Article

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MENTAL MAPS AND INFORMATION SURFACES IN QUÉBEC AND ONTARIO

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ABSTRACT

Maps of residential desirability and information surfaces in Québec and Ontario vary considerably between children and young adults in the two provinces. Such differences reflect variations in migration, education and economic factors. Difficult methodological questions are raised concerning the measurement of cultural and linguistic barrier effects.

KEY WORDS: Mental maps, information surfaces, barrier effects, migration, Québec, Ontario.

RÉSUMÉ

Peter GOULD et Nicole LAFOND : Cartes mentales et surfaces d'information du Québec et de l'Ontario

Les cartes de préférences résidentielles et de surfaces d'information du Québec et de l'Ontario varient considérablement entre les enfants et les jeunes adultes des deux provinces. Elles reflètent une expérience différente de migration, d'éducation et de politique économique. D'importantes questions d'ordre méthodologique sont aussi soulevées concernent l'effet de barrière joué par la langue et la culture dans un tel contexte.

MOTS-CLÉS : Cartes mentales, surfaces d'information, effet de barrière, migration, Québec, Ontario.

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RESIDENTIAL PREFERENCE AND MIGRATION

The growth of urbanization in Canada, whether viewed over the past century or the most recent decade, has been startling by any standards or comparisons that may be invoked. By 1971, roughly a century after Confederation, more than three-quarters of the people lived in large and still-growing urban areas, and during the last decade the urban population increased an additional fifteen percent. Geographically, the spatial concentration is even more dramatic, with sixty four percent of the urban population in the three major towns of Montréal, Toronto and Vancouver. Moreover, by far the largest proportion of future growth appears to be economically oriented to the large metropolitan areas (Ray, 1974, p. 10-11).

Such extreme rates of change, and such burgeoning concentrations of people in space, raise crucially important policy questions about the future. There is an obvious and natural tendency to consider such questions at fairly large aggregate scales. At the national level, classical questions of spatial efficiency arising from concentration are challenged by newer questions of environmental impact. At the metropolitan scale, such general concern is frequently translated into more specific questions of the tax base, the viability of public transportation, the capacity of local waste disposal systems, power generation, the provision of medical care, and so on. However, what we almost inevitably, and perhaps unwittingly, tend to lose sight of in such broad-scale policy questions is the individual. Despite the fact that most government policies are ultimately rooted in the concern for the individual, the person—the actual man, woman and child—is often a blurred aggregate figure who tends to get lost in the shuffle. In a sense this is inevitable: no government, local or federal, can set up a myriad of highly individualistic policies each tailor-made to the unique person. But some questions may be more directly humane than others: that is, the human implications may be more direct, stark, and capable of generating humane empathy and concern than others. Migration is precisely such a question. To date the emphasis and concern has been placed, quite rightly, on trying to tease out the major streams of migration as vital components in regional change; to gauge the effects of migration upon the burgeoning growth of the metropolitan regions; and to judge the effects of draining the once densely settled rural areas. Few, however, seem to be asking the rather naive question of whether the flesh and blood individuals in these great tides and rivers of human movement want to be a part of them. How much free choice is involved when a wife and husband and their children are up-rooted and moved to a new location, surrounded by strangers, in a new, clearly unfamiliar, and perhaps detested location far from the familiar friends and faces of "home"? The near ubiquity of "welcome wagons" in most cities is only one index of the chronic sense of alienation that many feel. That such attempts to welcome are commercially driven, far from altruistic, and designed to ensnare and drill a newcomer into patterns of desired shopping behavior, should not blind us to the fact that many newcomers feel lost.

This study, although dealing with aggregate views of small groups of children and adults, raises some serious questions about the residential preferences of people in Québec and Ontario. Without exception, large domes of local desirability lie over each place sampled, implying that many prefer their local areas with the familiar landscape and comfortable circle of friends. Where a move might be desired, the preferences are frequently expressed by late teenagers and young adults in the more rural areas as shifts in the peaks of preference, usually from the immediate locality to nearby towns, or perhaps to a city within the culture area. Significantly, such mental expressions of wanderlust fade in later years, and in adulthood all the peaks are centered again over the local area and town. In brief, although large streams of migration may still be feeding the growth of the major met-

ropolitan centers in Canada, they may well be driven by economic necessity rather than individual preferences. The psychic consequences of such economically-induced stress remain to be explored, but perhaps it is worth noting that many people with economic means tend to retire *away* from the big cities. Indeed, patterns of retirement by certain classes may well be indicative of locational preferences made at crucial, and often traumatic, points in life when reasonably free choices become available.

In discussing residential preferences in the context of migration, deeper questions of long-term policy arise. At best, there may be a tendency simply to monitor an on-going situation, to record how it has developed in the past, and to predict where it might be in the future, rather than think through which of many alternative futures might be desirable. A rapid and unconstrained rate of metropolitan growth will produce a future whose broad and detrimental consequences can be fore-seen fairly easily. The question is whether this is what the people want, or, indeed, whether they have been educated to think through what they want. It would appear that if the movements of people to the cities are basically driven by economic forces, rather than personal choice, that any modification of such forces would probably enhance individual human lives. In brief, policies of decentralization, while raising a few outcries from confirmed city dwellers, would probably be received with enthusiasm by many people. Such policies are not academic speculations: they are presently enforced in some advanced societies, whose people have asked about the future they want, and who are trying to steer towards such goals, rather than being carried along by forces that seem inevitable only in the context of certain, perhaps inappropriate, modes of thinking. Scandinavians, for example, tend to place the quality of life for the individual much more clearly in the forefront of concern than in North America. Within such general frameworks and assumptions about the life of the individual and the role of government, the shaping of human movements by changing economic opportunities in assuming an ever more prominent position. Many movements do appear to be sharply affected by the constantly changing topography of opportunities that strongly shape migrational patterns. But such topographies may also be shaped by the gradients of preference surfaces, or mental maps. Sometimes the steep slopes, produced by very rapid changes in preference over geographic space, constitute severe barriers to human movement, and forcing people to cross them in order to make a living may well produce traumatic and unhappy experiences. It is for this reason that our analysis starts by considering the problems of measuring, and so monitoring, perceptual barrier effects with highly distinctive spatial expressions.

THE MEASUREMENT OF BARRIER EFFECTS

It is difficult today not to be aware of the many barriers to human understanding and mutual respect. A number of these are created when the rights of a minority are thwarted or repressed. In such situations, barriers are quickly erected, sometimes by the minority as a protective device, sometimes by the majority to enclose and limit. Frequently there are barriers of a linguistic, cultural, ethnic or religious nature producing perceived differences, and these are then reinforced, sometimes by both sides. In some cases the barriers are formally delimited in space in the form of a wall, a prohibitory decree, or a national boundary with its passport, visa and customs paraphernalia. In others there are equally important, but informal, barriers which also have distinct spatial expressions. Many of these are what might legitimately be called perceptual or mental barriers: that is, they represent collective opinions, attitudes and perceptions that may discriminate sharply between certain areas and the people they contain. At the micro-level, for example, gangturfs may be mental constructs of perceived territoriality, but they are acknowledged to be sharply delimited in space, and we might usefully think of gang members having mental images of

invisible landscapes, whose topographies represent hills and valleys of danger, and whose gradients frequently index sharply increasing rates of induced psychic stress (Ley, 1972).

At the macro-scale, similar invisible landscapes emerge in the form of collective images about the desirability or undesirability of places for residential purposes. Gradients on such mental maps are often extremely sharp and may expose strong prejudices. Steep gradients may also represent considerable mental barriers to human movement, and it has been demonstrated that collective mental topographies can shape and predict migration streams (Lloyd, 1973), in somewhat the same way that the physical topography of a landscape controls the flow of water.

Sometimes such sharp gradients coincide with well-defined political, cultural, and linguistic boundaries, even though such boundaries may be "open", in the sense that human movement is not in the least hindered by legal or political control. A study of the Norwegian-Swedish boundary, completely open to all movement, and with mutually intelligible languages on either side, disclosed strong preferential and information biases in children only two kilometers apart in geographic space, but clearly "miles apart" in information space (Lundén, 1971, 1972).

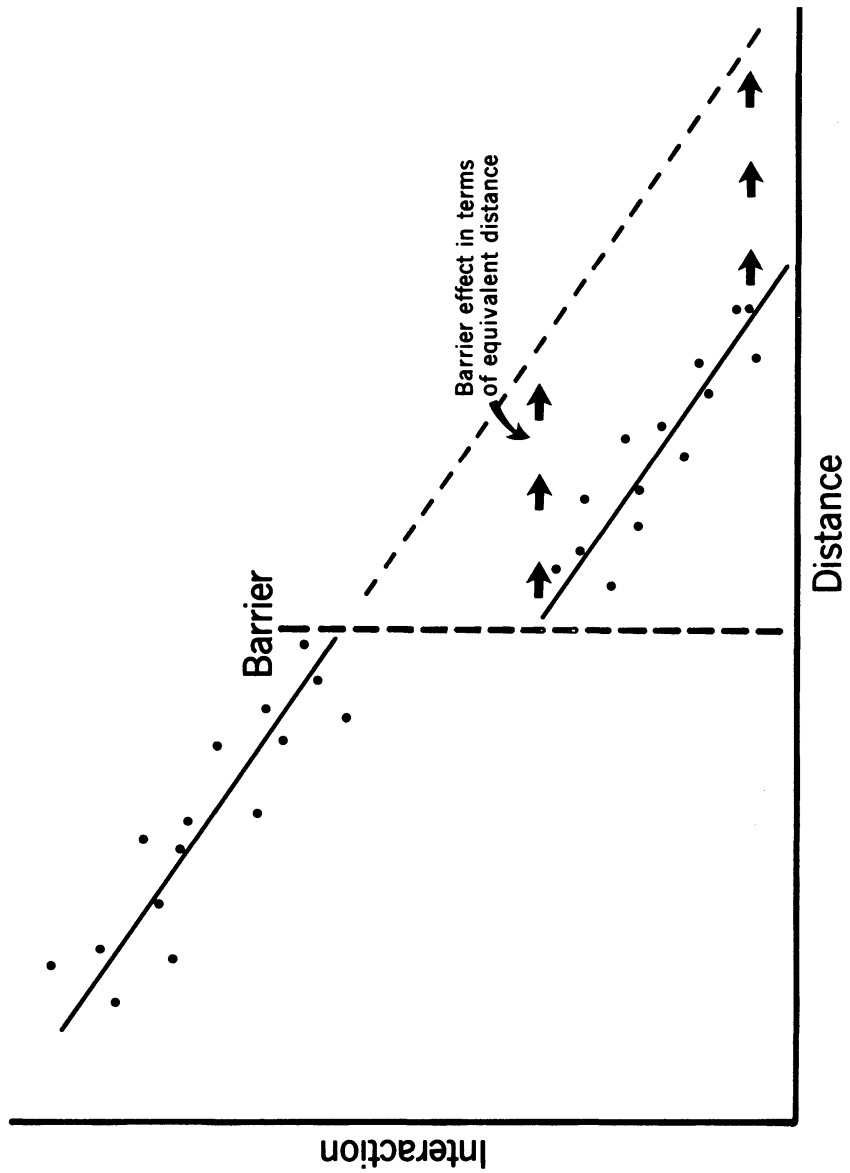
We have a closely analogous situation in eastern Canada, with the open boundary between Québec and Ontario. Here, however, linguistic, cultural, political and religious differences clearly reinforce the simple delimitation of the two provinces on the ground. Although smaller in number than their English-speaking peers, the Québécois have formed one of the two large and critically important charter groups throughout the later period of Canadian history, frequently tempering the frustrations induced by English-dominated governments at the Federal level by maintaining, and even accentuating, distinctive aspects of Québec culture.

The measurement of barrier effects, whether they be economic, political, cultural, informational, or specifically linguistic, proves to be a difficult task. As in many areas of the human sciences, we cannot manipulate the subject of our inquiry in the sense of a laboratory science. At the same time, we require a *normative* statement, of the suppose-there-was-no-barrier-what-then variety, against which to gauge actual observations. That is, we require a normative model to predict what interactions (flows of money, people, goods, etc.), there would be *if* a particular barrier did not exist. Only then can we use such a model as a ruler to *measure* the strengths of an existing barrier, and so monitor it over time (either historically or in the future), to see whether it is getting stronger or weaker. It is quite obvious that until we have such measurement capabilities any policies designed to change barrier effects must represent rather wild guesses, simply unsupported formulations by public authorities, whose expected ameliorative effects, or malign counter-intuitive effects (Forrester, 1971), are incapable of being monitored in any objective way.

As a simple example of such a measurement attempt, consider a proposed model employing simple regression techniques (Nystuen, 1967), based upon an early attempt to describe the effects of barriers on interactions between Québec and Ontario (Mackay, 1958). If some measure of interaction (telephone calls, migration flows, letters, air passenger traffic, etc.), is plotted against distance, we would expect a decay effect, allowing for differences in population at other places (figure 1). Across the barrier, interaction is less than we would expect if, for example, the language, nationality, and so on did not change. By fitting two lines, one on either side of the barrier, and then moving the lower one until it coincides with the expected extrapolation of the other, we have a measure of the barrier effect in terms of the equivalent distance over geographic space. Our regression line before the barrier is reached represents our expectations, or normative statement, while the second line describes the observed reality with the barrier in place. Bringing the two into

Figure 1

THE MEASUREMENT OF A BARRIER EFFECT IN TERMS OF EQUIVALENT DISTANCE IN GEOGRAPHIC SPACE



congruence allows us to gauge reality against our normative ruler. Unfortunately, such an approach raises formidable technical difficulties (Curry, 1970). Nevertheless, even when the human scientist is thwarted by technical difficulties he still faces the educational tasks of examining and describing an existing situation, both to increase the sensibilities of people to it, and to provide knowledge and insight as bases for forming possible recommendations and policies. It is with such basic educational tasks in mind that the following analysis has been undertaken.

THE MENTAL MAPS OF QUÉBEC AND ONTARIO

A mental map, in the sense the term is used here, is a cartographic representation of a collective image of residential desirability (Gould, 1974). The technical intricacies underlying the construction of such maps need not detain us here, for the basic idea is simple (Gould and White, 1974). A sample of people at a particular location are asked to rank areas on a specially designed map. The map used in this study cannot be reproduced here, since it was designed in three colours, but it consisted essentially of the more densely inhabited areas of Québec and Ontario, with an overlay of 92 hexagonal cells. Each person works directly on such a map, ranking each cell in terms of his or her own quite particular preferences for permanent residence, supposing the context for such a choice were entirely unconstrained by economic considerations. The ordinal values are then combined in a weighted fashion to produce a perceptual score for each area considered. When plotted on a map, these values serve the same purpose as the spot heights of the surveyor making a topographic map, and they are used as the basis for drawing contour lines enclosing areas of equally perceived desirability. On such a map the hills and mountains are places highly desired, while the valleys are places disparaged.

We cannot reproduce and discuss all the mental maps created in the course of this research, but simply pick out examples that demonstrate the major findings. We shall go first to the medium-sized town of Oshawa in English-speaking Ontario and examine the mental map of sixteen-year-olds (figure 2). The peak of the mental map (100) lies directly over the perception point, and there is a broad plateau of residential desirability over most of southern Ontario. The most striking feature, however, is the strong contrast between Ontario and Québec: while the former is generally blanketed with large perceptual scores, there is a sharp cuesta formed by the steep gradient down to the low, thoroughly disparaged, and undesirable perceptual plain of Québec. Even Montréal is perceived as generally undesirable, and the area around Québec is only slightly above the lowest values on the entire map. If these young people of Ontario *had* to live in Québec, they would probably opt for the major cities; but, given a free choice, they appear unlikely to slide down the gradient and migrate across the border into a province that is perceived as quite alien to them.

If we now move to a town of roughly the same order of magnitude in French-speaking Québec, the view of sixteen-year-olds from Trois-Rivières gives us a very different residential desirability surface (figure 3). Here the peak is over Trois-Rivières, but the whole area along the St. Lawrence River to Montréal, and south to Sherbrooke and Victoriaville, is regarded very highly. A secondary peak, almost as high as Trois-Rivières, lies over the city of Québec (98), while a third appears to the north over La Tuque, perhaps because of the holiday and vacation land image of this area. The high areas on this mental map appear spatially somewhat more concentrated than in the case of Oshawa, although large scores generally blanket Québec, except for the virtually uninhabited areas in the north. With this exception, the steepest gradient on the surface is southwest to Ontario, and this mental map forms almost the exact opposite of the one from Oshawa. In brief, few young

people from Trois-Rivières would choose Ontario, although cities such as Toronto and London do form minor hills on he low plain, analogous to Montréal and Québec looking the other way.

At this point, we are going to move down the urban hierarchy, and look at the views from two distinctly rural towns of roughly the same size. Sixteen-year-olds at Bancroft (figure 4), have precisely the mental map we might expect. High scores blanket the province of Ontario; a ridge of high desirability runs through the urban areas of Oshawa, Toronto, Waterloo and London; and there are small outliers at certain vacation areas and at the federal capital at Ottawa. From the latter, the sharpest gradient on the entire surface descends to disparaged Québec, and even large urban areas, such as Montréal and the city of Québec, scarcely appear above the low plain. We have a spatial expression of cultural and geographic chauvinism here that is hard to match as the sharp drop coincides almost exactly with the Ontario-Québec border.

Within Ontario itself a small but important fact emerges. The young people from this rural town do not assign the peak of their mental map to their own area (88) but to the larger nearby town of Peterborough (100), and even Oshawa has a higher perception score (93). This is something that has been noted with great consistency in Sweden (Gould, 1974): young children in rural areas have the peaks of their mental maps over their own town, but as they grow older, and move into the middle and late teenage years, they assign a higher collective allegiance to large nearby towns. These are not necessarily the largest towns or the capital of the country (which may even appear as a Metropolitan Sinkhole), but those towns nearby with considerably larger numbers of people in them. It is almost as though older children and young adults produce a mental or perceptual "stepping-stone" effect, analogous to such upward hierarchical propensities noted in studies of rural to urban migration.

Exactly the same effect is seen on the mental map of fifteen-year-olds at the small rural town of La Tuque (figure 5). The peak of the surface is at Québec, and even Trois-Rivières shares the same high perception score as La Tuque itself (91). Much of the St. Lawrence Valley southwest to Montréal is also highly regarded, and Ottawa now forms a distinct outlying node of desirability. So far, the mental map conforms to our expectations based upon the previous example at Trois-Rivières (figure 3).

But there is one striking, and possibly important, exception: whereas the mental map from the medium-sized town of Trois-Rivières totally disparaged Ontario, this collective image of rural teenagers has some of its highest peaks in the southwestern portion of the English-speaking province. A ridge of high desirability joins Toronto and Hamilton (88 and 81 respectively), while London and Windsor also form peaks along a high ridge. It would appear that rural teenagers in Québec, as opposed to their urban peers, play down the difficulties of fitting into a different linguistic and cultural community, and weigh far more heavily the presence or absence of large urban areas. With only a few examples we can only speculate upon the reasons for such striking contrasts at this point, but it may be that the La Tuque teenagers have a considerable sense of isolation, of "being out of things", and that their view of "where it's at" is strongly conditioned by flows of information generated by mass media concentratiing upon human events in the cities.

A second reason, based upon a direct comparison with Sweden that is supported by considerable evidence, is that out-migration from the La Tuque area, cumulatively reinforced by information feedback effects, may have been heavy to the cities of both Québec and Ontario. Many teenagers may have subsequently visited relatives, and acquired information of their own outside the usual communication channels of mass media. A final reason for which it is possible to marshall some evidence is that these young rural people,

Figure 2

THE MENTAL MAP OF SIXTEEN-YEAR-OLDS AT OSHAWA, ONTARIO

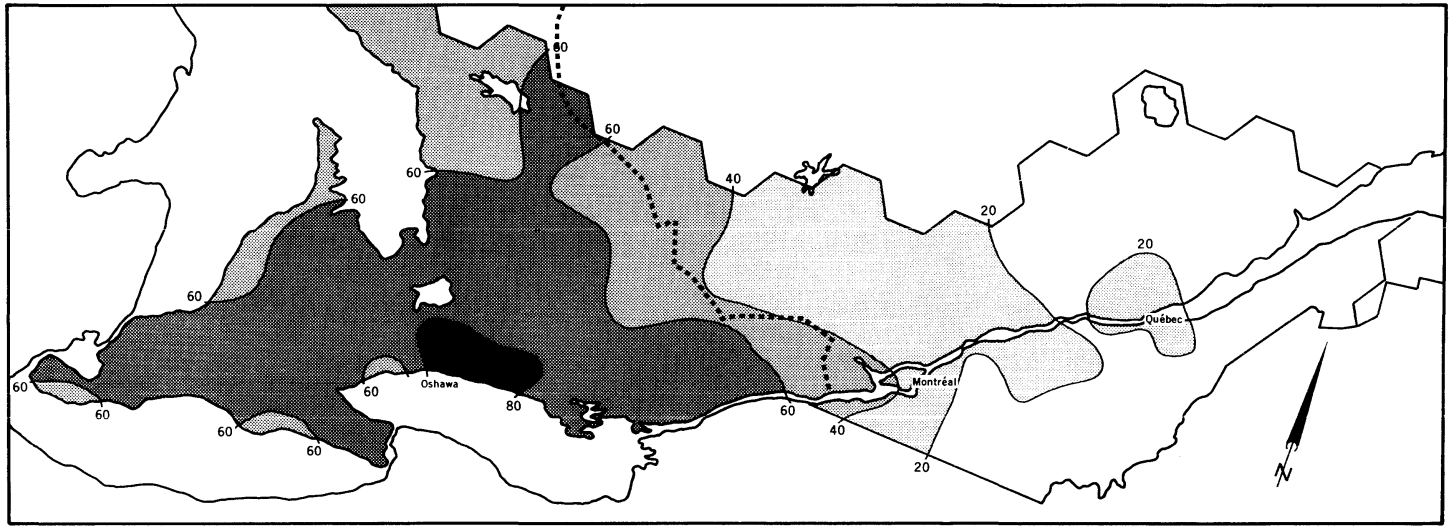


Figure 3

THE MENTAL MAP OF SIXTEEN-YEAR-OLDS AT TROIS-RIVIÈRES, QUÉBEC

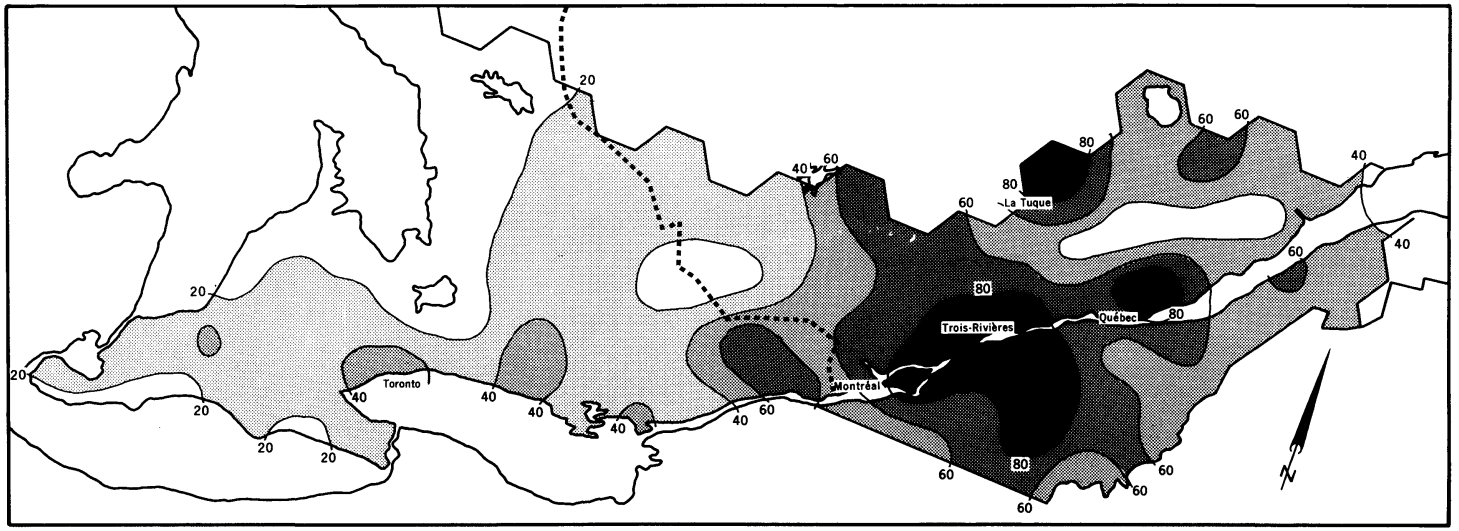
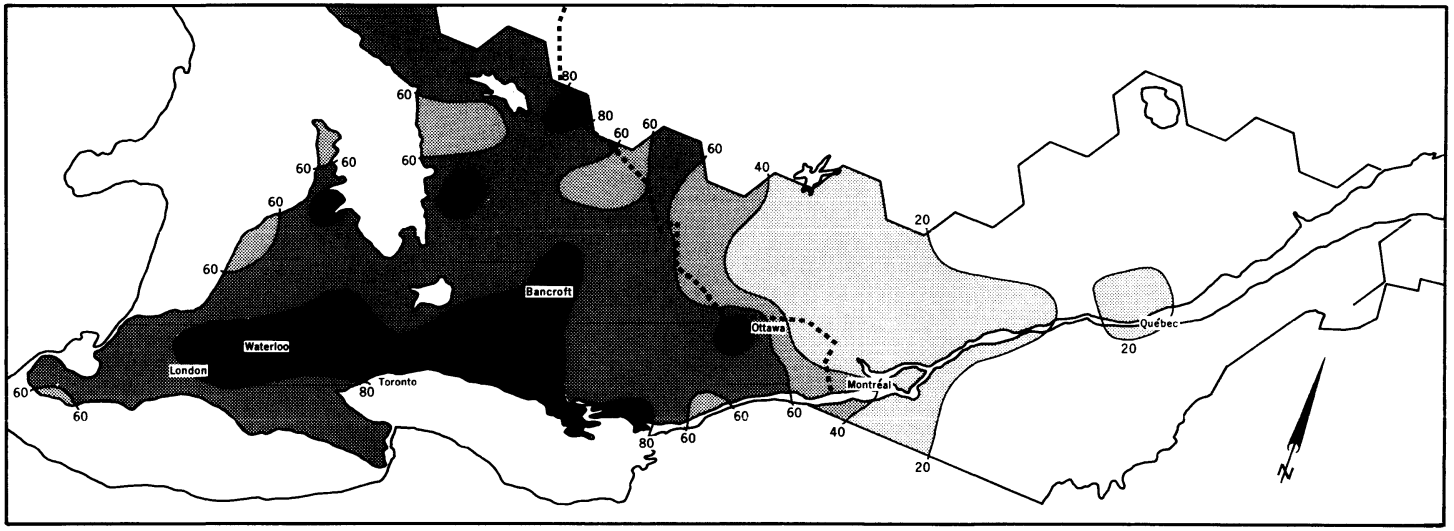
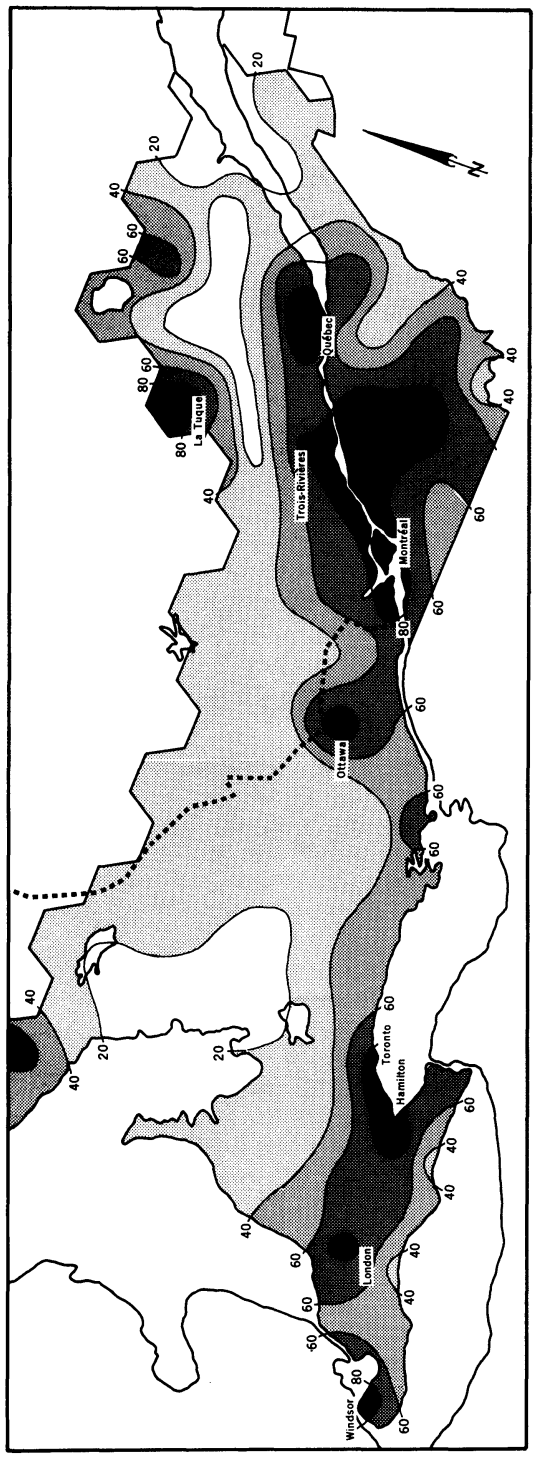


Figure 4

THE MENTAL MAP OF SIXTEEN-YEAR-OLDS AT BANCROFT, ONTARIO





THE MENTAL MAP OF FIFTEEN-YEAR-OLDS AT LA TUQUE, QUÉBEC

Figure 5

perhaps because of more open and less provincial schooling, are not simply assimilating the attitudes of their parents, but are slowly changing these rather stable and tenacious mental images that are handed on from one generation to another. For example, if we map the differences between the teenage and adult mental maps from La Tuque (that is, we literally subtract the adult perception surface from that of the fifteen-year-olds), we expose areas over which there are some differences of opinion (figure 6). Notice how this set of teenagers generally regards Ontario in a more favorable light than the adults, particularly in the southwest. The zero line, where adult and teenage views are the same, tends to parallel a considerable length of the boundary between the two provinces. Conversely, the towns of Québec are generally less well regarded by the teenagers compared to the adults, although as we have seen from their mental map (figure 5), this does not imply any active dislike. We are concerned here only with differences and comparisons, not absolute values of perception scores.

Unfortunately, such changes between children and adults are not always found to such a marked degree in samples from Ontario. If we subtract the adult from the teenage mental map at Oshawa, the differences between the two viewpoints are small, and appear widely scattered over the map. An area of marked adult preference lies to the north of Oshawa, and may represent a desire on the part of adults to retire to a close and well-known vacation area, but most of the differences are small, and the contrast with the La Tuque difference map is marked. As a result, we have some indication that Ontario preferences tend to harden quite quickly, so that teenage views virtually perpetuate those of an older generation. It should be emphasized that these are only tentative indications, because the comparison of mental maps raises formidable technical, mathematical and inferential problems which have not been solved in any truly satisfactory way at the moment (Gould, 1974).

We have considered widely differing mental maps drawn from samples of young people in medium and small towns well within both provinces. We shall now examine two mental images from approximately the same location, contrasting the views of English- and French-speaking teenagers in Montréal. The mental map of English-speaking fifteen-year-olds at Pointe-Claire (figure 7), must raise, in a spatial and geographic context, grave questions about the ability of one culture to assimilate, or even comfortably and compassionately integrate, a small group from the other. Although the peak of the surface is over Montréal, the whole view is sharply biased towards English-speaking Ontario and away from Québec, with a high ridge running southwest along the major urban peaks of the lake shore, and into southern Ontario as far away as Windsor. Québec City is a smaller node, but its score (62) is the same as that of many rural areas in Ontario.

The mental map of French-speaking seventeen-year-olds at Pointe-aux-Trembles, only a few kilometers away in geographic space at the other end of Montréal, forms a striking contrast of diametrically opposite bias (figure 8). The equivalent ridge of residential desirability now runs northeast along the entire St. Lawrence Valley as far as Rimouski, while Ontario is totally disparaged, with the minor exception of Toronto, the urban outlier equivalent to Québec on the English-speaking surface from Pointe-Claire. Although these teenagers may be only a few kilometers apart in geographic space, they are literally leagues apart in information space. Their strikingly contrasting mental images are shaped by entirely different streams of information, some of which impinge upon them through different linguistic channels, while others are presumably acquired in active patterns of search and travel, either to vacation areas with congenial, common-language fellow tourists, or to relatives, family and friends sharing the same language and culture.

Figure 6

THE DIFFERENCE MAP BETWEEN FIFTEEN-YEAR-OLDS AND ADULTS AT LA TUQUE, INDICATING WHICH AREAS ARE MORE PREFERRED BY EACH GROUP

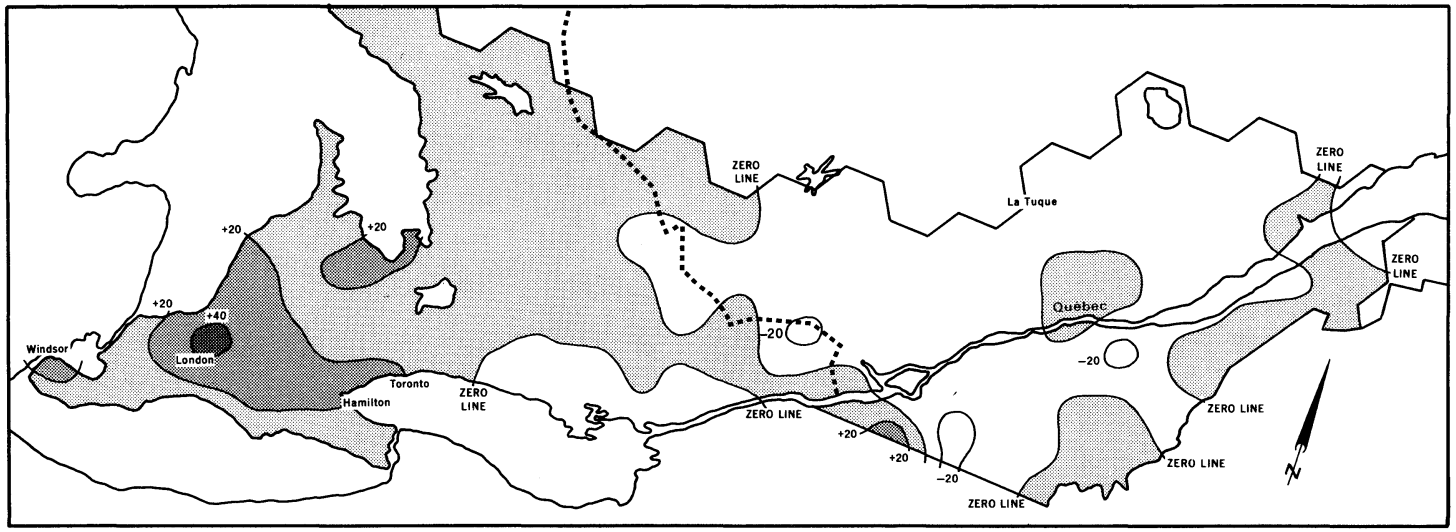


Figure 7

THE MENTAL MAP OF ENGLISH-SPEAKING FIFTEEN-YEAR-OLDS AT POINTE-CLAIRE NEAR MONTRÉAL

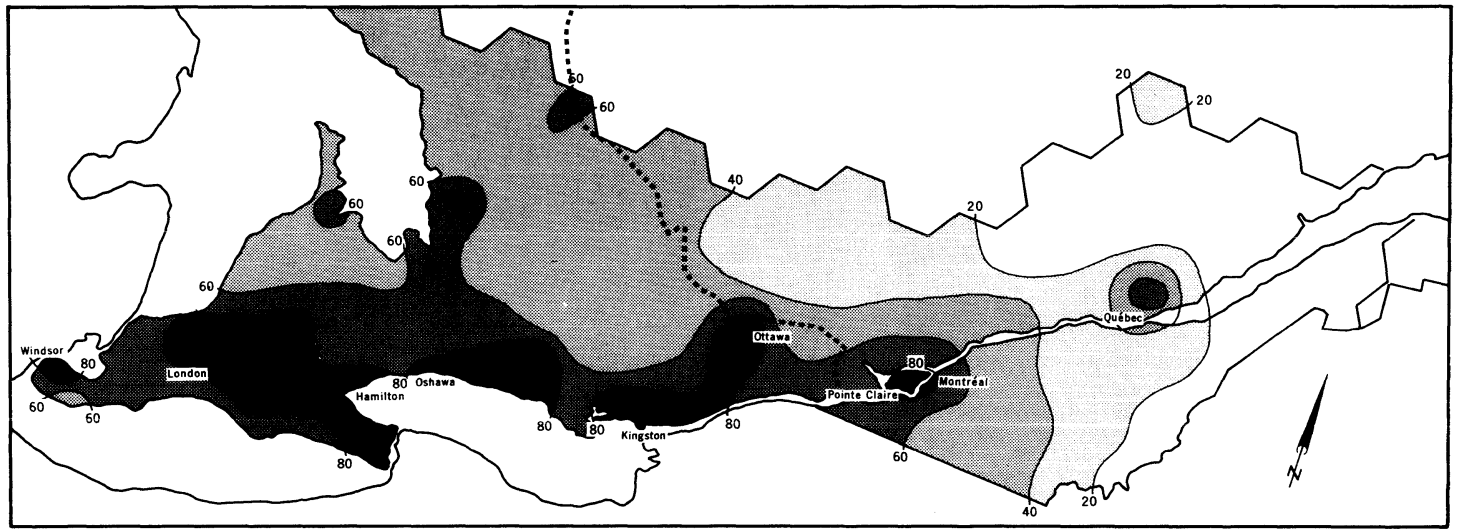
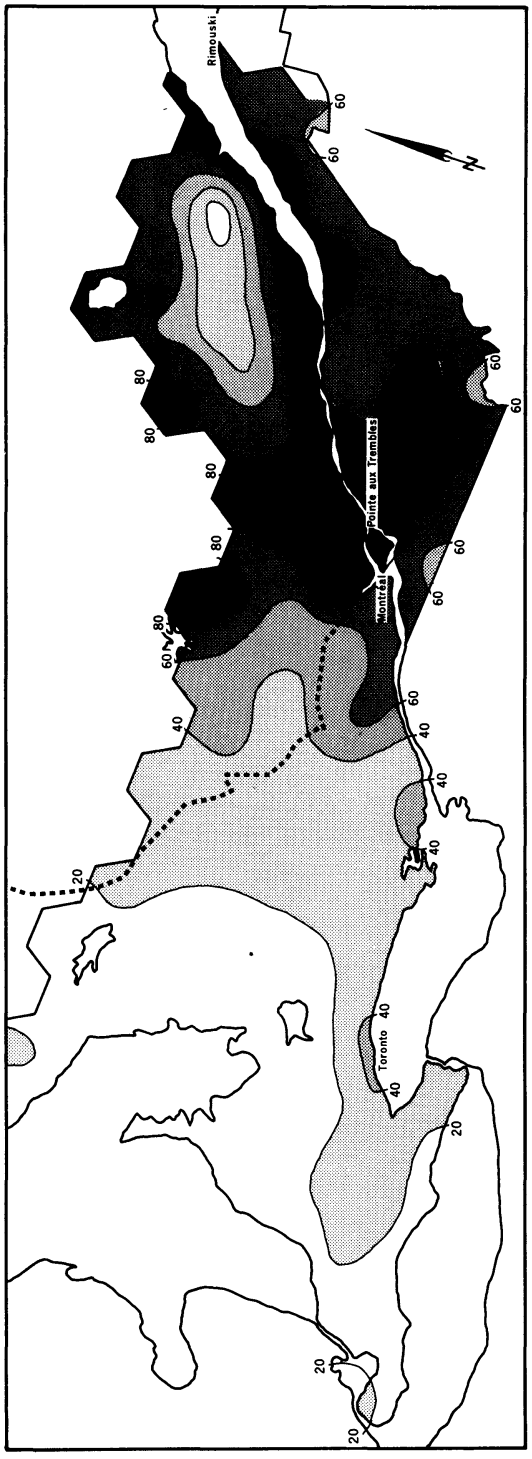


Figure 8

THE MENTAL MAP OF FRENCH-SPEAKING SEVENTEEN-YEAR-OLDS AT POINTE-AUX-TREMBLES NEAR MONTRÉAL



Spatial information displays such vivid contrasts, that one can only worriedly speculate about the degree to which common sources of information are shared by these communities. If we have the imagination to perceive that people live in other, abstract spaces, which in a very concrete sense may represent the "real world" much more relevantly than conventional geographic space (Atkin, 1974, 1977, 1980), then it would appear that the French- and English-speaking communities, while residing in the geographic space called Montréal, are living in quite different locations in our new spatial reality. What we require are maps—quite literally mappings in the deepest mathematical sense—of these spaces which could become much more pertinent for policy making, particularly in the areas of child, adult, and general public education. Such maps of abstract, but more relevant spaces, in which the people of Canada are truly located and embedded, would not only help in the formation of humane and compassionate policy, but increase the sensibilities of all Canadians to the problems of mutual respect and understanding. It is in this area that the role of the scientist cannot be divorced from that of the humanist. We require in these, and other adjacent areas of the human sciences, a return to the very best of eighteenth century traditions of humane inquiry.

INFORMATION IN A RESTRICTED GEOGRAPHIC CONTEXT

Throughout the discussion on mental maps, we have raised questions about the streams of information to which the children and young adults have been subjected, and the way in which such varying streams of information can warp and bias the surface of a mental map displaying the collective image of residential desirability across geographic space. It is time to address the question of information head on, since the existence of biased information streams may well emerge as a crucial component in many areas of human analysis that are of direct relevance and concern to policy makers, educational authorities, and concerned members of the public—including those directly responsible for the dissemination and presentation of information. Unfortunately, this is easier said than done: while the subject of information is emerging ever more prominently as a critical component in social and behavioral research, the concept is one of those intuitively obvious, but extremely slippery, ideas which appears difficult to pin down and measure. The measurement task is particularly formidable, and it is not helped by exhortations from human scientists who appear unwilling themselves to enter an area that must be inevitably messy and unsatisfactory in the initial stages of inquiry. Such exhortations are usually made by members of the "Plaza Toro School of Social Sciences", and those familiar with the operettas of Gilbert and Sullivan will recall that the Duke of Plaza Toro was most energetic in leading his troops—from behind!

Faced with such difficult definitional and measurement tasks, we shall have to be content with very simple surrogate measures that are easily acquired without enormously expensive, and frequently unsatisfactory, content analyses. Thus, we shall limit our examination of information to a very small subset of all the information children have; namely, conventional geographic information about place. Since we cannot constantly monitor the spatial content of the minds of children, we need a quick, efficient, and above all considerate way of getting them to dump out of their "black boxes" whatever geographic information they have in their permanent "core storage" or memory. Accordingly, and before the mental map questionnaire was given out, the children were asked, without any warning, to take a blank sheet of paper, and in a timed five minutes write down as quickly as they could all the places (cities, towns, and villages) they could think of in Québec and Ontario. Individual responses, like most unique phenomena, are not very meaningful, but when the responses of many children are plotted, we may map such aggregate expressions as information surfaces.

For example, seventeen-year-olds at Oshawa (figure 9), have a highly peaked surface centered upon Oshawa itself, and it is important to note that the intervals between the contour lines are now *geometric* (5, 15, 45 and 135), rather than arithmetic. Information, like so many other forms of human phenomena, appears to produce sharp, exponential gradients over geographic space. The "information field" or distance decay effect is marked, with steep gradients in all directions from the peak centered over Oshawa down to practically zero levels. We have an indication that the gradient is somewhat steeper to the east, towards Québec, and that there is some slight warping in a north-south direction. Québec is a virtual desert of information for these children, with the exception of two intruded domes at Montréal and Québec City.

Whatever groups of children we happen to chose in Ontario, virtually the same information surface appears. Comparisons between ages indicates that basic spatial information is generally acquired by the early teenage years, and alters little thereafter. We also have strong evidence that this is the same case in Sweden (Gould, 1974). The surfaces for the older teenagers are slightly higher, but the basic configuration remains the same as that of the younger children.

It should come as no surprise at this point that the information surfaces of French-speaking young adults of the same age display similar but opposite biases. At Pointe-aux-Trembles (figure 10), the information field is far from symmetrical. On the contrary, gradients to the west are extremely sharp (recall, again, that we have geometric intervals between our contour lines), there is a strong warping towards Québec, and most of Ontario is a desert of information at zero level, with the few exceptions of Ottawa, Toronto, London and Windsor.

It is clear that spatial information varies widely across the map: large *populations* tend to generate more information than the less-densely settled rural areas; *distance decay* effects are strong in all the surfaces we have examined (and in many others examples from Québec and Ontario which we have been unable to examine here); and *cultural biases* are evident according to the group being sampled. Even in a culturally homogeneous society, like that of Sweden, geographic information varies widely because of size and distance effects. That is:

$$\text{Information} = f \left\{ \begin{array}{ll} \text{Population of a} & \text{Distance from the} \\ \text{generating cell,} & \text{sample point} \end{array} \right\}$$

Usually the information a group of children have about the surrounding areas may be fairly accurately estimated by such equations as:

$$1n\,(I + 1) = a_{1.23} + b_{1.23}\,1n\,\text{Population} - b_{13.2}\,\text{Distance}$$

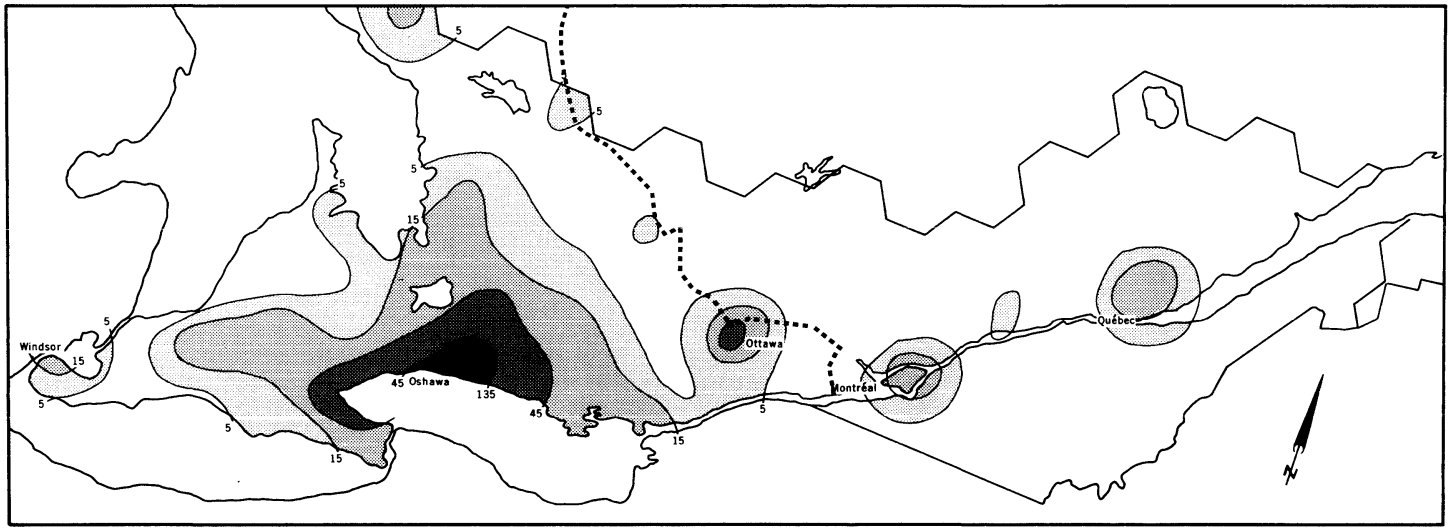
A basic question, however, is the degree to which cultural and linguistic factors shape the mental maps and information surfaces. We noted initially that there are considerable technical difficulties to be faced in trying to estimate such barrier effects. In essence, we have to try and slip out the ffects of population size and distance, and then try to measure the residual effect, which may be ascribed to language and culture. Although the results are tentative and technically unsatisfactory, it is sometimes worth reporting such failures since it is only from our difficulties that we can learn (Popper, 1963).

TRYING TO MEASURE CULTURAL BARRIER EFFECTS

We shall take as our examples the information surfaces of seventeen-year-olds at Oshawa in Ontario, and Pointe-aux-Trembles in Québec (figures 9 and 10, respectively).

Figure 9

THE INFORMATION SURFACE OF SEVENTEEN-YEAR-OLDS AT OSHAWA



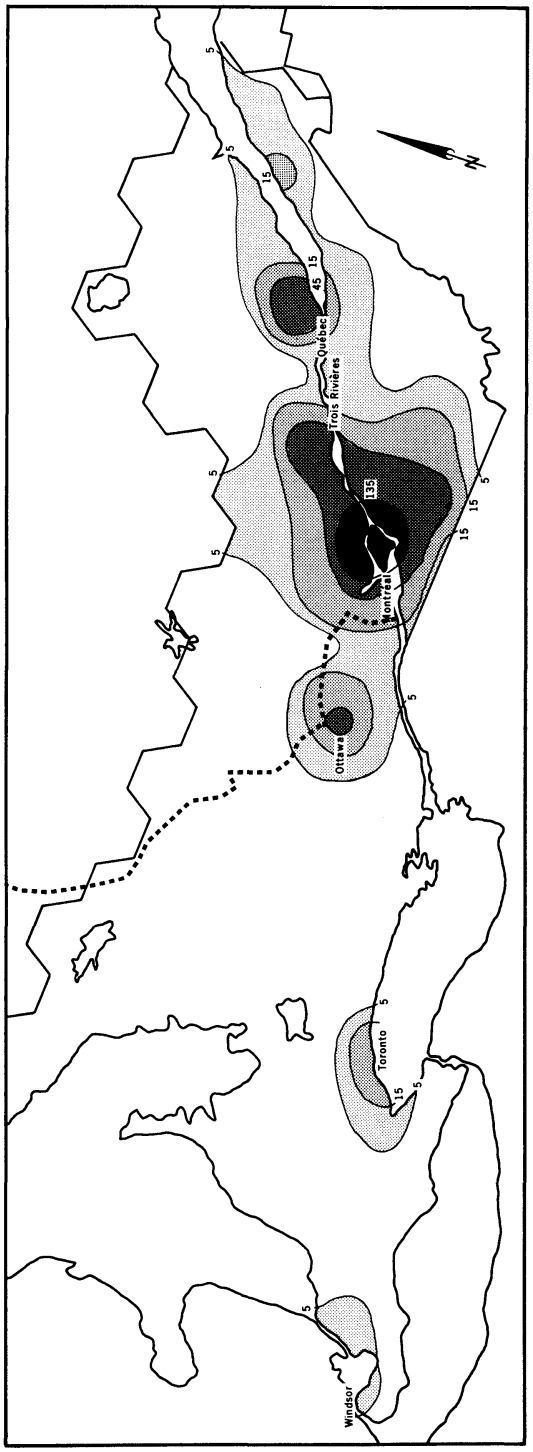

THE INFORMATION SURFACE OF SEVENTEEN-YEAR-OLDS AT POINTE-AUX-TREMBLES
Quebec
Trois Rivières
Montreal
Ottawa
Toronto
Windsor
135
45
15
5

Figure 10

If we were dealing with a culturally homogeneous population spread evenly over the land, we might well expect information to drop consistently away from the sample point, to form a symmetrical cone of information, or a series of concentric circles when plotted as contour lines on the map. Such, obviously, is not the case in Québec and Ontario: the people cluster in sharp exponential peaks, representing the towns and cities, and we are aware that we are not dealing with a culturally homogeneous society. Our information surfaces are undoubtedly reflecting variations in such population and cultural factors, as well as pure distance decay effects.

To examine a function between information and population (assuming implicitly that it is mainly people who generate information), we require the population of each cell on the map. By working with detailed census data, maps of census tracts, and maps of villages, towns and cities, it is possible to assign the populations of Québec and Ontario fairly precisely to the hexagonal cells. We have considerable evidence that such spatial assignment problems are not nearly as difficult as it is normally supposed, although the work may be time-consuming and tedious. Error terms of misassignment tend to be very small (Nordbeck and Rystedt, 1972).

If we plot the natural logarithms of the information scores plus one (1nI + 1), against the logarithms of the populations (1nP), the expected and moderately positive relationships are confirmed (figures 11 and 12). If we distinguish between the Ontario and Québec cells, however, notice the way in which virtually all the Québec dots are below those of Ontario on the Oshawa plot (figure 11), and *vice-versa* on that for Pointe-aux-Trembles (figure 12). Generally speaking, in Ontario the information the children have about a particular cell rises with increasing population ($r_{1.2} = 0.59$), but many of the Québec cells are at zero level, and it is almost as though these have to reach a distinct threshold level (around 1nPop of 12.0), before their ability to generate information rises rapidly. The same is true of the Pointe-aux-Trembles example: information rises with increasing population ($r_{1.2} = 0.58$), but this time Ontario cells lie consistently below those of Québec, and it appears that they must also reach a threshold level (1nPop about 11.0), before generating much information.

The relationship between information and population is far from perfect, for other variables are obviously important. If we plot the residuals (that is the differences between the *expected* amounts of information per cell according to the general relationship to population, and those actually observed), it is clear that distance relationships are of the utmost importance. If we now incorporate distance as a variable in our analysis, our ability to account for the variation in our information surfaces increases substantially, with equations of the form:

$$1n(I+1) = -1.5766 - \underset{(.48)}{0.38631nP} - \underset{(.51)}{0.005205D} \quad (R_{1.23} = 0.77)$$

and:

$$1n(I+1) = -2.2792 + \underset{(.59)}{0.43881nP} - \underset{(.47)}{0.005202D} \quad (R_{1.23} = 0.74)$$

for Oshawa and Pointe-aux-Trembles respectively.

Our ability to predict the amount of information in a cell from population and distance is hardly perfect, however, and again we can plot the differences (residuals) between our expected information values according to our equations, and the actual, observed values.

If there is a cultural-linguistic variable actually affecting the amount of information children have about a particular cell on the map, in essence a barrier effect cutting down information from the alien cultural area, then it should be exposed at this point—namely, *after* we have slipped out the effects of population and distance. In other words, if we incorporate the fact that a cell lies in Québec or Ontario, that its people are basically of French or English culture, will this significantly increase our ability to account for variation in information levels across the map? We realize that the cultural-linguistic boundary does not coincide exactly with the provincial boundary. But in this first, and still tentative probing of the problem, conducted in part to expose the technical difficulties involved, we have made this rough assumption. Such an assumption would weaken, or underestimate any cultural barrier effect, rather than falsely accentuate it.

It is here that we face very difficult technical problems which arise (1) from the fact that the variables we are considering (population, distance, and culture) are not independent of one another; and (2) because recent theoretical work has exposed the danger, not to say the folly, of interpreting and comparing the parameters controlling the effects of distance in our equations (Curry, 1970). If, for example, we incorporate a so-called dummy or qualitative variable, coding the Québec cells one (1) and the Ontario cells zero (0), we can add such a cultural variable to our analysis and test whether such cultural differences produce any significant changes in our predictive abilities. If we do this rather blindly, however, the results are disappointing because our overall relationships are increased only very slightly (0.77 to 0.79 for Oshawa, and 0.79 to 0.81 for Pointe-aux-Trembles). The equations after adding the cultural variable are:

$$\text{Oshawa: } \ln(I+1) = -1.7399 + \underset{(.48)}{.03867nP} - \underset{(.30)}{0.003081D} - \underset{(.24)}{0.7550C}$$

$$\text{Pointe-aux-Trembles: } \ln(I+1) = -3.9880 + \underset{(.65)}{0.48671nP} - \underset{(.20)}{0.002249D} + \underset{(.43)}{1.1572C}$$

where the standardized regression coefficients are shown in brackets beneath the usual parameters.

Superficially it might appear that cultural differences are absolutely irrelevant. But this is not true: the problem is that in both cases the other culture area is always farther away from the perception point than the local culture, so that culture and *distance* (a variable already incorporated into our analysis) are themselves highly interrelated. This means that when the cultural variable enters our analysis, the population effect remains almost unchanged, but there is a drop in the distance effect to compensate. We could, in fact, use the two variables, culture and distance, almost interchangeably. Indeed, in the case of Pointe-aux-Trembles, culture is a slightly more potent variable than distance. The naivety of our initial regression example (figure 1), where the difficult realities of two-dimensional geographic space were collapsed to the single dimension of distance, is distressingly exposed and highlighted. We cannot, at this point, distinguish between distance and cultural effects. That both are operating seems clear from the manner in which the addition of one of them to our analysis results in a compensatory lowering of the other. But they are so tightly convoluted in these examples that it has proved impossible to separate them out, let alone measure and compare cultural barrier effects between Québec and Ontario.

Nevertheless, whether cultural or distance variables are added separately or together to population, we *can* estimate reasonably well the geographic information a group of

Figure 11

RELATIONSHIP BETWEEN INFORMATION AND POPULATION OF SEVENTEEN-YEAR-OLDS AT OSHAWA

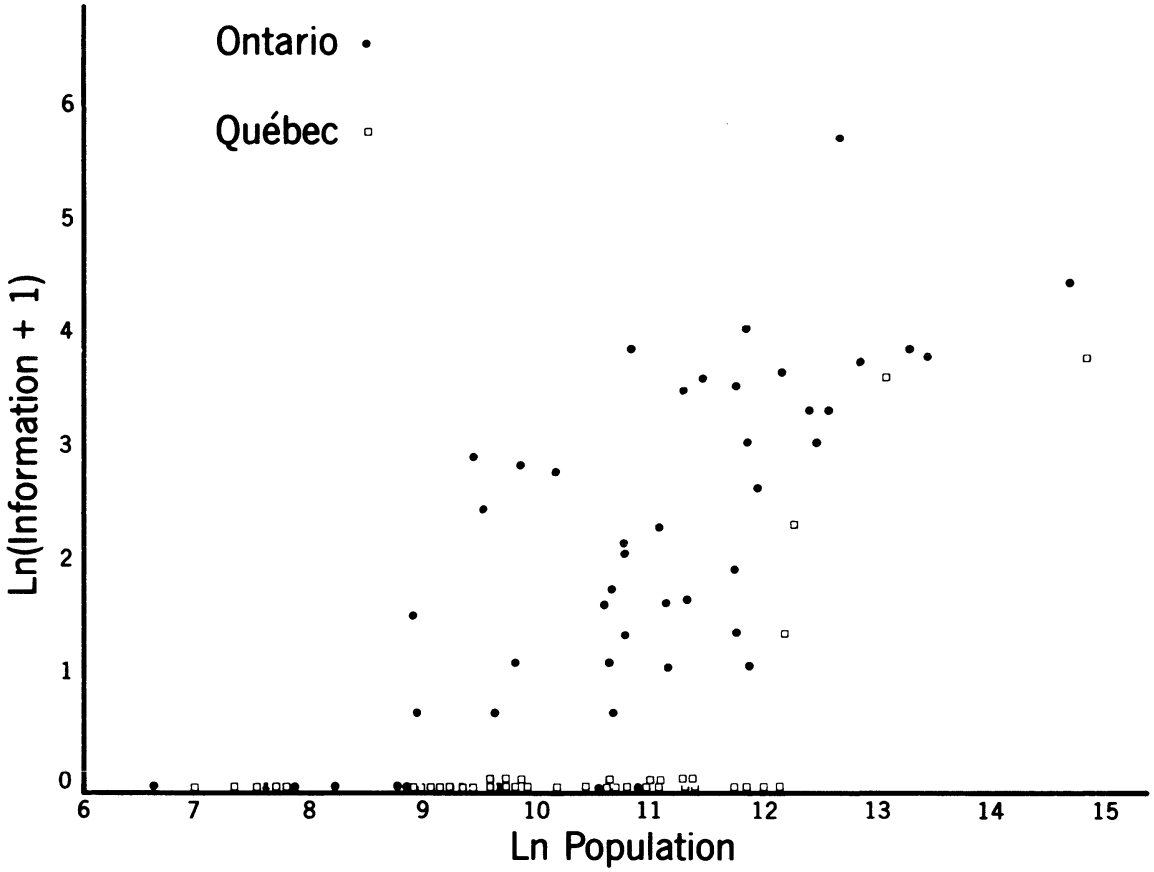
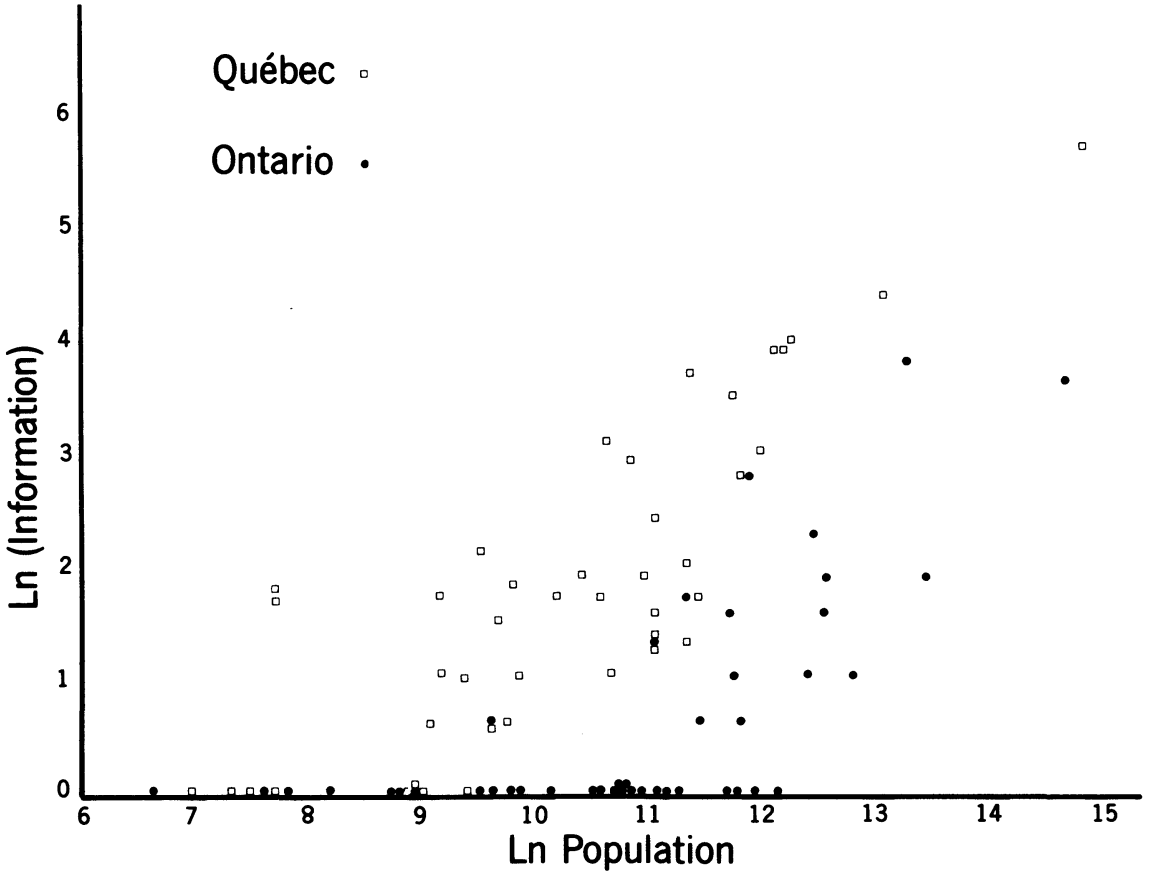


Figure 12

RELATIONSHIP BETWEEN INFORMATION AND POPULATION FOR SEVENTEEN-YEAR-OLDS AT POINTE-AUX-TREMBLES



children will have about a particular cell. Location has a strongly determining effect upon the information children have. It is, in fact, *location* within the dynamic, moving streams of information that emerges as a crucial factor in this analysis. Admittedly, we have been forced to examine only a small, and quite particular, subset of spatial information, but the fact that the hills and valleys of the information surface are highly predictable should make us think carefully about (1) the content of other streams of information to which children are subjected, both on an informal and formal basis, and (2) the maps of other, more abstract "information" spaces, and the effects of location in these less familiar, but perhaps more relevant, realities.

QUESTIONS, SPECULATIONS, AND POLICY IMPLICATIONS

We have examined, in a pilot study format, some of the mental maps held as collective images by groups of teenagers and young adults in Quebec and Ontario. Three broad areas of concern have emerged implicitly which are not only of academic interest, but whose further exploration have direct implications for public policy. These may be summarized as: 1) the degree of commitment by public bodies to both basic and applied research in the human sciences; (2) a concern for creating a diverse society characterized by mutual respect and consideration for cultural differences; and (3) reciprocal relationships between the urbanization and migration processes, and the degree to which thoughtful intervention can steer a society towards desirable alternative futures.

Ideally, the responsibility to recommend public policies should be underpinned by two prior and fundamental abilities: the ability *to know*, or in other words the ability to base policy recommendations upon secure and pertinent knowledge; and the ability *to assess*, that is the ability to monitor policies with reasonable fidelity, so that their effectiveness may be judged. Quite apart from the necessary political and financial constraints placed upon public decision-making, effective public policies are difficult to create because of the extraordinary complexity of the human society to which they must be applied. Much of the time it is not at all intuitively obvious what might, or should, be done. Even the pertinent facts are often unavailable, let alone the insight as to the way in which such facts are structured, related, and affect one another. But such insights are increasingly crucial in modern, post-industrial societies, for we are slowly realizing in a formal analytical sense what perspicacious civil servants have always known intuitively—that the complexities of both society and its individual human components are so great that policies designed to improve may, in reality, work in a totally counter-intuitive fashion (Forrester, 1973).

Two specific examples of such complexity emerge from this study. Our ability to measure and assess, and so monitor changing barrier effects, is extremely limited, particularly when these have a distinct geographical component to them. The assessment of such effects can hardly be considered irrelevant to a society characterized by biculturalism, but the ability to gauge and evaluate rests upon the ultimate resolution of difficult technical questions arising from the calibration of gravity models and the convolution of behavioral and spatial autocorrelative effects.

Secondly, the information streams to which the children and teenagers are subjected are difficult to specify, and even more difficult to measure. Yet we have seen that location within such "information spaces" is a vital determinant of the shape of the information surfaces, and the mental images they form. We know virtually nothing about such information spaces, and our abilities to inquire in this area are limited in the extreme. Yet such research, while lacking perhaps immediate application, should ultimately provide considerable insight in large areas of direct public concern, such as migration policy and education. Faced

with such distinctly different and biased information fields on the map, it is difficult to see how the awareness and sensibility of both professional educators and the ordinary public cannot be heightened.

To outsiders, Canada appears as one of the few modern, bicultural societies to escape large-scale, suppressive conflict. There can be few thoughtful men and women in government who do not have a deeply humane concern to reduce any tendency to growing Us-Themism. Yet we saw in the mental maps of children how these images crystallize out at an early age. First impressions are clearly vital, and attitudes once absorbed are hard to change. In Ontario, for example, it appeared as though children were absorbing the adult mental maps almost exactly, with their steep gradients down to a disparaged Québec. The same was true from the Québec side, although here there were some indications that the teenagers were less chauvanistic than their parents or their peers in Ontario. If true, this would confirm, in a spatial and geographic context, the findings of the Royal Commission on Bilingualism and Biculturalism (Johnstone, Willig and Spina, 1971).

We also saw the way in which the mental images of English- and French-speaking young adults at the same location were strongly biased towards their own cultural areas, and how the information surface of the French-speaking group also appeared warped by the effects of language and travel. A willingness, and even desire, to dwell amongst people is surely one measure of cultural affinity, openness of mind to other ways of thinking, a sense of pleasure in variety, and, at a very fundamental level, mutual respect and tolerance for differences in human culture. The mental maps and information surfaces display a sense of spatial or locational disparagement than can hardly be encouraging to those who would further such aims in the education of children.

Thirdly, and finally, the mental maps that children have of residential desirability may well give us important insights into the processes of migration—from province to province, from town to city, and from countryside to town. We cannot generalize at this point with so few specific examples. But we can, indeed must, legitimately speculate, particularly where we have some evidence from another post-industrial society to support our ideas. It is worth examining carefully the possibility that young people in medium and large towns are likely to stay within their own provinces and culture group. In small towns in Ontario, young adults appear likely to move to larger towns within the same province, if they have the opportunity, although once they have settled down as adults the peaks of their mental maps shift back to the home areas. In small towns of Québec, however, the mental maps have a number of peaks over the major urban areas, and while the highest of these lie in Québec, other major nodes of urban desirability lie in Ontario. This represents not only a marked contrast to the Ontario mental maps for the same peer group, but a distinct change from the adult, or parental maps. Perhaps children in Ontario, knowing themselves to be in the linguistic majority group, make little effort in general to learn French, regarding it as a subject to be "got through" and then dropped. Such attitudes inevitably cut down later in life the information flows which are generated by the people of French-speaking Québec. In contrast, it would appear that French-speaking children make a greater effort to learn the dominant national tongue, and in their later teenage years, as linguistic facility grows, they are exposed to more and more information generated initially in the English-speaking areas.

We have some indication that mental maps, or rather more complex multi-dimensional versions of them, can predict with considerable accuracy the streams of migration from a particular place to others (Lloyd, 1974). That is, we can combine in a weighted fashion the scores of the map cells on a number of relevant dimensions, and use these values to predict the proportions of migrations to other cells. Pushing further back, it also appears

possible to create cognitive spaces, in which the desirability of areas are evaluated along two or three fundamental scales. These scores may be similarly combined to predict the mental maps, so we have some chance of creating chains from cognition to preference to behavior. Whether such an analysis could be replicated for Québec and Ontario, and at the spatial scale employed in this study, is unknown at the moment, but it would have important implications for guiding public policy concerned with the urbanization and migration processes.

And it is upon this theme of public policy that we wish to end, using as a thought-provoking foil the policies and decisions of a more advanced, post-industrial society. To what end are we going to put research on such basic geographic questions as migration, urbanization, and the closely related problems of changing locations of employment opportunities? Will the people, through government, be content to monitor an on-going situation that is constantly backing into an unforeseen future, or will there be a growing realization that alternative paths to alternative futures lie ahead, constrained only by the tenacity and inertia of present spatial patterns and current forms of thinking?

In Sweden, there is a growing realization that monitoring on-going systems simply to learn where they are going is a primitive, and ultimately futile business. Primitive, because it does not employ human imagination, reason, and perspicacity to devise a better, more humane future; futile because no matter how well we measure, monitor, structure and analyze our social and geographic systems, we can never predict their exact future courses. Even in the most precise physical science every observation has an error term. In human systems these are likely to be large (Morgenstern, 1965), and we can think of epidemics of uncertainty rapidly diffusing through even our most carefully measured and specified models. Ultimately the error terms overwhelm our system, and our ability to specify the position and trajectory of our system is reduced to zero. We have reached the *ignorance time* (Linhart, 1973). Since ignorance times in human affairs are likely to be short, predictions about vital aspects of human societies are likely to be off—sometimes considerably off, as every demographer knows. Sweden appears to be asking different sorts of questions (S. O. U., 1972): not questions of where we are going, but where do we want to get to? They are determined, for example, to avoid a Scandinaviopolis, and they do not want large and still-burgeoning cities. They monitor the North American situation very closely, because it appears to give them some lead time to avoid some of the chronic mistakes of human, societal, and spatial organization exemplified on that continent. Accordingly, they are moving towards deliberate policies of decentralization, with government setting the example by placing many agencies in smaller towns around Sweden, and substituting twenty-first century electronic communications and hookups for nineteenth century anachronisms. Moreover, the opening and closing of industrial plants, literally the creation and destruction of employment opportunities for men and women and their families, is aided and abetted by government policy, and the worst effects are cushioned by humane programs of reeducation and retraining, help in moving, and aid in finding new and rewarding employment opportunities. It is clear, from the adult mental maps of Sweden, that the peaks are almost invariably over the local areas. People are comfortable with the familiar friends, faces and scenes, and many fear the psychic trauma of locational change which can be so severe. To what extent are the mental maps of people on this side of the Atlantic the same, and to what extent do we wish to think through such alternative ways of meeting basic human needs?

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