

printer can have a maximum of 119

segments (the first print position is utilized to control line spacing), and therefore the array would require 119 memory locations if a 120 position printer is utilized.

9. End points array: the printing position of the right end point of each segment of a scan line requires two memory locations on the G.E. — 225 computer and thus a 120-position printer requires 238 (2 x 119) memory locations.

10. Printing symbols: printing symbols supplied by the user of the program will require 150 memory locations if provisions are made for a maximum of 150 statistical classes.

The implementation of this program on the G.E. — 225 computer at San Fernando Valley State College provides for twenty lines of remarks, for one variable format card, for 150 statistical classes, for a 120-position printer, and for 1000 unit-areas. With these requirements, 842 memory locations remain unused after the system monitor, system sub-routines, the program proper, and the various data arrays are located in the computer's memory. A computer smaller than the G.E. — 225 (8K memory) can be utilized by reducing the number of unit areas and by removing some of the options from the program.

SUMMARY

The scan line method of producing maps on the line printer of the digital computer requires little capacity for core storage in digital computers and therefore provides a general opportunity to produce some kinds of maps on computer line printers. Moreover, the size of the map that can be produced is not restricted by the memory requirements of the program. The algorithm presented here should make it feasible for more geographers and for more students of geography to become familiar with, and to utilize, the digital computer for the making of maps.

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PERSONALITY AND BEHAVIOR IN ENVIRONMENT

J. SONNENFELD

*Texas A & M University*

ABSTRACT. A concept of environmental personality is introduced which applies to behavior in the geographic environment, defined operationally as a non-interacting environment. A personality inventory was given to a mixed sample of some 350 individuals. It includes four basic measures of environmental behavior or behavior potential; these relate to environmental sensitivity, mobility, control, and risk. Results obtained by analysis of age, sex, residence, occupation, and education seem to verify the utility of the measures for distinguishing group differences.

IT has been apparent for some time that the physiology or culture or environmental experience of individuals and groups is too variable to be accounted for simply by reference to different kinds of environmental behavior of individuals and groups. Within any population there may be found risk-takers and risk-avoiders, those who are sensitive to environment and those who

are insensitive to it, those who seek out the exotic and those who prefer the conventional, those who are mobile and migratory by disposition, and those who appear wedded to place. The population in which these types are found may be quite homogeneous in racial physiology; all may have been equally exposed to the traditional group culture; and all may have had equivalent experience with environment. Yet individuals will differ one from the other, and similar differences may be found among populations who differ in race or culture or environmental experience. The behaviors may be differently manifest in different populations, but these will still be recognizable as involving risk, or sensitivity, or a restlessness which causes one to seek out the different in environment.

This tendency to behave in certain ways is a function of personality which is specific to behavior in the physical environment, and which implies a behavioral potential, a predisposition to behave in a certain and consistent fashion in environment.

The significance of personality for understanding variation in environmental behavior relates to the fact that environmental users and managers are in all cases behaving individuals liable to a variety of behavioral controls and influences. They are responsible for decisions concerning the allocation of limited spaces and resources, whether operating as individuals with designated decision-making authority, or as integral members of a group of interacting individuals collectively charged with the responsibility of making decisions in critical or complex situations. At the extreme, whole community groups may also be involved in the decision-making process, if only as voters who are required to approve appropriations or elect officials to whom they subsequently relinquish part of their decision-making powers.

The significance of the individual was recognized by the Sprouts, who have been studying issues of environmentalism in politics and international relations. In their discussion of cognitive behavioralism, they described geopolitical decision-makers as basing their decisions ultimately on what was known or believed to exist in environment, with success being determined by the extent to which the cognitive or psychological environment of the decision-maker coincided with the operational

environment representing the real world. But this is only a partial analysis of the geopolitical decision-maker, for his psychological environment is made up of more than a variably limited or complete knowledge of the real world. It is made up of a set of attitudes and expectations and predispositions to behavior which are a function of the individual's personality, a personality that predicts for environmental behavior within the context of the geographical environment as much as social personality predicts for social behavior within the context of the social environment.

#### THE NATURE OF ENVIRONMENTAL PERSONALITY

In a recent paper on the concept of the behavioral environment, I made a distinction between the geographic and non-geographic environment in behavioral terms. Neither the human/nonhuman distinction, nor the natural/artificial distinction was seen to have any functional relevance when behavior in environment was at issue. The only clear difference between the environments that geographers are concerned about, and that which most other social and behavioral scientists deal with, is the existence or non-existence of social interaction. I have defined the geographical behavioral environment as a non-interacting environment which may be physical, biotic or social. Human behavior—for example, such as results in environmental disturbance—may yield a reaction from the physical environment, but this is a reaction directed toward the disturbance rather than to the human source of the disturbance. Social interaction, by contrast, involves a relationship between individuals who are capable of behaving and adapting to each other, generally with expectation of a behavior in return.

Environmental personality can be distinguished from social personality in equivalent terms. While social personality may be defined as a predisposition to certain kinds of behavior within the context of the interacting social environment, environmental personality can be defined as a predisposition to behavior within the context of the non-interacting environment—the geographic environment of space, resources, and landscape. Making such a distinction implies differences in the behaviors directed toward the social environment by contrast with those directed toward the

geographic environment. For example, an individual's reaction to risk inherent in people may be quite different from his reaction to risk inherent in the non-interacting environment; his sensitivity to beauty in people may be quite different from his sensitivity to beauty in nature; his submissiveness toward dominating people may have no equivalence in the behavior he directs toward "overpowering" elements of environment. In fact, there may or may not be consistency in social and environmental personalities: this remains to be tested.

#### PERSONALITY MEASUREMENT

A major problem in the study of personality is to get measures of its existence. Personality as such is not seen; it is inferred; it implies a potential to behave; it exists as a predisposition or predictor of behavior which must be inferred from actual behavior. Thus, personality exists as a hypothetical construct, the measure of which rests ultimately with behavior. Developing a measure of behavior potential which is amenable to testing against real world behaviors is therefore basic to the personality characterization of individuals and groups. Efforts over the last several months have been directed toward developing such a measure, more in the nature of an inventory, of certain basic personality attributes potentially predictive of behavior in environment.

The personality inventory which was finally put to test focuses on four categories of behavior or of personal characteristics which have implications for behavior: (1) *sensitivity to environment* based on a measure of complexity of perceptions; (2) *mobility in environment* based on preferences for certain environments, and the characterization of these in terms of "excitance" and risk; (3) *control over environment* based on beliefs concerning the control exerted by environment over the human situation, as applied both to self and to others in a cognitive and prescriptive sense; and (4) *risk-taking in environment* as a function of attribution of risk to a systematic set of situations and activities involving some degree of hazard, which yields, in addition, a measure of the individual as risk-taker.

Briefly, the sensitivity measure is made up of a check list of terms descriptive of environ-

ment — positive, negative, and neutral in their connotations (e.g. annoying, artificial, attractive, barren, changing, etc.) — by which the respondent is asked to characterize his home environment. The number of items checked is not so much a measure of the complexity of the environment occupied as it is a measure of the complexity of perceptions and the level of sensitivity to environment. Preliminary results do, in fact, indicate that the number of items checked is *not* a function of the areal extent or "objective complexity" of the home environment being characterized; the consistency in number of items checked by individuals who base their ratings on quite different environments, and, similarly, the inconsistency in the number of items checked by those who occupy essentially similar environments, is striking.

The mobility measure suggesting a tourist and possibly migration potential gives indications of being one of the more productive of measures. This measure is obtained by contrasting the respondent's rankings of a set of ten real world locations (Alaska, East Africa, Florida, Greenwich Village, Mediterranean Coast, Mexico, Paris, Russia, Swiss Alps, Tahiti) according to those the respondent would most and least like to visit, in the one case, and those he would most and least prefer to live in on a long-term basis in the other. In addition, these same locations are ranked in terms of risk and exotic character. These rankings are then compared with the preference rankings in order to get indications of the importance of the exotic and environmental risk as motivations — positive and negative — for travel and residential choices. Using each respondent's own risk and exotic rankings eliminates the problem of differences in the exotic and risk characterizations of locations by different individuals, the existence of which has been separately verified.

Attitudes relating to the control exerted by environment over individual and group behavior is determined by choices from a set of possible reactions to the occurrence of natural hazard in environment: suggesting, alternately, that it is best (a) to avoid areas containing natural hazards; (b) to work harder to reduce the risks; (c) to learn to live with natural hazards; (d) or to be thankful for the excitement and challenge that hazards in environment provide. Not only does the indi-

vidual indicate which of these most accurately describes his own position, but also that which he thinks others consider to be their position, as well as what he thinks ought to be the "proper" attitude toward natural hazards in environment.

Finally, risk-taking potential is determined by a variety of measures, including: (a) an index based on risk attributed to certain residential situations, occupations, sports activities, and military specialties, together with an indication of which of the activities or situations the respondent would like to participate in, as well as those he would definitely prefer to avoid; and (b) an index based on risk attributed to a set of normal experiences (traffic, recreational, and medical contexts, for the most part) in which the respondent has previously been involved. The extent to which individuals engage in these behaviors is also scaled, to provide a measure of actual risk-taking behavior. Implicit is the assumption that a measure of risk-taking potential requires not only an indication of what risks the individual normally takes, but also whether or not he is aware that he is taking risks.

Inventories have been completed by a mixed sample of some 350 respondents and data analysis is now in progress. Populations are initially being compared by age, sex, education, environmental experience, residence, occupation, and marital status. Following this, rankings on the various indices (sensitivity, mobility, risk) will be used to establish quartile populations. These will be treated as representing behavior or personality types, and analyzed for characteristics distinguishing the quartile extremes: the more and less sensitive to environment, the risk-takers and risk-avoiders, the stimulus seekers and stimulus avoiders, and so on.

The results so far suggest that the measures are distinguishing what they are supposed to be distinguishing, in the sense that population differences that one might have predicted are being verified. However, a number of less obvious kinds of differences are also becoming apparent.

Thus, the mobility index in which locations are ranked according to residential and visiting preferences and then compared with exotic and risk attributes, showed group differences in practically all dimensions of population analysis. The females, for example, were more

consistent than the males in their ranking of locations for both visiting and longer-term residence, as well as more conventional by indicating that they would avoid those places they characterized as risky and as exotic to a greater extent than did the males.

Among age groups, there was no consistent difference between the places most preferred for visiting and those preferred for longer-term residence, but it was clear that the more exotic and more risky places became less attractive with increasing age.

Preferences also differed according to level of schooling completed. Those with the least schooling preferred places less exotic and risky and were more consistent in wanting to live in the kinds of places they would also like to visit; the more educated by contrast were much less consistent in their preference for visiting and longer-term residences, and much more attracted to risk and the exotic in environment.

Occupational groups also varied, though not always in obvious ways. Those classified in creative occupations were apparently the most exotic-preferring, while the medical types were the most risk-preferring in terms of the places they most wanted to visit. The group of research scientists and engineers (actual and potential) had the most contrasting set of rankings for visiting and residential locations (high tourist potential), but their preference for the exotic and risky environments varied about the norm; if they were the most curious in terms of a desire to see places different from those in which they wanted to reside permanently, the source of the curiosity was a stimulus or differentness not necessarily exotic or risky in nature. Interestingly, business, engineering, and military types were—next to the creative group—the most exotic preferring in terms of the places they ranked as most desirable for visiting; but they were also the most risk avoiding in their preferences.

The results obtained from different residential groups were also rather interesting. Those currently living in the denser urban areas were the most preferring of places to visit different from those which they preferred to live in on a long-term basis; they were also the most preferring of exotic locations for their visiting. This was especially the case for those who listed the megalopolis or city (in apartment houses) as the place of current resi-

dence. Those who listed childhood residences in cities had essentially similar tastes, but with a striking preference for visiting the more exotic and risky locations. When groups were distinguished according to preferred residence, the city types stood out again as preferring the more exotic environments for visiting. That group which chose farms as the preferred residence were closest of all other groups to the megalopolis types in wanting to visit what they characterized as the more exotic and risky environments. Yet those who lived on farms during their childhood and those who currently were living on farms, were among the least interested in visiting places different from those they wanted for long-term residence, and about average in their desire to see the riskier and more exotic environments.

Residential groups also proved distinctive on the "environmental sensitivity" index. Those who either were residing or who would prefer residing in urban areas, scored the highest on this index; i.e. they checked off more descriptive terms to characterize their home environment than did other residential groups. Those who preferred farms for living also scored relatively high on this index. Surprisingly, however, those who derived from megalopolis or city apartment environments during childhood, though relatively few in number (10), ranked the lowest on the sensitivity index. Since this group also ranked high in wanting to see places different from those they preferred for residence, their lesser sensitivity may be the result of a sensory adaptation to their own environment. Yet the much higher rating on the sensitivity scale of those who currently live in urban settings and/or who prefer such settings is striking, and suggests that more than adaptation to local conditions is at issue. Actually, rural types did not fare so badly on the sensitivity scale, but small town as well as large town living seemed to yield individuals ranking low on the sensitivity scale.

Analysis of the risk scale is only partially completed, but differences again are apparent. For example, with the exception of recreational activities, the males generally seem less aware of risk than the females. In addition, the young differ from the older groups in attributing less risk to the variably hazardous

occupations and recreation activities listed. The more educated seem generally to perceive less risk in the residential settings, occupations, and military activities listed than do those with less schooling; they also were more interested in experiencing more of the situations and activities than were those with less schooling. At the other extreme, the older groups indicated that they definitely would avoid more of the risk situations and activities than did the young; and similarly, the less schooled were more risk-avoiding than those with more schooling.

The only data on risk-potential at the time of writing, based on the attribution of risk to normally experienced situations and activities, and respondents' behaviors in respect to these, suggest that the older groups both perceive greater risk and behave consistently by taking fewer risks than is the case with the younger age groups. Less consistently, the females are much more apprehensive of risk than males, but appear to be equal to the males as risk-takers. Only partial data are available on the risk-taking behavior of the various occupation groups. These suggest that production workers (factory, agricultural types) take the greatest risks, with the military and creative types close behind; the technical-engineer and medical types appear to be the least risk-taking of occupational types.

None of the above represents final conclusions, since data analysis is far from complete. However, the data clearly are suggestive of the existence of real group differences in environmental behavior. And while differences appear as a function of age, sex, and other group characteristics, each of these groups contains individuals who differ from the norm at more and less extreme levels. There is clearly need to inquire into the nature of the extreme types; at this stage, these represent potential personality types, which, I am predicting, will be found to occur among most populations. This is central to the concept of environmental personality as a source of both within and between group differences as well as of between group similarities. Yet the existence of age and residential group differences suggest an important dynamic dimension to personality development that begs of further examination and testing.