertation and Early Writings on Space, Chicago*, The Open Court Publishing Company 1929.

[11] The development of modern physical science along with mathematics is covered in numerous writings. The most important for the summary given here are, P. W. Bridgman, *The Nature of Some of Our Physical Concepts*, New York, Philosophical Library 1952; R. Carnap in the Preface of H. Reichenbach, *The Philosophy of Space and Time*, New York, Dover Publications 1957 (1928 original); and M. Jammer, *Concepts of Space*, Cambridge, Harvard University Press 1954—particularly for Poincare's prescription on the measurement of space. Metrical distance is an attribute of phenomena not space. In physics one either selects a metric and measures what is empirically given and then chooses the "space" accordingly, or selects a "space" and chooses the metric accordingly. In either case, space is a parametric system and nothing more.

[12] This is undoubtedly the meeting ground of the mechanists and the organicists on the concept of "the whole greater than the sum of its parts." This fallacy is resolved in that no part exists separate from its whole. The definition of any part is its elemental character *plus* its relations, or composition, in the whole. The totality of parts (element and composition) equals the whole—no more, no less. On more specific aspects of the whole/part problem see E. Nagel, Wholes, Sums, and Organic Unities, *Philosophical Studies*, Vol. III: 2: 17-32, February 1952; and M. Brodbeck, Methodological Individualisms: Definition and Reduction, *Philosophy of Science*, Vol. 25: 1-22, January 1958, both for discussion and references.

[13] F. Lukermann, *op. cit.*, pp. 5-8. Recent discussions of determinism in the geographic literature are cogent here, in that granted *scientific* determinism, cumulative (serial) causation at the empirical level only results in contingent phenomenal occurrences that observationally have the aspect of "novelty" or "emergence," i.e., indeterminancy. See O.H.K. Spate, The End of an Old Song? The Determinism-Possibilism Problem, *Geographical Review*, Vol. 48: 280-282, April 1958, for discussion and references.

[14] It is important to understand that functions cannot be observed. What is observed is a group of events that follow one another, that are contiguous to, or co-existent with one another. Function, on the other hand, is a logical, deductive conclusion about these events as parts of an integrated whole. See E. Nagel, Teleological Explanation and Teleological Systems, in H. Feigl and M. Brodbeck (eds.), *Readings in the Philosophy of Science*, pp. 537-558, New York, Appleton-Century Crofts Inc. 1953, on the ascription of function to parts of organic wholes.

[15] See L. W. Beck, The Synoptic Method, *Journal of Philosophy*, Vol. 33: 13, pp. 337 ff., June 1939, for a discussion on the synthetic discovery of the whole.

[16] The most pertinent critique outside the social science literature is in E. Nagel and C. G. Hempel, Symposium: Problems of Concept and Theory Formation in the Social Sciences, *Science, Language and Human Rights*, American Philosophical Association, Eastern Division, Vol. 1, Philadelphia 1952.

[17] J. Q. Stewart and W. Warntz, *op. cit.*, pp. 167-169. The prediction of such distributions, or positions, is what the mechanistic geographers and location theorists mean by solving a locational problem. That this has no meaning with respect to location or place in traditional geography, economic or otherwise, is patent from the manifold nature of their models: the force field of the mechanistic geographers is the inertial (static equilibrium) formulation of classical mechanics which prescribes an absolute, empty space and action at a distance, and not the kinematic formulation of modern physical field theory which treats space as simply a functional relation between moving physical particles, *ergo*—no phenomena, no space. See E. C. Semple, *Influence of Geographic Environment*, pp. 129-165, New York, H. Holt and Company 1911, for the relative definition of location after Aristotle, Ratzel, and Mackinder.

[18] W. Warntz, Contributions . . ., p. 423, see footnote 1; and W. Warntz, Measuring Spatial Association with Special Consideration of the Case of Market Orientation of Production, *Journal of the American Statistical Association*, Vol. 51: 276: pp. 598, 602 ff., December 1956.

[19] All current connotations of "function" can be related to this

definition, particularly the geographers' use of the term as meaning "proper or purposeful activity." It has been suggested that such a meaning is logically derived from the co-variation of non-random activities. However, co-variation (after E. Mach) can be either a functional relation, i.e., a simultaneous and reciprocal (synchronic) dependence; or a cause and effect relation, i.e., a directed and irreversible (diachronic) dependence—neither being independent of a causal nexus (necessary condition or ground). Function in this context is either a "stage" in a process or a "means to an end" judgment of a process. Are we, then, to understand that function means nothing more than the *function of a process* in geographical problems? On the co-variation thesis see S. F. Nadel, *The Foundations of Social Anthropology*, pp. 101, 287, 368 ff., London, Cohen and West 1951; also S. F. Nadel, *The Theory of Social Structure*, London, Cohen and West 1957; and J. H. Steward, *Theory of Culture Change*, Urbana, University of Illinois Press 1955.

[20] See, for example: J.O.M. Broek, The Functions of Urban Areas, *The Professional Geographer*, Vol. V: 6, p. 4, November 1953. These conclusions apply to all multi-component regions of which the city is but an example.

[21] It is interesting to note that the plea for process is not a partisan issue between physical and cultural geographers. See A. N. Strahler, Empirical and Explanatory Methods in Physical Geography, *The Professional Geographer*, Vol. VI: I: 4-8, January 1954; J. Leighly, What has Happened to Physical Geography?, *Annals of the Association of American Geographers*, Vol. 45, p. 318, December 1955.

[22] Kant, in the passages referred to in footnote 10, states that all empirical perceptions may be classified in three ways, i.e., logically, as conceptual systems of nature (science?); or physically, as descriptions according to time (history), or space (geography). Quite obviously, geography as a descriptive (idiographic?) study is limited to a synchronic ordering of phenomena, history, to a diachronic ordering of phenomena. Does this imply that geography as a *scientific* (nomothetic) study of logically conceived systems of nature must restrict itself to synchronic (i.e., functional) formulations of phenomena? Certainly no other science would restrict itself to either the temporal or spatial dimensions *alone* of the phenomena it studies—much less to the study of a single variable.

[23] The three levels of explanation utilized here are elaborated on in another context in L. Skarsgård, Some Remarks on the Logic of Explanation, *Philosophy of Science*, Vol. 25: 3: 199-207, July 1958. Note, particularly, references to C. G. Hempel and the philosophers of history, P. Gardiner, W. Dray, and A. Donagan.

Learned Societies Around the World

France

Institute of France (Institut de France). Founded 1795. President is always the president of the "Académie francaise." Chief organizational center of the five large learned academies of France:

French Academy (Académie francaise). Founded 1634.

Academy of Inscriptions and Literature (Académie des inscriptions et belles-lettres). Founded 1663.

Academy of Sciences (Académie des sciences). Founded 1666.

Academy of Fine Arts (Académie des beaux-arts). Founded 1803.

Academy of Moral Sciences and Politics (Académie des sciences morales et politiques). Founded 1832.

The Institute of France is financed by private individuals and by large industrial enterprises. It awards the "Osiris," "d'Animale," and "Jaffe" prizes.

The five academies publish important bulletins and records as do numerous specialist academies and societies.

College of France (Collège de France). Founded 1530. Responsible for promoting the advancement of learning in fields of sciences and arts, and for publishing scientific journals, of which the yearbook deserves special mention.

Museum of Natural History (Muséum d'histoire naturelle). Center for promotion of research in natural history and zoology.

Italy

The leading Italian society for scientific research is the *"dei Lincei" National Academy* (Accademia Nazionale dei Lincei) in Rome. Founded 1603. Divided into sections, (1) national sciences and mathematics; (2) philosophical-historical sciences. Each section has 72 members. Publishes reports, proceedings, monographs, and yearbooks.

In addition to regional institutions, there are other organizations operating on a national basis, which contribute a great deal to the dissemination of Italian scholarship and learning in other countries. In 1950, the Department of Academies and Libraries of the Ministry of Education sponsored a total of 209 academies and cultural institutes, 106 of which operated on a national and 103, on a regional level.