PART III

CHAPTER 13

"You don't spare trouble, doctor," the inspector remarked; "nor time either," he added, with a significant glance at his watch.

"No," answered Thorndyke, as he detached the finished sketch from the block; "I try to collect all the facts that may bear on a case. They may prove worthless, or they may turn out of vital importance; one never knows beforehand, so I collect them all. But here, I think, is Dr. Egerton."

. . .R. AUSTIN FREEMAN
"The Aluminum Dagger"

When the dust had settled, what had happened? Sure, Group L had come into existence. Group L had gone to Europe. Group L had even come home. And, Group L still exists and the trip goes on. What does it mean? What had happened? Is there another way of talking about this event, another way than the one I took in Part II? Maybe. We shall see. But before we do, let's pause a moment to collect our wits. I write this sitting at a table surrounded by mounds of data. In every case the data are neatly organized into folders. On top of these folders sit other folders containing summaries of the data, reductions, distillations of the data. On top of these sit still more folders containing summaries of the summaries, reductions of the reductions, distillations of the distillations, maps of the maps, lists of the lists. I look at it all and I wonder: what is it? Just what is all this paper?

I

Return for a moment, in your mind or in fact, to the introductory discussion of matter, space and time (pages 13-16). There we came to realize that matter, space and time are merely convenient bundles of events: instead of matter, space and time, there are only events, locations in space-time. Russell says:

> From all this it seems to follow that events, not particles, must be the "stuff" of physics. What has been thought of as a particle will have to be thought of as a series of events. The series of events that replaces a particle has certain important physical properties, and therefore demands our attention; but it has no more substantiality than any other series of events we might arbitrarily single out. Thus "matter" is not part of the ultimate material of the world, but merely a convenient way of collecting events into bundles. (Russell, 1945, 832)

It may not be clear what Russell means by particle, or, then, to what he is referring when he speaks of events. We used his language in an almost poetic manner, extending the meaning of words by analogy and metaphor. But for Russell, and the physicists to whom he refers, an event, an irreducible event, is a very specific thing, what is commonly called today an elementary particle, elementary because it seems so far to be the sine qua non of existence. These particle-events are the stuff of nuclear physics and the names of many are not uncommon: electron, neutron, proton. The names of others seem sometimes to be the stuff of science fiction: antineutrino, antisigma minus, antilambda. These

particle-events form series of events. An example of a series of events might be the atomic nucleus. A still greater series might be the atom itself. A list of series of events of increasing magnitude might read: chemical compound, a sheet of steel, an automobile, a freeway, the Interstate Highway System, and so on. The series of all events is the universe. The example given is only one of an infinitely large set of possible hierarchies of series of events.

Let's get back for a moment to that irreducible particle-event. Understanding, that in the final analysis, an event is merely, or entirely, a location, a warp, in space-time, allows us to ask an intriguing question: how are these particle-events studied? No one has ever seen one of these particle-events, or touched it, or heard it, or felt it, or tasted it. Yet it has been detected. What does that mean? The American Heritage Dictionary says: "To discover or discern the existence, presence, or fact of" (page 359). Definitions are slippery things. When you try to latch onto them they slip through your fingers like babies' hair. Rather than push this one around in its natural circle, see what it looks like in action. To detect requires the assistance of a detective or, at least, a detector.

Chen Ning Yang lists three basic types of detectors in use for the study of these particle-events (Yang, 1962, 38). In the first class are such devices as the ionization chamber, the Geiger counter, the Scintillation counter, the Cerenkov counter and so on. In the second class are included the cloud chamber, the diffusion chamber and the bubble chamber. Photographic emulsion is alone in the third class. Of this last Yang writes:

> ...C.F. Powell and his group in Bristol had developed the technique of using photographic emulsions to detect charged particles. The ions produced in the emulsions by the charged particles along their paths cause black grains to appear after development. These grains mark the tracks or paths of charged particles through the emulsion. (Yang, 1962, 21-23)

While all the detectors listed above are not identical to the use of photographic emulsion, they are similar in one regard: they record or indicate the passage of an event. It might be said of them that they actualize or eventualize an event. Note that they do not in any way capture or seize the event, but merely indicate its occurrence, its passing, its being. The clicks of the Geiger counter, the trails of condensate in the bubble and cloud chambers, and the tracks on the

photographic emulsion are like the footprints of an escaping criminal, or the cookie crumbs left by Santa Claus from the snack left out for him on Christmas Eve. The footprints are not the criminal, the crumbs are not Santa. Nor are the trails of elementary particles elementary particles. Thus it is that the data of the physicist consist— not of mesons and neutrinos— but of their trails. The actual event is gone before you can say "hello."

To prevent my point from slipping by equally quickly, let me make it again, and more generally: a student, or scientist, never studies events themselves. He studies their traces, their trails, their paths through space-time. No one studies the thing he is studying and this is the dilemma of science. The eventual character of each and every event or series of events eludes the scientist forever by the mere fact of being an event. We are left with trails, fleeting glimpses, ticks, counts, measurements, paths, footprints and crumbs.

Not only is the event gone before you realize it, but between the trail, the click, the path in the photograph and the event itself lies a gulf, a gap that is in the profoundest sense forever unbridgeable. Consider the question of the existence of Santa Claus. What evidence is there that he exists? For one thing there are the toys beneath the tree; there are the thousands of pictures of him plastered around the world at Christmas time like the picture of Mao around China; there are the many Santas sitting in the many department stores or standing on street corners ringing bells. But that is all circumstantial evidence, much of it conflicting and contradictory. Is there a way of proving that Santa is?

It is the custom in many homes to leave a glass of milk and a plate of cookies for Santa Claus on Christmas Eve. The supposition is that Santa will come down the chimney, deliver his toys and before moving on to the next house, stop for a snack of cookies and milk. Christmas Eve arrives and the cookies and milk are laid out lovingly just before bedtime. The next morning the kid rushes into the kitchen to see if Santa's arrived. Behold! The cookies are gone and only a few crumbs remain. The milk is gone leaving only a white ring around the glass. Therefore Santa has come. Consider this custom as a scientific experiment. A hypothesis is formulated to the effect that Santa exists. An experiment is designed to test this hypothesis by forcing Santa to leave a trace of himself. The results are positive. The conclusion is that Santa must exist.

Santa is the event, the elementary particle, the subject of study. The cookie crumb, the ring around the glass are the trails, tracks, paths: the data. Consider the crumb. What is it? It is not Santa. It does not catch Santa, it does not make him manifest. From this crumb we

cannot describe Santa's height, girth, age, sex, race, manner of dress, system of beliefs, and so on, and although we might come to some conclusions regarding his appetite and taste in food these would be highly speculative in nature. What, then, do we see in the crumb? Only this: a crumb. Such is all data. It is not the event, nor can the event be studied in the end by analyzing data. Only the data can be studied, and thus the analysis of data descends to the analysis of data and nothing more. Descriptions, explanations, understandings of events have nothing to do with the analysis of data. In this case, and in every case, they are separated by an unbridgeable gap.

There was a Lucille Ball show on TV once that made a great impression on me. Lucy is hauled into court for driving the wrong way down a one-way street. When arrested, she was not moving, but the direction of her car indicated that had she been moving forward she would have been in violation of the law. Lucy protested her innocence, claiming that she was driving backwards the right way down the street. The court is skeptical. Lucy asks for a ladder. The ladder is brought into court and, while the arresting officer covers his eyes, Lucy ascends the ladder and then starts back down. Halfway down the ladder, she asks the arresting officer to open his eyes. What's she doing she asks him. He says she's going up a ladder. The court gasps and Lucy is let off. It was just a dumb TV show, but that's the gap between data and event, and that's how big it is. The scientist, like the cop in the story, is stuck with the data, the trace, the trail, not with the event.

In no branch of science is this more obvious than in atomic and nuclear physics. To go from the click-click of a Geiger counter, to go from a trail etched on a photograph to describing the characteristics of elementary particles is to go a very long way on very little. Physicists have turned this impossible journey into a supreme art. Writing of the years immediately following 1913, Yang says: "We could only wonder what it was like when to reach correct conclusions through reasonings that were manifestly inconsistent constituted the art of the profession (Yang, 1962, 9). Yang is not disparaging here. Rather he is filled with admiration for the spirit of the physicist that boldly crossed the gap between data and event, and who, without looking backwards for a second, without regard for consistency, came nonetheless to acceptable conclusions. But in the same breath, Yang is pointing to the reality, to the horrifying reality, of that gap, that gap between subject matter, between event, and data.

Physics is not the only science that is forced to study trails and traces. Such is the fate of all scientists, of all students, probably of all who would describe. The event events, and we are left watching the trail of vapor in the sky, listening to the dying roar. We search the sky

in vain for a glimpse of the jet. There is nothing else to study but tracks. For all that an event is ineluctable, it is likewise evanescent. The one thing that may distinguish physics from other sciences is the distance its practitioners have gone between event and data, between data and description. They have gone a long way on very little.

So far we have discussed the evanescent nature of the event, and the distance separating that event from its grace, our data. But the fact is that the data are an event, for there are nothing but events. Nonetheless, it is clearly possible to distinguish between the event of interest (an elementary particle or Santa Claus) and the trace event (trail in emulsion or crumb). Yet the distinction is meaningful under only one condition: that the trace event be always considered in the context of the event of interest. If the focus of interest shifts, from particle or Santa, to photographic emulsion or crumb, it is these trace events that become the events of interest. To study these, further trace events must be isolated. A possible set of trace events for the study of photographic emulsion or crumbs might well be the traces, the data, obtained through chemical analysis. As you see, science is the art of isolating trace events in a given context of interest. To modify an old cliche, one man's trace event may well be another's event of interest.

The role of the trace event, the data, must now be clear: indication that an event has transpired. It freezes the evidence of this passing in a useful form. Although a particle event transpires in a brief instant, the trace can be examined for years, even centuries, and used in any number of locations. Although Santa comes and goes in the night, the crumb remains to beguile the eyes of the child on the following morning. The event has transpired but the data hang around and around and around.

In summary there are four points about the nature of data:

1) Data, or the trace event, can never be confused with the event of interest. The trace event is never the subject matter of study.

2) The trace event is forever separated from the event of interest by an interval that remains uncrossable.

3) The role of the trace event is to freeze evidence of the passage or occurrence of an event in space-time.

4) A trace event is only a trace event in the context of an event of interest; and a trace event cannot be divorced from the context of an event of interest.

Restated in terms of Santa and the crumb, these observations read: 1) The crumb is not Santa, nor is the crumb the focus of interest; 2) The crumb reveals nothing about Santa himself; 3) The crumb freezes evidence of an event at a point in space-time; 4) The crumb outside of the context of Santa is nothing more or less than a crumb; and when divorced from this context becomes an event of interest in its own context, thus contradicting point number one, and hence disallowed. What does the crumb say about the existence of Santa? That he came in the night? That's right, the crumb can't say who came in the night, nor what, nor when, nor how, just only that an event transpired. Period. Does Santa exist?

Yes, Santa exists. And so also do the Tooth Fairy and the Easter Bunny. For millions of humans they are achingly real events. Their existence is as incontrovertible as the dime left under the pillow, the colored eggs hidden on the lawn, the crumb left on the plate. These things are data and it is their role as data that is important, nor their physical substance. The crumb is not the critical thing about the Santa Claus. Santa eats cookies every night. The crumb is important only in that it freezes, preserves, the event of the Santa's coming.

"Santa Claus came last night," one kid shouts to another.

"Awww, gwann! Santa Claus my eye!" comes the response.

The first kid holds out the plate with the crumbs. "Look what he left behind."

There is a light in his eyes.

I I

Crumb. Crumbs. On a plate. If you look closely at my eyes, you will see a light in them. I am holding the plate out for your inspection. Here's what's on it:

TABLE 13.0

GROUP L DATA: A LIST

The Trace Event	Where	When	Respondents
Hometown Map #1	Home town	21 June	20
HT Map Questionnaire	Home town	21 June	18
Hometown Map #2	Home town	21 June	20
Hometown Map #3	Home town	24 June	15
Point-line-area List	Home town	24 June	15
Predictive Map London	Home town	24 June	10
Map of Ideal City	Home town	24 June	13
Psychological Questionnaire #1	Home town	24 June	19
Psychological Questionnaire #2	Home town	28 June	17
Stereotypes #1	Home town	28 June	9
London Map #1	London	4 July	36
Stereotypes #2	Oxford	5 July	25
London Map #2	London	6 July	26
Adjective Checklist #1	London	6 July	36
London Map #3	London	7 July	19
London Map #4	London	7 July	4
Stereotypes #3	Ulm	10 July	32
Adjective Checklist #2	Innsbruck	11 July	35
Remembered Bus Seating Chart #1	Lago di Santa Croce	13 July	32
Venice Map	Venice	15 July	26
Adjective Checklist #3	Venice	15 July	31
Stereotypes #4	Assisi	17 July	27
Rome Map #1	Rome	18 July	33
Rome Map #2	Rome	20 July	30
Ideal Bus Seating Chart #1	Rome	23 July	28
Rome Map #3	Rome	23 July	24
List of Adjectives	Lucerne	26 July	14
Lucerne Map	Lucerne	26 July	14
Paris Map #1	Paris	28 July	16
Paris Map #2	Paris	30 July	10
Paris Map #3	Paris	1 August	8
Paris Map #4	Paris	2 August	3
Adjective Checklist #4	Paris	2 August	20

The Trace Event	Where	When	Respondents
Remembered Map of London	Home town	30 September	24
Remembered Checklist of London	Home town	30 September	24
Remembered Bus Seating Chart of London	Home town	30 September	24
Remembered Checklist of Innsbruck	Home town	15 November	16
Remembered Map of Innsbruck	Home town	15 November	16
Remembered Bus Seating Innsbruck-Venice	Home town	15 November	16
Remembered Checklist of Venice	Home town	15 November	16
Remembered Map of Venice	Home town	15 November	16
Contact (letter or visit) since trip	Home town or New York	Dated	27
Bus Seating Charts (54)	Noted	Dated	
Notes (100 pages)	Noted	Dated	

Each trace event in the table has been isolated in space-time, or rather analyzed into a space-element and a time-element. This is in fact not the case at all. The where and the when in no way apply to the trace event. Take as a specific example London Map #2. In my mound of data are twenty-six second maps of London. These maps, these pieces of paper, constitute the trace event, and they are here in Worcester. Furthermore, they have been here for months. The when and the where refer to the time and space elements of the event of interest, in this case twenty-six kids mapping in London on the 6th of July. It is the event of interest that has been analyzed into its space-element and its time-element, not the trace event. These maps may contain information of a temporal and spatial character, but that is to be discovered by analyzing the maps themselves (by isolating other trace events to help us do the jog). The location of the event of interest is not inherent in the trace event. It cannot be discovered by an examination of the trace event. It has nothing to do with the trace event. It is an attribute of the event of interest itself. This is to say, that the data and location of the data creation are not attributes of the data, but rather of the event of which the data is a record. The locations assigned to the events in the table are approximate. Let me give you a few examples.

1) The Psychological Questionnaire #2 is located in the kids' hometowns. This is true for most of the kids. Nonetheless, five were completed on the trip itself. Since the majority were completed at home, however, this location has been assigned.

2) Stereotypes #2 is located in Oxford. Since this schedule was filled out on a moving bus between Oxford and Stratford-on-Avon, Oxford is an approximate location.

3) The same is true of the events occurring in Venice. These also took place on the bus trip from Venice to Florence.

The same is true of the times at which events occurred. I followed this general rule in assigning a date: when more than half the material is dated at a certain time, I have assigned that date as the time at which the event occurred - when less than half the kids agree on a given date, I have arranged the information chronologically, and used the median date. In this last case the information usually has different dates on each individual piece. This is particularly true of post-trip information which arrives in the mail over a month's time. In regard to the map sessions in Europe, I have been able to follow the majority rule in every instance, though it should be clearly understood that the first map drawn by a kid was so labelled no matter on what date it was drawn. In some cases all of the material was collected within a given hour. This was true of almost all the material collected on the moving bus. In the case of the Adjective Checklists, all of them were collected within a given ten minute period.

The trace events listed break into one of four types, or combination of these types: 1) Verbal; 2) Graphic; 3) Matrixed; 4) Mapped. Each type involves active participation on the part of the respondent, but some require more strenuous activity than others. All of the information that can be mined from these types can be used to discuss the tour event, and from a variety of perspectives. The information can be used to discuss the kids individually or collectively, to make remarks about the environment, and to discuss the relations of the environment and the kids, collectively or individually. The emphasis varies from type to type.

1) Verbal Type. The verbal information contained in the trace events is of three sorts: a) Answers to questions couched in sentences; b) The creation of lists in response to questions; c) The notation of prepared lists. Most of the verbal information consists of these last two sub-types. Sentence-like answers to questions show up only in the psychological questionnaires and on the early map materials. The

advantages of this type of information are numerous and well-known: information beyond the demands of the researcher is provided, usually leading to greater insights and to the formulation of yet more successful questions. Nonetheless, the information is often incomparable, and hence useless when dealing with group phenomena. Consequently, this sub-type has been employed as a trace event in those instances when the information is most likely to be considered in the context of an individual kid. Sub-types b and c have none of the advantages of sentence-like responses, but at the same time do not suffer the disadvantage of incomparability. If a category sufficiently broad can be defined, individual lists can be merged to a single for the group. At the same time, any single list can be considered in the context of an individual. This is particularly true of sub-type b where the kid generates his own list. The individual list can be used to construe the definition of the question from the kid's point of view and is doubly useful in this regard. Sub-type c includes the Adjective Checklists. In this case the information is absolutely comparable and the analysis of a set of checklists can be considered a collective group response. Utility in regard to the individual is limited, though not nil. It is limited because the individual is constrained by the prepared nature of the list. It is impossible to assess individual feelings in this case, except as a function of the list. That is, there are three variables in the use of this device: the stimulating environment, the kid, and the list. In the freer forms the list is implicit in size of vocabulary and ability to use language, neither tested in Project Group L. Because the list is implicit in sub-types a and b it is seldom considered there, but must be considered in sub-type c. Interestingly, the kids insisted on their right to violate the explicit instructions of the adjective checklist: they employed multiple checks to add emphasis. On the list, you are allowed to check or not check a descriptive adjective. The kids did this, but added double and triple checks to enrich the act of filling out the form. Further, additional adjectives crowded the margins of the paper.

The Adjective Checklist was the only investigative device that was consciously modified by the kids without encouragement. The reason for this is not hard to find, and will be pursued in the discussion of the remaining types of trace events. If the kid is to be considered the event of interest, it is obvious that detectors must be employed to catch the kid in action. The detectors are the trace events, the schedules employed in Project Group L. However, a kid is not an elementary particle, and objects to having his existence confirmed via a Geiger Counter. Of all the schedules employed in the project, the Adjective Checklist best resembles a Geiger Counter. In fact, the resemblance between the click of a pencil beside an adjective and the click of the counter is greater than is comfortable. The activity required of the kid in filling out this form

is so close to nil as to enable us to describe the kid as passive in regard to this schedule. Passivity is a two-pronged problem. On the one hand, since it demands minimal effort and consequently fails to hassle the kid, it is easily accepted. ("Sure, I'll fill out an adjective checklist. It only takes a flick of the wrist and five minutes.") But on the other hand it is at once insulting to the intelligence and incapable of inducing the sort of "pride" in effort that leads to decent results. Those kids that valued ease of accomplishment over pride of craft filled out the list as required. But those kids who valued pride over ease enriched their experience by increasing their role, by reducing their passivity, relative to the form. "Pride" is an inadequate and incorrect word, yet hopefully it makes the necessary distinction.

2) Graphic Type. This type demanded slightly more activity on the part of the student than did most of the verbal types. It was used exclusively on the psychological questionnaire, and was included precisely to increase the participation level of the student, to engage him and attract his attention by the unusual nature of the task. In these cases the student was required to discuss his energy level, for example, by filling out bar graphs, by tracing curves through graph space, by slicing pies into segments. Discussions of these types with the students reveal the fact that they were enjoyable tasks because they required a great deal of effort from the students. On the other hand, they are difficult to analyze in any collective fashion. However, they do point to the positive role played by demanding effort from the respondent in the performance of unusual tasks. The information gleaned from these devices is probably most useful in the context of an individual as the event of interest.

3) Matrixed Type. This type, actually as sub-set of the graphic type, bears a certain resemblance to the mapping operation. This device was employed on the psychological questionnaire as well as in the StereoMatrix and Rank Matrix. The matrix consisted of a graph space in which the student was to locate a mark against two variables simultaneously. The form was at once demanding of participation, and hence positively received, and yet was designed to be filled out on a moving bus where its richness diminished its appeal. Essentially, it was well designed, but out of keeping with its environmental situation. The information contained is used easily both in individual and collective cases, and refers both to the kid as event of interest and to the environment as event of interest, always within a temporal context. Of the three types of trace events discussed so far, the matrix is richest in terms of the psychogeographic orientation of Project Group L.

4) Mapped Type. Under this rubric are included two distinct schedules: a) The bus seating charts; b) the maps. Since this sort of

trace event will provide the bulk of the information utilized in describing the trip event as a whole, it requires explication. The operations involved in the bus seating charts are slightly less complicated than those involved in the mapping operations. Bus seating charts were employed in three basic situations: first, they were used to record the actual locations of the kids on the bus, second, they were used by the kids to remember locations of themselves and other kids at previous points in space-time, and, third, they were used by the kids to devise an Ideal Bus. Two operations were basic to the completion of the bus seating charts: the identification of individuals (similar to identification of landmarks in the world) and their location vis-a-vis one another (similar to the relative location of landmarks in the world). These two operations were involved whether the chart was being used to record locations in actuality, in memory, or ideally. A glance at the first charts filled out by Bob and me will show that we had conquered neither operation at the end of the tour of London on the first day. Examination of Remembered Bus Seating Chart #1 will show that the kids had not completely identified all of the kids in Group L by the 13th of July — after thirteen days. Basically, the bus seating chart was a mapping operation with this distinction: the surface of the chart was finite and the potential number of relative locations was fixed. Nonetheless, the bus seating schedules demanded great input from the student, and concerned him immediately. Further it was an obvious test of his strength, in terms of being able to remember, and generated the enthusiasm typical of an arm-wrestling session. Further, it was an obvious bridge between the stereotype schedules and the mapping operations and provided the entire project with visible organic unity that was at first missing. Additionally, it is the most complex trace event we have discussed so far. Its information can be plumbed in regard to the individual kid, to the functioning of the group, to the bus as a lived-in world-space, and to the inter-relations of these three things. As a trace event, the bus seating charts show the trails of many more particular events than any other single device employed with the exception of the maps. They are obvious traces of behavior: actual, remembered and projected.

As was true of the bus seating charts, the maps themselves required enormous input. Because the kids' input was not structured once they had absorbed the grammar and vocabulary of the mapping system, this input was greater on this schedule than on any other. It was as great as it would have been were the student asked to write a short story or draw a picture. In confronting the blank map, the student confronted infinite space and his own experience in a single arena. He was asked to reify his experience in an unstructured situation. There were no matrices, no bus seating blanks to fill in. Furthermore the mapping operation required effort from the student not simply when drawing the map but continuously. That the students recognized this is manifest from the

number who sketched maps during the tour of Rome on the first day. After making the first map of London, the kids were aware that success in drawing a map was intensively related to their degree of awareness of the environment while shopping, sightseeing, strolling and so on. The mapping operation was either an integral portion of their trip experience, or no part at all.

The first thing demanded of the student was the identification of landmarks in the environment. It was not sufficient to see a thing, but also to tag it with a descriptor: "Tower of London" or "Carnaby Street." This increased the level of activity on the kids' part. Furthermore, it was necessary to consider constantly the relation of tagged landmarks to each other. To produce a map that would vary significantly from the Predictive Morphology of London meant staying on the ball at all times. Not only was it necessary to consider relative location within the city, but to consider the orientation of these locations to some external system. Further, since the nature of individual experience is usually sequential, the mapping operation demanded that time be kept in the foreground. In very many cases the sole clue to the relative location of tagged landmarks was the sequence of occurrence of the sighting. As will be seen, the order in which the mapped elements were placed on the paper reflected the order of sighting. Sightseeing occurred in space-time, and it was this that was juggled by the kids when drawing the map, rather than the apparently simpler problem of portraying space. This adds up to a task involving the kid completely.

What sorts of information do the maps provide? Certainly they tell us an enormous amount about the individual kid, but they are equally rich with regard to the perceived environment. In mapping we are taking the pulse of the man-land interaction as no other device can. By employing a common mapping grammar and vocabulary, the maps are also comparable one to the other, and hence yield information concerning the group experience. But these are things about which the map information tells us.

What do maps contain in and of themselves? Traditionally it has been supposed that the map contains information of a purely spatial sort; that is, the map has been seen as having spatial-spread, but not time-depth. This traditional viewpoint has been most clearly stated by James M. Blaut:

> Maps artifically segregate the spatial aspect, and largely ignore the temporal aspect, of space-time reality. The map is an abstraction dealing primarily with the structure of areas;

> what it generally shows is a representation of distribution with temporal change largely ignored except where highly simplified concepts of change can be shown by arrows, date labels, sequences of isochrones, degrees-of-change devices, etc. We simply cannot portray change by means of maps; perhaps the best we can do is to prepare a temporal sequence of maps of one locality, a series of artificially segregated "instants," and force the mind to treat them as indicators of continuous flow, much the same as in a movie sequence (Blaut, 1954, 9).

This is Blaut's most naive set of remarks about space, time and maps, but as such are the clearest indicators of the root of the problem. Blaut confuses "change" with "time." Thus he states that maps "ignore the temporal aspect" in the opening sentence, but goes on to discuss, not "time" but "change" as though the two words meant, or implied, the same thing. Blaut assumes that "time-change" is continuous, whereas there is no support for this position in, for example, quantum mechanics. Blaut assumes that a map shows "space" but provides no grounds for this assumption. Later Blaut was to recast this set of remarks in more "sophisticated" language, but without modifying his basic confusions and assumptions:

> The map-thing, the ink-on-paper sign-vehicle itself, is of course relatively unchanging, and beguiles us into thinking that the map-meaning, the signification of the map, is something other than process. Further confusion is added by the fact that maps portray simultaneity directly, pictorially, whereas time-depth is represented only (in most cases) by inference (Blaut, 1961, 3).

In this passage Blaut clearly recognizes that the map does indeed show "process" although he feels the map "beguiles" us into thinking otherwise. But note that all he has actually done is to have replaced "space" with "simultaneity" ("maps portray simultaneity") and "time" with "process." Thus he makes in the latter passage the same remarks about "simultaneity" and "process" that he earlier made about "space" and "time." That this is in fact exactly what he has done is obvious from the following:

> But one essential feature of all such sign-systems (as maps), and for our purposes their most important feature, is the depiction of finite slices of

> process, either as narrowly dated as the moment during which the shutter of an aerial camera is open or as broadly dated as the clock-time lapse between the earliest and latest events shown on a map. What gives these structural models the appearance of being "purely spatial" is the fact that time is signified indirectly ..., while the relative spatial dimensions up-downness and right-left-ness are signified directly, or pictorially. (Blaut, 1971, 20)

Note that "process" is being sliced in this quote, just as "time" was sliced into "instants" in the first quote. In addition to the fundamental confusions made by Blaut originally, he has now compounded our difficulties by using "structure," "simultaneity," and "space" in relatively synonomous fashions, and "change," "process," and "time" identically. To give Blaut his due, I doubt that he really meant what he wrote, but we live with what he wrote.

The situation can be clarified if we discuss the model of reality underlying the three Blaut quotes, the model underlying, not only the traditional view of what a map contains, but all geography as well, particularly historical geography. This underlying model conceives of existence as a tunnel. The diameters of this tunnel are taken to represent the spatial dimensions of existence, while the length of the tunnel is taken to represent the temporal dimensions of existence. In Blaut's many languages, the diameters of the tunnel represent "structure," and at all diameters "events" are "simultaneous." The length of the tunnel represents "process," while "change" takes place from diameter to diameter, from slice to slice. In my three-and-a-half years of graduate study I have watched six widely published professors draw these tunnels, or stacks (for some reason they are always cylindrical), on blackboards with a nauseating frequency. The model has this one advantage: it allows one to stop time, freeze "change" or "process" in some sempiternal, if unrealistic, fashion, and to then examine "space" or "structure" like the movie editor at his moviola. That is, the model makes geography, if not a decent reflection of existence, at least simple, and perhaps simplistic.

The historian is not the less to blame. His model of existence is similar to that of the geographer, but with the terms reversed. The historian's analogues to maps are his "time-charts" or "chronologies," which have been supposed to have "time-depth" but lack "spatial-spread." In response to both groups H. Minkowski has remarked: "...nobody has ever noticed a place except at a time, or a time except at a place"

(Minkowski, 1964, 298), and while Minkowski provides the perfect conclusion to the debate, he provides no explanation of the source of confusion. If, in fact, there is no time except in space, and no space except in time, why do geographers refuse to see time (not, by the way, "change" or "process," confusions introduced by Blaut, but simply "time") in the surface of the map. In an intriguing little article called "Ostensible Temporality," C. D. Broad tells us why. In this article Broad tries to set up analogies between space and time. Having constructed one such, he says:

> This spatial analogy is valid and useful to a point; but I will now indicate some important ways in which it breaks down. The triadic relation "between" occurs both in a linear spatial series and in a temporal series. We can say both that Bletchley is between Euston and Rugby, and that the experience of writing this sentence is between the experience of eating my breakfast and that of eating my dinner. Nevertheless, there is a profound difference. Temporal betweenness is not fundamental; it is analysable into the relational product of a certain dyadic relation taken twice over. The fundamental facts are that eating my breakfast preceded writing the sentence, and that writing the sentence preceded eating my dinner. The triadic relational fact that writing the sentence is between eating my breakfast and eating my dinner is analysable into the conjunction of these two dyadic relational facts.
>
> Now in the linear spatial series the exact opposite is the case. No doubt one can say that Euston is south of Bletchley and that Bletchley is south of Rugby, and one can compare this with my breakfast preceding my writing the sentence and the latter preceding my dinner. But there is a fundamental difference. The relation "south of" tacitly involves a reference to some third term beside those which are explicitly mentioned, viz., to the sun or to a compass-needle. But the relation "earlier than" is a genuinely dyadic relation which directly relates two experiences of the same person and contains no tacit reference to some third term. (Broad, 1964, 322-323)

Broad has isolated the respect in which Blaut can consider "time" as processural and changing (in the sense that the triadic relation "between" can be broken into the dyadic relation taken twice over) and "space" as structural or simultaneous (in that the triadic relation remains at least a triadic relation). But Broad's argument falters when he fails to consider the only meaningful experiential way in which Bletchley may be said to be between Euston and Rugby. This notion, which Broad (Blaut, and Harvey by the way—see his faintly naive and rather precious treatment of maps in Harvey, 1969, 369-386) would regard as "spatial" can be readily re-expressed as follows: If I were to travel from Euston to Rugby via Bletchley, my experience of Euston would precede my experience of Bletchley which would precede my experience of Rugby. In this manner, Broad's spatial phenomenon becomes temporal. But this is more than an exercise in translation for I would inquire in what sense any other interpretation of "between" has meaning. For example, if I were to go from Euston to Rugby via Featherby, then Featherby would be "between" Euston and Rugby, not Bletchley at all. That is, there is no absolute sense in which spatial "betweenness" exists outside of the temporal context. Things are "between" one another in space and in time identically, in the sense that the triadic relation "between" can in both space and time be reduced to a pair of dyadic relations and nothing else.

But if this is true, then events cannot transpire in "space" simultaneously. That is, it becomes meaningless to say that Euston, Rugby and Bletchley co-exist in the same "instant" of time. But the definition of "simultaneous" used in relativity physics supports this. Einstein says: "There is no such thing as simultaneity of distant events" (Einstein, in Smart, 1964, 283), which may be taken as meaning that only those events are simultaneous between which light cannot pass. (For if light can pass from one to another, then they are separated by the amount of time it takes light to pass from one to another, at least. But if light cannot pass between them, then they occurred in the same instant.) Clearly, the event called Rugby is not, in this sense, simultaneous with the event called Euston. But if simultaneity is not an attribute of space, in what sense can Blaut claim that "maps portray simultaneity directly, pictorially"? Clearly, Blaut's remark is meaningless.

In other words, the distinctions that Blaut makes between "space," "simultaneity," and "structure" and "time," "process" and "change" are fallacious. What then do maps portray? Obviously, they are images of events which, according to our introductory discussion, may arbitrarily be analyzed into a space dimension or a time dimension, neither of which is to be preferred over the other. Thus Blaut was more or less correct when he stated that "time" was implied by the map, but wrong when he said that "space" was directly presented. He should have

also said that "space" was implied by the map as well. In actuality, we infer "space" or "time," either, or "space-time" from a map as we will, as we find it convient to do so. A map is simply an image of an event, an event arbitrarily bounded in each of four dimensions. The event of a map has length, height, width and duration, and the map-trace of this event, in its physical determinateness, has arbitrally set the length, height, width and duration of the event to be represented.

And now that we have distinguished between the Blautian confusions of "time" and "process" or "change," we can also note he is entirely correct when he says that a map cannot show "change," since his notion of "change" can be reduced to the notion of "the examination of a number of events with presumed causal relations." Each event in this group could be represented by a map-trace, and the map-traces could be arranged—not chronologically—but in the order of the presumed causal chain. (This causal order may or may not be identical to a given chronological order. It would seem that chronology is very likely nothing but a function of presumed causality, but this discussion would lead us too far astray, as interesting as it would be.)

In our analysis of the Group L maps we shall have occasion to employ the time-dimension of a given map, as well as to examine a series of map-traces arranged in causal order (in this study, the causal order is not distinguished from the chronological order). The time-dimension of a given map is presumed in our adoption of the Assumption of Navigational Sufficiency (in Chapter 17), and the causal-chronological ordering of the maps is presumed in each of the following chapters. The maps provide the bulk of our data and the types of analysis they undergo are set forth below.

The first thing is the traditional Lynchian sort of thing. This is an aggregate analysis, and the conclusions apply to the experience of the group rather than to any individual. This analysis will also be applied to the Group K maps, and, on the basis of inter-group differences and the similarity of Group K and Group L experience, the causes of the drastic variation between the Group L and Group K maps can be described. The content analysis also allows remarks concerning the tour environments, particularly London, Rome and Paris, to discriminate between the tour environment and the geographic environment, and to discuss the incremental nature of geographic learning.

Taking the identical set of maps, we shall run them through what is being here called a pseudo-graph analysis. The nature of the data prevented use of graph analysis, and so this body of methdology was modified to the pseudo-graph analysis. This commences as an individual

analysis, the maps of each kid being considered individually. Conclusions here involve a discussion of types of mappers and varieties of strategies employed to come to grips with the issue of mapping an environment. Five types of mappers and strategies are isolated. The individual information is subsequently aggregated, allowing us to make remarks concerning intercity differences, as well as group changes through time.

Once again, using the same set of maps, we discuss the changes through time of a selection of individual environmental elements as they are portrayed on the maps. This information is at once individual and aggregate and the conclusions are related to the two prior sets of analysis. Since the basic issue under attack is the question of veridicality, this analysis is called the veridicality analysis.

The underlying assumption of the next analysis is that all the sketch maps of London, Rome and Paris are accurate representations of these cities. An attempt is made to understand what appear at first to be gross errors. This is accomplished by discovering the basis of projection underlying each map and relating these mental projective systems to the content analysis, the pseudo-graph analysis, and the veridicality analysis. Interesting connections are found between mapping strategies and types of projections, between content and projections. Variations are revealed that cannot be explained by the foregoing analyses.

These variations are explained by the areal and overlay analysis. Here is discovered the affective character of mental map projections. Areal extent and rules of projection are found to vary according to the attitude taken toward the city by the mapper. This analysis is both aggregate and individual in character. Attempts are made to link data obtained from the Adjective Checklists to data obtained from the attributive overlays. Conclusions from this analysis are compared with conclusions from all proceeding sets of analysis.

Finally we turn to the bus seating charts in an attempt to discover types among the kids based on a variety of socio-metric indices. Supplementary information in this analysis is derived from the psychological questionnaires. These indices are then compared with the conclusions reached by the map analysis and interesting connections are made. This concludes the trip map analysis section, though not the analysis. Our attention then turns to a brief consideration of the post trip data, and the three sets of information—pre-departure, trip, and post trip—are compared in an attempt to discover elements useful in erecting a predictive model of trip behavior.

Where, in all of this, it might be with some justification asked, is psychogeography, that field studying the perception, cognition, and consequent behavior vis-a-vis the geographic environment? Where indeed? It is not, in bald point of fact, a meaningless question. As was made clear in our original definition of the field, the cognitive portion of the paradigm is not available for study directly, except by neurologists, whose success to date, remarkable as it is, is far from complete. Consequently we are thrown back on expressed behavior in the attempt to learn anything about the cognitive portion of our problem. And this lands us smack-dab in the middle of an embarrassing dilemma, for quite clearly the expressed behavior that we are investigating are the sketch maps themselves. That is, we are forced to make the sketch maps stand proxy for the behavior—the walking and moving through the city itself. It would have been marvelous had we been able to monitor completely the behavior of the kids as expressed in making street-corner decisions about the path to take, about where in Rome they were, and about how to get there from here; it would have been marvelous could we have equipped each kid with some sort of radio transmitter and plotted continuously their paths through the space of Paris; it would have been wonderful if we could have bugged each kid and picked up all the navigationally relevant information that passed between them. Nor, amazingly enough, do I feel that the kids would have objected. It is sometimes startling the things people will do when asked in a human and humane manner. But all these are dreams probably never to be fulfilled and certainly entirely impossible of attainment in the currently austere era of parsimonious social science. It almost seems as though social science has been caught wearing—to adopt the most popular metaphor in all social science—the emperor's new clothes, and as if the taxpayer—or his representative—had cried enough. Nor do I hold a grudge in this instance, for certainly if anyone has been guilty of parading as silk what is in fact only air, then that person has likely been a social scientist.

But this is beside the point. The point is merely that we lack real knowledge about the experiential behavior of the kids except as expressed in the sketch maps and our other instruments, and the dilema that we face is this: the sketch maps as behavior follow causally from the prior cognitions; but we are postdicting the cognitions from the behavior; and are actually postdicting the perceptions from the already postdicted cognitions. That is, all we have is behavior from which to derive images of cognition and images of perception. Having postdicted these perceptual and cognitive images, we then set them up as explanatory causes by which to explain the expressed behavior. Preposterous you say? Perhaps if we return to our discussion of Santa Claus we may find a way out, if there is a way. If there isn't, perhaps, like the physicist described by Yang who came to acceptable conclusions in the wrong way, we must say, "Hang the

dilema! Full speed ahead!!"

Consider Santa Claus again. Consider the possible ways of knowing that he is. One of these ways of knowing provides us with a crumb and a ring around the glass. Another way provides us with pictures and stories and songs. The first way of knowing we shall call the scientific, though in this particular instance perhaps pre-scientific would be a better word. The second we shall call poetic. Other terms might accomplish the same task, but these will suffice. One might ask whether it is possible to come to different sets of knowledge by following one or the other of these paths. In the case of Santa Claus it would seem that we can. The poetic route has as its destination a Santa Claus who is fat and jolly and dressed in red with white trim and a white beard who lives at the North Pole and spends the year making toys with his elves and who flies around the world in a sled pulled by reindeer on Christmas Eve. The reality of this Santa can be attested to by the Post Office who annually receives a ton of mail addressed to him, and yet it is not necessary to seek proof of this Santa beyond the power of the images we hold of him. The scientific route has as its destination a rather more paultry image, one consisting of a crumb, and a ring around a glass that will be washed away all too soon. Is there any sense to be made of these distinctive approaches?

Consider now the trip to Europe. The poetic route to knowing about this experience was taken in Part II. Whether or not Part II was "poetic" is irrelevant. It followed a poetic route in coming to grips with the trip. It ignored the scientific approach to knowledge, replete with its deductive systems, its rules of evidence. This poetic way resulted in a set of images of the trip, powerful images of the heat, the elation, the anger, the faces and feelings, the people, the situations. Its reality is attested to by its being, and it needs and demands no other attestation. On the other hand, you have read a precis of the nature of the chapters to follow, chapters that will observe the rules of deduction and inference, the rules of evidence dear to the heart of the scientist. Observe that in place of David Abrams, human being, we shall deal with pieces of paper that stand proxy for him; that in place of Marina Giaconda, human being, we shall deal with pieces of paper that stand proxy for her; that in place of sitting on a bus moving through the world on a hot day in July, we shall look at a piece of paper. What will that paper tell us that we don't already know?

To be quite frank, next to nothing.

Then why bother?

There's only one reason that's any good. The two ways of knowing complement one another, not in simple additive fashion where two is better than one, but in such a way that the crumb resonates with the poetic image of Santa, in such a way that the two ways of knowing become one more complex way of knowing, in such a way that the crumb breathes life into Santa as Santa gives the crumb a reason for being. Just as matter, time and space collapse on examination into an event, so poetic and scientific means for knowing collapse into simply knowing, inseperable, meaningless in isolation. We are so much! It seems a shame to sell us so short. We are more than atoms and less than gods at the same time that we are neither, and always both.

The sin, then, is separation, and it has been a sin into which few great artists and few great scientists have ever fallen. The separation between art and science is a function of fear and mediocrity. The simple rules and platitudes of either art or science offer comfort only for the gutless. The mediocre scientist, hiding behind his facade of deductive logic and inferential statistics, never takes his own measure and never wants to; the mediocre artist, hiding behind his facade of metaphor and simile, likewise fails to take his own measure and likewise never wants to. To take his own measure would demand the abandonment of either narrow deadening system, ejecting him violently into the world, trailing clouds of glory hitherto unseen. Unafraid, he would look about him... and see.

The artificial distinctions between art and science, between the subjective and the objective, between knowledge gained through deduction and inference and metaphor and simile, are falling...

They are not falling as the result of scientists getting together with artists to advise them on techniques; they are not falling when artists and scientists get together at Aspen over a bottle of Scotch; they are not falling as the result of new magazines embracing both approaches; they are not falling by being added, mediocrity piled on mediocrity; or being shared, exchanging garbage the one with the other. They are falling as science discovers its limitations, as it looks deeply into the mirror only to find poetry staring back. Two of the crowning achievements of science in this century have been to look as deeply into the mirror as possible: there was seen the incompleteness theorem and the uncertainty principle. These are tributes to two scientists who dare to look, Kurt Goedel and Werner Heisenberg. Of the first James R. Newmann writes:

> Goedel set out to show that the axiomatic method which has served mathematics so long and so well has limitations; in particular, that it is impossible

> within the framework of even a relatively simple mathematical system—ordinary whole-number arithmetic, for example—to demonstrate the internal consistency (non-contradictoriness) of the system without using principles of inference whose own consistency is as much open to question as that of the principles of the system being tested. In this endeavor he was successful; thus we reach a dead end so far as one of the major branches of mathematical research is concerned. Formal deduction has as its crowning achievement proved its own capacity to make certain formal deductions. In a sense, therefore, formal deduction may be said to have refuted itself (Newman, 1956, 1616).

Goedel's Proof, as the incompleteness theorum is also called, has upset the very roots of the logical system that science has exploited so efficiently for so very long. Needless to say, this is just a little shocking, a wee bit unnerving, sufficiently so that commentators are moved to remark as follows:

> None of this is to be construed, however, as an invitation to despair, or as an excuse for mystery mongering. The discovery that there are formally indemonstrable arithmetic truths does not mean that there are truths which are forever incapable of becoming known, or that mystic intuition must replace cogent proof. It does mean that the resources of the human intellect have not been, and cannot be, fully formalized, and that new principles of demonstration forever await invention and discovery... It is an occasion not for dejection because of the limitations of formal deduction but for a renewed appreciation of the powers of creative reason (Nagel and Newman, in Newman, 1956, 1659).

But while Nagel and Newman were energetically not despairing (although probably sweating profusely), Werner Heisenberg was nailing shut the coffin containing the objectivity of the experimental scientist:

> This indeterminateness of the picture of the process is a direct result of the indeterminate-

> ness of the concept "observation"—it is not possible to decide, other than arbitraily, what objects are to be considered as part of the observed system and what as part of the observer's apparatus...In the same way it is now profitable to review the fundamental discussions, so important for epistimology, of the difficulty of separating the subjective and objective aspects of the world (Werner Heisenberg in Newman, 1956, 1054-55).

We have already discussed this issue (pages 43-45). We have come full circle. In this document (subjective or objective or neither) I present traces and descriptions (are they any different?) of events (for there is nothing else) in a convenient (the only organizing principle) manner. Period. No truth. No liklihoods. No answers. No explanations. Just convenient bundles with convenient tags.

If it's any help, I do believe in Santa Claus.