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The use of temporal constructs as a model for understanding perceptions of environmental hazard

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THE USE OF TEMPORAL CONSTRUCTS AS A MODEL
FOR UNDERSTANDING PERCEPTIONS
OF ENVIRONMENTAL HAZARD

by

Victoria Koehler-Jones

A dissertation submitted in partial fulfillment
of the requirements for the degree of

Doctor of Philosophy

in

Sociology

Department of Sociology
University of Nevada, Las Vegas
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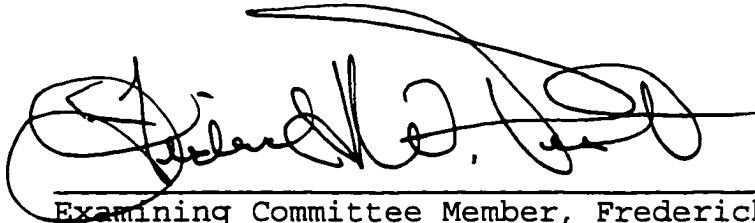
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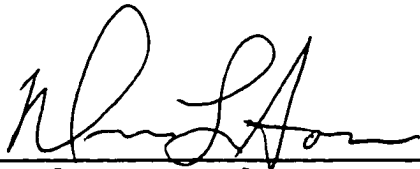
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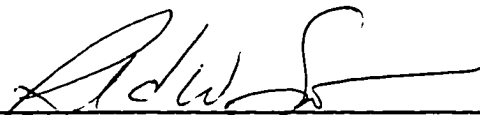
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ABSTRACT

An extreme physical event, such as a flood, becomes a hazard when social structures and systems are endangered by it—and it becomes a disaster when these structures and systems are actually disrupted. As the twenty-first century approaches and population pressures continue to grow, natural disasters will occur with greater frequency, bringing serious consequences for more people than ever before. The problem of minimizing damage is aggravated by inadequate recognition of hazard in time to mitigate or prevent disaster.

This thesis develops a framework for understanding how perceptions of natural hazard are associated with ideas about the passage of time and images of the future. Future perspectives are shown to be social constructs which act to filter perception so that aspects of the environment are either amplified or obscured. It is also argued that images of the environmental future are relatively stable but may change temporarily in response to immediate threat.

In an effort to lay the foundation for empirical study of these relationships, elements of future orientation are separately analyzed including the anticipation of change when moving from the present into the future. Ideas about

the nature of change are thought to be especially relevant to the study of the perception of future disaster. Problems in assessing personal perspectives of the environmental future are discussed and suggestions are made for the development of a quantitative instrument. The section on methodology includes consideration of changes in individual temporal perspectives as the individual moves from non-awareness to perception of hazard and eventually to hazard resolution and the resumption of normal life.

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CHAPTER 1

STATEMENT OF THE PROBLEM

Perceptions of Environmental Hazards

Spontaneously occurring geophysical events, such as extreme hydrological incidences of flooding and drought, have always caused great hardship and suffering in addition to loss of human life and property. Unfortunately, the potential for the occurrence of these natural disasters has increased at a logarithmic rate in recent years because of rapidly growing population density and the consequent development of unsuitable land such as flood plains, low coastal areas, subsidence zones, eroding cliffs, and the like. Further, the effects of disaster now quickly transcend traditional geographical and political boundaries, particularly in modern societies, because of growing interconnections between financial, communication and transportation networks. This implies that when disasters occur nowadays, their consequences are not as localized as they were in earlier times but spread both in scope and significance to encompass larger populations over broader areas. To make matters worse, more subtle hazard problems such as urban storm water runoff and arid-lands flooding,¹ are emerging as we approach the twenty-first century (Showalter, Riebsame and Myers 1993).

Mileti and Sorensen (1987:190) once observed that natural disasters could be completely eradicated if precautions against natural hazards were totally successful. The message these authors wished to convey is not that complete protection is possible, but that the more effective prevention and mitigation strategies become, the more disaster can be avoided. In recognition of this fact, significant efforts have been made in recent years to understand and control the natural forces that result in extreme water conditions on land—such as flooding and drought. Today, a wide range of technical and engineering advances have made it possible to eliminate or reduce hazard impacts. Examples include: mapping and delineating flood plains, flood-proofing and changing building practices, establishing flood control and water retention works, and developing systems which quickly and effectively forecast and communicate warnings.² Policy interventions have also been developed: planning for land-use and water conservation, restricting building in areas subject to inundation or mud flows, and requiring the purchase of flood insurance. These issues are so well understood that council members of the International Decade for Natural Disaster Reduction (IDNDR) have stated that enough knowledge already exists to significantly reduce damage from natural disasters; the information need only now be applied. Unfortunately, finding solutions to natural hazards has been

easier than finding ways to ensure their implementation. The success of any mitigation technique hinges on its adoption prior to a catastrophic event, but it has been difficult to persuade individuals and local officials of the importance of taking early action to effect change. After risks have been assessed, policy has been made and plans have been laid, it is left to the individual to appreciate the meaning behind those activities. After the experts and the professionals weigh in, the individual himself must come to recognize the latent elements in a situation that will inevitably lead to disaster unless he takes some kind of action.

A great number of studies have been devoted to understanding the reasons why preventive measures are often ignored when they could be easily adopted. Models of rational thinking suggest that variations in the perception of hazard result directly from either incomplete or incorrect knowledge of the impacts those hazards will create, but simply presenting the public with information on flood and drought, for example, will not necessarily result in actions being taken. As Mileti and Fitzpatrick point out: "...humans create their own perceptions of risk, and these may or may not match the objective risks imposed by nature and circumstance, and sometimes estimated by science" (1993:13). Anticipation of disaster—influenced as it is by such "non-rational" factors as group perceptions, social

pressures, economic and cultural investments, and delusions both individual and cultural—is in the final analysis an individual subjective phenomenon for which no efficient explanatory model yet exists.

Nevertheless, research findings have identified a number of factors which shed light on the underlying mechanisms that shape precautionary behavior, factors such as prior experiences, belief in one's efficacy and the willingness to make cost-benefit decisions. Much work has been devoted to understanding how people make sense of probabilities regarding risk information. Whole books have been written summarizing this research and advising technical experts on how best to communicate hazard information to local officials and to the public. But the problem remains: Unnecessary tragedy occurs regularly because of the failure of individuals to implement recommended prevention strategies.

Summarizing a July 1992 hazards conference titled, "Assessment of Research and Applications of Natural Hazards Workshop," Showalter, Riebsame and Myers state the consensus opinion that, "Despite much discussion over the years, we still need better ways to assist the transfer of findings from the 'research lab' to the people who use the information and to find ways to more effectively implement what we already know" (Showalter et al. 1993:29). Toward this end it was suggested more research should focus on the

ways by which people develop and react to their perceptions of hazards and how responses are affected by socioeconomic status, lifestyle choices, the media, and other forces. Disaster researchers working from all perspectives would like to better attract the public's attention and generate in people a willingness to act in a timely way to implement disaster prevention measures.

Concepts of Time as a Theoretical Explanatory Tool

The fundamental assumption of this thesis is that, since hazards point to the unfolding of disasters at some unknown future date, one's personal perceptions of future and of change modalities must underlie all thinking about, or even recognition of, environmental threats. A sense of time—shaped by physiological, psychological, cultural and social forces—is fundamental to one's perspective of jeopardy from future harm.

A sizeable literature exists which is devoted to understanding the origin, nature, and consequence of various concepts of time and change. The logic of applying findings from the sociology of time to problems regarding the perception of hazard is simple to justify: Both are concerned with the way meaning is ascribed to events that are yet to come and both are concerned with the process of shifting attention from the quotidian present to probable distant futures.

The relevance of time to the understanding of hazard perception can be simply illustrated by three points drawn from the literature on time.

1) While most people are future oriented, it is uncustomary to look beyond the immediate future. Individuals simply have little time available to entertain the possibility of events scheduled or expected to take place past the proximal future. Pressures of everyday life force people to focus on the present and near future. The economic model is also relevant when cost-benefit assessments result in near-term payoffs being given priority: Future benefits may be "discounted" even though, in the long-run, they may turn out to be more meaningful and have a more substantial impact than present benefits. Uncertainty about "when" an event may occur (as happens with most disaster forecasts) further encourages discounting because one can be persuaded that disaster may not actually occur until sometime in the distant future when it may be less important or completely irrelevant. This rationale explaining the failure of publics to deal with hazards has not gone un-noticed by decision researchers (Shackle 1961; Bjorkman 1984; Svenson 1988, 1989, 1990), but it has been considered only in isolation from the many other elements which go into making up the temporal identity of an individual. A central proposition of this thesis is that to adequately understand the individual's relationship to

potential future disaster, it is necessary to elucidate the person's entire temporal identity, at least with respect to future time horizons and attitudes toward the process of change. No single influence can be assumed to predominate over others.

2) The future is often assigned properties that make present action unnecessary or irrelevant. Again, there are two arguments that can be made, each taking opposing views of the power of human beings to control the outcome of events.

Belief in human efficacy is sometimes taken to extreme with the attitude that all future problems can be effectively dealt with as they arise. According to this view, advance planning is unnecessary because humans will develop the capability to effect whatever solutions are necessary to forestall danger when it actually becomes imminent. One aspect of this confidence has to do with attitudes toward science and technology. Technological society's considerable ability to translate scientific knowledge into practical use has persuaded many that, regardless of the nature and scope of future difficulties, solutions will develop in time to mitigate the problem.³ A related line of reasoning is reminiscent of the Horatio Alger idea that virtue will be rewarded with riches and success. If a man is to secure his future, whatever it may be, by hard, honest work in the present, he is encouraged to

concentrate all attentions on the present. This more personal form of efficacy, like the former, is focused on the idea that resources will be created and solutions reliably developed and applied to future problems as they materialize. Risk taking behavior is often justified by this rationale. This perspective is also an important component of any market-driven economy, again because focus on the present creates resources in the present that can be made ready and used to advantage in economic opportunities as they develop in the future (Douglas and Wildavsky 1983).

The second attitude toward human efficacy is that preparation for the future is not just unnecessary but completely irrelevant. In this view the future cannot be predicted or controlled. *Che sera sera*. Omens and signs may be used to predict events, but forces outside human control influence and direct those occurrences. Such fatalistic thinking may embrace the idea that no one can control nature and thus, disasters from natural causes are inevitable; the forces of nature always have and always will wreak destruction and havoc on mankind. Related to this passive perception is the more radical view that responsibility for disaster may be attributed to gods or demons or the failure of the moral community, so that action in the form of appeasement or conciliatory gestures is believed to make a difference. Humans may have some input but the outcome depends on higher powers that cannot be

completely understood. The history of the human race is rich with attempts to propitiate spirits to prevent their visiting disaster on the community.⁴ Turner, Nigg, and Paz (1986) documented the existence of these beliefs in a study of earthquake perceptions in California. Their importance lies in attitudes toward mitigation; clearly if one has no control over outside forces, the disaster problem becomes one of clean-up and repair rather than mitigation and prevention. If one's safety rests on the performance of rituals, attention to physical conditions of safety also suffer.

These apparently conflicting attitudes toward causation and control are often blended together. For example, members of the Latter Day Saints believe human efficacy and future technology will provide resources which will permit large increases in the human population, but they also believe these forces work in partnership with a comprehensive divine plan in which everything is provided for and foreordained. The various ways these concepts fit together is worth exploring. Studies of social time recognize that belief in the predictability of the future and belief in the power to control the future are important variables in perceptions of the future.

3) A third quite different aspect of time, relevant to hazard recognition and assessment, has to do with individual expectations regarding constancy and change.

Sociology of time literature suggests that people normally do not live with the daily understanding that radical and abrupt change could disrupt life at any moment. Most people believe that change happens gradually or at least with warning, so that tomorrow will grow out of today in the same way that yesterday grew out of the day before. Thus most people are comfortable with the idea of a logical consistency to the flow of events such that the relevant (immediate) future will probably be secure if yesterday was secure and if today seems secure. This experience of continuity or duration is so ordinary as to almost escape notice. In fact, the expectation of constancy or slowly evolving change is the state that gives meaning to the very idea of disaster. The disaster concept depends on some measure of normative stability from which to project a catastrophic disruption. Kastenbaum (1974:66) says, "An event could not be singled out as catastrophic if chaos and threat reigned at every step and at all times."

Expectations of change affect future orientation because individuals experiencing crisis or periods of radical transition focus attention on the present to an abnormal degree; survival requires an intense dedication to immediate events. On the other hand, individuals experiencing continuity and security have more latitude; the present stretches out into a future that has the possibility, if not the actuality, of being richly

articulated. The meaning of, or even belief in, the existence of a future is qualitatively different in each case.

This brief overview of three generalizations offered by the sociology of time shows some of the reasons why people are not customarily oriented toward events likely to take place in the distant future and, further, that certain beliefs and attitudes may make it seem unnecessary to be attentive to the future at all. Moreover, research has shown that individuals normally live with expectations of continuity and "sameness." These observations are clearly relevant for understanding perceptions of hazard. The question is: to what extent are such perceptions responsible for the incongruity that exists between objective and perceived risks of disaster from natural hazards? Empirical investigation may show that temporal and environmental cognitions are not merely associated with each other but are causally related in some fashion.

The topic of time has not gone entirely unrecognized by hazard researchers. Many investigators have made direct reference to temporal constructs in the analysis of their data. As early as 1978, Burton, Kates and White summarized cross-cultural work on hazard perception with the observation that different people have different understandings of future timing. Turner, Nigg, Paz and Young (1981) discussed fatalistic beliefs, attitudes toward

the accuracy of prediction, and orientation toward the future in their study of California residents. In a later work, Turner, Nigg and Paz (1986) ask, "Under what circumstances do people handle uncertainty by assuming that things will continue as usual, and when is this tendency overcome? ...How do time spans and time perspectives affect the assessment of risk?" (Turner et al. 1986:17).⁵

Having recognized that various interpretations of "future" and "change" are important to the understanding of hazard perception, researchers have stopped short of investigating the full significance and utility of these constructs. This present work, therefore, is an attempt to describe or portray the qualities and features of temporal identity and show how it can be used as a means of improving our understanding of hazard perception.

Procedures Used to Explore the Research Question

This project's goal is to point the way toward the development of an instrument which can be used in the field to measure relationships between temporal constructs and perceptions of hazard. Chapter 2 reviews the hazard perception literature highlighting gaps and inconsistencies that can be logically and effectively addressed using findings from the sociology of time. This review shows that, while some hazard researchers already recognize that perceptions of hazard are in some way related to temporal

constructs, the full value and utility of temporal concepts for understanding hazards awareness remains unexplored. Chapter 3 develops the synthesis between temporal and perceptual constructs by drawing out the principle threads connecting them to each other. Chapter 4 reviews the time literature explicating the major components of the temporal signature. As each element is defined and systematically integrated into the broader temporal signature, the analysis shows not only the complexity of temporal elements, but also their importance and usefulness in explaining the human/environmental interface.

Chapter 5 lays out a conceptual model where each element is defined and systematically integrated into a workable theory. Methodological implications are discussed in Chapter 6. Some of the challenges associated with gauging abstract and subjective concepts are addressed and suggestions are made for the development of a measure of the time/perception construct. The chapter ends with a discussion of the limitations and problems inherent in this approach. The last chapter summarizes key findings of the investigation.

Assumptions and Expectations

The potential of using temporal constructs as a theoretical explanatory tool rests on the assumption that there is a relationship between concepts of time and perceptions of hazard such that: 1) images of the future⁶

are associated with awareness of processes developing in our natural environment, and 2) perceptions of static and dynamic change are associated with awareness of processes developing in our natural environment.

Another guiding assumption is that ideas about the nature of time reflect strong normative forces and, consistent with other aspects of cultural values, are resistant to change (McGrath 1992). It may be, however, that temporal ideas are temporarily affected by major perturbations in the social fabric, such as happens when disaster looms and finally strikes. One possibility is that temporal horizons widen as the threat of disaster grows more real. Another possibility is that temporal horizons shrink to the immediate present during actual emergency situations.

A complete theory of risk perception should address the lack of fit that exists between objective and perceived risks of disaster from natural hazards. Slovic refers to this incongruity when he laments: "...risk assessors and risk managers have often tried to communicate with the public under the assumption that they and the public share a common conceptual and cultural heritage in the domain of risk. That assumption is false and has led to failures of communication and rancorous conflicts" (Slovic 1986:407). It may be that the inconsistencies that often exist between assessment of risk by experts and perceived risk by individuals can be explained by personal time constructs

such as time horizons and attitudes toward change and duration. Specifically, research may illustrate that disaster planners, who have studied the history and likely future of specific hazards, have wider temporal horizons (with respect to those hazards) than the individuals with whom they wish to communicate. As a consequence, the resulting "temporal discalibration," to use a term coined by Noyes (1980:67), interferes with the effective communication and implementation of their plans.

Endnotes

1. The nature of water runoff changes with urban and suburban expansion because the frequency, quantity and direction of flow is affected and because various pollutants and sediments can be picked up and transported. Development of arid and semi-arid land causes new problems with flood hazards because they are inherently more difficult to define than in humid regions.
2. Showalter, Riebsame and Myers (1993:27) note that we still have a limited ability to predict flash-floods in various locals.
3. In highly technological societies there is a growing point of view that one can not plan for the future because science is making the future unpredictable; technologies and knowledge bases are changing too rapidly.
4. In each of these cases individuals may be either apathetic or cataclysmic in attitude, depending on whether they believe that disaster will never come or that an apocalypse is imminent.
5. This is the summary of the huge research project, Community Response to Earthquake Threat in Southern California, conducted in the late 1970s by Ralph Turner, Joanne M. Nigg, Denise Heller Paz and Barbara Shaw Young. Sponsored by an NSF grant and published in 1981.
6. Bell and Mau originally coined the phrase "images of the future" in their argument that temporal images orient behavior and affect social change (1970:209).

CHAPTER 2

REVIEW OF THE PERCEPTION OF HAZARDS LITERATURE

What is Hazard Perception?

Natural hazard has been described in simple terms as a conflict between the natural environment and human management of that environment (McDonald 1979), the manifestation of which brings about an event so extreme that it exceeds the normal capacity of humans to deflect, absorb or buffer it (White 1974:4). Gerasimov and Zvonkova point out that natural hazards stem from highly dynamic processes which are, by their very nature, uncertain in their effects (White 1974:243). It is this uncertainty that confounds and obscures the perception of hazard and the subsequent recognition of the need for mitigating solutions.

In sociology of disaster literature the phrase "*hazard perception*" has been assigned various linguistic duties depending on the nature of the study and the interests of the author. Questions center around whether hazard perception should be distinguished from risk assessment, and whether perception of hazard differs from attitude toward the environment or knowledge about the etiology of natural disasters. Some imagine hazard perception to be the same thing as understanding the mitigation measures associated

with some hazard. All of these concepts and various others have been applied to the same and different phenomena throughout the history of hazards studies (Saarinen, Seamon, and Sell 1984:36). Even thoughtful treatments vary internally in scope and meaning of hazard perception. In the present work we are interested in the problem of initial recognition. Since discernment is driven by interest which is linked to probability of loss, any discussion of the threshold of awareness of potential loss must include attitudes, knowledge and risk assessment (expectation), but the elements of choice and action, coming later, belong to a future study. Burton, Kates and White help to clarify this distinction by saying: "The process of choice does not begin until after a first threshold of awareness of actual or anticipated loss is reached" (1978:88).

When searching the literature for a linguistic definition that meets these requirements, one finds a fitting statement by Mileti, Drabek and Haas: "Perception of hazard is an individual's understanding of the character and relevance of a hazard for self and/or community. The perception may include notions about speed of onset, scope, intensity, duration, frequency, temporal spacing, causal mechanisms, and predictability" (1975:23). Mileti goes on to specify elements of both knowledge and risk assessment: "...[hazard perception is] cognition or belief in the seriousness of the threat of an environmental extreme, as

well as the subjective probability of experiencing a damaging environmental extreme" (from Saarinen et al. 1984:37). Siccardi and Adom suggest that perception creates a mental picture that is not necessarily a reproduction of an earlier event but an adjustable synthesis of situations analogous to real-world possibilities: "...*perception* is the result of perceiving, meaning the empirical and/or intellectual knowledge of an exterior real object, and casting and organizing it into a synthetic mental image" (Siccardi and Adam 1993:4). The present work then, treats "hazard perception" as a variable which refers to individual recognition and understanding of potential threat (for self and/or community) in a way that creates a mental image of future impact.

Difficulties with Hazard Perception

Perception of risk is a strong determinant of the willingness to act to mitigate harm (Perry and Lindell 1991) but the threshold of hazard recognition and assessment varies greatly among people. Quarantelli laments, "most individuals show little concern about disasters before they happen even in risk prone areas" (Quarantelli 1992:3). McPherson and Saarinen found, for example, that residents living within the 100 year floodplain around Tucson, Arizona, have no real appreciation for either the probability that a serious flood will occur or the damage

that one might cause (McPherson and Saarinen 1977). This situation poses a problem because those who fail to perceive the full meaning of potential threat are hampered in their ability to take suitable protective action. Burton, Kates and White explain:

Some people ignore or fail to perceive environmental risks that would stir others to consider alternatives. To exceed that limit induces the person to think about an extreme event and of ways of dealing with it. Up until that time, although damage may be suffered from the event, it is absorbed in some fashion as a part of the use system (Burton, Kates and White 1978:88).

Various educational and communication techniques have been tried and found unreliable as stimulants of hazard recognition. A booklet titled, "Explaining Flood Risk," published by the U.S. Army Corps of Engineers, observes that: "Presenting people with information on flood risk does not necessarily ensure their learning..." (U.S. Army Corps of Engineers 1992:1). In a study using geography students at the University of Hawaii, Sorenson found no relationship between knowledge (which in this case was fairly uniform) and students' widely differing perceptions of risk (Sorensen 1983). The existence and nature of environmental threat was not uniformly perceived.

This chapter will document a variety of situations in which people are able to overlook or misunderstand hazard. While going through this literature we will point to inconsistencies and weak interpretations which can be

redressed by using a model of human perception based on temporal constructs.

Experience and the Life Situation

Experience is not a good predictor. Intuitively one would expect the actual experiencing of disaster to be the single most important variable in predicting how one would perceive hazard, and much research has taken place in an effort to demonstrate this, but—like most social phenomena—hazard perception appears to be affected by a complex of variables. While experience with actual disasters has been shown to affect attitudes, ideas, feelings and understanding of disaster, researchers uniformly recognize that experience is not, by itself, a reliable predictor of hazard recognition. For example, Roder found that the experience of being flooded creates only a weak restraint for those choosing a subsequent home on a flood plain (Roder 1961). One problem may be memory decay; the impression made by disaster grows weaker as the experience recedes into the past. Quarantelli says: "Overall, there is little personal learning as a result of undergoing a single disaster" (Quarantelli 1992:6). In Drabek's comprehensive overview, Human Systems Responses to Disaster (1986) he states:

In short, at times, under conditions not yet specified, it appears that experience increases hazard perception, although not uniformly among all types of individuals. The factors that constrain

this social process, giving it these variations in pattern, remain unclear (Drabek 1986:327).

In related findings, Burton, Kates and White show that length of time spent in different hazard-prone areas can affect perception of the problem, but the way perception is affected depends on the situation. In most potentially dangerous situations newcomers appear to be more sensitive to hazards than long-time residents, but several researchers have demonstrated that this is not true for inhabitants, new specifically, to flood plains and avalanche areas, where the relationship is reversed (Burton, Kates and White 1978; West and Harper 1980). These same researchers have demonstrated that urban dwellers are less sensitive to natural hazard than rural people (Burton, Kates and White 1978⁷; West and Harper, 1980) but the important predictors involved in this relationship have not been identified and, in fact, do not seem to obtain in every case. For example, Payne and Pigram found that there were no significant differences in awareness between urban and rural residents who are exposed to flooding in the Hunter River Valley in Australia (Payne and Pigram 1981).

Socioeconomic status is not a good predictor. This variable has not proven efficient as a predictor of hazard perception either. White (1974:5) suggests variations in hazard perception seeming to be associated with socioeconomic indicators—such as education and income—will be shown as spurious when other, non-SES variables are

controlled-variables such as attitudes toward risk-taking and fate, and views of nature—as well as the more objective elements of experience and specific relevance to income and property. Kunreuther (1978) agrees with this view. In an ambitious study combining survey techniques with laboratory experiments, Kunreuther explored perceptions of, and mitigating behaviors toward, both earthquakes and floods. He found that socioeconomic variables played a relatively unimportant role: "Neither income nor education levels had any explanatory power in determining homeowners' perception of the seriousness of the hazard problem" (1978:242). The work of Murton and Shimabukuro (1974) lends further support to this finding.⁸

Occupation can increase acceptability of risk. One would expect to find a relationship between occupation and attitude toward natural hazard because interests, values, experiences and needs are associated with both the selection of occupation and perception of hazard. Unfortunately, Islam found no perceptual variation in his 1974 study of the inhabitants of the coastal area around Galachipa, Bangladesh. Questionnaire data showed that perception of danger from cyclones did not vary by either occupation or education (Islam 1974:21). In this study, however, agriculture was the primary occupation and owners, tenant farmers, laborers and supporting occupations all depended upon the products of the land for their livelihood; it may

be the case that the Galachipa population exhibited little meaningful differentiation in occupation (regarding the importance of the land to personal income).

Burton, Kates and White (1978) suggest that, parallel to occupational differences in the definition of acceptable risk on the individual level, whole societies may vary in their collective interpretation of risk because of economic and social values. Moline says it succinctly:

The acuity of perception of a hazard in nature is partly a function of the mix of the need for the resource and the social problems confronting people in that place. In the Ganges floodplain of India, where the sole source of income is from that land, the rising water may be a matter of the most intense concern. For owners of residential property along the Rock River in Illinois (U.S.A.) it is of secondary importance (Burton, Kates and White 1978:102).

A close look at the previously cited Islam study supports this view by showing perception of cyclone danger along the coastal area of Galachipa is very high among all residents. Having experienced seven severe cyclones in the decade previous to the study, all residents were pessimistic in their expectations for the future. In fact, the high perception of the likelihood of disaster seems to have been accompanied by a higher Overall level of acceptable risk.

Many researchers have shown that the degree of seriousness accorded to an environmental threat is affected by the riskiness of daily occupation. Greene, Perry and Lindell (1981) investigated loggers' perceptions of threat from Mt. St. Helens during the spring prior to the

cataclysmic eruption of May 18, 1980. They found that loggers and their families tended to deny the risk associated with Mt. St. Helens more than those who did not make their living logging. These researchers explain, "It is known that individuals engaged in hazardous occupations, although conscious of the existence of risks, tend not to define day to day exposure as continually life-threatening" (Greene, Perry and Lindell 1981:53). Lucas, too, discusses the effect on miners of daily exposure to dangers: "Many miners, according to their testimony, consciously and deliberately tried to occupy their thoughts with other subjects; they consciously 'put it [danger] out of their thoughts'" (Lucas 1969:33). Instead, attention was channeled into a wide range of acceptable behaviors which, having been socially legitimated, were expected to be engaged in (practical jokes, nonchalance, horseplay, banter, etc). These signifying behaviors are seen as dissonance reducing mechanisms which create a distance from threat. Many miners consciously substituted thinking about money instead of danger: "Well, you go down there and get to work, and you don't think of things like that—you dursn't. And we was making good money" (Lucas 1969:33).

Lamson's 1983 study of hazard perception among Newfoundland fishermen supports this theme. Dangerous environmental hazards such as storms, ice cover, whales, and so forth, tend to occur suddenly and, in general, are

unpredictable and beyond human control. Nevertheless, Lamson found that fishermen accept and adapt to environmental hazards as a natural, "to-be-expected" feature of their occupation. Storm damage is expected to occur and accepting this risk is part of the occupation. Only in unusual circumstances does weather deter fishing (Lamson 1983).

Values and Systems of Belief

Whatever influence these more pragmatic factors actually have on hazard perception, beliefs and values appear to constrain their effects. Any effort to understand these constraints must include consideration of: the influence of community values; views of nature and how they are affected by attitudes toward magic, science and religion; beliefs about individual control of one's fate; various cognitive biases having to do with causation and predictability; and the role of chance.

In the following discussion we will suggest ways in which biases in norms and belief systems may result in selective perceptions of hazard, putting some people at greater risk of becoming disaster victims. But since these perceptions are both causes and consequences of disaster, topics are not cleanly differentiated; causal issues blend with locus of control issues which blend with disaster subcultures, etc. Similarly, individual, social and

cultural levels are intertwined and difficult to clearly separate.

(1) Community recognition of disaster. Many communities are subject to a variety of disasters. Tokyo, for example, is vulnerable to disaster resulting from the combined effects of earthquakes, fires and tsunamis. But regardless of the possibilities a number of researchers have shown that hazards are prioritized differently and the threat identified as most dangerous varies from community to community, (Petak and Atkisson 1982; Quarantelli and Tierney 1979; Helms 1981; Jasanoff 1993). While Japan has a sophisticated approach to disaster prevention, in many other countries hazards appear to be singled out for concern independent of available scientific evidence. Some work has been done investigating the effects of variation in community size, composition, and citizen expectation, but the reasons for differences in community concern are apparently not well understood. Values and beliefs may be of utmost importance in understanding the relative salience of various hazards (Mileti and Sorensen 1987).

Siccardi and Adom observe that, while threats from nuclear and toxic materials have prompted increasing public concern in industrialized countries during the past decade, risk from natural threats, such as flooding, have been largely ignored because they occur so relatively infrequently. These authors lament that, "...in the area of

natural risk, mainly floods, society seems to be memoryless" (Siccardi and Adom 1993:7). This results in situations where those involved in developing urban and industrial areas see restrictions on land use as unnecessary and costly.

(2) The disaster subculture. In communities where a certain specific hazard characterizes the environment, such as recurring hurricanes or earthquakes, disaster subcultures can develop. Moore suggested the concept of 'disaster subculture' in 1964 to explain adaptation to hurricanes along the Gulf of Mexico. He noticed that heroic folk tales, such as survival by riding ocean debris for days, had become part of the culture. "At the core," Moore explained, "is an attitude of defiance and of pride in ability to 'take it' expressed in vehement refusal to flee before the winds" (Moore 1964:195). This attitude, characterized by pride in the ability to face danger, is understood as an emotional response appropriate to local norms and values. Moore tells story after story of individuals who wrongly believed they were tough enough and strong enough to survive the effects of hurricane without evacuation. One story, about an elderly couple in Galveston, told how the family only left the island "when one of their children had a birthday and at Christmas" (1964:199). They did not leave for hurricanes. It was a tradition. They had pride in the special strength of their house which had survived the big storm of 1900. In

an earlier article, Moore described attitudes toward tornadoes, commonly thought of as deadly forces over which one has no control: "Most persons living in areas subject to tornadoes make wry jokes about the possibility of their being involved, but do not see the threat as serious enough to call for preparatory action further than, perhaps, equipping the home with a storm cellar" (Moore 1956:734).

These are all examples of a basic characteristic of disaster subcultures...the shared denial or trivializing of danger. Disaster subcultures fail to perceive and appreciate the full importance of hazard. Drabek says, "disaster subcultures dampen the threat dimension of hazard perceptions for specific disaster types for which these communities are more vulnerable" (Drabek 1986:340).

Turner, Nigg and Paz (1986) contribute the idea that a true sub-culture has attitudes which, though originating in actual experience, must be diffused and communicated to those who did not share the experience. These attitudes are "kept vital by emergent symbols and discussion" (1986:296), meaning, at least in part, that disaster folk lore becomes institutionalized. According to these authors the pattern of awareness that develops and becomes part of the local culture can include both adaptive and maladaptive attitudes. Unjustified bravado, for example, can be combined with conventional ways of viewing and dealing with the disaster

agent. In any case, a hazard perception develops which characterizes the whole community.

Wenger, James and Faupel (1980) surveyed three communities to determine the degree to which residents and local officials believed in disaster mythology. They explored perceptions of hazard to determine the existence of disaster subcultures and their effect on lawlessness, looting, and ineffective recovery techniques. "Disaster subculture" was defined as a community having any disaster-related experience, knowledge or structure which, by itself, serves to distinguish the community from the larger culture. By this definition, these researchers determined that there were such communities and that the disaster element causes community members to be more—not less—sensitive to perceiving agents of disaster.

When does a disaster sub-culture develop and when does it not? Disaster subcultures appear to require the shared experience of an unusually bizarre and cruel event. In 1961, for example, Galveston, Texas suffered more from tornadoes and water spouts than from Hurricane Carla. The unexpected suddenness and brutality of these weather abnormalities caused anger and feelings of injustice: "Galvestonians gave the impression that they felt that the tornadoes were a dirty, underhanded trick by the weather, whereas the hurricane had been an aboveboard overt blow for which one could prepare and which one could expect now and

then" (Moore 1964:200). But in the end the community shared a special experience, unique to them and unknown to the larger society: "The phenomenon is something like being inducted into a secret society, or surviving a military campaign..." (1964:201).

In contrast, Turner, Nigg and Paz were unable to find clear evidence of an earthquake disaster sub-culture in California in the mid-eighties: "At most, we can speak of an earthquake theme in a culture or subculture and of the differential incidence and elaboration of that theme" (1986:309). This research team recognized that California differs from many hurricane, tornado and flood regions because of the relatively long and aperiodic interval between destructive quakes (1986:13).

Perceptions of seismic hazard may well be distinct from perceptions of meteorological hazard but an even more interesting analysis comes from the authors discussion of culture as a map. "As a map, the culture highlights figure from ground in the world of experience and identifies the special significance of objects, places and experiences" (Turner, Nigg and Paz 1986:310). Customs, values and mores act as patterns which focus attention and prescribe attitude.⁹ By this reasoning disaster sub-cultures are not distinctly identified in California because the common regional culture already has a common earthquake awareness theme. "Figure" and "ground" are one: "...feeling oneself

to be a member of an especially vulnerable group does not imply any disproportionate awareness of especially vulnerable groups..." (1986:311). For example, while awareness of the vulnerability of old buildings is widespread in California, it is no more acknowledged by those who actually live in old neighborhoods than by the county at large. The implication is that coastal areas vulnerable to weather abnormalities have not incorporated that hazard into the culture in the same way that Californians have incorporated seismic hazard; there is a qualitative difference between these cultures in the common awareness of hazard.

Are Californians simply apathetic to earthquake danger? Meltsner (1978) found that Californians generally denied earthquake hazard. His research documents indifference and inurement: "...the longer one lives in California, the less one is likely to care about earthquakes" (Meltsner 1978:174). "Apparently there is some ambiguity about perceptions of hazard in earthquake country because Turner and his associates found that although a sizeable number of residents (34%) said they would go on as usual in the event of an earthquake, the majority of people admitted to being frightened and worried about seismic activity and reported being actively concerned about the danger" (Turner et al 1986:148-151). This percentage may be even higher today

given the recent increase in the incidence and severity of earthquakes in the region.

(3) The personal significance of disaster.

Environmental hazards with sudden and spectacular onset can bring excitement and meaning to life. Greene, Perry and Lindell (1981) investigated citizen perceptions of threat from Mt. St. Helens during the spring prior to the cataclysmic eruption of May 18, 1980. The volcano had been quiet since 1857 but more than two months before the actual eruption, beginning on March 27, ash and steam began to escape. Many residents appeared to be "getting a big kick out of it," and some were reported as saying they wished the mountain would erupt (Greene, Perry and Lindell 1981:49). The prospect of witnessing an eruption was exciting, at least for some, perhaps for the entertainment value and perhaps for the brief importance such an event would give to their lives. Kastenbaum (1974:70) speculates that society "needs" disaster as a means of venting intrapersonal or interpersonal pressures—a view that runs parallel to Durkeim's notion that a certain amount of crime is necessary to reinforce the collective conscience.

Disaster attractiveness appears to be partly related to ignorance of consequences. In the case of Mt. St. Helens, general understanding of volcanic activity was lacking so that several residents believed, for instance, that they could easily achieve high ground in case mudflows caused the

river to rise. Many respondents expressed the belief that lava was simply very hot rock which would cool so fast, once it left the crater, that it would not move very far.

Although attempts were made to inform the public, beliefs about volcanic dangers were resistant to change.¹⁰ Green, Perry and Lindell speculate that cultural adaptation processes encourage discounting or ignoring the true nature of the risk for infrequently occurring hazards (Greene, Perry and Lindell 1981:53). They conclude that threatened citizens will "seize upon any vagueness in a warning message which allows them to reinterpret the situation in a non-threatening fashion" (1981:60). This may well apply to admirers of impending hurricanes as well.

(4) Changing cultural meanings of disaster. It cannot escape notice that those who flirt with disaster today do so within the broader cultural understanding that the powerful forces of the natural world act according to systematic, observable principles. But current concepts of disaster reach back only a short distance into human history. Until the scientific revolution people tended to see natural cataclysms as willful representations of some intelligent force—god, human, supernatural, or some combination. Gilbert and Barkun point out that during the mid-to-late Eighteenth Century in England, natural disasters were often considered to be deliberate visitations from the Christian God who expected, but did not get, sexual restraint from his

"children." Because of this interpretation, disaster prevention was at that time a function of sin prevention (Gilbert and Barkun 1981:289).

Kastenbaum observes that people have always had a strong tendency to use the idea of a willful god or a willful universe to explain why a particular disaster occurred:

...disasters often have been associated with the mood of the universe and in governing deities. If our enemy's ships have been scattered to the winds by a ferocious storm, why, then, we must have been doing something right. But if the ground trembles beneath our own feet, and it is our temples that come tumbling down, then it is obvious that we - or somebody among us - has been deficient in piety or zeal (Kastenbaum 1974:69).

Botkin (1991) further explains that people are compelled to see order, pattern and meaning in the world. We, in the Western world, have notions about the security of nature that are deeply rooted in history and tradition. In 44 B.C. Cicero wrote, "Everything in the world is marvelously ordered by divine providence and wisdom for the safety and protection of us all...Who cannot wonder at this harmony of things, at this symphony of nature which seems to will the well-being of the world?" (in Botkin 1991:65).

Before science and technology became widely understood in industrialized society, disruptions in this "symphony of nature" were, as Kastenbaum, Gilbert and Barkun point out, considered to be events with moral and divine significance. The tradition of linking disaster with normative behaviors

and attitudes is a part of our heritage that, however modified by science and secular thinking, has not entirely lost significance. The belief that disasters need to be read and interpreted is still easy to find but the current trend is for disaster victims to try to fix blame on man. Liability actions bring more certain and immediate relief than what can be gained by divine propitiations. As Drabek says, there have been "...fundamental changes in hazard perceptions. God is losing ground, when it comes to flooding, for example. And if not God, then man" (Drabek 1986:342). The question is, how much is perception of hazard still influenced by cultural beliefs about magic and religion?

(5) Attitudes toward scientific communities. In a comprehensive study conducted by Turner, Nigg, Paz and Young (1981)¹¹ it was determined that Mexican Americans distinguished themselves from White Anglos by showing a less favorable attitude toward science and a more favorable attitude toward folk beliefs such as "earthquake weather" and prophetic earthquake forecasts. Blacks in general were more skeptical about the possibility of foretelling future earthquakes at all, including the foretelling of earthquakes by unusual animal behavior, "but insofar as they are concerned they lean toward the use of nonscientific rather than scientific instrumentalities" (Turner, Nigg, Paz and Young 1981:44). Turner and associates speculate that lack

of faith in science may be related to attitudes toward authority in a broader sense. These authors further found that Blacks are more likely to believe that scientists and public officials withhold information about earthquakes while Mexican Americans have a more favorable view of government officials than either Whites or Blacks. These authors conclude that differences between Black and Mexican Americans show "the extent to which minority groups, so similar in their disadvantaged position in American society, may exhibit contrasting social systems and orientations for dealing with shared risk and uncertainty" (Turner, Nigg, Paz and Young 1981:49). It may be the case that, since Mexican Americans tend to give the greatest amount of authority to religious leaders (while Black Americans tend to give the greatest amount of authority to adult female heads of households), the institutional nature of the religious authority may be more easily generalized by Hispanics to include public officials.

Turner and his associates investigated the extent to which Californians understand earthquake hazard by use of naturalistic or physical frames of reference versus mystical and teleological perspectives. They determined that a small percentage of respondents used a mystical or magical frame of reference as indicated by beliefs such as these: earthquakes occur because of the ideas in someone's head, or because of the work of a sorcerer, or because launching

satellites pollute the atmosphere, or for some other physical reason with no plausible connection to an earthquake. An even smaller group used a religious or teleological frame of reference as indicated by beliefs like these: earthquakes are part of some grand design or divine plan for the world, or they are punishment for the sins of mankind, or they are harbingers of the millennium.

More than 12% of all respondents believed that human activity affects the likelihood of earthquake occurrence, but most of these did not refer to scientifically recognized possibilities such as impounding water behind dams:

Instead, they seemed to imply that the triggering human action interfered too deeply with nature or was socially reprehensible. The fear that drilling and digging in the earth is likely to set off an earthquake implies magic more than it does physical causation. The second most frequent answer in this category, underground bomb testing, undoubtedly reflected the abhorrence of atomic warfare. Hence a great many if not all of these answers melded a physical framework with either a magical or a moralistic framework (Turner et al. 1986:261).

In general, these researchers found widespread recognition of the importance of physical models in understanding the mechanisms of earthquakes, but this knowledge is blurred by accompanying beliefs in non-physical causation. The authors conclude that scientific and non-scientific ways of understanding the world exist side-by-side in our society. Further demonstration of this ambiguity is seen in beliefs about earthquake prediction. Although earthquakes cannot be predicted with either

scientific or non-scientific technologies, almost one-third of the Californians polled said they believed people other than scientists could predict earthquakes. Interestingly, secular or new age mysticism appears to be more important than traditional religious mysticism as an alternative to scientific prediction: Twenty percent of the total sample identified psychics, mystics and occultists as individuals who could predict quakes, as compared with only 3.4 percent who believed religious figures could predict earthquakes.¹² In short, Turner and his associates found that science and "non-science" are inextricably intertwined in the minds of most Californians:

...coexistence rather than polarization is the rule as far as science and nonscience and naturalistic and nonnaturalistic frames of reference are concerned...we find both secular and religious mysticism important at certain phases of the encounter between scientific and popular thought, and we see a naturalistic frame of reference diluted by moralistic and sacred-nature perspectives. But the coexistence for most people does not seriously undermine faith in science... (Turner et al. 1986:273).

What are the implications of this for perception of hazard? In the Turner et al. study, belief in scientific prediction of earthquakes was found to be linearly related to awareness of hazard. The greatest hazard recognition was associated with belief in scientific predictions and exclusion of all nonscientific forecasts. Belief in non-scientific forecasting (such as prophecy, personal premonition, or "earthquake weather"), together with some

belief in science was associated with a lower recognition of hazard. For those who did not believe in scientific predictions at all anticipation of hazard was almost non-existent (Turner et al. 1986:273).

In concluding, Turner and his colleagues describe the system of hazard perception as a commingling of components from the physical world and the worlds of magic and personal or religious belief: "...a great many if not all of these answers are a melding of physical frameworks with either a magical or a moralistic framework...While people understand earthquakes overwhelmingly in physical terms, the physical frameworks they use are sometimes contaminated by other frameworks that are less compatible with science" (Turner et al. 1981:144).

(6) Internal versus external locus of control. The importance of beliefs and values in perception of hazard is further suggested by attitudes about the controllability of disastrous events. Here again we see ideas developing from both cultural influences and personal variations. Drabek argues that personality constructs, such as fate control, are cultural products which come together to create a world view within which perceptions of hazard form and willingness and ability to mitigate harm can develop. In his work, Human System Responses to Disaster, Drabek (1986:330-331) suggests that attitudes toward fate control are related to perception of hazard and disaster mitigation in much the

same way that Weber's Protestant ethic is related to the growth and development of capitalism: Various cultural climates provide more "nutritive soil" for the growth of mitigation beliefs than others.

Porfiriev explores these concepts using a different terminology. He points out that individuals with "rational" perspectives use the uncertainty of hazard prediction as a stimulus for taking immediate action to protect against danger while, in contrast, individuals with "radical" perspectives are so affected by the uncertainty that the thought of taking any action is hindered. The logic underlying "radical" perception may be either fatalistic or apocalyptic, neither of which leads to an active defense against predicted natural hazard. Fatalistic people either mistrust risk assessors or see them as irrelevant. Porfiriev uses Russia as an example of how socio-psychological factors contribute to ideas about future calamity:

Russian society for decades has lived with the expectation of disaster. Therefore, when a natural hazard or another emergency prediction occurs, user communities may perceive it as nothing more than additional evidence or confirmation of their own grim moods and misgivings. There is a constant expectation that the situation will become worse, no matter what the specific situation. This environment is saturated with social apathy...as a logical result, prediction warnings are neglected (Porfiriev 1993:50).

Certainly it makes sense that the perception of disaster would be strongly affected by cultural beliefs

which represent events as acts of fate...whether these events are perceived with indifference or the belief that they are "hard knocks" one must take on the chin. The other "radical" response treats uncertainty as an understatement. Those who tend to think in apocalyptic terms believe there is a real risk but they may not trust scientific prediction, preferring instead to rely on fortune-tellers, prophetesses and so forth for more accurate information. Again, according to Porfiriev:

Recently in some of the Soviet cities [the] media issued predictions made by prophetesses fixing the exact place and time of the future quake. Despite the professionals' opinion publicly disproving these forecasts, thousands of people left their workplaces and homes. Naturally, the disaster did not take place and communities suffered substantial economic losses and nervousness. Nevertheless, some inhabitants continue to consider themselves lucky to escape death and thus justify their over-vigilance (1993:51).

Porfiriev suggests that individuals in the radical apocalyptic mode of thought may be open to the belief that certain groups have the power to deliberately plot and execute plans for natural catastrophe: "In December, 1988, even the most intelligent circles of the Armenian society supported the idea of a preplanned explosion aimed at distracting communities' attention from the Kharabakh conflict and designed to provoke an earthquake in Spitak region"¹³ (Porfiriev 1993:51). This example reflects an exaggerated belief in mans' ability to both predict and control nature.

Along more rational lines, Saarinen (1966) found that Great Plains farmers who believe that man does not control nature are more perceptive of the risk of drought than those who believe man does control it. Simpson-Housley and Bradshaw later attempted to replicate Saarinen's work by making a study of suburban attitudes toward seismic activity in Wellington, New Zealand. Attitude toward control was theorized by this research duo as the rational product of belief in the efficaciousness of one's own actions together with belief in the predictability and controllability of nature:

When [the consequence of] an event is interpreted to be mainly if not entirely contingent upon chance, luck, fate or factors outside the actor's control, this indicates a belief in external control. If the consequences of an event are conceived by the actor as contingent upon his own decisions or actions, this credence may be labeled as a belief in internal control (Simpson-Housley and Bradshaw 1978:65).

Based on questionnaire data, these authors supported their hypothesis that those who take action to prevent or mitigate earthquake damage are characterized by a belief in internal locus of control and those who concentrate on repairing damage after it has occurred are characterized by a belief in external locus of control. But they were unable to demonstrate that "externals," supposedly subject to greater fear and anxiety due to lack of perceived control, are more sensitive to the possibility of earthquake occurrence (the Saarinen finding). Their results may be

incommensurable with Saarinen, both because of their sample size was small and women were disproportionately represented, but primarily because the focus was on seismic activity, a natural phenomenon very different from drought. More importantly, however, this study shows that "perception of" or "sensitivity to" risk may not be predicted by locus of control alone.

The relationship between locus of control and willingness to take action was the subject of Bauman and Sims' (1974) work on religious beliefs in Puerto Rico and the United States. Comparing attitudes toward hurricanes in these two cultures the authors found that, while citizens of both cultures are equally religious, the two groups have different conceptions of the role of God in man's world: "Puerto Ricans see him as directly involved in what happens to them, whereas Americans see him as benign but removed; their motto would be 'God helps those who help themselves'" (1974:30). In this study Puerto Ricans consistently gave more recognition to the importance of external forces shaping their lives (luck, God, national economic development, etc.), while Americans stressed autonomy. The interpretation of these researchers is that those who "acknowledge the power over their lives of outside forces," are more fatalistic and more accepting of outcomes, but at the same time more frightened of hurricanes. Bauman and Sims suggest that the roots of these differences lie in the

divergent traditions of Spanish Catholicism and American Protestantism (Bauman and Sims 1974:29-30). Strictly speaking, "fatalism," refers to the situation where there is no possible access to control...no way to affect outcomes... and this is not the case with Spanish Catholics among whom the whole idea is to exert control through the use of sacred magic. Nevertheless there appears to be significant variability in the strength and use of such beliefs. Turner, Nigg and Paz, who studied Californians in the 70s, observe that Americans do not expect God to shape their lives: "...although the great majority of our respondents said that religion is important in their lives, very few of them suppose that religious leaders can forecast earthquakes and few tried to explain earthquakes in religious terms" (Turner, Nigg and Paz 1986:275).

In an earlier study Turner, Nigg, Paz and Young (1981) monitored California residents over a number of years to determine earthquake readiness. These researchers found that, while three out of five people are fatalistic about the effects of earthquakes, many of those who were labeled fatalistic try to mitigate damage anyway. Locus of control, by itself, was an unreliable indicator of the willingness to take action. This study shows how unclear our understanding is about the relationship between those constellations of beliefs about prediction, control and fatalism, on the one

hand, and the willingness to act to mitigate damage, on the other.

The same study also looked at the relationship between fear and attitudes about the controllability of the future. The authors report that, while many Mexican American respondents expressed an unjustified faith in the possibility of predicting and managing the future—an attitude at odds with fatalism—they nevertheless measured high on fear of future earthquakes. African Americans respondents, on the other hand, were assessed as being more fatalistic but less frightened of future earthquakes (but more frightened by past earthquakes) (Turner, Nigg, Paz and Young 1981). The question that must be addressed is why African Americans demonstrated less faith than Mexican Americans in the possibility of managing the future. Turner, et al. suggest that apprehensions about future earthquakes may have to do with general orientations toward the future. They argue that their data can be interpreted to mean that African Americans are more present-oriented and less future-oriented than either Mexican Americans or European Americans, and that this present orientation somehow relieves or moderates future fear.

(7) Looking for omens. The Turner, Nigg and Paz (1986) book, Waiting for Disaster, discussed the problem of living in an indefinite period of warning or "lead time" until disaster occurs. Because of the difficulty of living

on an emergency footing and the necessity of living normally, omens are needed to put boundaries on problematic time windows. In the case of California earthquakes this means experiencing geological phenomena such as sinking ground and microtremors, but for many it also means experiencing more subjective phenomena: Sixty-eight percent of all respondents believe unusual animal behavior can warn of an impending earthquake. Forty-four percent believe in unusual, "earthquake" weather, and thirty-nine percent report believing in premonition, instinct or ESP prior to onset (Turner et al. 1986:263). The authors argue that these findings are significant:

...widespread endorsement of folk signs shows that people believe nature can be apprehended directly and personally, without appeal to authority or to technical knowledge. Second, the substantial support for scientific and nonscientific modes of prediction means that many people accept both. Apparently, faith in the capability of scientists to predict earthquakes coexists comfortably with faith in folk prediction and mysticism (Turner et al. 1986:263-4).

Turner and his associates interpret this sensitivity to signs as an indication of the need for a predictable future (Turner et al. 1986:315-342). Slovic, Kunreuther, and White (1974) also point out that serious attention is not paid to the possibility of disaster until it is clear that the probability of the event actually occurring is very high. The pamphlet, "Explaining Flood Risk," points out that uncertainty provides a convenient excuse for ignoring the threat of flooding (U.S. Army Corps of Engineers 1992:6).

(8) The role of chance. The experience of narrowly avoiding disaster can create an attitude of chance with respect to future hazards. Parker, Brewer and Spencer (1980) interviewed homeowners who lived just outside of Santa Barbara, California, a year after a major brush fire had destroyed 205 homes. The researchers observed that, during the fire, each homeowner faced similar situations with similar resources but, because brush fires move randomly, some homes burned and some were spared. Here are some elements of similarity: a) homeowners exerted the same amount of actual control over the situation, b) brush fires move randomly, c) homeowners acted alike regarding fire prevention, d) home characteristics were similar, and e) fire-fighting activities were similar. The study, which was designed to explore the belief in control over chance events, found that those whose homes had actually burned attributed the burning to chance, while those whose homes had been spared attributed their good fortune to their own efforts. The researchers found that the experience affected perception of future hazard; victims estimated a higher probability of future fire damage than did non-victims. In sum, the authors state that, "...the illusion of control over victimization is persistent, even among those clearly exposed to high risk, unless or until one is a victim oneself" (Parker, Brewer and Spencer 1980:459).

Perceptions of the probable occurrence of disaster are affected in quite another way by false intuitions such as the "gambler's fallacy." Using this logic it is assumed that if an event has occurred at one point in time it is less likely to occur again during the following point in time. This is the familiar belief that lightening cannot strike twice in the same place, or that the 100 year flood cannot occur two years in a row. In this case, the experience (or expectation) of disaster twists perception into a misplaced sense of future invulnerability. In fact, events which have multiple components with complex relationships such as flooding and heavy snowfall, are essentially random which means the probability of recurrence is just the same one year and the next.

Based on questionnaire data from twenty sites, Burton, Kates and White (1978) argue that "sophisticated" recognition of the random placement and timing of disaster is most prevalent in high-income countries. In pre-industrial societies, however, the universe is more likely to be seen as ordered and determined; droughts and floods are perceived, not as chance events, but as recurring phenomena with regular predictability (Burton et al. 1978:99-100). Some, however, deny that disaster will ever return: "For the most part, Nigerian farmers respond to questions about drought by denying that it will return—a stance that is embedded in belief that the occurrence of dry

periods is divinely ordered and is neither to be predicted nor protected against" (Burton, Kates and White 1978:100).

The foregoing studies show the difficulty in subjectively assessing risk from the small sample of experiences most people have. Very often knowledge of a single happening is broadly generalized to other events with very dissimilar characteristics. Another approach to understanding nature, described by Burton, Kates and White, is to use a single piece of concrete information to represent the larger picture for a particular event:

The Australian farmer is exposed to a large body of meteorological and climatological data when he approaches the crucial decision of when to seed his crop - and then proceeds to use [only] a reading from his rain gauge as a basis for choice; or he may sow at the same time each year regardless of conditions, or, more likely, scruff the soil to obtain a rough check of soil moisture to back up an innate feeling that "this is the time" (Burton et al. 1978:97-98).

Even though it is relatively easy to show the numerous ways bias affects perception of hazard, Slovic, Kunreuther and White (1974) argue that, "people believe they have a much better picture of the truth than they really do," and this generally leads to underestimation of the phenomena (Slovic et al. 1974:195). Since uncertainty can be unnerving it would be much more comfortable to, if not actually subscribe to Cicero's idea of harmony and well-being, at least believe that the forces of nature are understandable and controllable.

(9) Other cognitive biases. One explanation for personal confidence in hazard perception is that the future under consideration is often restricted to the time just ahead of the present. This point is illustrated by Burton, Kates and White in their interview with a real estate developer whose new building was situated in a low-lying area. When asked, the developer said he thought his structure would not be flooded, even though he recognized floods had taken place in the past. But when pressed, he "observed further that he knew that the stream had many years earlier reached a stage at that point as high as his shoulders. How then could he say there was no risk? His answer was, 'There isn't any risk; I expect to sell this building before the next flood season'" (Burton, Kates and White 1978:96). This example suggests that time horizons for future disaster can be affected by situational needs and personal attitudes that overshadow objective understanding and acceptance of the dynamics of nature.

The Burton research team summarize their cross-cultural work on hazard assessment with the contention that, "People have difficulty in defining the future timing and significance of an extreme event in a fashion that is intelligible to others. Part of the problem is the difference among people in time horizon as dictated by the length of time to which they look forward..." (Burton et al 1978:96). In other words, not only do people have various

attitudes and limited understanding which biases hazard recognition, but they also have different time horizons for a meaningful event taking place in the future. Although no supporting research is available the situation undoubtedly creates a communication problem between scientists, city officials and community members. Scientists are trained to take a long view of environmental processes and city planners and engineers are charged with creating and implementing master plans which require looking ahead at least 20 years, but individual citizens operate on fairly short-term time horizons (Burton, Kates and White 1978:96). Each of the three may appraise the future in ways that are drastically different from the others.

The way people perceive the time period prior to the onset of some specific natural disaster is a critical element in public readiness. Mileti, Fitzpatrick and Farhar summarize their understanding of this point:

People have a general tendency to push risk into the distant future and to refuse to accept it in the near term. And although few people deny risk all together, most view it as a problem that will not materialize for years. The typical result is that people postpone protective actions and perceive risk for the immediate future as low (Mileti, Fitzpatrick and Farhar 1992:20).

Information warning of hazard may be disregarded when individuals are preoccupied with current matters (Turner 1979:56). Furthermore, the bias toward "now" is complemented by a similar bias in favor of "here." Recognition of hazard encompasses ideas about how a

specific place is affected by events in other places. For example, Payne and Pigram found that residents of the Hunter River Valley in Australia expected that flooding would occur if and when it rained in the Hunter River catchment. Only a few respondents recognized that less immediately local precipitation could also cause flooding (Payne and Pigram 1981:468). This finding is of particular importance for understanding attitudes toward flash flooding in arid and semi-arid regions where the place experiencing the flooding is often sunny and clear with no precipitation in sight.

Another cognitive bias, one that affects choice and decision-making, was observed by Burton, Kates and White: Just as with physical phenomena, attitudes seem to have an inertial quality. The preference for staying with or keeping whatever attitude one already has can, however, change rapidly under certain circumstances. These authors suggest that this phenomena is often found in situations of social change:

While people seem enmeshed in an inertia that discourages any departure from the existing set of adjustments to the hazard, they still have the capability of very rapid adoption of new adjustments when circumstances are favorable (Burton, Kates and White 1978:107).

In the next chapter we will see how the idea of attitudinal inertia can, when applied to temporal signatures, explain many problems in the disaster literature.

Summary and Conclusions

Many, if not most, people who are exposed to potential disasters from the natural environment have had no history of experience to help them understand the jeopardy they are in. For those who have had experience with disasters, researchers have shown that, by itself, experience can be inadequate to ensure that the person will take mitigating action to prevent or forestall future harm. When occupation or economic well-being are threatened by natural hazard, perceptions can be enhanced, but chronic threat may increase acceptable risk and therefore dull perception. One problem is that norms of behavior and systems of belief can have a strong affect on how the environment is perceived. A number of socially constructed views appear to contribute to bias in perception and assessment, but in every case studies exist which show hazard perception is still rather poorly understood.

There is some support for the view that perception of hazard depends on a combination of factors involving resource need and social definition. For example, the hazard identified as most dangerous varies from community to community. Sometimes an entire community shares in actively denying the importance of a threat that poses a particular vulnerability. This happens when community members bond together to create a "disaster subculture" in response to a common critical experience. The special attitude that

characterizes such a community is one that focuses attention on select aspects of danger.

Although one research team found that the majority of Californians admit to being frightened and worried about seismic activity, another investigator concluded that Californians generally deny earthquake hazard and react to warnings with indifference and/or inurement. Are these inconsistencies merely artifacts of method and measurement or are there unidentified variables which predict feelings of fear or complacency more accurately? One research team suggested that the true nature of risk can be ignored or down-played through "discounting" when hazard leads to disaster only infrequently, such as with volcanic eruptions. It was observed that people can focus on any vagueness in a warning in order to interpret the situation in a non-threatening fashion. This situation is made even more dangerous by the finding that people actually believe they have a more accurate picture of the true situation than they really do and, as a result, they underestimate real danger.

Social meanings of natural disasters have changed over time becoming more objective and dispassionate. But some researchers have found that, even today, lay conceptions of scientific processes which underlie and lead to disaster can be modified by religio-moralistic beliefs about fatalism. These variant cognitions—scientific and moralistic—seem to be integrated within the minds of most Californians with the

result that earthquake hazard is seen in a variety of ways. When disaster prediction is based largely on non-scientific information such as the presence of omens, sensitivity to danger tends to be muted but when science is the basis for prediction, hazard awareness tends to increase. Even so, the relationship is unclear between differing beliefs about prediction—both scientific and non-scientific—and willingness to take action to mitigate damage. This ambiguity suggests that other as-yet-unspecified variables may intervene between prediction and outcome or may qualify the conditions of prediction in some way.

The importance of current cultural beliefs about fate versus individual efficacy were discussed. Hazard perception and sensitivity to risk tap two somewhat different aspects of the general problem of response modalities; locus of control appears to be associated with hazard perception in some studies but not "perception of" or "sensitivity to" risk studies. It was speculated that future orientation might be used to explain future apprehension and, further, the way fatalistic thinking affects hazard perception. Since future orientation has not yet actually been used as a perspective from which to investigate these relationships the question remains open. A related idea has to do with the suggestion that people may actually have different time horizons which qualify meanings assigned to future events.

In some cases omens and signs are relied upon to give sufficient warning to prepare for disaster. Although one research team interpreted the art of watching-for-signs as an indicator of the need for a predictable future, no research investigating this hypothesis has been reported.

The non-professional approach to subjective assessment of risk is often based on only one piece of information. Vulnerability and timing may be assessed using some traditional indicators or by reference to recent events. When a disaster has just happened it may be used as a sign that another cannot occur for some period of time. Disasters are sometimes believed to be cyclical events that recur periodically, but they can also be thought of as singular, non-repeating occurrences. Since most people have a small sample of experiences to use in constructing subjective probabilities, socially constructed values and beliefs are critical components of hazard perception.

This review is not meant to deny that citizens today are more aware of potential threat from the environment than at any time in the past. Social trends encourage the belief that dangers of all kinds are controllable by human beings and that government entities can and should protect citizens from environmental threats (Turner 1979). Residents of post-industrialized countries have high expectations for the quality of their environment today and for future generations (Page 1987). Nevertheless, Quarantelli points

out that disasters are expected to increase beyond our present ability to prepare for them: "If we look not from the past to the present, but from the present to the future, [increased disaster] is the inevitable outcome. Such changes as will occur in disaster planning while in the right direction will not be able to match the quantitative and qualitative increases in disasters if the present level of effort is not increased" (Quarantelli 1992a:23). Elsewhere he states that: "There is a dialectical process at work: there will be more and worse disasters at the same time that there will be more and better planning" (Quarantelli 1992b:6).

The potential for the occurrence of natural disasters is increasing rapidly due to growing population density and the concomitant development of unsuitable land such as flood plains, low coastal areas, land fills, faulted and fractured zones, and so forth. In addition, the consequences of disaster are no longer localized but are spreading in both area and significance; the effects of disaster in industrialized and non-industrialized societies quickly transcend geographical and political boundaries because of interconnected financial, communication and transportation networks. In spite of this increase in vulnerability, Drabek (1986) suggests that perceptions of threat remain largely unaltered. Since social structures and systems change more slowly than physical and technological

realities, disaster mitigation efforts are understandably late in catching up even though, ironically, technical and engineering advances have greatly increased the means to reduce hazard impacts. The threat of escalating damage and human misery focuses the importance of hazard perception research.

While we may fail to appreciate the significance of potential disaster in our own swiftly changing environment, hazards threatening foreign cultures may be even less recognized by us. Kastenbaum argues that concepts and definitions of disaster depend on selective perceptions resulting from geographic, racial and ethnic bias. He explains: "...as physical and emotional distance is increased, so the magnitude of death and destruction must increase by an undetermined but powerful constant before the situation can be classified as disastrous and call forth appropriate relief efforts" (Kastenbaum 1974:66). This suggests that there is a kind of threshold effect for misery which must be surpassed before we recognize disaster to others. As we continue to increase the hectic pace of the post-industrial, post-modern world, the distance to this "misery" threshold may grow making it even more difficult for us to appreciate potentially disastrous situations in other parts of the world. The argument here is that when attention is focused on immediate issues, more distant

problems—distant both in terms of time and space—are excluded. Quarantelli quotes Smelser:

The various environmental crises that the world is facing—exhaustion of resources, spoilage, toxicity, and pollution—will grow worse before they grow better. The logic behind this assertion is that the impulse among nations to develop economically and compete with others is so strong that they will be given greater priority than impulses to protect the environment. In the short run, environmental considerations constitute a cost and a liability in the drive toward competitive productivity. This effect will no doubt be stronger in those nations struggling to catch up—the former Eastern bloc and the Third World countries—than in the developed nations with developed environmental movements (Smelser, in Quarantelli 1992a:23).

Economic competition and the increasing rate of social and cultural change, both at home and abroad, may work to decrease sensitivity to the environment even as the effects of environmental upheaval grow in importance.

In short, natural disasters have a greater probability of occurring and the consequences can affect more people. The problem is aggravated by inadequate recognition of hazard both at home and abroad. This chapter has shown that serious environmental threats are often ignored or minimized. Insensitivity to hazards results in much unnecessary human misery because disaster mitigation measures can reduce or eliminate harm if the threat is perceived and recognized in time to act. Unfortunately future threat may be accorded even less importance as people find it increasingly necessary to concentrate their means on

solving today's problems and as costs continue to rise when resources are shifted from the present to the future.

Drabek (1986) suggests that the problem exists partly because society is a system and hazards can only be understood within the interpretive framework of the prevailing definitional structure; when the interpretive structure changes hazard perceptions will change. The next chapter will show how conceptualization of future events, like disaster, takes place within the broader and more fundamental framework of temporal patterns. In other words, the way people think of future events is actually a product of ideas about future and past orientation and temporal flow; one cannot appreciate the meaning of future events without considering these broader temporal structures. Although extensive work has gone into understanding images of the future and how they are constructed and changed, the entire study of time has gone unnoticed by hazards researchers.

Endnotes

7. The Environment as Hazard, edited by Burton, Kates and White, (1978), is a collection of articles documenting parts of a sizeable effort to relate findings from flood studies to other geophysical hazards in a dozen nations. Nearly 3,300 households were interviewed in 30 different locations. The entire project was designed specifically so that different cultures could be compared across different hazards and physical environments. An earlier book, Natural Hazards: Local, National, Global, Gilbert F. White, editor, (1974), also documents part of this project. Both volumes have become classic reference works for disaster research and will be mentioned often in this review.

8. Touching briefly on related elements, neither age nor distance from the river were correlated with the specific perception of flood hazard in the Mad River floodplain of Humboldt County, California (West and Harper, 1980). But age does appear to matter in other environmental research; Jianguang found that younger individuals are more sensitive than older subjects to hazards that endanger the broader environment (Jianguang, 1993).

9. In this perspective racial subcultures and other component groups merely contribute variation to the broader foundation of regional culture.

10. Some literature shows that, relative to other low probability events (such as earthquakes), perception of hazard from volcanic activity is given the least amount of attention.

11. This is an eleven-volume work describing public response to the possibility of a major earthquake in Southern California. The study included extensive media analysis and six population surveys.

12. Non-scientific prophecy can easily be seen in attitudes toward the weather forecasts in The Old Farmer's Almanac. Published each fall since 1792, these predictions are popularly believed to be conjured up through the collective wisdom of New England farmers even though they are actually based on solar flares and sunspots. Chief weather prognosticator, Dr. Richard Head, former chief scientist for the National Aeronautics and Space Administration, uses observatories, satellites, weather services and historical data to generate a years worth of monthly weather forecasts

by geographic region. But according to the Executive Editor, Tim Clark, people are disappointed when they find out a scientific approach is used: "They like to think we're out on the back porch in overalls looking up at the trees and saying, 'Wa'll, what d'ya think?'" (From an article published in the "Las Vegas Review Journal," Friday, November 25, 1994. Bob Golfen, reporter.)

13. Spitak was the site of a large earthquake earlier in 1988. It was a tragic event because a great number of lives were lost due to bad land use and poor building construction.

CHAPTER 3

THREADS CONNECTING HAZARD PERCEPTION AND TIME

In the last chapter we discussed social and economic aspects of hazard perception showing the important contribution made by beliefs and values. The variables surveyed included: community values; views of nature and how they are affected by attitudes toward science, magic and religion; beliefs about individual control of one's fate; ideas about causation and predictability; cognitive biases toward short term thinking and attitudes about chance.

Ideas about time were mentioned during this review but several specific connections can be articulated which tie the whole subject together. In this chapter we will explain thirteen threads which run between hazard perception and sociology of time and then will reduce those threads to major temporal topics. We will examine time literature and show how it can shed light on the phenomenon of risk perception.

Thirteen Threads

(1) The very definition of "hazard perception" includes temporal constructs. Notions about the speed of onset and duration of a projected event, impressions and ideas concerning the frequency and temporal spacing of such

events, and understanding of the causal mechanisms and predictability of the event are all temporal cognitions and part of the broader time perspective.

The fact that hazard perception requires mental images further ties the concept to images of the future.

"Imaging," meaning to picture in the mind or to imagine, is one of the shared elements of both perspectives. The ability to create rich detail and significance is required for the construction of all futures including perceptions of future hazard. An impoverished image of the future will explain lack of meaning assigned to future hazard.

(2) The impact of experience fades with memory decay. It has been said that society is "memoryless" where natural hazards are concerned. This is a natural part of the temporal signature although extent and rate of fade are related to the larger temporal perspective which is a product of both culture and personality.

The relative importance attributed to the various temporal modalities (past, present, future) can explain why experience alone is often insufficient to ensure future mitigation. For example: (1) the focus of attention may not be on past experiences; (2) one may wish to avoid actively thinking about one's past; and (3) the significance of past experience changes as future expectations and hopes develop. It may also be the case that some manner of thinking or

cognitive bias hinders recognition of the connections and causal relations between past and future events.

(3) The disaster sub-culture posture toward defying danger emphasizes the here-and-now during the disaster experience. This attitude is a deliberate short-term modification of future orientation in response to crisis. Using past successes, it celebrates and exhilarates the present while ignoring future consequences. This particular kind of disaster experience creates a legacy, and sometimes a legend, that colors all future expectations.

Another temporal aspect is also relevant to the sub-culture attitude: The normal pace of life is quickened by the expectation of sharp, disjunctive change prior to the actual onset of disaster. The promise of swiftly occurring changes—replacing steady and predictable continuity—adds to the growing excitement and feeling of aliveness. A description of the entire temporal signature of members of disaster sub-cultures would show how they differ from populations without such cultures, like California, for example.

(4) The desire that people have to see order, pattern and meaning in the world also refers to the human need to ascribe or attribute form and structure to the way time moves—from the past, through the present, and into the future. Perceived patterns of time vary from culture to culture and across history. Those who believe in inevitable

human progress tend to see time moving linearly while those who are more closely associated with nature are more likely to see cyclical repetitions of events. These patterns can explain variation in hazard perception because a linear sense of time hampers recognition of the repetitive elements in the complex dynamics that trigger cataclysmic events in the natural environment. Those who feel that time moves in cyclical, elliptical or spiral patterns are more sensitive to the possibility of disaster even though, not subscribing to notions of progress, they may be less ready to believe in its prevention.

(5) Mystical and teleological perspectives of prediction and causation co-exist with analytical thinking in the mind of modern man. These two modes of thought jointly, and perhaps independently, affect ideas about situational hazards. Understanding temporal constructs goes a long way toward illuminating this situation. Ideas about causation, the predictability of events, and temporal constructs are inseparable because the relative importance of the various temporal modalities—such as past, present and future—and ideas about consistency, flow, and directionality of time, depend on basic assumptions about the nature of reality.¹⁴

(6) Concepts of causation and prediction are related to a complex of ideas which include belief in personal power. The "world view" associated with ideas about control

includes ideas about vulnerability to hazard. Since the person with internal locus of control is guiding his own future, his perception of hazard differs from the person with external locus of control. The relationship between locus of control and perception of hazard can be explained by past failed attempts to control outcomes as well as images of the future but all temporal modalities are meaningful here. The conflicting conclusions drawn from various empirical investigations may well be resolved by using the entire temporal signature rather than just control of the future.

(7) The Porfiriev example of Russian fatalism shows that Russians resigned themselves to a future consonant with their perceived past: disastrous. Fatalism and self-determination play a well-known, well researched role in the development of the future. Literature showing how social and cultural frameworks affect future expectations helps to explain how people interpret information when they try to recognize and understand hazard.

The continuum running from fatalism to self-determination describes a philosophy which can limit or enhance the individual's ability to shape and control the environment. In extreme fatalism the outcome of events is subject to fate, perhaps determined by a deity or by the stars. Events are predetermined therefore free will or any act of volition is assumed to be futile. In extreme "self-

determination" all events have antecedent causes which are completely knowable and which create conditions leading to a predictable outcome but individual "free will" can control and manipulate causes (Reber 1985). The "fatalism/self-determination" variable has been defined by the kind of future image it creates but it too is a product of all temporal modalities, not just future.

(8) The use of signs and omens—to indicate when something is about to happen—has the effect of providing a calm, worry-free present. This creates a feeling of security in the present that is necessary for normal life. The idea that the future will telecast signals in time to take protective action shapes perception of hazard. What kind of a future is it that reaches back in time—independent of the workings of the natural world as we know it—to warn of its coming? The answer to this question will shed light on reasons why hazards are sometimes difficult for the lay public to appreciate.

(9) Belief in the idea that one experience of disaster will prevent the occurrence of another disaster in the same place or during the same time period (the gambler's fallacy), or belief that bad luck runs in threes, or other such biases in assessing the probability of an event, brings predictability and order to what would otherwise be a complex system of relationships more accurately described as random. These biases create the feeling of a predictable

and stable (if not actually controllable) present and a near-future. The security that comes from believing the future is knowable explains the resulting bias in assessing the probability of hazard.

(10) Economic need can focus attention toward or away from potential disaster. We see this wherever income is directly affected by hazard, whether it be in various occupations or in the broader culture. For example, in the short run environmental considerations are often costly and can create a competitive disadvantage for builders. The desire to maximize profit in the present often results in shortened time horizons. This means only the near past is remembered and only the near future is considered when making economic decisions. The phenomena of shortened horizons explains why we see development of flood-plains and other hazardous environments.

(11) Temporal horizons and concepts of change are situation specific and, further, the same situation of hazard will be understood differently by professionals than by lay persons. This means that temporal horizons for a particular hazard and ideas about how a particular disaster is likely to unfold depend on relative distance from the phenomena and professional position. This explains why education and communication techniques aimed at getting individuals to take protective measures often fail. These differences—called "temporal discalibrations"—go a long way

toward explaining communication problems between professionals and the public.

(12) Average people have a tendency to downplay moderately high probabilities of near-term risks by pushing them into a more distant future. Similarly, interventions showing immediate payoffs are preferred over those that may mitigate or prevent harm at some indefinite future date. This "discounting" of time is a well documented phenomenon which can be better understood when placed in context with other temporal constructs such as onset speed of disaster.

(13) Under certain circumstances the customary inertia common in public attitudes toward new proposals gives way and new protective measures are then taken against disaster. A capacity to act and a sense of responsibility are necessary to make quick transitions such as happens, for example, when a flood-warning system is quickly implemented. But resistance or readiness to change is part of the broader temporal signature which is composed of the characteristic or typical future and past orientation together with ideas about how time moves from one modality to another. When sudden sharp disruptions—such as the threat of impending disaster—bring present-day survival needs into clear focus, the temporal signature changes, but only temporarily. Understanding this elasticity and resistance to permanent change will facilitate the understanding of why it is

sometimes difficult to get people to look ahead and plan pro-actively against future harm.

Time: The Common Element

This pattern of relationships shows that ideas about the future illuminate and explain various perceptions of potential hazard. The way a situation is assessed and understood depends on when an event is expected to occur, how and at what speed it is expected to arrive, the future value or meaning of its arrival relative to present values (likely impact and severity), whether outcomes can be predicted and controlled, and so forth.

Many already existing theories contain elements regarding the future of an individual. Whenever expectations and goal setting play a part—as in economic value theories, theories about environmental controls, action theories, and so forth—benefit can be gained from the use of future perspective as a variable. But these uses only hint at the power of temporal constructs to explain order and cognitive congruence.

Time is an ordering principle. Time is a social construction that brings order to our lives. Barbara Adam says: "Time is an ordering principle that coordinates, orients, and regulates interactions between people and groups" (Adam 1990:42). It also interprets and makes available our natural worlds. Whether cesium clocks or crop

harvests are used to delineate important periods, time helps us understand, organize and use the world around us.

The character of time depends to a large extent on the way technological development has affected relationships between people and their natural environments. But social structures such as politics and economics, cultural history, and concepts found in religion, philosophy and language also contribute to ideas about time. The importance of social influences can be seen when subcultural values and temporal ideas contrast with the dominant patterns of the culture (Kluckhohn 1953).

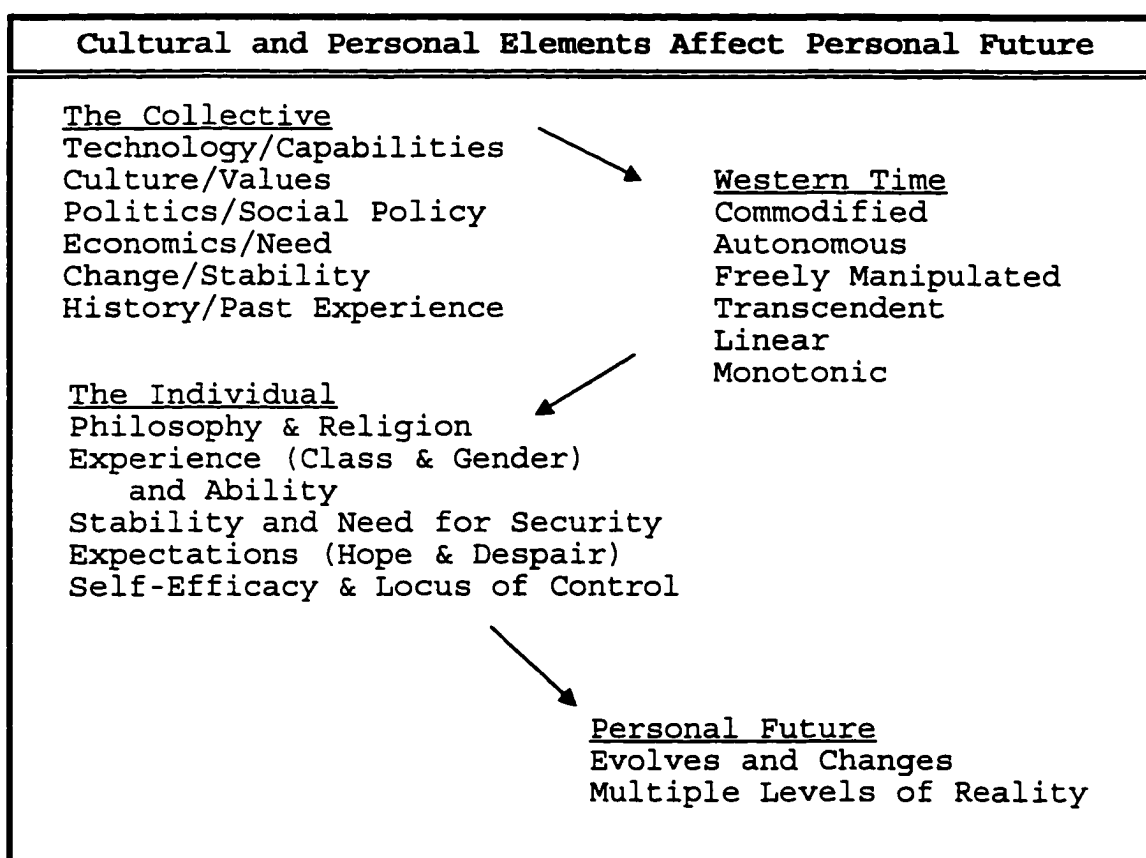


Table 1. Temporal perspective is a complex set of interrelated ideas stemming from the merger of cultural conditions and values with those of the individual.

Cultural concepts of time are not immediately perceptible or identifiable, but when examined it becomes apparent they represent strong normative forces affecting both the behaviors and the cognitions of members of the culture. Consider the dominant Western view: future oriented, active and individualistic. We place a premium on the security of long-term planning, but social policy is supposed to provide for this leaving us free to respond to developing opportunities without worrying about or doing too much to plan for the future. Popularly we subscribe to a linear, monotonic progression of time from the past, through the present, into the future, but we have little cultural use for the past (except as defining waves of commodification and consumer taste). Our values are largely near-term; we concentrate on the immediate growth period ahead. Our desire to continue economic abundance encourages us to overload the present and near future with planning (Nowatny 1975). Both rapid change, which is related to technology, and "freedom" benefit from short-term perspectives.

Durkheim discusses the subtle power of social time when he argues that, to the extent that social time exercises a restraint or compulsion on the individual it lies outside individual consciousness, and to understand it one must look to the sociocultural factors that create it (Durkheim 1915).

It is clear that on an individual level temporal perspectives reflect cultural and subcultural influences but—since individuals adopt cultural values in different degrees depending on pragmatic factors, feelings of social power or alienation, position in the social structure, and so forth—specific points of view differ from person to person. Shotwell talks about this imperfect process:

A sense of time means a knowledge of happenings. It is to be found only where memory has been disciplined to its task of knowing the world that was, by a keen awareness of the world that is, where the analysis of the present calls for the prior events in the light of which the present takes on its meaning. The sense of time is not a neglected inheritance to be reacquired from primitive instincts but the slow and still most imperfect acquisition of culture (Shotwell 1949:65).

Cognitions, knowledge, beliefs and attitudes, as well as capabilities and motivations, all come together to structure a model about how time operates and functions. The patterning of time, for example, depends partly on ideas about prediction and causation, ideas which can stem from mystical and teleological frameworks or rational, scientific frameworks. Personal power, fatalism and self-determination affect images of the future as do ideas about chance and luck. The nature of any individual's future depends on the answers given in response to questions like these: Is the future knowable, predictable and stable? Does the future telecast (supernatural or supersensory) signals like omens? Is the future based upon (rational) causal principles? How

much knowledge of the present is needed to predict the future? In short, what forces give shape to the future and what are the various contributions from human, natural and supernatural forces?

Thus, temporal constructs of culture create a framework for the organization of individual personalities...personalities that show themselves in their unique ways of accommodating and harmonizing with each other and the natural environment. Fraisse speaks of this process when he says: "The very way in which he submits to temporal pressure, or revolts against it, reveals what he [man] is and what he would be" (Fraisse 1963:290).

As reflections of culture, individual ideas about time evolve and develop with cultural change. But, as with most other cultural values, change takes place very slowly (McGrath 1992). As a reified and concretized construct—which can be moved around to "save" daylight and even-up the length of the year—time's meaning stays relatively fixed.

Major Temporal Topics

The conceptualization and operationalization of the future in earlier studies varies with the recognition of its importance and complexity. We argue that a thoughtful treatment of the issue with respect to the man-nature interface must consider three different vantage points: (1) the temporal perspective (how time is planned and used); (2)

the pattern and flow of time from the present (or from the past through the present) into the future (how time functions); and (3) the characteristics and durability of the temporal signature which is created by points (1) and (2) and how resistant this signature is to change. The following section elaborates these points.

Temporal perspective. This subject covers the relative cultural and sub-cultural importance of the three time divisions (modalities) of past, present and future as well as their density, differentiation, extension, and evaluation. Here we explore ideas about "discounting," a process where present unpleasantness is pushed to the future. We look at personal preferences for making the present exciting as well as market requirements for short-term planning. This is the place to explore the connection between imagination and the future and to look at ideas about memory decay with the receding past and living with a foreshortened future.

Pattern and flow. These topics address the way time moves from the past, through the present and into the future. Patterns of time may be circular, elliptical, linear, or otherwise, with or without directionality. Flow is a term that includes ideas about rate of change as well as consistency or uniformity. Here we will talk about whether the environment changes gradually or sharply and how

expectations differ regarding the speed of onset of particular events.

The temporal signature. Since concepts of time do not exist in isolation from each other, we suggest that future investigations consider the whole temporal network—at least with respect to future time horizons and attitudes toward the process of change—because no single aspect can be assumed to predominate over others. The entire temporal identity is a complex of ideas and attitudes, of which those relating to the future have been defined in the previous two topics. Temporal identity is an individual cognitive map or definitional structure which provides an interpretive framework within which the individual can define and understand the world around him.

The idea of a temporal signature, which implies uniqueness and individuality, is useful for understanding temporal discalibration between communicator and listener. If a temporal mismatch exists, the question then focuses on whether the temporal signature can be changed. How stable is it? Does it have inertial or elastic properties that come into play in response to various hazard perceptions? What steps would a disaster researcher have to take in order to communicate effectively with a member of the lay public? Since no research yet exists which can answer these questions directly, we can only sketch out the problem through inference using the existing literature.

The next chapter will describe research contributing to an understanding of images of the future and how widely these images differ. In his book, What Time is this Place?, Lynch testifies to these differences in a poetic way:

Men look out on the future with very different eyes; some consider tomorrow or just the next hour; others are preoccupied with events a generation away. The future may seem something that lies ahead of us, something to be explored with hope and effort, or it may seem to be rushing toward us, beyond our control. It may be a realistic expectation tied to present and past experience, or it may be a disconnected fantasy of wish and fear. It may be something to avert or a promised land (Lynch 1993:90).

Endnotes

14. One caution here: simultaneous belief in both science and non-science suggests a challenge to measurement validity because order and unity is often made possible by the creation of multiple levels of reality. Inconsistencies may only appear when one is juxtaposed against the other (and may even then be lightly explained away). Also, it would appear that African Americans, Mexican Americans and Americans of European stock all differ in their relative mixes of scientific and prescientific thinking.

CHAPTER 4

REVIEW OF TIME LITERATURE

Temporal Perspective

Temporal perspective is a term which refers to both temporal orientation and temporal horizon. "Temporal orientation" means the relative importance of, or degree of involvement in, the past, present and future. "Temporal horizon" refers to the meaningful depth of the past and future. "Meaningful depth" means how "far ahead" or "behind" people think, be it days, weeks, months or years. It also refers to the depth of the present or the time-space in which one acts. While the temporal perspective includes other dimensions, these are the two major distinctions used in the literature. Temporal orientation and horizon may or may not be correlated with each other and should be (but aren't always) treated separately.¹⁵

One element of temporal orientation, the nature of the future, is central to social action and decision-making. Therefore much empirical work has been devoted to investigating the relationship between this temporal concept and social structures. Much less work has been done on the present and past aspects of temporal orientation or temporal horizon. Why this bias in the literature exists is unclear, but it may reflect the cultural time biases of Western

social science research. We will also try to show that the literature on empirical studies suffers from an impoverished and incomplete understanding of temporal perspectives—one which can be remedied by opening the scope of study to dynamic processes.

The Development of Temporal Perspective

The cultivation—or individual evolution—of future and past perspectives is the subject of Piaget's (1969), The Child's Conception of Time, where he approaches the problem in terms of cognitive development. As a child matures, cognitive capabilities grow from simple reflexive behaviors and concrete cognitions to more complex abstractions of reality. For example, at the age of 4 or 5, nascent thought about time and space begins to develop from simple relationships at the sensory-motor level. By the age of 7, children who have confused age with height, insisting that the taller child is older, begin to think in terms of succession and duration so that concepts of aging and the passage of time begin to develop. At the same time, the child learns to anticipate consequences and think in terms of future possibilities and as a result he begins to structure the future with more complexity. Eventually the individual owns a characteristic future perspective or posture toward time to come. This perspective characterizes the individual and is resistant to change.

Shannon (1975) supports and qualifies Piaget's work by exploring cultural differences in the development of future perspectives in older children and young adults. Using a simple "Lines Test" in which subjects indicated the amount of "space" best representing past, present and future, Shannon found that, while Anglo-American children of ages 14-17 had a more extended future than those in the range of 10-12, Native Americans and Mexican Americans adolescents showed little or no difference based on age. Shannon's interpretation is that members of disadvantaged subcultures with uncertain futures may be more appropriately served by concentrating on the present than the future (Shannon, 1975). Other authors have drawn relationships between control of future and depth of future but social influences should not be underestimated. Friedman (1990) states that the growth of knowledge about time comes from the process of adapting to an environment which already has a particular temporal structure: "We do not develop in the direction of ideal models of time, but rather build representations that capture relations that matter in our lives," (Friedman 1990:102). In examining the growth and development of temporal constructs it may be important to consider ethnic differences within social psychological perspectives.

Being socially situated to achieve future goals may be less important than the ability to differentiate between unattainable wishes and realizable expectations—an ability

which can be related to emotional problems and inadequate social adjustment. Klineberg (1967) found that future orientation increased from childhood to adolescence among normal subjects but decreased among those who were labeled as maladjusted due to severe behavioral problems. Klineberg's interpretation is that maladjusted 10-11 year old children develop a type of future that is unrealistically extended due to projections of wish-fulfilling fantasies: "...maladjustment, poor school performance, low social status, and little involvement with present experiences were all found to be associated with a greater orientation toward the distant future." This type of distant future, however, soon disappeared: "[among slightly older children between the ages of 13-16]...maladjustment, poor school performance and little involvement in present experiences come to be associated with a more restricted outlook on the distant future" (Klineberg 1967: 192). Klineberg argues that future orientation is associated with the development of a positive ego-identity, a theme which has found much support in psychological literature.

Neither Shannon nor Klineberg used a complex measure of future perspective. Had they included measures such as density, coherence and reality-measures which will be discussed in sections ahead—research outcomes may have been different, and, since no work has been done, one can only

speculate on childhood and adolescent ideas about constancy and change in any more complex sense.

Temporal Perspective and Social Structure

Because temporal perspectives are learned constructs, researchers have expected to find class-based differences. Another reason has to do with the production and maintenance of symbols distinguishing the upper class. Nowatny (1975) observing that objects and positions of status must be acquired and preserved by members of the upper class, argues that strategies designed to accomplish this normally require the development of long-term, future oriented time perspectives. Members of the lower class, aspiring to the same symbols of status, will normally attempt to find methods of acquiring them and this means that they too must develop long-term, future oriented perspectives. But only short-term perspectives will result when long-term perspectives are either unfeasible or unnecessary. One implication is that members of the upper class, securely ensconced in their position, are essentially unchallenged and have no need of long-term perspectives. In this case, members of the lower class (who are dominated by the upper class short-term perspective) will be left with short-term perspectives themselves because they see no feasible way of obtaining, in the long run, the symbolic or material resources they desire. This politics of time results in something of a stalemate unless the lower-class can adopt a

long-term perspective for some other purpose such as revolution, "whereby they place their claims to increased status into the future" (Nowotny 1975:335-6).

For some groups, like the working class, the short-term time perspective can be the only adaptive strategy in the face of future uncertainties and risks which cannot be controlled for or protected against and about which little is known. When prospects are dim, there is no incentive to expand the future temporal horizon; indeed such conditions can trigger retreat into the present or even the past.

Time perspective is thus affected by the pressure of daily living: Lower classes struggle with future planning because living requirements are so demanding that energy and resources are simply insufficient to transcend daily requirements. Here the politics of the allocation of scarce resources and the politics of time converge. A counter argument is that men are thinking creatures, interpreting meaning, developing desires, and making decisions for themselves. The ability to transcend the immediate present is always there and can be tapped by special events (such as revolution) or new knowledge, (such as class consciousness), that allows a reorganization of these critical relationships.

Delinquency, Social Class and Socialization¹⁶

Conflating temporal orientation with temporal horizon, (confusing the presence of a future orientation with the

depth of that orientation) LeShan (1952) theorized that lower-class children have "shorter time-goal orientations" as a result of having lower tolerance for frustration. But this thesis was not supported by Ellis, Ellis, Mandel, Schaeffer, Sommer and Sommer (1955). In their study upper-middle class children were ranked by tolerance for frustration and asked to tell a story which was analyzed for "action time span." They found no relationship between the two variables. Since lower-class children were not used as subjects it is inappropriate to generalize these findings to that class.

LeShan suggested that a short temporal perspective may have implications for delinquency. This idea was supported with a quasi-experimental design conducted by Barndt and Johnson (1955). Matching groups of 15-17 year old boys, half delinquent and half non-delinquent, were asked to create endings for stories. Delinquent boys did produce stories with significantly shorter time spans than the non-delinquent boys. But Stein, Sarbin and Kulik (1958) re-interpreted the relationship between short time horizons and delinquent behavior by arguing that the apparent relationship spurious; a third variable, socialization, affects both planning horizons and pro- (or anti-) social behavior rather than delinquency per se.

The relationship between socialization and temporal perspective also was first investigated by LeShan who

hypothesized that temporal orientations of parents are evidenced by their child training techniques. He grouped parents into categories, (lower-lower class, three levels of middle class, and upper-upper class) and examined the way behavioral consequences were used as a child rearing technique. Analyzing written materials, LeShan concluded that upper-upper class techniques of child rearing emphasize the maintenance of tradition and heritage, while techniques used by the middle group were more future oriented. Middle-class parenting cultivates behavior in preparation for future advancement such as going to college, getting married, etc. In contrast, rewards and punishments for lower-lower class children were quite immediate with very few references to long-term future-oriented moral or developmental reasons for behavior.¹⁷ In this pioneering research, LeShan illustrated the hypothesis that different time orientations are found in different social classes by examining stories told by 8 to 10 year old children. He found that the length of time covered in these stories varied by social class, with middle-class children creating stories that extended over longer time periods than those of lower-class children.

LeShan's findings were criticized by Greene and Roberts (1961) and Judson and Tuttle (1966). LeShan's work was further criticized by Kendall and Sibley (1970), who replicated his research but suggested that time span of

story may have been an artifact of story length. In the Kendall and Sibley study middle-class children told longer stories and used more past-tense verbs than lower-class children. They conclude that the meaning of story time span is difficult to interpret, but later studies show that both IQ and past orientation actually contribute to a developed future. In other words, additional variables may elucidate and elaborate the LeShan findings, rather than negating them.

Brim and Forer (1956) studied life planning and found that children from the middle class plan further into the future than children from lower classes. This study considered not only the value attached to thinking and planning for the future but also the ability to project or richly articulate the future. These investigators hypothesized that some individuals, by virtue of their status in society, are better able to foresee their future than are others. For example, stable and well organized status sequences have some degree of predictability (such as progression through grades in the school system), and persons with power, money, prestige, etc. have more control over their future. In controlling for these factors, Brim and Forer were able to use class to explain variance in length of planning for white male adolescents and undergraduates, but only marginally so. The authors conclude that the correlation of long-range planning with

socioeconomic status reflects imbedded value and structural influences.

Rosen (1956) also emphasized psychological and cultural factors. Again using high school students, this researcher demonstrated that differences in the motives and values of social class members are correlated with differences in vertical mobility. This work has relevance for both temporal orientation and horizon because the value of the future is accompanied by an expectation as to when the future will bear fruit.

Lamm, Schmidt and Trommsdorff (1976) focused on aspects of future orientation and social roles among German adolescents. Their work attempted to explain both class and gender differences in attitudes toward public issues (economy, politics and environment) and toward private issues (family, occupation and personal development). Domains of study were singled out because, as Trommsdorff says, "The thematic context can presumably shape cognitive structures, since it specifies for a given situation the individually relevant goals and motives" (Trommsdorff 1983:383). Again consistent with LeShan, middle-class youths had longer time horizons in both public and private spheres. But these authors were further able to demonstrate that the subject or topic of planning makes a difference; among lower-class adolescents, females had a more extended future orientation in the family domain and a shorter one in

the occupational domain. This was explained by the theory that the lower the social status of a family, the more strongly are partner relationships oriented toward sex-role stereotypes. (Svenson (1988) and Bjorkman (1984) also demonstrated that future time horizons are situation specific.)

In reference to developing a research tool, Schneider and Lysgaard (1953) propose the existence of a deferred gratification pattern where gratification or satisfaction is postponed in a pattern characteristic of the middle class. The deferred gratification pattern is evidenced, for example, when achievement of economic independence is delayed in favor of education, when sexual gratification or consumption is deferred and when money is saved. This model is relevant to time perspective research because there ought to be a corresponding difference in the temporal orientation of the two classes. Schneider and Lysgaard emphasize the normative aspect of deferment and suggest that the lower-class tendency toward non-deferment almost certainly has a normative element, a proposal supporting the argument that time perspective is a product of socialization.

Schneider and Lysgaard have their critics. Beilin's (1956) work with college-bound youth suggests that postponing is a phenomenon introduced by the observer: Lower-class college youths see themselves as gratifying

developed values by going to college, rather than relinquishing other valued behaviors.

Straus (1962) was unable to replicate the relationship between social class and the deferred gratification pattern. This study used a relatively complex measure of socioeconomic status for high school students (family income, possession of certain items, and education of parents and grandparents). The students responded to a questionnaire designed to measure delaying tendencies for such things as sex, consumption and aggression. Controlling for class status and intelligence, Straus found that deferred gratification correlates best with individual achievement orientation. "Learning to defer need gratification seems to be associated with achievement at all levels of the status hierarchy..." (Straus 1962:335). Straus interpreted this finding as support for the theory that need deferment is functional for social mobility in American society.

Continuing this critique, Miller, Riessman and Seagull (1965) cautioned against using a pattern of non-deferred gratification as an oversimplified model of low income behavior. Among the methodological criticisms, these authors point out that class groupings are gross and inconsistent because class is sometimes based on employment status and sometimes on other variables such as income and education. Within class categories the distribution of

deferment behavior is unclear because it is not known how many class members exhibit what degree of non-deferment. The authors were also concerned about conceptual difficulties. They argue that the value and consequences of either delayed or immediate gratification may not be the same for persons from each class. Luscher (1974:115) shares these criticisms when he questions the meaning of deferred gratification and how it may be related to time perspective and achievement motivation, leading to upward social mobility.

Jessor, Graves, Hanson and Jessor (1968) published the results of a five year study of deviance among members of a tri-ethnic community in southwestern Colorado. Interviews were conducted with Anglo-American, Hispanic and Native American adults and high school students. While tendencies toward immediate gratification and short time perspectives tended to refer to a single orientation, they were not identical as predictor variables in this study. Jessor, et al. found that females showed greater delay of gratification but shorter time perspectives than males in all three ethnic groups. Had they controlled for subject area (as in Lamm, Schmidt and Trommsdorff 1976) they may have been able to interpret this finding. In general, Anglo adults appeared to have an extended time perspective relative to both Hispanics and Native Americans, and both Anglo and Hispanic high school subjects had extended time perspectives in

contrast to Native Americans. In conclusion, however, these correlations were not strong enough to confidently adopt sociocultural structures as predictors of personal tendencies toward gratification or time perspectives.

It should be noted that deferral behavior is the positive version of "discounting" where the consequences of present behavior are suspended or pushed into the future. As we explained in the foregoing chapter, discounting is central to disaster readiness because, as Milletti argues: "How people perceive the time period for a natural disaster risk is a major constraint to public readiness [because] there is a tendency to push risk to the distant future..." (Milletti 1992:20).

Theoretical and Methodological Problems

Doob (1971) made an extensive review of the literature on class and future time perspective and concluded that the relationship is unclear. He reasoned that, "in America marked and consistent differences between social class have not been demonstrated, probably because they are in fact very small..." (Doob 1971:246). All investigators agree that different cultures and sub-cultures do, in fact, exhibit different references to time and different notions of temporality; the question is how to interpret and predict these differences. Doob suggested that methods of measurement have been insensitive to variables that could explain cultural differences because variable interactions

obscure significance in many studies. In fact, for a long time most research consisted of simple measurement techniques such as the projective technique used by LeShan, and Barndt and Johnson, or probabilistic methods like that of Wallace (1956) (described below) where individuals are asked to identify events which they think will happen to them in the future. Many investigators argue that methodology must be developed which is both clearly precise and appropriate to the task of assessing the effects of social class on the development of future time perspectives.

For example, Sorokin and Merton (1937) observed that, when asked about future occurrences, subjects rarely refer to calendar dates, preferring instead social events or phases of the life cycle. Examples are: training periods, military service, job and career development, marriage, etc. Toward this end, O'Rand and Ellis (1974) developed a Social Time Perspective Scale designed to allow college-age youth to project time in social categories. These categories can be understood as "a temporal arrangement of future social events meaningful to the individual as a member of a given social unit" (O'Rand and Ellis 1974:54). Using this approach, the authors collected data from both interviews and written records. The assumption was made that the life cycle is sequentially ordered so that events can be chronologically ranked. Analysis again showed that college freshmen (middle-class) were thinking ahead to the time when

their own children will grow up, while college-age youth who were not in college, but working (lower-class), were not thinking beyond marriage.

Another problem with methodology has to do with what appears to be questionable sampling procedures. The reader will note that most research concentrates on small numbers of students who may have been selected for convenience. No one appears to be unduly concerned about this or about the possibility that teenagers and young adults may be atypical with respect to temporal horizons.

One of the main criticisms, made by Luscher (1974), is directed at the assumed one-dimensionality of the time perspective and its homogeneous structure. As pointed out at the beginning of this section, the concept "temporal perspective" is more complex, theoretically, than just future time perspective. In addition, Nowotny (1975) argued it is a mistake to assume a unitary future exists which is equally valid for all social categories, regardless of class, status or power. She further charges that authors of research on deferred gratification and variations in time perspectives by social groups, are subject to criticism because they themselves are victims of their own position in the social structure; these authors assume that a long-term perspective is the "normal" socio-psychological standard (Nowotny 1975).

As early as 1956 Wallace complained that, "Concepts such as time sense, time orientation, time perspective, and time perception are employed interchangeably, often in the same investigation, or are utilized in such a manner that no clear idea of the intended meaning is given, either in conceptual or operational terms" (Wallace 1956:240). Using two matched groups of adult hospital patients, one group diagnosed with physical health problems¹⁸ and one group diagnosed with schizophrenia, Wallace attempted to identify and discriminate two important temporal concepts. Data on important life events were analyzed for both coherence (consistency in ranking the temporal occurrence of important life events) and extension (the range of years between subject age and the most distant event named). Wallace concluded that both the length of the future time span and the organization of it are significantly reduced for schizophrenic patients as compared with medical patients.

In a more sophisticated approach, Kastenbaum (1961) used factor analysis to identify dimensions of future time perspective. This technique was to lead to a more complete understanding of the elements that constitute future orientation. Data included measures from IQ, personality and opinion scales as well as four logically independent measures of future time perspective. These latter measures included: story completion data (LeShan 1952, Barndt and Johnson 1955); sequence arrangement tasks (Wallace 1956);

projection of future events, and projective techniques (Kuhn and McPartland 1954). Two hundred and nine high school seniors served as subjects. In his analysis Kastenbaum found four distinct factors, the first of which clustered around general concern for future experiences. The second factor grouped high IQ, attitudinal preference for spontaneous and creative behavior, and the preference for directional, dynamic time imagery. It was interpreted in this way: "the person of good intelligence who tends to accept social values and seek his satisfactions within the realm of 'approved' cultural action will share the American middle-class interest in future achievements and the concomitant preference for images of time that suggest a definite movement toward the valued future" (Kastenbaum 1961:212.) The third factor has to do with density, defined as "the number of events, roles and experiences an individual expects to populate his future" (Kastenbaum 1961:217). The fourth factor, which had high loadings for intelligence, unstructured extension and coherence, was interpreted as, "the ability to bring intellectual resources to bear upon relatively unstructured situations, with resultant coherent organization of the contingencies" (Kastenbaum 1961:213). In other words, this factor concerns the inclination to explore and organize the future from an unstructured present.

Kastenbaum's model of future time perspective contributes concepts of "density" (number of events populating the future) and "directedness" (preference for an active conception of time with directional motion from "now" to "later") to Wallace's earlier notions of "coherence" (degree of organization of future events) and "extension" (the length of future time which is conceptualized, or the time horizon). Kastenbaum further qualifies his model by considering the importance of "cognate variables" such as planning ability and personal pace. The author proposes that "response inhibition" is the variable opposing future time perspective. He also suggests that a framework for understanding the planning process might start by thinking of future time perspective as a function specific to the individual which permits him to create a model of the future—which then can be implemented through planning (Kastenbaum 1961:215). This idea places future time perspective antecedent to everything else.

In uncovering some of the multiple elements of temporal perspective, Kastenbaum's work helps deal with the criticism of overly simplified constructs. The results help explain why previous work has been inconsistent in confirming or contradicting the importance of class differences in temporal perspectives.

A different theoretical criticism is that the structure (both temporal orientation and temporal horizon) of a

person's future time perspective may not be the same in all areas of life. An earlier discussion explained how Lamm et al. (1976) recognized the topic dependency of time perspectives, but this idea was first expressed much earlier by Frank (1938). Frank suggested that different time perspectives can be associated with different stages and roles in life:

...we are struck by the very complicated scheme of time perspectives operating at any one period in a culture where we see each individual living with and in radically different time perspectives...a single individual may develop a variety of time perspectives, each applicable to a different aspect of living, so that he may view economic events in one dimension, political in another, social in another, sexual in another, and so on, with little or no apparent conflict; or he may develop a more or less homogeneous set of dimensions for all aspects of life, bringing his conduct into a well integrated pattern (Frank 1938:297).¹⁹

Extending this variability in future orientation to social class, we are reminded again of Miller, Riessman and Seagull (1965), who interpret the pattern of deferred gratification as a situation-specific variable, rather than one fixed to social structure. Caro's work (1965) also suggests that future time horizons depend on personal and situational factors rather than social class. This researcher points out that the concept of deferment implies time conflict between near and distant goals and, as such, is a better measure of achievement orientation and potential social mobility than social class. Since these studies, or maybe because of them, the work on deferred gratification

has died out but the idea of multiple time perspectives, varying by subject, has grown in importance.

Trommsdorff, Lamm and Schmidt (1979) conducted a study showing how change in the external environment affects future orientation. This longitudinal study was designed to capture changes in outlook and future time perspectives as a result of the transition from secondary school. A panel of two groups of German adolescents, one destined for college and one for vocational training, were given questionnaires on two occasions, two years apart. Consonant with the research hypothesis, the change in future orientation depended on subject area, class and gender. Although we argue later in this chapter that change in the external environment can be associated with change in future orientation, this study may suffer from complications associated with normal shifts in expectations of maturing adolescents.

Temporal Perspective Summary

"Temporal perspective" is a complex of ideas but it can be made more understandable with the recognition that its many aspects are subject and situation specific. Reproducibility of results may be enhanced by specifying self versus other, personal versus general, and familiar versus professional. Concepts such as "density," "directedness," "coherence" and "extension," together with

"cognate variables" (as explained by Kastenbaum), help to clarify and define important elements.

The picture that emerges is entangled and contradictory, but evidence seems to suggest that class, gender, and socialization are related to temporal orientation, with deviance and social mobility less so, while temporal horizon is associated with class, gender, and mental health status.

Theory underlying empirical investigations of relationships between temporal perspective and social structures is fragmented and inconsistent in scope and, as a result, there is wide variation in research techniques. Studies cannot easily be compared with each other because each researcher conceptualizes and operationalizes different aspects of the problem, or renames the same concepts of the same problem.

In Bergmann's (1992) view, better theorizing would require the inclusion of broader social systems in a matrix within which individual temporal perspectives can operate. We argue that this means, in part, that one cannot start with arbitrary distinctions between the social and the psychological because time may extend and act in a complex way across all levels. The research issue of levels of analysis may divide up what time "is" in such a way that a clear approach using concepts like density becomes impossible. Using such distinctions at this stage threatens

to obscure the very thing we are trying to study. The problem now is to clarify what time is in itself, *zeit an sich*, and then determine the appropriate epistemological and methodological approach for study.

Pattern and Flow

Time is a Synthesis of Socio-psychological Rhythms

Sorokin and Merton (1938) developed a compelling argument that social time evolves to match the "rhythms of collective life," thereby serving the particular society it belongs to. Structured by common beliefs and customs, the time of sociocultural life can only be qualitative because its value depends on meaning. Punctuated by critical dates and pauses, it flows unevenly:

The fundamental trait of sociocultural time is that it does not flow evenly in the same group and in different societies...The rhythm of events—through which and by which we judge the flow of time—is different, like a symphony with a slow movement and with a fast scherzo, each of which is felt directly... (Sorokin 1964:171).

Discussions about time measurement in non-industrialized societies refer to several kinds of natural phenomena but, on closer inspection, these are selected not for their intrinsic merit as natural phenomena but because of their social significance. The periods of the seasons, for example, gain their value from their usefulness: "The seasons of primitive peoples are a reflection of their occupational and religious activities" (Sorokin 1964:180). This observation lead Sorokin to conclude that the rhythm of social life is

the main thing that defines periodization. Underlying measurement of the duration or tempo of social processes is the duration and tempo of other social processes (Sorokin 1964:218).

Industrialized cultures, of course, have replaced qualitative indicators with quantitative and reified reference points creating a seemingly objective, universal time. In fact, we have objectified time so much it seems to be completely autonomous and independent of all human events. In The Elementary Forms of Religious Life (1915) Durkheim observed that time has become a social emergent exercising an external compulsion on the individual. Fortified with the impartial authority of cesium clocks we confute any lingering suspicions about the authenticity of a time which transcends the uneven and imprecise rhythms of not just human and social bodies but astronomical ones as well.

The objectification of time has certain pragmatic consequences noted by William James (1922) when he said that objective time is "a useful fiction" but this collective, quantitative method of time reckoning does not make the meaning of time uniform; while it may be considered so in a mathematical sense, time continues to be used and lived qualitatively. In other words, "when" things occur still matters only in relation to when other things occur, and how long things last continues to vary with social activities or

group achievements. "Each group, with its intimate nexus of a common and mutually understood rhythm of social activities, sets its time to fit the round of its behavior" (Sorokin and Merton 1937:619). It is what happens in the various social arenas such as occupation, family, religion, education, medicine, law, and so forth, that creates the experience of the flow of time as well as the conception of "future:"

Within the same territorial aggregate, composed out of different religious, occupational, economic, national, and cultural groups, there are different rhythms and pulsations, and therefore different calendars and different conventions for the sociocultural time of each of these groups (Sorokin 1964:196).

Although mathematical time performs the same function as the old traditional time—that is, it coordinates and synchronizes human activities (and can coordinate and synchronize all the other various times as well)—it loses some meaning when applied to social life...similar to the way any translation loses meaning. Sorokin, who referred to time as the universal Esperanto²⁰, noticed this with his observation that quantitative time, applied to sociocultural processes, makes equal what is unequal. Careful attention to social processes shows that both sociocultural and mathematical times shape our concepts of duration and change. "Full-blooded sociocultural time...similar to the time of primitive groups," exists side-by-side with quantitative, mathematical time (Sorokin 1964:190).

Durkheim, Sorokin, and Merton are among those who argue for the importance of developing a sensitivity to the underlying variability and unequal flow of social time in any endeavor to understand social phenomena, (Sorokin 1964:208; Sorokin and Merton 1938:628; Durkheim 1915).

So now we must recognize the idea of time as a multi-dimensional, slowly changing set of constructs that evolves to meet diverse cultural needs, as well as the idea of time as an emergent, one-dimensional, objective fact with an existence independent of any function it serves. And the mix and blend of these seemingly incommensurable ideas changes—as explained later in this chapter—as the individual uses his personal experience to interpret and give meaning to these ideas, inventing and reinventing various futures as he moves through various stages in life. Adam (1990) suggests that the trick is to recognize the symbol of time is often treated as an abstraction (a critique that is basic to the earlier research and probably its greatest weakness), while the experience of time is actually a synthesis of socio-psychological variables—a synthesis that happens so neatly that it often appears to be no synthesis at all.

Enriching the scope of temporal perspective. Up to this point our research review has concentrated on empirical attempts to analyze temporal orientation and temporal horizon. Most research on these topics has been confined to establishing static relationships between future orientation

and various personal and social characteristics, as has been discussed. The major conceptual difficulty of this approach lies in understanding the existential meaning of these terms. It is not enough to find gender and class distinctions; one must ask exactly how these distinctions come to have meaning beyond their reduction to empirical quantitative measures. A closer analysis of the phenomenal or existential meaning or experience of time is necessary. On reflection we see that dynamics of process and change are inherent to the concept of future because feelings and beliefs associated with the movement of the present into the future color and shape the meaning of future. The following survey of existing literature begins with cultural studies, moves into social-psychological research, and ends with a brief consideration of contributions made by our shifting understanding of the natural world around us.

Patterns of Time

Many studies of the patterning of time contrast groups with simple undifferentiated temporal awareness with those having complex and precisely measured awareness. (In interpreting this contrast, most researchers avoid the explicit use of an evolutionary model²¹ to explain different forms of time.) In this section we will look at such things as whether the future is open or closed, how many different categories exist for now and "not now," whether time is linear, multi-linear, non-linear or repetitive, and whether

pace is consistent or inconsistent. The following studies explain some of these diverse ideas and show how they function. These concepts move us even deeper into our understanding of temporal orientation and temporal horizon. From simple structural and developmental explanations we broadened our approach to encompass the "cultural construction" of rhythmicity. Now we shall look even deeper into the variables associated with this constructing process.

Elastic discontinuity. Hallowell (1937) compared Western society with that of the Berens River Saulteaux—a tribe of Canadian Indians who were hunters and fishermen, whose culture was without the practice of agriculture or husbandry of any sort. Hallowell was interested in the relative use of social events as reference points for past, present and future. He began by observing that Western man lives in a section of time that reaches back into the dimness of pre-history and forward into the distant, as yet unknown, future. Following Durkheim, Hallowell notes that time transcends Western man because it goes on with or without him. Further, because we reckon time in so many things, and can date practically anything imaginable, Westerners are extremely conscious of time. This importance is eloquently brought home by Parkhurst:

That experience, that increased pervasive awareness of time as a super-sensible medium or container, as a stream, or an infinitely extended warp upon which the woof of human happenings is woven, is without

question a notable characteristic of present-day consciousness (Parkhurst in Hallowell 1937:648).

Hallowell describes Western time as commodified because it is bought and sold, autonomous because it is not related to specific events, and freely manipulated.²² In contrast, the Saulteaux position themselves in time according to the rhythm of events such as the moon, the weather and other conditions of nature.²³ The kind of moon or season depends on the activities occurring during that event. But in these recurring processes time has a special property: temporal distance is not created. The return of the full moon, for instance, is considered a repetitive event, not a division of continuous time. Duration is experienced as an event: there is the unit "night," and the unit "day," and some unequal intervals dividing up the day which are tied to the location of the sun. A scant number of creative metaphors are used to describe these periods. Words for time are few because, on the whole, there are no set times for activities: "Their rhythm is elastic in the extreme and except when motivated by hunger or necessity they are dictated to a large degree by external circumstances and by whim" (Hallowell 1937:656). Bourdieu made similar observations in his work on the movement of life and the perceived shapes of time and space by the Algerian peasant: "Time experienced, just like space perceived, is discontinuous, made up of a series of heterogeneous islets of differing duration" (Bourdieu 1968:60).

In the Hallowell study external events are seen as being largely irrelevant to the workings of transcendent Western time while social activities are matched with environmental events to create time in the pre-literate society of the Saulteaux,²⁴ and similarly for Bourdieu's Algerian peasants.²⁵

The Hallowell piece is characteristic of a number of anthropological and psychological case studies on time in primitive societies. As mentioned above, the literature is rich with contrasts such as: agricultural versus industrial, one religion versus another religion, Dionysian versus Apollonian, the mythical past versus the historical past, and so forth. Although differences are demonstrated by using these stereotypes, Nowotny (1975:329) argues that variation within groups is often obscured by this process. Bergman (1992) agrees, and further points out that the use of clocks and calendars in Western civilization obscures the variability that exists in the timing of social stages and events. Since Western society is differentiated and complex, the meaning of time often varies according to social status as noted above (also see Zerubavel, 1979). And lastly, as we have already mentioned, not all members of a society adopt cultural values in the same way or to the same degree (Coser and Coser 1963).

Bergmann suggests that studies such as Hallowell's may suffer from a methodological difficulty that makes it

difficult to draw conclusions about typical behaviors. While the anthropological approach may produce quite valid data in non-literate or homogeneous societies, contemporary societies are heterogeneous, with groups and factions subscribing to their own values, which makes them more difficult to characterize using ethnographic techniques (Bergman 1992:94). But focusing ethnographic methodologies on specific sub-cultures can be an effective way of identifying commonalities, as Green (1970) demonstrates in the following study.

Serpentine progress toward infinity. Green (1970) singled out lower-class Blacks from present day West Africa, from Northeastern Brazil, from the Caribbean Islands and from the "Black belt of the American South" for her study. Her observations showed that there are similar temporal orientations in art and behavior among members of all four groups. During the ethnographic process, Green documented a unique concept of time which is very unlike the way time is articulated in the West, but which may be understood by some on psychological or spiritual levels. In this conception time, space, and the life-force are one and they move and stop together:

The essence of being, which life-force is, is considered to move unevenly in time, by a serpentine progress toward infinity. There is no end. The movement of life-force varies constantly from straight to zig-zag, from large to little, and from fast to slow. Held or released, life-force is dynamic in its eternal urgency to move and to cause everything to move with it (Green 1970:575).

Green continues:

Mathematically, life has been described by Griaule as a metaphorical helicoid which moves and also has a certain type of movement within it while maintaining a unitary shape containing opposites. The movement of this helicoid toward eternity undulates and hesitates like a screw-thread because it must subsume a vast number of pulsating dynamics within it (Green 1970:576).

There is no division between the past and the present because the past fully exists in the present. They cannot be separated. Attitudes toward the future are either fearful, because of the mysterious forces being exerted by both the living and the dead, or dominated by the expectation that the future will not be very different from the present. Both of these attitudes and beliefs encourage focus on the present, which can be antithetical to long-term planning: "Involvement in an enormous present therefore reduces Negro concern with the time-extended ramifications of past and future...[they] are not anchored in their past nor haunted by their future" (Green 1970:576).

Green paints a graphic illustration of a non-Western concept of time which helps to show how extremely complex temporal perspectives are and how patterning varies across many levels. The importance of Green's work, however, is that it shows enduring similarities in temporal perspectives across groups from different cultures when group members share a common heritage. The beliefs and values associated with ideas about pattern and flow appear to be surprisingly resistant to modification and change.

Even more importantly, Green's work suggests that temporal perspectives stem from even deeper processes than the simple linear concept of past-present-future which lies at the heart of current empirical research. There is a simultaneity between patterning processes that must be accounted for.

Contemporary viewpoints. Some support for this parallel patterning process is provided by contemporary work. In the early 1980s, Block, Saggau and Nickol developed the sixty-five statement, "Temporal Inventory on Meaning and Experience," referred to as TIME. Various aspects of the constant, Newtonian, progression of physical time were contrasted with the Einsteinian, relativistic conception of time. After collecting data from 403 Montana college students all items were factor analyzed and reduced to 19 substantive clusters. The authors conclude that Montana college students tend to agree that time passes at a constant rate, progressing like the flowing of a river. Most respondents believe in the Newtonian view that time is its own dimension, is neither space-like nor energy-like in nature, and is a one-dimensional but cyclical force that flows independently of external forces. But the importance of their work lies not in the identification of the majority response, but in their discovery of the variability in attitudes toward the nature of physical time. In fact, a surprising number of Montanans agree with the non-intuitive,

Einsteinian view that time is a space-like dimension with relativistic flow.

Block, Saggau and Nickol administered the same instrument to students from Japan and Malawi (Africa) a decade later. They compared the results with the earlier responses given by Montana students, finding that Japanese students distinguished themselves by being less likely to subscribe to the idea of a constant progression of time than students from either Malawi or the United States. Further, students from Japan were less likely to believe that time is cyclical and many of them questioned whether a distinction can even be made among the traditional temporal modalities of past, present and future (Block et al. 1994).

The Flow of Time

Pacing is integral to future orientation. Tempo or pacing is a dynamic process with an implied future. Marilyn Dapkus (1985) conducted twenty non-structured, in-depth interviews using a naturalistic, descriptive approach to identify and inventory all the various parts of time and distill out the basic conceptual categories they belong to. This "unprejudiced observation of all there is to be observed"²⁶ resulted in the identification of three major themes: (1) change and continuity (becoming in time); (2) limits and choices (doing in time); and (3) tempo (pacing in time) (Dapkus 1985:408). According to Dapkus the first category, Change and Continuity, focuses on the three

modalities, past, present and future, and the fact that things are constantly changing but have continuity over time. The second classification, Limits and Choices, has mostly to do with decisions about time allocation, a subject that is not directly relevant to this work. The third category, Tempo, refers to "the speed or pattern of movement in time, whether fast or slow, regular or irregular" (Dapkus 1985:411). The author found that a number of statements combine the first category, becoming in time, with the third category, pacing in time. This work is significant because it further develops and improves on the simple model that informed earlier work concentrating only on the importance of the three modalities themselves.

Discontinuous flow. We have seen that some cultures do not have a linear conception of the progression of time. While our culture generally subscribes to this notion the personal meaning of temporal progression is far from uniform. Using case studies Cottle (1970) found the meaning of past and future can be influenced by individual cognitive styles or ways of thinking. Two fundamental styles of thought described by Cottle are "Atomistic" and "Gestaltist," where time is seen either in chunks or as a unified whole:

The Gestaltist notion of time suggests that the present passes continuously into the future, just as the past flowed continuously into the present. The atomistic notion of time suggests that the time zones are distinct; that is, they are separated from one another (Cottle 1977:175).

These styles of thinking may provide insight into the individual's subjective understanding of causal relations:

...persons who tend to see parts within a particular whole as being disconnected should be less capable of perceiving relationships between these parts than persons whose style of thinking urges them to find relationships between parts. The Gestaltist perceiver, therefore, should see not only relationships between time zones but ways in which events in one time zone affect events in other time zones (Cottle 1977:175).

Cottle muses on the implications of a discontinuous concept of time. Would it be possible, he asks, for people to have any faith in their capacity to shape the future? Would it be possible to conceive of one's destiny—if one could understand the concept of destiny at all—if one is enmeshed in what appears to be an unconnected and separate present existence?

Cottle's work suffers from the same difficulty we mentioned earlier; objective time, social time and psychological time all apparently co-exist in some way that is not yet understood but seems to function in parallel, interactive processes all happening simultaneously. This supports the earlier point that the arbitrary division of time according to level of analysis may be premature. Just as there are levels of consciousness and degrees of knowing, individual thought may deftly leap around and through multiple ideas about time and causality however contradictory they may appear to be. As we mentioned in Chapter 2, rational, scientifically based beliefs appear to

exist side-by-side with primitive or magical beliefs. Eugene Subbotsky (1993) argues that, as the young person develops the capability of understanding basic scientific principles and ideas of causality, old (magical) forms of thinking are not so much displaced as relegated to those situations that still require them. Subbotsky reasons that "unusual realities" such as myths, dreams, imagination and superstition—notwithstanding their contradictions and logical flaws—are a legitimate component of consciousness that remains an important part of the consciousness of adults who have a fully developed sense of "everyday reality." When faced with questions about what exists in reality and what only appears to exist to the individual, magical or superstitious beliefs can always be reactivated, even in adults (Subbotsky 1993). Empirical work may support or discredit the notion that concepts about causality are hampered by a discontinuous sense of time.

Idiosyncratic dynamics of flow. Over time each individual acquires a sense of time which is consonant with but not identical to those around him, and which becomes a durable, stable part of his or her personality (Rappaport 1990:49). Within this sense of time, each person creates personal temporal horizons, the past through memory and the future through anticipation. This temporal control is "...conditioned by everything which determines personality:

age, environment, temperament [and] experience" (Fraisse 1963:177).

At the point where concepts of time are well enough developed for the individual to function in his or her culture, time becomes part of the background of daily life and is unlikely to be the subject of scrutiny or evaluation unless it creates a problem of some kind such as tardiness, moving too slow or too fast, inability to let go of the past, unreasonable pre-occupation with living in a suspended present, unreasonable expectations of the future, and so forth. In Marking Time: How our personalities, our problems, and their treatment are shaped by our anxiety about time, Rapport (1990) describes case studies of clients who exhibit some of these problems, but even in the diagnosis and treatment of psychological disorders, time—as an imperfectly learned construct—is rarely addressed.

For a number of years this author has been collecting graphic representations of a typical week from college and university students. With no hints or suggestions for them to use as a guide, the results have been varied and highly individual. We see linear, circular, elliptical, and spiral representations, some with spaces giving width to various days or parts of the week. Sometimes the patterns are ascending, sometimes descending, and often highly irregular. Occasionally students depict disjointed or separated

elements, or elements out of order, suggesting that each day has its own independent existence.

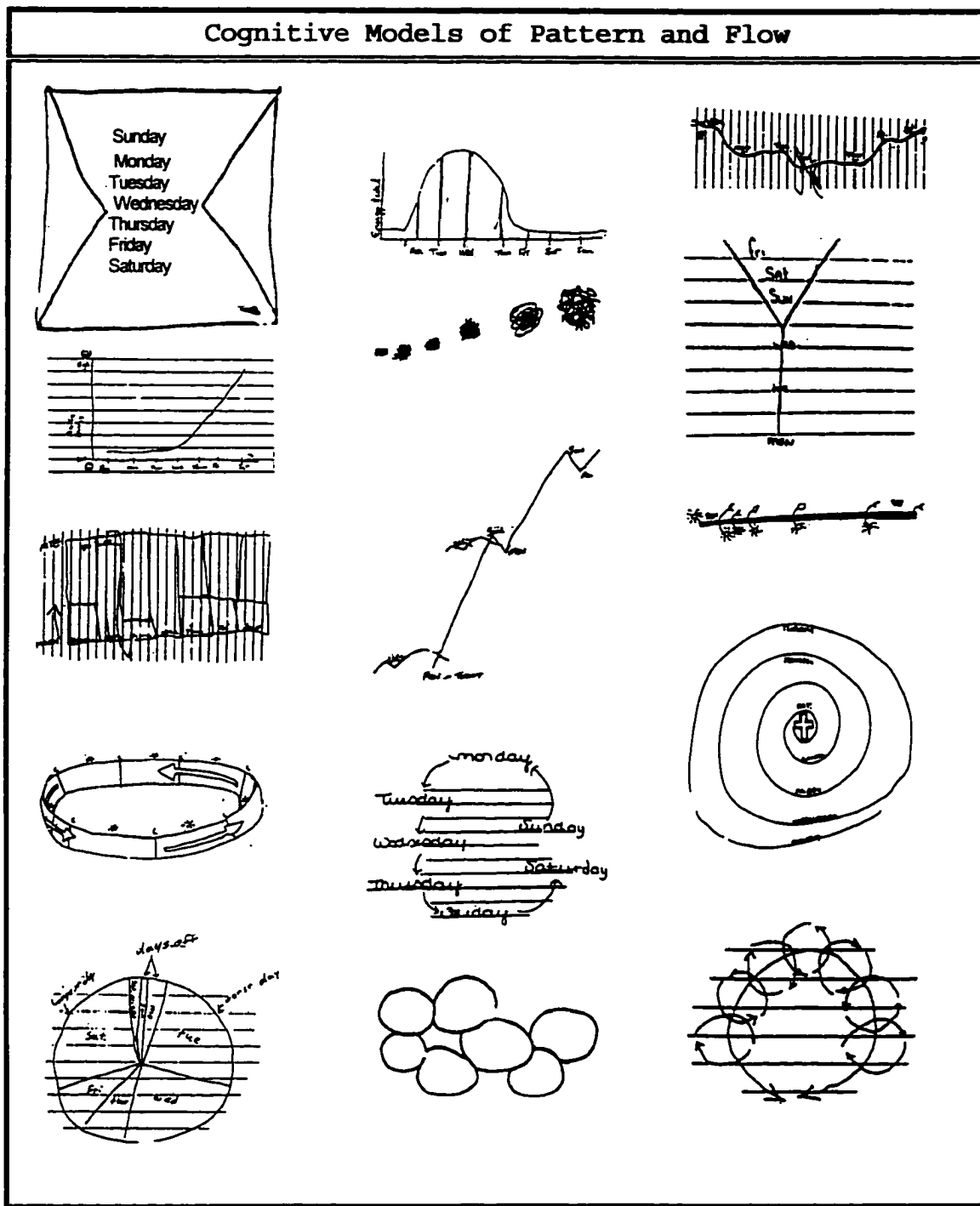


Figure 1. Pictures of a week. Although labels identifying days of the week may not be detectable here, it is easy to see that the shapes are creative and unique. While these patterns represent different elements such as stress, energy, activity, relaxation, happiness, free time, mood and so forth, they all illustrate very personal and idiosyncratic thoughts about the way time seems to move.

In the painting, "Inventory 1967," Saul Steinberg portrays idiosyncratic images of recurring weeks and months.²⁷ In this case a repetitive pattern is not extended to years. Each year is individually characterized in a way that is uniquely distinct yet connected with the others.

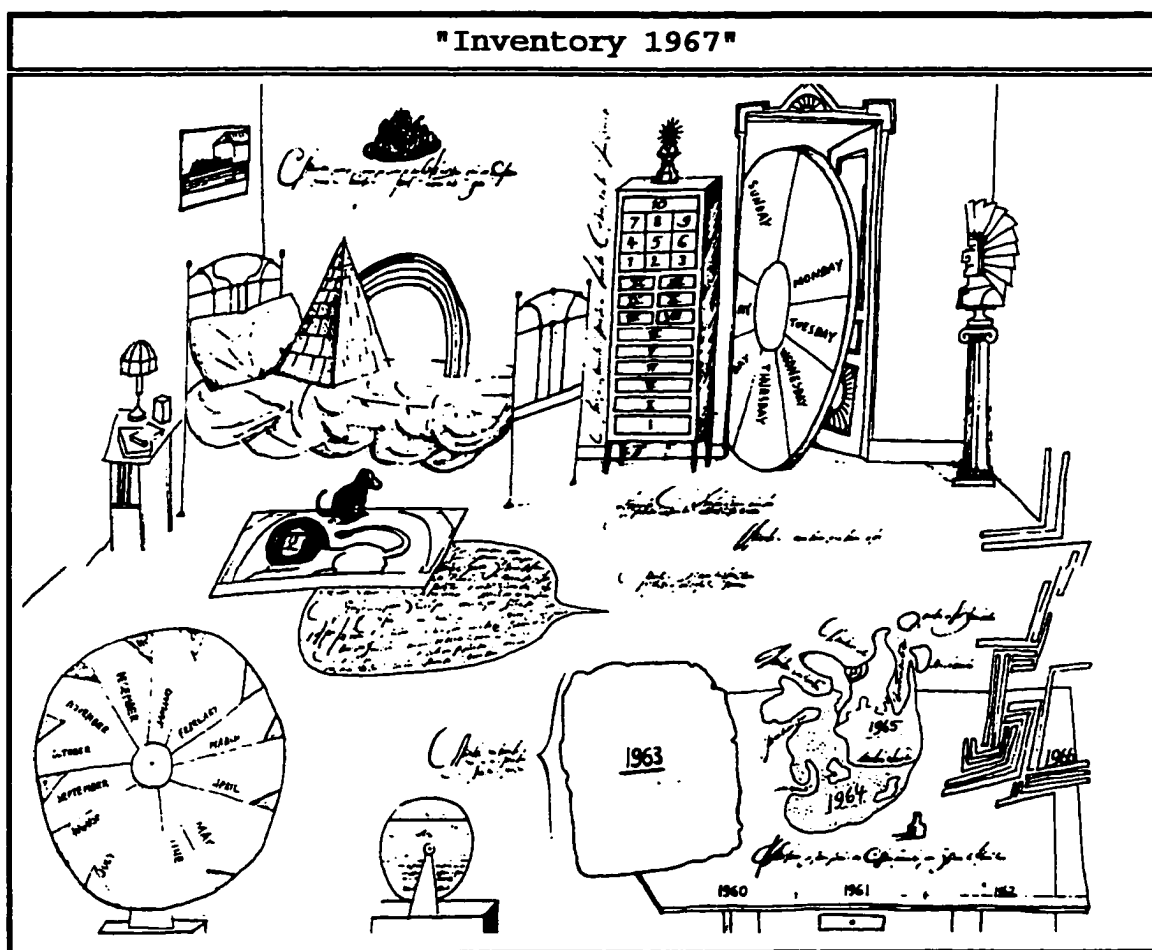


Figure 2. (Rosenberg, Harold. 1978. Saul Steinberg. Alfred A. Knopf in association with the Whitney Museum of American Art, New York.)

This sample of assorted designs is offered as an illustration of the idiosyncrasy of conceptions of

continuity and discontinuity in the passage of time. These mental models are difficult to interpret²⁸ because of the casual method of data collection and because different variables are being depicted. We can argue however that each picture speaks to the artist's expectations regarding the movement or flow of time in his or her own life.

Individual renditions of culture. In most cases (but not all) week days are distinguished from weekend days in some way. Zerubavel (1985) calls this a "pulsating" week because he sees it as a periodic cycle where ordinary and extraordinary days are alternated. The flow of life is disrupted by activity that is: "...sacred and profane, consumption and production, active socializing and isolation, freedom and obligation, domestic and public, spontaneity and routine" (Zerubavel 1985:117-120). The word "cycle" may be misleading considering the linearity of some of these designs but the individual expressions of temporal irregularity do seem to express repetitive "rhythmicity."

Temporal discontinuity is experienced over longer periods of time too. Institutionalized holidays, personal ceremonies and transitions all break and segment time. Zerubavel notes that calendars break up months and years by showing hiatuses at beginning and ending points, but no research has yet investigated the relationship between calendar design and temporal experience. It may be that experienced or planned activity creates a temporal flow that

is confined—but not actually shaped—by customary graphics like the calendar. In the painting shown below, "March-April 1966," Steinberg conveys the joyful feeling of moving into spring and summer by showing a bicycling cat crossing a large gulf separating April from March. The months have been concretized into individual continents across which one must travel. The colorful country ahead is filled with birds and the sweet promise of summer; once on the other side of March, life will be qualitatively different.

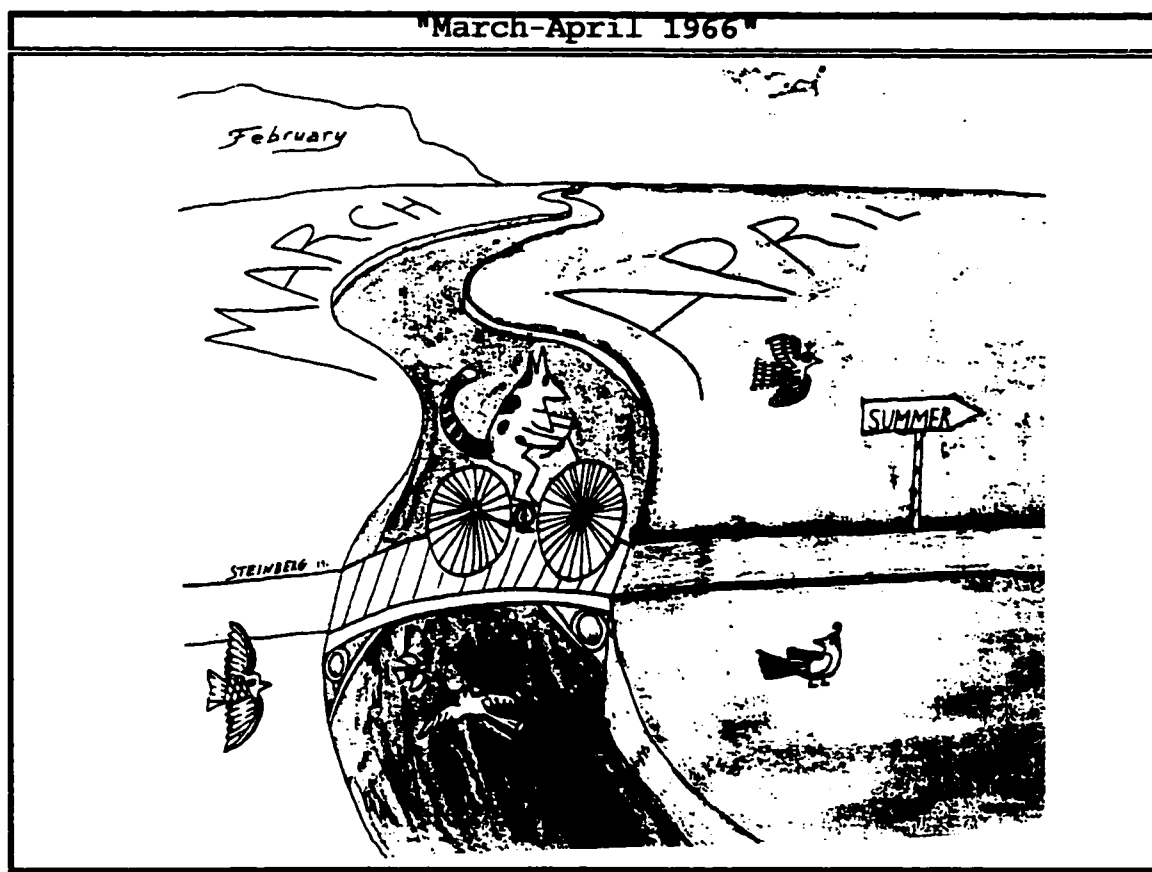


Figure 3. (Rosenberg, Harold. 1978. Saul Steinberg. Alfred A. Knopf, in association with the Whitney Museum of American Art, New York.)

In Marking Time Rappaport (1990) describes case studies where each individual was asked to draw a time line showing important life events in the past, present and future. These representations show time compressed or stretched, busy or unstructured. In this way Rappaport is able to indicate something about the width of the individual present and expectations for the arrival of future events. Rappaport's interest is in understanding clinical depression as a disorder resulting from the disruption of future orientation, but his anecdotal studies illustrate various ideas about the flow of time over the space of a lifetime.

Jean Piaget and others have discussed the changing perceptions of time for individuals moving from birth to death but, again, art provides one of the best illustrations. In the figure below, Steinberg fancifully portrays life voyages of various personalities so he can show the unique journey of the artist as one which takes him around, among and between all others.

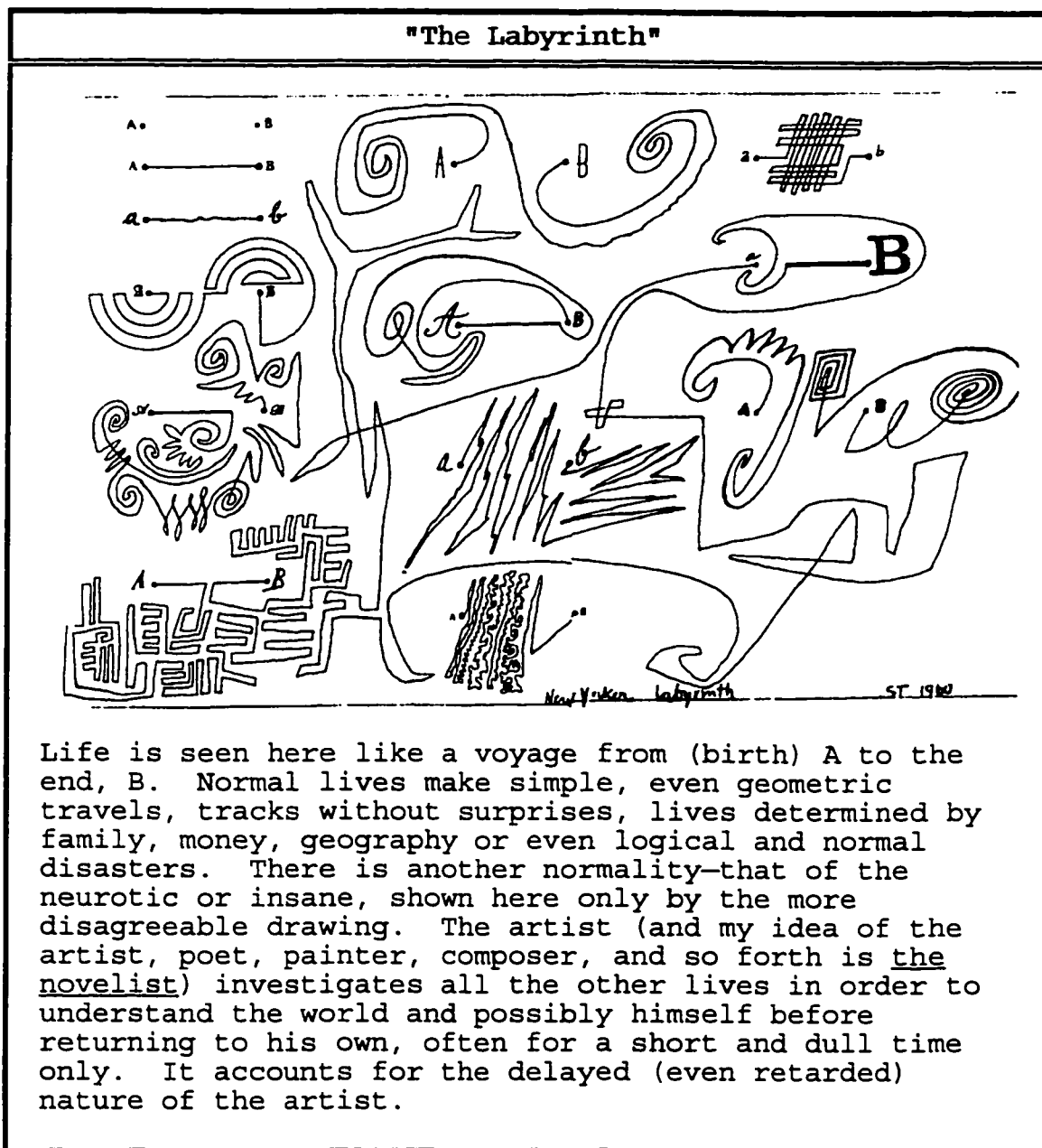


Figure 4. The Life Voyage. (Rosenberg, Harold. 1978. Saul Steinberg. Alfred A. Knopf in association with the Whitney Museum of American Art, New York.)

Schutz and Luckmann (1989) contribute to our understanding of these phenomena with their discussion of how future perspectives are continuously formulated and re-

formulated as an on-going phenomenological process. Following ideas set forth by Husserl in The Phenomenology of Internal Time Consciousness, Schutz and Luckmann suggest that attention—by defining that which is relevant in the world around us—is what makes us live within our present experiences or, alternatively, makes us turn back and reflect on the meaning of our past experiences. According to Schutz and Luckmann, when full attention is given to making something happen (such as when we are performing or working in some way) we are "wide-awake." This wide-awakeness regulates consciousness by controlling the tension between memory of past experiences and anticipation of future experiences. In this way the individual uses his personal experience to interpret and give meaning to ideas, inventing and reinventing various futures as he moves through stages in life.

Contributions from natural history. Individual temporal maps are created by the streaming of social, cultural and personal events, including dominant scientific thinking concerning the motion and change of the natural world around us. Geological constructions of process and flow have been directly borrowed by historians and social scientists to help understand social processes, and are indirectly acquired by the individual through social and educational processes. Furthermore, the popular understanding of geologic flow is particularly relevant to

understanding lay perceptions of some natural processes that lead to disaster.

Extreme hydrological events—flood, drought, erosion, subsidence, water spouts, and so forth—can result from a combination of geological features and meteorological processes. Geologic time, which is stratigraphic, is very different from meteorologic time, and both differ from sociocultural time. So how do humans perceive geologic and meteorologic events? How do we "time" the natural world around us? First, all systems of time are human constructs and in that sense are affected and conditioned by the social milieu (Sorokin 1964:168).²⁹ Second, although extreme hydrological events are part of the natural environment, disasters themselves are part of the sociocultural environment. The sociocultural, social-psychological time factor is the real source of disaster because the problem lies in the difference between warning or learning and action or behavior.

The expectation of evolving and more or less predictable change reflects recent teachings in the earth sciences. But before the 19th Century most geologists were Catastrophists, that is, they believed the history of the earth was one where sudden, convulsive upheavals disrupted the earth's crust. The earth was thought to have experienced devastating forces outside those of ordinary natural processes. This began to change in the early 1830s

when Charles Lyell, a British geologist and Uniformitarian, argued that what appears to be upheaval can be explained by the regular operation of normal, natural laws operating over a long period of time. His argument was that, since existing principles should be tried before inventing something new, and since—it appeared to him—physical laws are constant in time and space, it necessarily followed that all past geological processes act at essentially their current rates. With the increasing acceptance of evolution,³⁰ Catastrophism eventually lost favor.

But today, neo-evolutionary ideas include the possibility of radical changes in short periods of time. Derek Ager, a geologist, has recently published, The New Catastrophism (1993) which argues that the geological record is dominated, not by slow, gradual change but by episodic rare events causing local disturbances. Ager's work is seminal because, while the Lyell perspective makes the present the key to the past, Ager represents an intellectual shift in re-thinking relationships between the past, present and future (Ager 1993). Now geologists—as well as geneticists, biologists, geophysicists, and others—are challenging the uniform value of what Charles Bonnet³¹ long ago referred to as the unrolling or unfolding of pre-existing parts.

The question we ask here is how duration and tempo of natural processes are understood by members of the lay

public. Sorokin says the social memory fixes past environmental events through the social framework: "...the social milieu is an indispensable condition of our memory and our time apprehension" (Sorokin 1964:185). And are perceptions of the environmental future also pinned to unfolding social events? And isn't this the very nub of the problem? The occurrence of geologic and meteorologic events seems to have nothing whatever to do with social frameworks.

Pattern and Flow Summary

In summary we have a rich collection of ideas with emergent properties which cannot be explicated by a single correlational study. The unpredictable emergence of multiple forms with multiple meanings—mathematical, social and psychological—rather than creating confusion with what might be considered logical contradictions and inconsistencies, functions simultaneously in various proportions while making a unified whole. In this synthesis we see that the meaning of time lies not in the elements of time but in their social and psychological significance.

Within a culture, the temporal rhythms of social life surge and flow unevenly, reflecting occupational, religious, and other events. The nature of the time created is not the same from one culture to another, nor is it identical among subcultures and minorities. Variations occur in the salience of naturally occurring phenomena like moon cycles, in the ways of dividing up and marking time, in the

perceptions connecting time and space as well as those between time and energy or the life-force. In Green's work with various members of African culture we saw simultaneity denying the past-present-future continuum. Block, Buggie and Matsui's work showed some Japanese and American students questioning traditional concepts of linearity.

By showing that personal ideas of time are highly idiosyncratic, this chapter has illustrated the importance of the psychological component of time. These elements include continuous and discontinuous aspects of flow. Cottle described individual tendencies to think in atomistic chunks of discontinuous time versus in a more unified and holistic time which he called Gestaltist. The suggestion was made by Schutz and Luckmann, following Husserl, that attention is what controls the tension between memory of past and anticipation of future.

The discussion of the Uniformitarian-Catastrophism debate in the earth sciences concerns the flow and pattern of non-social events, and how those ideas might affect man's understanding of temporal flow in the world around him. Research has yet to investigate man's perception of the flow and pattern of the natural processes that bring disaster. If, as Sorokin and Merton argue, motion is specific to the situation, what kind of dynamics are there in the man-nature interface?

In short, more was learned about dimensioning the construct of time. It was shown that a model of temporal perspective must consider more than tempo and the pattern of movement—fast, regular, irregular—it must also include patterned expectations about change versus continuity in time.

Temporal Signature

As mentioned earlier, temporal perspectives that characterize individual thinking (density, extension, coherence etc.), together with ideas about how time moves from one modality to another (pacing, continuity, etc), unite to form a unique temporal identity or temporal signature for each person. The term "temporal signature" refers to a pattern of expectations which has continuity in meaning persisting over the variety of everyday life experiences.

This complex, multi-dimensional coalescence of attitude and knowledge develops, grows, and slowly changes over the course of a lifetime. Important life events such as marriage, birth and death—events that, for example, cause the past to become uncommonly meaningful or the future to seem unusually clear and prominent—may have an effect on temporal signature but the nature and duration of that effect has not been the subject of direct study. Research may show that the experience of an exceptionally significant event causes an abrupt and permanent change in the structure

of temporal signature or it may show that these constructs, as integral to the personality, are adaptably elastic so that original characteristics return at the earliest comfortable moment.

The elements composing a temporal signature may fluctuate but, just like the identifying character of one's written name, the overall pattern remains recognizable. Phenomenological experience inconsistent with temporal expectations triggers cognitive dissonance which, when mild may be easily tolerated, even passing without recognition. In fact, temporal perspectives can limit the perception of new potentialities by creating cognitive boundaries.³² But when an experience truly jolts, the temporal signature may be completely disrupted, creating extreme discomfort.

In this section we show how a critical experience can differentially change temporal signatures so that certain people respond in one way and others in another. We illustrate this and other possible patterns with simple schema showing changing future perspectives. Finally we speculate on the possibility of deliberately affecting the structure of temporal signatures without the actual experience of crisis.

Crisis Affects Temporal Identity

Recalling Schutz and Luckmann, we might say that nothing commands full attention like a crisis. When a political or environmental event precipitates the collapse

of social institutions and the dissolution of social order, all attention is focused on the immediate present. If hardships and losses continue over a period of time, belief in the possibility of any kind of a predictable and controllable future can be eroded. Planning is impossible.

Poland is an example of a country that has experienced great instability while in the process of establishing new systems. In 1989 Elzbieta Tarkowska published an essay, "Uncertainty of the Future and Domination of a Presentist Orientation," in which she addresses the question of the meaning of the future for people who are actually caught up in rapid social transformation. A 1980 survey of Polish temporal orientations and attitudes toward time³³ identified very few people who thought in terms of distant goals. Even those who were most active focused only on everyday activities and, at most, the proximal future:

Present-day pressure was felt as a closed, expired time, with a lack of perspectives, limited by concern for various necessities of life. Preoccupation with current matters and concentration on everyday family needs did not allow any wider perspectives (Tarkowska 1989:178).

This survey was done in the climate of political unrest leading up to the establishment of Solidarity in September of 1980.³⁴ During the time the survey was being conducted, the Charter of Workers Rights was drafted (1979) and dissidents and workers continued to agitate for change. Local authorities and leaders were experiencing a growing sense of instability in their positions and a large

percentage of them did not expect to remain in office (Tarkowska 1989:179n). So it was in this state of extreme turmoil that citizens were polled and it was discovered that they felt that they had no future. Tarkowska concluded that, at the end of the seventies, "presentism" characterized the temporal orientation of the entire Polish society.

Then came the establishment of the Solidarity Movement in September of 1980 and large masses of people plunged themselves into public activities with renewed hope and energy. Another perspective of the future dawned for some of these citizens, but others remained caught in the "presentist" position. Basing her distinctions on Gurvitch (1969), Tarkowska believes two distinct temporal perspectives were in evidence at the time, neither very good for planning. One perspective, dominated by the present, is characterized by the experience of change which seems to occur in accidental and irregular fashion. The other perspective, moving toward the future, is characterized by the feeling that time overtakes itself because the future so rapidly becomes the present. One of Tarkowska's chief contributions is the recognition that the distinction between these perspectives depends on the position of the individual; for those who were positioned to be actively involved in events unfolding in Poland at the time, temporal horizons opened up into the past and the future, at least to

some extent. "This was particularly true in the first optimistic, hopeful months of Solidarity's existence when suddenly the pre-determined world turned into a set of opportunities" (Tarkowska 1989:180).

By late 1980 and 1981, economic crises continued to grow, "forcing short-range, emergency actions and turning upside-down any planning" (Tarkowska 1989:180). Martial Law was imposed in December 1981. In Tarkowska's argument the future was foreshortened, not just as a result of the shock of martial law, but also as old pre-August 1980 orientations came flooding back:

The effects of extreme presentism - immediacy and provisionality, making up typical elements of the existing socio-political system - intertwine with the effects of a collapse of social hopes and of the protracted crisis bearing a specifically intensive 'culture of the present' limited in its future visions, permeated with provisionality and temporal discontinuity (Tarkowska 1989:193).

In Tarkowska's analysis the "presentist" orientation in Poland was a deliberate attempt to avoid further disappointment—a justifiable defense in response to a new social order. Citizens withdrew or resigned from the future because they no longer had influence over its' shape and content. Consequences of present actions were trivialized making way for behaviors such as vandalism, drug abuse and alcoholism.³⁵

Dynamic aspects can vary in the opposite way under other circumstances. Larger political and economic processes can create feelings of stability for the

individual instead of swiftly moving and tumultuous change. But when everything appears to be shifting rapidly, control is at a premium and the primary need is to adapt or stabilize. Rappaport and others have observed that, under these conditions, there is a tendency to shift thinking toward the past—real or imagined (Rappaport 1990:155). Sometimes the past is romanticized and used to legitimate forces throwing off the present.

Hypothetical Patterns of Fluctuation

Combining Tarkowska's work with ideas from Rappaport, Cottle, Schutz and Luckmann and others who have investigated the way temporal structures operate, we see an outline of the dynamics between temporal signature and the construction and resolution of hazard. While everyday expectations create what could be called a background perspective, the meaning of "future" changes as problems take shape and assume significance. The actual occurrence of a significant event triggers re-evaluation. Some situations are perceived as compatible with decisions already made reinforcing the present posture while other situations may lead to changes in attitudes, decisions and behavior. Ideas and feelings about time are deeply affected by each stage of disaster recognition and resolution. But throughout these perturbations, temporal signature is unsteady and vulnerable to change. Its normal resilience creates a limited elasticity which, under some conditions, returns to baseline

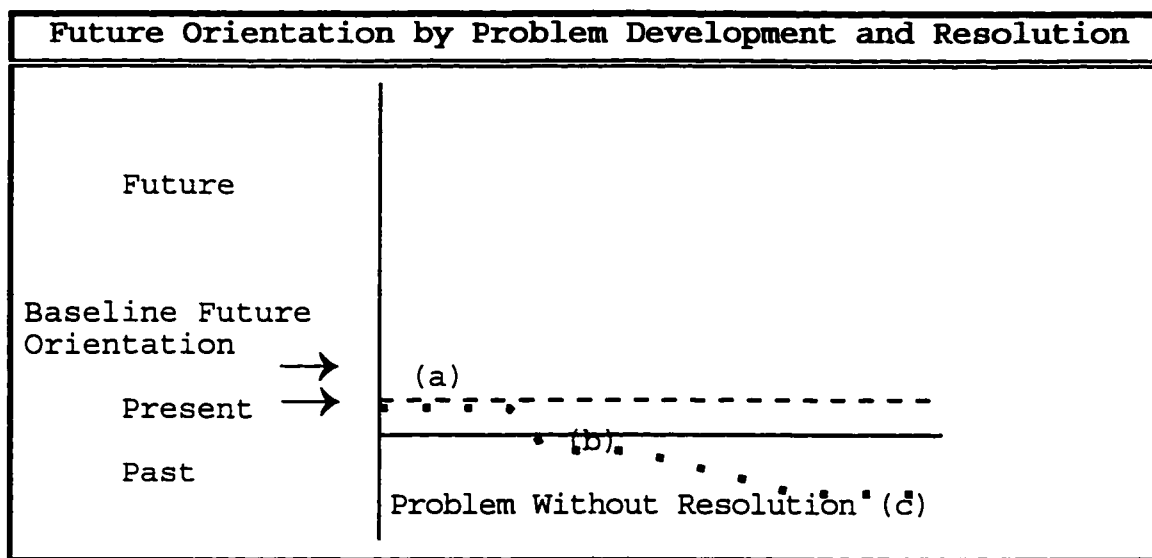


Figure 6. Case B. Future orientation sharply collapses at the sudden onset of disaster (a). Continuing crisis forces "presentism" to continue (b). Persisting crisis generates nostalgia (c).

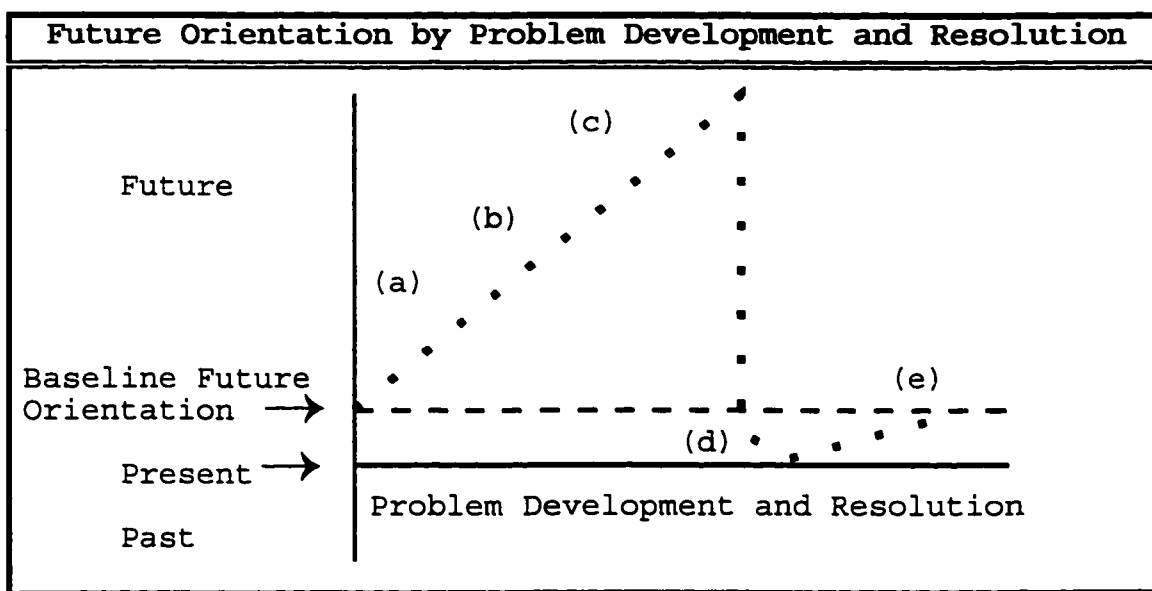


Figure 7. Case C. An increase in problem perception results in an increase in intensity of future perspectives creating a graph that looks like a slow learning curve (a). As problem visibility increases in public consciousness, future orientation increases logarithmically (b). The rate of future orientation continues to increase as long as society is mobilizing to deal with the problem (c). When crisis strikes before a solution can be implemented, the future ceases to exist and perspectives collapse to the present (d). When survival needs recede, future perspectives return to baseline (e).

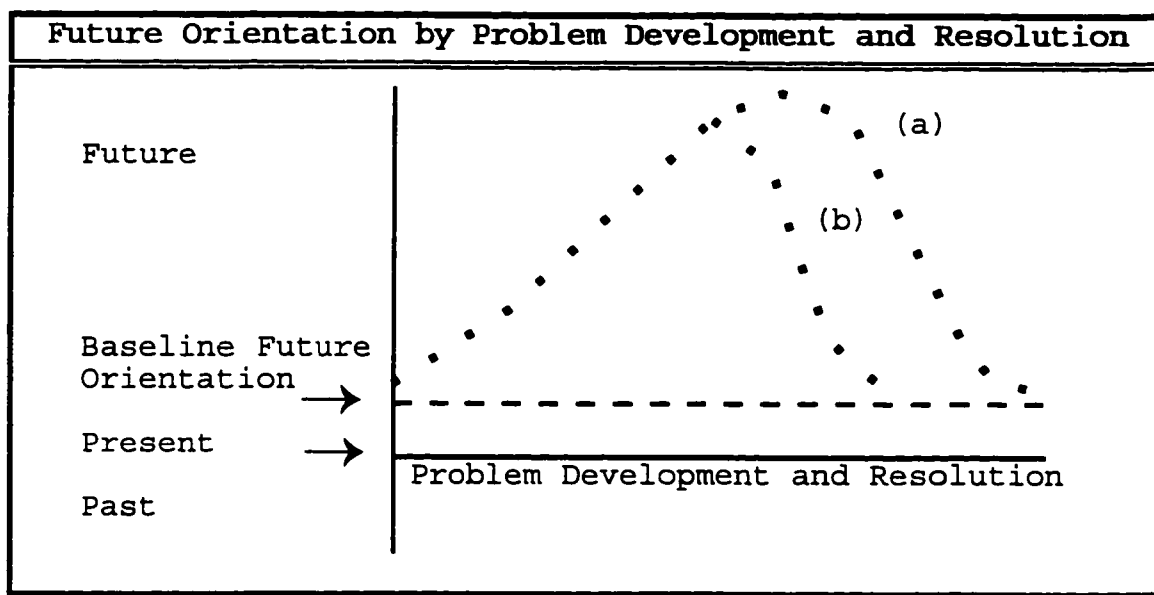


Figure 8. Case D. Future orientation increases then decreases when problems are resolved without catastrophe. When expectations of disaster are not realized, an artificially high future orientation may be sustained for some period prior to a gradual return to baseline (a). When problems are resolved through planning, the characteristic future orientation may return more rapidly (b).

Deliberate Modification

One might ask whether it is possible to deliberately encourage a future outlook that will increase the probability that early action will be taken to mitigate or prevent disaster. Do the patterns of temporal signature lend themselves to deliberate intervention? What variables or interactions between variables might account for patterns showing collapse into presentism, nostalgia for the past, intense interest in the future, and so forth?

Except for case studies in clinical psychology, there are no known investigations of the deliberate and permanent modification of individual future perspectives. The

question of how future perspectives actually function has been addressed with untested models which, seemingly, try to connect everything together with double-ended arrows. No one knows, for example, under what conditions future orientation might function as an independent, dependent or intervening variable. Schneider (1990) points out that research has not yet been done which can untangle these relationships: "...socio-psychological questions about the influence that the social environment has on future perspectives and about the influence of future perspectives on the behavior of the individual towards his social environment haven't even been asked yet" (Schneider 1990:14). The same is true for the individual and his natural environment.

In the Tarkowska study temporal attitudes were adaptations to specific situations. The shape of these adaptations appear to be sensitively dependent on the initial position of the individual. Those who were positioned to be actively involved in unfolding events experienced increased access to the future while those who were unable to act felt confined to the present and immediate future.

We also know that changing the temporal signature may be problematic because of the close relationship between temporal and personal identity. Melges (1990) argues that one's entire sense of identity depends on continuity in

temporal perspective, especially future time perspective. Melges finds that perspectives on the future are more permanent than are other elements of time such as sequence, rate and rhythm and so forth because, being goal-oriented creatures, future time perspective lends order and direction to life. If the continuity of the future perspective is disrupted one becomes estranged from ones self leaving an uneasy feeling of strangeness and unfamiliarity (Melges 1990:245-257). This argument suggests that we are driven by shared visions of future states but flexible about how and when we might achieve those states. We should note here, however, that if the personal meaning of future is restricted to the present and near-term, or if it is found in the past, then Melges observations refer to, not a forward looking temporal signature, but whatever posture belongs to the individual. Again, the situation suggests that the initial position of the individual is central to outcome. The next chapter develops a model which can be used to explore flexibility and changeability of the temporal signature.

Temporal Signature Summary

Tarkowska's work shows that while presentism characterized the Polish population after civil disruption, when there existed some hope for improvement and stability, a portion of the population (those who were positioned to be actively involved in unfolding events) developed some future

and past orientation while the rest remained presentist. Additional setbacks and continued bad news drove this forward-looking group to return to their earlier position of presentism. This study is consistent with literature showing wider time perspectives among those who have achieved some degree of success, have some experience with delayed gratification, and have mental and physical health. Being positioned for action enhances future time perspectives.

But a more interesting aspect of Tarkowska's work lies in the patterns of change in response to crisis. Sudden sharp disruptions caused by natural disasters are similar to other major life events in the way they disrupt temporal identities except that, being non-social in origin, they have a foreign element of surprise. As in civil upheaval, at the moment of disaster survival needs of the present trivialize earlier meanings of past and future and the experience of sudden sweeping change negates any previously held ideas about a future that unfolds slowly and predictably.

Since disasters seem to show—by the collapse into presentism—how the patterning of temporal signatures are disrupted, this information might be used to show theoretical shifts in future orientation depending on problem development and resolution.

Endnotes

15. In an overview of time orientation, de Volder (1979:74) reports that no correlation was found by Matulef et al. (1964) and Platt et al. (1971) while Kastenbaum (1961), Shybut (1968) and Schreiner (1970) found a positive correlation between time orientation and horizon.

16. I am indebted to Bergmann (1992) for having identified many of the following studies.

17. LeShan also pointed out that lower-lower class children were are likely to experience abrupt changes in their lives, while middle class children are trained in a more gradual fashion. This is an observation that suggests that perception of change may also vary by social class.

18. The control group consisted of patients with a range of medical and surgical problems but none of the subjects had any record of psychiatric illness.

19. We suggest that the innate drive humans have to understand and control their environments may strain the individual to synthesize a unified perspective. The desire for coherence may be responsible for the fact that temporal variability is essentially invisible on a superficial level.

20. Sorokin refers to time as a universal Esperanto because it homogenizes and regulates the diverse collection of peoples moving together into urban centers. Even more, time standardizes the needs of whole societies and cultures. It helps propagate and spread cultural ideas like religious cults across different geographic regions as well as facilitating more mundane activities like barter and trade (Sorokin 1964:188).

21. See Bergmann 1992, pages 118-120 for a bibliography on the evolution of social time awareness.

22. Sorokin and Merton observed that the convention of shifting clocks to and from daylight savings time shows we consider it "presumably less violent" to shift the hours of the day than the hours at the office (1937:626).

23. This study describes attitudes held in 1937.

24. Again, eschewing the idea of evolutionary time, Hallowell argues that traditional ideas about flow and

change do not reflect a "primitive mentality or racial make-up," so much as differences in culturally constituted experience (Hallowell 1937:670).

25. The relationship between time and social action in traditional societies is beautifully explained by Eliade in his book, Myth and Reality, where, in discussing myths of eternal return and rites of renewal, he explains, "...one is no longer living in chronological time, but in the primordial Time, the Time when the event first took place" (Eliade. 1963:19-20).

26. Quote by Lorenz, in Dapkus 1985:408

27. Saul Steinberg may be best known for his illustration of the United States seen from the perspective of 9th Avenue, New York.

28. In About Time: Inventing the Fourth Dimension, Friedman (1990) addresses the question of whether mental images mediate thinking by summarizing various small but very interesting research projects of his own and others. He demonstrates that mental images are actually used in finding solutions to time problems by thinking in spatial terms: "No doubt mental imagery serves us in our day-to-day thinking about numerous time patterns, freeing us from our bondage to the present and allowing us to 'see' relations between widely separated times" (Friedman 1990:58).

29. In Time & Social Theory Barbara Adam (1990) argues that all time is social because physical time, biological time, social and experience-related time, all exist in relation to each other.

30. Evolutionary change is usually associated with the British naturalist, Charles R. Darwin—who made popular Lamarck's idea of organic mutability in the mid-1800s—and his contemporary, the British biologist and writer, J.S. Huxley. But actually the idea of socially progressive, linear change can be traced back to the Enlightenment in the persons of John Locke, Voltaire and David Hume.

31. Bonnet was a Swiss naturalist who lived from 1720 to 1793.

32. This phenomenon is likely to be related to temporal discalibration in instances where miscommunication occurs because of different assumptions and perspectives of time.

33. Conducted in 1978-80 by the Division of Life-styles Research in the Institute of Philosophy and Sociology, Polish Academy of Sciences. Directed by Professor Andrej Sicinski.

34. For example, members of the Workers Defense Committee, established in 1976, had been attacked and jailed.

35. The relationship between restriction of temporal horizon and anti-social behavior is consistent with LeShan's argument that delinquent boys have shortened time horizons.

CHAPTER 5

MODELING THE TEMPORAL SIGNATURE

Temporal signature is a pattern forming process. The various shapes resulting from this process trace out time characteristics that can be interpreted as open, closed, progressive, traditional and so forth. By studying pattern at a moment in time we can determine the states of the components making up the temporal signature process.

The process itself is fueled by elements of temporal progression, such as pace and rhythm. Since these motions form the deep structure of pattern we must acknowledge that process and structure are complementary. Each offers a different and essential construction of the phenomenon, and each are necessary for its complete description. This insight is critical to understanding the temporal signature model.

The elements of temporal perspective—orientation, depth, density, and so forth—are aspects of temporal signature that have been measured quantitatively. They speak to the phenomenology of what people experience but are not exhaustive. As elements that have been isolated and assessed without benefit of underpinning theory, they offer something like a translucent surface through which one can make out elements of pattern and flow but, by themselves,

they do not reveal the complementary structure of the larger temporal signature. But it is difficult to know what they mean outside of this context. The question is, how do the elements of temporal perspective fit in with the qualitative dimensions of pattern and flow?

Model Dynamics

While earlier approaches have reduced temporal perspectives to simple linear cause and effect relationships, on reflection we see that, when considering the entire temporal signature, the nature of the phenomenon is neither simple nor linear.³⁶ The future in all it's multiple forms and meanings, together with the present and the numerous constructions and reconstructions of the past, can be entertained in one mind with illogical and even conflicting simultaneity: Time flows quickly and slowly, toward a future which appears to be at once open and closed, bringing consistent but disjunctive change.

As an alternative we propose a "timeless" model in a linear sense because, where every element can hold every value at once, it is the relationships between and among elements that gives shape and defines character. But the temporal signature is not static. It is a process where the salience and dominance of various elements is continually shifting to augment, overshadow, or obscure others. The description that emerges is more like hypertext where various aspects move across layers of depth, in and out,

interweaving in fluid, multiple, interlinking, yet parallel operating forms. Although the mathematical expression "non-linear" has been used as a single term for this complex of motions it has been suggested that a richer description would have humanistic connotations. J.T. Fraser has suggested: "kaleidoscopic, unrestrained, multi-dimensional, volcanic, many-colored, unruly, elusive, rhapsodic" and, my favorite, "unpredictably ordered."³⁷

In contrast linear models of time look rather like "flatland" where elements and their values appear to exist in inexplicable and fragmented independence from each other. This snapshot of how things look or feel at a particular point in time—and which has been taken to reflect a unique and enduring perception—denies the complex processes and interpretations that lurk beneath the surface.

The mysteries of temporal signature resist being reduced to an analysis of the surface. In the next chapter we will suggest multiple analytic tools—traditional social statistics, complexity theory, existential sociology, phenomenological sociology, and other approaches as appropriate—to reach beyond our rational notions of linear reality.

Model Elements

An inventory of temporal flow, pattern, and the emergent elements forming temporal perspective will be discussed in this section.

1) Temporal progression. This is a dimension of process and motion which includes consideration of flow and it's dependence on (or independence from) other dimensions and forces. Also relevant is the degree of regularity or irregularity of rhythms and their continuity or discontinuity over time.

2) Pattern. This is a structural dimension revealing the shapes (cyclical, elliptical, linear, and so forth) of the temporal perspective and, more broadly, the temporal signature. Pattern includes degree of demarcation of past, present and future as well as scope or "wholeness" of perspective.

3) Temporal perspective. These are phenomenological or existential elements of pattern. Elements specifically identified by researchers are: orientation or directedness with respect to the modalities (past, present and future), depth or expansion of past and future horizons, and "reality" which is a qualifier of orientation and depth. Reality includes density, richness and coherence.

Now we will turn to a more detailed discussion of the elements making up these three dimensions.

(1) Temporal Progression

This is the dimension of process and motion which describes, among other things, movement or flow of the present into the future. The question here is "how" the present is moved into the future. Two components describe

the speed and nature of this "how" in motion: tempo and rhythm.

Tempo refers to the pace of activity. With respect to future events, tempo includes both the rate at which the future approaches and the speed of onset of specific events, with respect to past events it is how fast they fade away. This element has significance for situations such as the one referred to by Green et al (1981) where people living around Mt St. Helens believed they could outrun the rising river if volcanic mudflows reached it.

The topic of tempo also bears upon relativism or independence of flow, i.e. the role of external forces, and/or other dimensions such as space, on the "flow of life." For example, the Einsteinian view argues that speed depends on position or motion (relative to space as gravity) while the Newtonian view argues for uniform consistency unperturbed by context.

Overall, the dimension of tempo, covers "fastness" and whether that "fastness" has independence.

Rhythm refers to the regular recurrence of certain features of time. It asks whether time moves in "pulsating" or periodic cycles, as described by Zerubavel (1985), whether its motion is smooth and predictable, or whether it is irregular and unpredictable. If the latter, one must ask whether is it truly unpredictable or only apparently unpredictable.

A distinction can be drawn between the existence of rhythm and the nature of change within that rhythm. It may be that, within a rhythmic system, change occurs gradually or in sharp disjunctive motions bringing unexpected novelty. So the second aspect of rhythm is whether the cadence within the rhythm is smooth, choppy, disjunctive, etc.

Overall, the character of the "how"—the structuration of the flow and it's movement into the future—is an essential part of future image even though it has been unrecognized in previous research.

(2) Pattern

As we have already pointed out, temporal progression reveals itself as pattern. Pattern also has two parts: shape and structure within that shape.

Shape. The structure of the existential flow of time is highly idiosyncratic in small chunks of time like weeks, as was shown in Figure 1.³⁸ Speaking more broadly, anthropologists and others have characterized the structure of cultural time as, at times, cyclical, elliptical, spiral, linear, and so forth.

Conventional views project these patterns in two dimensions but, as we have shown, their complexity suggests that designs with overlapping levels of experience are more faithful expressions of the underlying processes. Cyclic (and other) biological processes combine with external rhythms—natural, manmade, social and so forth—to create

tangled arrangements which, when captured in multi-dimensional patterns, can symbolize the intricacy of the shapes created by these intermeshing, intermingling movements.

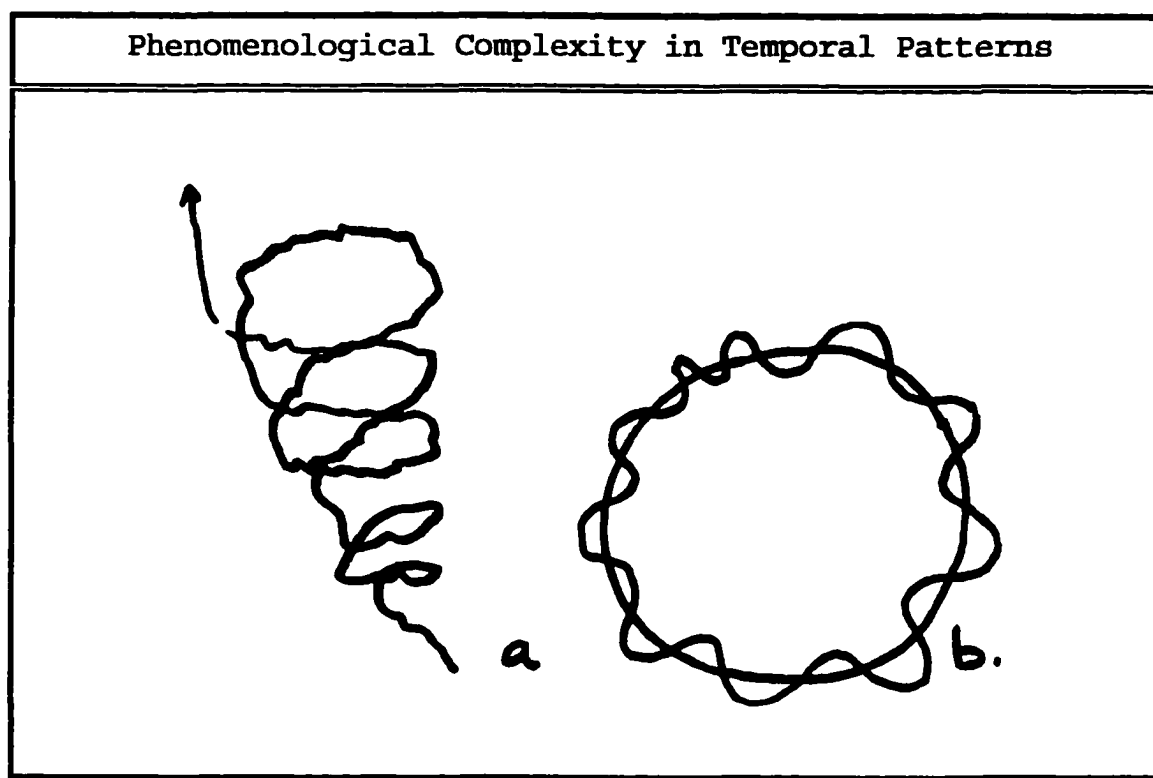


Figure 9. Drawing A shows a general pattern of time spiraling upward to a broader, more open future. Drawing B represents a cross-section of the spiral rhythmically laced with a smaller pattern—monthly biological cycles, perhaps. Complexity can quickly grow when more processes are included and when the third dimension is used so that wave forms move in and out perpendicular to the surface of the page.

Modal differentiation. The second aspect of pattern is the degree of differentiation assigned to the modalities: past, present and future. Assuming a continuum of time running from past to future, there is also a continuum of

precision running from clearly demarcated segments to a state where everything exists at one time—in the present (Dapkus 1985; Block 1994). Cottle's (1977) work points to another aspect of modal differentiation, or way of looking at the continuum, which he calls atomistic versus Gestaltist. This has to do with the tendency to see time either in chunks or as an infinity of points creating a unified whole. We might refer to Cottle's variable as "scope," or existential extension of these precise demarcations.

In short, pattern is useful in investigating attitudes toward future disaster because, as maps showing temporal experience and expectation, they portray the inevitability or uncertainty of future occurrences. Differentiation and scope are aspects of the patterning dimension which have important implications for perception of causal relationships because they define the way the flow is segmented and the character of connections between things.

Since, as we have shown, elements of temporal patterning can not be effectively represented using only two dimensions, the investigation of pattern will benefit enormously from computer graphics.

(3) Temporal Perspective

Temporal perspectives, the phenomenological/existential elements of pattern, have three major qualities:

orientation, depth and what we call "reality," (substance or concreteness of future or past images).

Orientation refers to the relative importance of, or degree of involvement in, the various modalities: past, present or future. Following Schneider, there are seven (simplified) possibilities for which modality or combination of modalities predominate:

Predominate Orientations in Time			
	Past	Present	Future
Balanced	X	X	X
Forwardlooking I	-	X	X
Forwardlooking II	-	-	X
Flight	X	-	X
No Perspective	-	X	-
Backwardlooking I	X	X	-
Backwardlooking II	X	-	-

Table 2. Orientation. from H.D. Schneider, 1990:38)

Depth. While orientation has to do with directedness, depth has to do with distance or reach. A subtle distinction exists between "extension," or the range of years between subject age and the most distant event named (as investigated by Wallace), and "expansion," or meaningful depth of the past and future (as explored by Fraise (1985) and Kastenbaum (1961)). "Expansion" asks how far forward or backward in time the subject occupies himself with in conceptualizing a particular type of event, either objective

or mythical. Projective ability applies to both extension and expansion, but memory decay is only relevant to expansion. Expansion then is a broader, hence more useful, term.

Reality qualifies orientation and depth by specifying how well articulated spaces of time are. First introduced by Lewin (1963), the concept is based on the idea that precision indicates how realistic future or past images are in the mind's eye. This aspect of temporal signature has to do with order and planning and consists of three parts: density, richness and coherence.

(1) "Density" measures and explains orientation and depth by asking how many events, plans, goals, apprehensions or anticipations are placed in what temporal spaces. By asking "...the number of events, roles and experiences an individual expects to populate his future," Kastenbaum asks how many relationships or connections are drawn from present activities to future states. But connections to past states, and relationships to present experiences, are also highly relevant.

In a comparative analysis one can ask, for example, about the number of future expectations relative to present and past experiences. Or the question may be posed to explore depth, as Nowotny suggests, by asking whether an overly dense proximal future has negative implications for thoughtful consideration of the distal future. Along these

lines, the relationship between density and extension may be represented thusly:

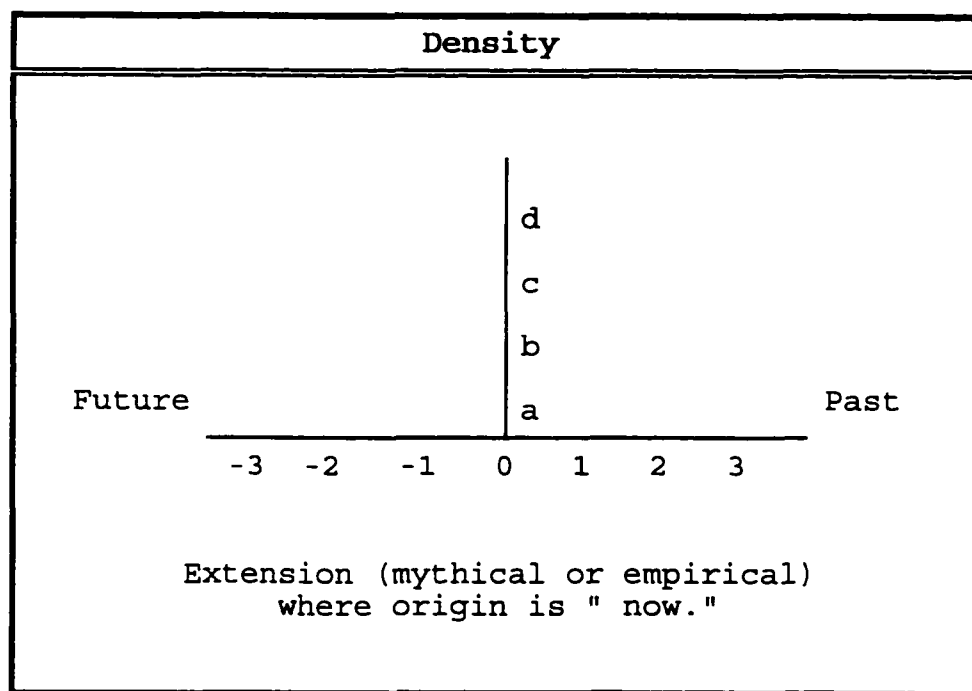


Figure 10. The number of events, roles, and experiences one expects to have in the future or remembers having had in the past.

(2) Richness is a term that captures the level of existential or phenomenological detail in present planning or past remembrances. It provides qualitative differentiation by assessing the unity, intelligibility, or logical integration of the event itself.

(3) Coherence is a further mark of differentiation that explores the degree of consistency in the structuring and ordering of events. Wallace (1956) originally used the term with reference to the sequential ranking of tasks, and

Kastenbaum (1964) later used it for the broader purpose of arranging the occurrences of important past life events.

Trommsdorff (1983) and Trommsdorff and Lamm (1975) argue that Coherence is related to causality because the ordering of events in temporal sequence is primarily intended to establish causation but we suggest that the order they refer to is unnecessarily linear. With respect to causality, Coherence is better conceptualized as an aspect of Pattern so that, rather than referring to concrete and finite arrangements of particular events or experiences, we can point to open compositions where abstract structures with multiple dimensions create limitless possibilities within aesthetically consistent arrangements. These arrangements then have the property of being integrated in the same qualitative way musical compositions do—not logically but intelligibly.

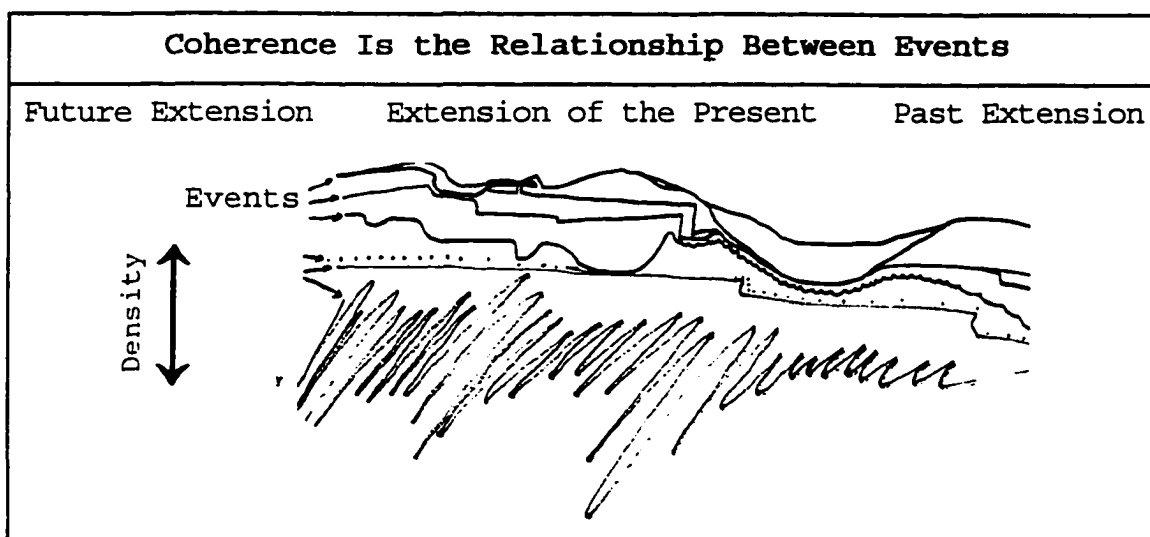


Figure 11. The impression of the layering of events in this figure portrays the quality of Coherence by showing interactions, fuzzy boundaries, and contrasts between stability and explosive change. These forms are meant to show irregular, qualitative spaces where the mixture of ingredients creates a unified "harmonious" whole.

Summary of Model Elements

Various levels of concrete-ness provide a wide range of possible ways of "seeing" time. Theoretical distances and concrete expectations are manifest by future planning or past remembrances which exist at both fuzzy and detailed levels.

But we remind our reader that each of the elements discussed depend on subject and object, (what one is talking about and to whom it is relevant). We normally plan only weeks or months into the future when we are thinking of such things as holidays, birthdays and the purchase of big-ticket items, but Svenson's (1984) work shows that thoughts turn to longer time periods with regard to environmental subjects such as climate change and hazardous waste. Desirable

planning horizons increase as we move from self to other. In our concern about how far into the future extreme hydrological events are perceived—and perceived in such a way that they are made of sufficient concern to change or impact the everyday world—we must be clear in our definition of subject and object.

While we have clarified model elements we have not discussed phenomenological or existential meaning. Again, context is critical: optimal density, for example, depends on the subject of discussion and for whom it is relevant. With respect to the relationship between coherence and reality, Schneider made this value judgement: "...we can assume that the future perspective is more favorable the more coherent and in touch with reality it is," but he neglected to explain what is meant by "favorable," and we are left to wonder whether it means being right about what actually comes to pass or whether it means emotional satisfaction (both being meaningful realities).

States of the Structure

Having described the model we now turn our attention to a brief description of the universe within which the temporal signature actually operates. When one asks, what will dictate the state of the model, or what drives the structure to occupy different states at different times, one is finally asking the question that has occupied researchers from the beginning. While the criteria for establishing

what is relevant has been slowly evolving over the subject's history, the reader will now see how past research fits in the overall picture. Even though we can't explain everything we now have a structure to "hang things on."

Drawing this literature we find that values taken by model elements are modified by primary variables, such as biology and resources, and by personal cognitions such as imagination, epistemology, feeling and motivation.

Primary Variables

The properties given to the flow and structure of the temporal signature depend on biological capabilities associated with age, IQ, and mental and physical health, as well as the resources brought by class, money, power, and politics. Perspectives stemming from social mobility, education and upbringing, and the stability and predictability of expected status sequences have been shown to be important. Ethnic and cultural background and norms and values in the current environment are also primary.

While much of the earlier work has tried to explore these variables, none has recognized that, as resources, they each have rhythms and patterns of their own, born of interaction or entrainment with rhythms and patterns of multiple individual temporal signatures. The resulting moire, again, shows the complementarity of process and structure.

Personal Cognition Variables

The following independent variables have been elaborated on ad nauseam (for example see Strauss (1962) for definition of social class), whereas the dependent variable—which always has to do with some aspect of the sense of time—has not been clearly defined. This is true in spite of Doob's assertion (1971) that measurement has been insensitive to explanatory variables. He is probably right in saying, however, that variable interaction obscures significance in many studies.

Personal cognition variables modifying the temporal signature include:

- (1) Imaginative ability, or the ability for creative conjecture. This element includes the capability of recognizing relationships and differentiating the unattainable from the realizable. It includes concern for the future and inclination to explore and organize.
- (2) Cognitions about the epistemology or origin, nature, methods and limits of time. These cognitions cover beliefs and expectations about ways of knowing, or "how" we "use" ourselves to know to construct the elements that make the patterns. A central question might be: What forces give shape to the future? Are they human, natural, supernatural, or merely the product of chance and luck? If they are human how does belief in individual efficacy versus fatalism affect

their outcome? Other questions have to do with whether the future is knowable, predictable and stable.

Inherent to these topics is the role of metaphysics and the paranormal. Does the future telecast signals? What is the reality assigned to omens, prescience, foreknowledge?

- (3) Feelings and emotions fuel passions about such things as: evaluations of what is good and what is bad; whether locus of control is internal versus external; the relative strength or weakness of ego identity; the tendency to discount future penalties; patterns of immediate versus deferred gratification; achievement orientation and the need to plan; and precision of measurement for use of time as in tardiness versus punctuality.
- (4) Motivation or desire which gives direction. This element focuses interest and attention.

The following section elaborates and explains these variables in terms of our model.

That cognitions and emotions give value to temporal dimensions is not in dispute. While Trommsdorff (1983) has suggested that relationships are complex Lewin has gone so far as to argue that time perspective is the totality of an individual's ideas and opinions about the whole of the psychological past and future existing at any given time. To measure such a concept all relevant cognitions about the

past, present and future must be identified, including all associated mental images and conjectures, as well as their contents and the relationships among them. Schneider advises that relationships between daily life and future expectation—such as potential disaster—depend on the conceptualization and evaluation of various dimensions of time and, in agreement with Lewin, he specifies that future orientation encompasses all representations, plans, goals, wishes, hopes, fears and other meanings attributed by the present daily life structures to the time that lies before us (Schneider 1990).

This challenge is made only slightly less daunting by itemizing the elements of concern: imaginative ability, epistemological ideas, emotion, and motivation. As we see how each of these color the various aspects of temporal signature we can also begin to appreciate how they come together to construct complex constructs like Kastenbaum's fourth factor which describes the inclination to explore and organize the future from an unstructured present.

1) Imaginative ability. The concept of "imaging" a future assumes the capacity for creative conjecture. Imagination is required to create projections or mental "reviews" of the past as well. Imagination—"the process of recombining memories of past experiences and previously formed images into novel constructions (Reber 1985)"—may be driven by wishful thinking or firm reality. Whatever the

validity, this creative and constructive capability informs the temporal signature by affecting each of the dimensions (pattern, flow, temporal perspective) that compose it.

Boniecki argues that, when viewed as the capacity to verbalize an event and its effect on everyday life, imagination is an important element, separate unto itself, even though it may be difficult to distinguish clearly from mental capacity (Boniecki 1980:167). Schneider, too, discusses "conjecture" in association with the meanings given to various dimensions of the future even though he does not treat this variable separately.

Mental processes that lead to conceptualizations that are unique and novel may foster the inclination to explore and organize an open future. The ability to weigh alternative imagined time streams of varying extension and duration, and the ability to "see" relationships, underlie temporal perspective.

2) Epistemology. This element addresses ways of knowing. It explores the way we "use" ourselves to construct the elements of temporal pattern and flow. And the answers come from deeply held beliefs about the origin, and nature, and limits of knowing. In doing so it taps into a collection of ideas ranging from causality (Trommsdorff and Lamm 1975), to religion and egocentricity.

The first question is: What forces give shape to the future—human, natural or supernatural? Or is the future

suspended on threads of luck and chance? Beliefs about external or internal control, and personal attitudes toward fatalism and self-determination are addressed here. Subjective probabilities and faith accorded them are also part of this topic, (including beliefs about past failures or successes).

Another aspect is whether the future is knowable at all. Is it predictable because of its stability or for other reasons? This inquiry leads to questions about the role of metaphysics and the paranormal, such as whether the future telecasts signals. We must then ask, in what ways can the future bring foreknowledge to the present...through the use of omen, prescience, or other mechanisms?

In short, epistemology narrows or defines the "how" of temporal processes.

3) Emotion. Trommsdorff puts motivating and feeling variables together in a category called "cognitive structuring." The result is a "multi-dimensional cognitive-motivational construct" with an emphasis on motivation (Trommsdorff 1982:384). We feel that a more powerful approach discriminates emotion, which gives "fuel," from desire, which gives direction. Emotion gives value to temporal elements in two ways: It shapes the way time itself is interpreted and it shapes the way the self is perceived.

Feelings and mood qualify ideas about future (Trommsdorff and Lamm 1975; Fuchsle et al 1980; Trommsdorff

et al 1982; Kastenbaum 1965; Gorman and Weissman 1977) and associated behaviors (Schneider 1990). The three dimensions that have been chiseled out by the semantic differential scale of connotative meaning—evaluative, potency, activity—are likely to be helpful in explaining the way emotion fuels passions about temporal ideas.

With respect to the self, emotion intensifies feelings about ego identity and personal control, achievement orientation, the need to plan, enthusiasm for deferred gratification, and the willingness to discount eventual costs—all variables that have been associated with temporal perspective (orientation, depth, and reality).

4) Motivation. Trommsdorff points out that motives are directed toward goals which may be set in the near or distant future and which may have the quality of either wishing to achieve or wishing to avoid.³⁹ Using an expectancy-value theory—where human behavior depends on expected outcomes and the values associated with each of those outcomes—Trommsdorff argues that strength of motivation is related to expectations for future success (Trommsdorff 1983:384). Nuttin (1964), too, casts motivation in terms of subjective needs and anticipation of need satisfaction in the near or distant future.

Motivation gives value to the past as well. Beliefs in karma, ancestor worship, etc. depend on constructs of the

past—the knowing of which is shaped by interest, attention and desire.

In short, motives direct future goals and past recollections, shaping temporal orientation, density, differentiation, precision, coherence and reality.

Socio-cultural Reinforcement

In Chapter 4 we talked about time as an ordering principle through its normative power. As we leave the discussion of the variables that modify the temporal signature model, we recognize that society reinforces particular states in the structure. Group processes create expectations and ideas of conformity giving birth to forces which come together to give meaning to the various dimensions of future (and past) orientation for each of the various subject areas in life.

Summary

This chapter developed the concept of the temporal signature by identifying its major dimensions: temporal progression, pattern, and the existential elements of pattern which form temporal perspective. The model identifies process as the fundamental, underlying force giving shape to Pattern, and shows Temporal Perspective to be a partial study of the subject by contributing elements that are easily understood and measured.

The chief contribution of this chapter's analysis is the recognition of the limitations of linear quantitative models of process, and the necessity for multi-dimensional, qualitative descriptions of the unpredictably ordered dynamics of the cognitions making up the temporal signature.

Although not created by rational thought, and not articulated in conscious process, concepts of time nevertheless produce a useful order. As life presents many various stimuli the characteristic pattern taken by this order—the temporal signature—changes and adapts. This dynamic aspect is important to understanding the temporal signature.

In this chapter we suggest that, as an ordering structure, temporal signature has a "baseline" position with some amount of "staying power." As problems or issues develop and resolve, future perspectives may be temporarily dislodged, only to be re-established at the earliest convenient moment.

Summarizing these and other characteristics of the model we distinguish between elements of the model itself and variables affecting states of the model. Elements of the model itself include:

- (1) Temporal signature is a process which forms patterns.
- (2) Pattern shapes are multiple.

- (3) The process itself—a description of "how" time moves—is not linear but multi-dimensional and unpredictably ordered.
- (4) Patterns of temporal signature have phases.
- (5) The relationship among and between elements is what characterizes the different phases of the temporal signature.
- (6) These relationships are continually shifting.
- (7) Temporal perspective is one part of—an existential aspect of—the temporal signature.

Variables affecting model states include:

- (1) Primary variables, such as age, socio-economic status, gender, IQ, health, ethnicity and culture, each of which have their own rhythms and patterns.
- (2) Personal cognition variables such as imagination, beliefs, feelings, and motivations.
- (3) Context. Because context delimits consequences, any state depends on (1) the subject, and (2) whether the object of interest is self or other.

Considering the complexity of the phenomenon under investigation, we can now begin to see why it has been difficult to predict behavior—such as mitigating action to prevent disaster—based only on images of the future, whether that future be myopic or visionary. Prolonged brooding or fantasizing about the future for instance can distract one from taking action in the present, or, future orientation

may stimulate problem solving and planning which, even though it may cause delayed gratification in the present, results in action with the potential of future benefit. We now know that the simple concept of future orientation by itself falls short of explaining or predicting because of the way it is modified by involvement in the present and/or past, and because of the property of "reality" of which coherence and causal ideas are a part. Elements of the temporal signature function in complex interdependence.

The next chapter will discuss potential qualitative and quantitative approaches to gathering data and suggests some ways computer modeling may prove useful in further understanding the dynamic relationships within the model.

Endnotes

36. Linear models show effects directly proportional to causal stimuli.

37. Personal communication April 8, 1996.

38. It is not known whether the experience of pattern is ubiquitous, or at what age it begins to develop. Might some individuals express no discernable pattern at all?

39. Lazarus (1981) observed that cognitions can be removed from reality by distance thereby creating a temporarily easing effect which offers relief in some way.

CHAPTER 6

METHODOLOGICAL IMPLICATIONS

Definition of the Proper Object of Study

The original challenge was to develop a general theory of individual temporal perspectives in order to understand: (1) images of the environmental future; (2) ideas about the nature of environmental change and anticipation of change; and (3) the elasticity of these perspectives in response to experience—where the individual moves from unawareness of impending disaster through the various stages of perception, experience and resolution to eventual resumption of normal life. We are now in a position to characterize the temporal signature—either the pattern itself or the pattern forming process—so we can investigate the ways in which it orders temporal perceptions of the natural environment.

Since objectives (1) and (2) can be addressed with a single pattern of future and flow, while objective (3) refers to different (multiple) patterns of future and flow, we may address our primary objectives by developing correlational studies. We may, for example, compare a patterned state of one individual with that of another individual or, alternatively, we may develop comparisons between the patterned states belonging to a single

individual as he experiences or responds to different environmental conditions. These studies require the identification of unique properties of pattern in sufficient detail to make distinctions between synchronous states—states existing at one time.

Another approach would be to focus on understanding the process of change that shapes evolution of one pattern into another—the mechanism of adaptation—as the temporal signature responds to changing environmental conditions. In this case the problem becomes one of characterizing the succession of forms created through the ceaseless morphogenesis of pattern.⁴⁰

Methodologically Important Characteristics of the Temporal Signature

The methodological approach should be able to examine the following characteristics of the phenomenon:

- (1) Simultaneously occurring variables.
- (2) Different possible strengths and durations of each variable.
- (3) Variables that contradict one another. For example, forward projection and backward (post event) interpretation may be operating at the same time.
- (4) Variable systems of interacting factors that are integrated into a whole and that cannot be broken out without losing the object of study.
- (5) Dynamic and continually shifting variables.

- (6) Sudden small or large changes in the environment that may change variable values reorganize the whole system.
- (7) Relationships between variables change during different phases of the system.

Characteristics of the data.

Before discussing potential methodologies we touch briefly on the characteristics of the data that might be made available to us.

As shown in the last chapter, temporal signatures are qualitative, multi-dimensional, unpredictably ordered, dynamical themes that shape individual and, ultimately, group life. But as unconsciously developed structures they are not necessarily accessible to the conscious mind. Composed of both tacit and explicit knowledge, they are difficult to study. In fact, inquiry may "re-time" the object's characteristics because the data collecting instrument is highly reactive with the object of study. In considering the difficulties of accessing the kind of information we seek, we note Michael Polanyi's observations on the subject:

Polanyi's (1958) point is that '...tacit knowing is more fundamental than explicit knowing: we can know more than we can tell and we can tell nothing without relying on our awareness of things we may not be able to tell' (Weimer 1987:245).

Walter Weimer drives the point home in his discussion of tacit knowledge and the nature of rationality:

Our consciousness and explicit awareness, and the rationality that depends upon them, are a thin veneer upon the tacit dimension that, although it operates according to complex rules of determination, is not consciously rational (1987:245).

In addition, the temporal signature functions in a complex way across all levels, blending together the social and the psychological, the micro and the macro. Like streams flowing and twisting in a dynamic fluid, the interacting parts can be distinguished but not be separated. The elements of temporal signature take multiple, continuously shifting forms—neither predictable nor rational—the meanings of which depend solely on relationship or pattern.

What we do know about the data:

- (1) Aspects of a person's temporal signature may be available to him or her as tacit rather than explicit knowledge—or may not be available at all.
- (2) The traditional approach of distinguishing levels of analysis is not helpful: the social and the psychological as well as the micro and the macro are inextricably interwoven.
- (3) Classical techniques of direct observation cannot be used (in either field or lab) because temporal constructs exist as ideas or perceptions integrating temporal input in the mind.

- (4) Since temporal signature underlies the ongoing interpretive process individuals use to function in their daily worlds, behavioral consequences of this interpretation may provide indicators of the underlying pattern.
- (5) While a wealth of knowledge exists about the general nature of the temporal signature, it is mostly descriptive.
- (6) The act of measuring will certainly collapse individual ways of thinking to those of the researcher. We use the term "collapse" because the natural richness of the concepts involved—barely hinted at in the drawings in Chapter 4—may be reduced to those few aspects the researcher himself is able to identify.

The potential for intrinsic invalidity points to the value of a holistic approach where the integrated whole of the temporal signature has a reality independent of and greater than the sum of its parts.

Potential Methodologies

The methodological heritage of sociology includes approaches extending from quantitative to qualitative techniques with mixed ideas about the importance of theory. The language of each methodology shapes questions and directs where answers may be found. We are interested in understanding a pattern that creates order. Shall we measure and assess or shall we describe and portray? Or

some combination? Because the object of study is still not fully characterized (and may never be), we must guess at the most profitable approach.

This section will identify various means of addressing the issue, running through qualitative and quantitative approaches and ending with a brief discussion of complexity theory, of which chaos theory is a part.

Qualitative Methodologies

In Chapter 4 we established that temporal signature is a product of individual interpretive work which closely follows developmental and socialization processes. Clearly, the subject fits well with qualitative approaches because of its focus on individual interpretations of a dynamic reality. If we begin our inquiry by asking about either (1) the socially negotiated meanings that temporal structures have for the individual, or (2) the way meaning creates and changes temporal signature, we will be concentrating our investigation on what the individual perceives to be significant about time.

Research approach. A qualitative approach directs us to sensitively examine the actions and reactions of the individual in his daily life in order to perceive and understand meanings and motivations. Using the temporal model developed in Chapter 5 (the elements of which are outlined in Table 3 below) as Blumer-like sensitizing concepts, situation specific data can be carefully collected

until the patterns of temporal signature begin to form and take shape. Following Glaser and Strauss's ideas for developing a grounded theory, once the elements are assigned theoretical values these values can be empirically confirmed by forming hypotheses and testing them in parallel situations.

The Temporal Signature	
I. Temporal Progression	
1) Tempo	
(a) Pace of movement with respect to both the theoretical future and the practical unfolding of events.	
(b) Flow and it's independence or dependence on contingent events.	
2) Rhythm	
(a) Recurrence, smoothness, regularity or unpredictability.	
II. Pattern	
1) Shape: Multiple concepts including	
(a) Theoretical and practical aspects	
(b) Cultural and individual aspects	
2) Differentiation of modalities	
(a) Demarcation of past-present-future	
(b) Atomistic versus gestaltliche in scope	
III. Temporal Perspective	
1) Orientation: past, present, future	
2) Depth: forward and backward extension	
3) Discrete indicators of reality:	
(a) Density	
(b) Richness	
(c) Coherence	

Table 3. Summary of Elements in the Temporal Signature

Data gathering techniques. Taking a symbolic interactionist approach one might attempt to identify the unique properties of each of the elements of the temporal signature by attending to symbols—linguistic, gestural, written, graphic, pictorial, musical and so forth—and the way they are used in communications to create temporal structures for the self and/or society. Elements of temporal signature can serve as sensitizing concepts (Blumer) to lend direction and focus inquiry in a grounded theory approach. Accumulate observations and, using analytic induction, look for patterns and similarities, form hypotheses, test in parallel situations. Build up substantive theory about man's relationship to the environment in cases where flooding can happen anytime. Possibly develop a model that will predict when man will put himself in jeopardy.

A slightly different interpretive procedure may be developed using the phenomenological perspective which argues that we can never really know whether things are merely a projection of the mind (idealism) or whether there are objects in the world separate from human knowledge of them (materialism). Since, according to this perspective, the only thing we can know is how objects appear to exist, this approach to inquiry would emphasize learning about temporal dynamics in terms of the way they are actually understood and experienced by the individual in the

immediate environment. For example, temporal patterns could be characterized by focusing on the effects of an environmental event on the way temporal elements are experienced.⁴¹ The sharp focus on the direct experience of events, occurrences, happenings and so forth, at the actual time of experience, makes it possible to achieve a high level of validity in the researcher's representation of the individual's relationships with, and reactions to, real-world events.

A research objective centering on understanding processes—such as successions of forms created by the continuing development of temporal patterns or, more formally, processes governing the rules of morphogenesis between temporal elements—may also be inspired by ethnomethodology. This approach to understanding social phenomena normally focuses on the use of resources in socially motivated interactions. Often applied to understanding conversational rules, rules of negotiation and so forth, we suggest extending the technique to understanding the rules of the morphogenesis of (the experience of) temporal states. Here we look at how the individual skips from temporal state to state.

In his work on multiple realities, Schutz ([1962] 1971) talks about "finite provinces of meaning" as a set of compatible experiences with a common style. For example, everyday life experiences have in common the style which is

manifested by a very specific "tension of consciousness." When face-to-face, speaker and listener perceive each other as "unbroken totalities" where the world seems real, unified and natural. But a shock causes one to move from this "finite" province of meaning into another one. Examples are falling asleep, losing oneself to the theater, having a religious experience, and so forth. Each of these has a particular cognitive style of its own and passing from one to another involves a "leap" or a radical modification in the tension of consciousness. Different realities provide the opportunity to explore different temporal states.

Employing the documentary method of interpretation, Garfinkel (1967)—following Husserl and Schutz—developed the idea that the appearance of individual behavior can be viewed as a "document" representing an underlying pattern. In a threatening setting where disaster is eminent the variety of behaviors a person engages in—behaviors that have some timing—constitute patterned evidence for the underlying temporal identity. This identity could be further understood by contrasting it with a study done at the moment of disaster, or after disaster resolution, and so forth.

Existential sociologists would couch the issue in terms of the highly complex psychological reality of the experience of time. Here the investigation is centered on the experiential realm of everyday human life in natural settings. This school of thought recognizes the vast flux

of human processes in all their uncertainties, thus existential sociology is not couched rationally but rather is open to the "puzzling wonders of human life." Because the researcher is fundamentally unable to provide systematized explanations—one cannot grasp the vast flux of human processes—he instead must attempt a synthesis of rationality (science) with "situatedness" and feeling (art).

Good, rich data, with insight into individual drives and ongoing processes, can be also be acquired through the thoughtful use of non-observational techniques. The semantic differential, for example, offers a way to quantify meaning by having the subject evaluate connotative meanings assigned to adjectives describing temporal signature model elements. This technique customarily makes use of three primary factors—activity, potency and evaluation—producing data which blend nominal or purely descriptive measurements with ordinal or ordered information. It breaks with the qualitative paradigm during the analysis phase as data are aggregated using statistical analyses.

Another way to try to get at meaning inherent in the temporal signature is through the use of projective tests where the individual is presented with a standardized (but unstructured) set of stimuli and requested to respond to them in as unrestricted a manner as possible. Although it is not usually possible to actually score the results it may be possible to categorize by kind or type. The problem, of

course, is that one can never be sure what exactly is being measured and, since the data are more limited than those gained through field observation, patterns and recurring arrangements will be difficult to detect with any reliability. It may also be difficult to develop a standardized set of temporal stimuli that do not corrupt the subject by suggesting "correct" responses.

Contributions from the qualitative paradigm. The dimensions and elements identified in the temporal model (listed in Table 3) appear to have construct validity. That is to say, they appear to give thorough coverage to the entire content domain of the temporal signature. A research design using one or more of the qualitative approaches discussed in this section may provide the opportunity to achieve subjective validity as well. To the extent that an individual can access and recognize his own thoughts on time-related matters, Weber's "meaningful adequacy" may be established so that results are faithful to the individual's interpretation and understanding of his temporal world. Because the theoretical framework of both the subject and the research paradigm are based on process, there is much congruence between subject and method. Replication is always a problem with qualitative methodologies but the use of multiple measures may enhance validity of findings.

Quantitative Methodologies

In contrast to the qualitative techniques just discussed, quantitative approaches focus on discriminating variables to determine how they relate to each other in a stable reality. Although a strict "scientific" approach cannot be used because one cannot manipulate and, in fact, cannot even precisely specify the variables of interest, one may be able to apply modified quantitative techniques to some advantage. If this is the case we can hope to eventually explain and possibly control the temporal signature rather than simply describe and understand it. Since the genesis of this dissertation rests on time as a problem in the perception of hazard, it would clearly be desirable learn how to influence and modify temporal constructs.

To consider using quantitative tools in the investigation of the temporal signature one must first be convinced that this "pattern-that-creates-order" can be taken apart. If it can be, one suggestion might be to apply the proper methodology to each separate element that makes up the temporal signature and then try to reassemble them as a whole. H.D. Schneider (1990) is among those who suggest splitting up the components into numerous partial constructs and investigating the parts separately. He suggests investigations be made to determine the importance of the various cognitive and affective elements on the overall

meaning of future perspective. He further proposes investigations be made to find which aspects of future perspective are most strongly affected by the social surroundings. We could do the same here for the natural environment. Investigation of the manner in which unfolding events (environmental events) affect future perspectives may also shed light on the durability and resilience of the temporal signature.

The instrument. During instrument development it will be important to recognize that dimensions of meaning come from both abstract and concrete indicators. This means the respondent should be queried about both thought and behavior. Ideas about temporal measurement should include both calendar events and social or religious events. To enhance measurement validity, scales may be developed with indirect questions such as: "What do you think, are things getting better, or are they getting worse?"

The way time is actually used could serve as an indicator of some temporal elements. Elements of temporal signature come together to create future oriented, disaster related, action. Action is not an element itself, as Schneider suggests, but is more properly used in operationalization and measurement. The idea of action is implied in several elements because it is associated with behavior (albeit thinking or planning behavior rather than overt behavior). For instance, in "density" future planning

is the action of having made plans or giving thought to the "how" of making plans that have extension, with a certain character which will be sorted out according to the rules of conjecture. There are a number of expected behaviors associated with the earlier question, "What do you think, are things getting better or are things getting worse?" that would be scalable. Should we expect that if things are perceived to be getting worse, one would reap now and sow nothing, while if things are getting better, one would sow now and reap later?

Personal cognition variables—imagination, epistemology, emotion, and motivation—create ideas about how time operates, which affects how time is used. Each variable presents its own challenge for measurement but unique solutions can be found. Regardless of variation in scale and/or level of measurement, it might be useful to collapse the resulting datum into nominal categories for analysis as shown in Table 4. This would create useful types or classes (labeled here as "Social Type I" and "Social Type II") which could be used to assign values to the elements of the temporal model.

Cognition Variables and Social Type			
Concept	Social Type I	Social Type II	Method of Measurement
Imaginative ability	+	-	Scale A
Reality discrimination	-	+	Scale B
Beliefs about knowing	-	+	Scale C
Role of supernatural	+	-	Scale D

Table 4. Data may be aggregated to create nominal categories of social type.

Variable relationships. Once the various elements are quantified one should attempt a multivariate structural analysis, such as path analysis, where coefficients estimate the strength of relationships among these several variables. While the analysis need not be causal or deterministic, associations can show direct and indirect effects of changes in the independent variables (personal cognition variables) on the dependent variable (temporal signature). Once ideas develop about how variables relate to each other mathematically they can be programmed to produce various patterns reflecting the temporal signature.

We can speculate on the patterns that may emerge with variation in the value of individual elements of temporal perspective. Table 5 below is a simplified schematic for the temporal perspective showing how the qualifiers of orientation, extension and reality hold particular states of meaning through various qualities of pattern and flow.

Variations in the Elements of Temporal Perspective			
Aspect of Pattern and Flow	Orientation	Extension	Reality
	a1	b1	c1
	a2	b2	c2
	a3	b3	c3
	a4	b4	c4
	a5	b5	c5
	a6	b6	c6
	a7	b7	c7
	.	.	.
	.	.	.
	.	.	.

Table 5. These elements of temporal perspective may combine in many forms to produce some general pattern of flow, such as $a3+b3+c1$, or $a1+b2+c7$, and so forth.

Aspects of future perspective may or may not be correlated with each other—correlations and interactions are at this stage completely unknown—and as a result, as already mentioned in Chapter 4, some researchers have suggested that they be looked at separately. The problem is how to quantify the variables and especially how to obtain data at an appropriately high level of measurement to be able to perform statistical analyses.

Contributions from the quantitative paradigm.

Quantitative methodologies operate as though critical characteristics can be separated out, defined and accurately measured. This approach assumes that we can measure fundamental uniformities, shared by individuals across time and culture, on repeated occasions, tapping into the same

constructs every time. Necessarily narrow in focus, results have a high probability of being reliably reproduced. A large amount of easily categorized data can be collected in a relatively short time. But the phenomena described by traditional statistical distributions, (normal, Poisson, etc.) represent only a small part of the social science data. In dealing with questions of continuous/discrete, parametric/nonparametric, and so forth, a large fraction of our knowledge of social phenomena, like the temporal signature, is lost.

But the fact that this method produces numbers can be a great advantage. Numbers open the door to various kinds of analyses and manipulations that help understand complex phenomena in entirely different ways. As we measure variation and trace effects we may begin to develop probabilities predicting future states. One way to do this is through computer modeling.

Complexity Theory

Because the temporal signature is composed of multiple, interlocking elements, a chief concern—and a theme running through this dissertation—is that taking it apart will destroy what it is we are trying to understand. The very concept of temporal signature was developed out of respect for the integrity of meaning inherent to the whole pattern forming process. Computer modeling based on complexity theory may be helpful because it shows the collective

behavior of interacting units. Complexity theory is based on the recognition that complex phenomena may have complex causes that are not reducible to a few variables (Gleick 1987).

Complexity is the study of the behavior of basic, interacting units with the potential of evolving over time. The product of these unfolding interactions is some phenomena which has emergent properties.⁴² Small changes in "insignificant" variables may cause the whole patterns to change. This theory grew out of efforts to understand turbulence and flow in gases and liquids, natural selection process, and other phenomenon that undergo pattern change over time (Waldrop 1992). We have a similar need here: to understand how the complex elements of the temporal signature change over time and how one temporal signature is selected over another.

Chaos theory, a particular study of complexity, shows that very complex and what appear to be random interactions may in fact obey complex rules that restrict the values that elements can take over time. Furthermore, Michael Feigenbaum discovered that, although the values of elements or interactions themselves may be unpredictable, their rates of change may be patterned so that there is an orderliness in the dynamics of unpredictable systems (Peitgen, Jurgens and Saupe 1992). Computer generated outcomes based on these

formulas may offer a means for understanding how one temporal signature changes into another.

Alternatively, it may be possible to model the temporal signature pattern forming process with a neural network. Here each element of the temporal signature could be assigned to what is called a "neurode," where it's value is programmed to accept or reject various stimuli, and the whole run to determine how temporal patterns are learned and recognized (Jantsch 1980).

Contributions from complexity theory. While the temporal signature is itself a qualitative phenomenon, computer simulations could provide a rich opportunity to experiment with the complex interaction of elements as different patterns emerge and take shape. It may be possible to simulate the morphogenic rules that guide changes in the temporal signature over time by incorporating Feigenbaum mapping processes or other techniques from chaos theory into the computer program (see Koehler 1990; Koehler and Koehler-Jones 1996). This experimental work could help to clarify how to construct qualitative or quantitative techniques for observing how people develop and change temporal signatures in the real world.

Summary

Method is the logical application of principle and process but in our case the phenomena-temporal signature—is embedded in the principle, the process and the object of

study. Further, the ability to measure a quantity does not guarantee an understanding of its nature. A classical example of inconsistency between the two, as Levich has pointed out, is "a thermometer which has been fine for measuring temperature both in the flogiston [sic] epoch and after the appearance of the molecular-kinetic theory" (Levich 1995:2).

Having developed the model we find that there remains many ways to query the object of study. Shall we investigate the meanings assigned to patterns, the principles creating the structures we've found, or the psychological reality of the experience of temporal pattern and process? Shall we disassemble the whole, get out our rulers and measure the pieces, then try to reassemble everything and understand how it works? Can we do any of these well enough to understand, and eventually shape, the way people perceive future disasters?

One of our objective has been to help solve problems of disaster professionals as they attempt to convey to lay persons the importance of taking early mitigating action to prevent disaster. We have laid the groundwork for the development of a data collection method that will demonstrate the rich variation of temporal signatures associated with various perceptions of environmental hazard. Using either qualitative or quantitative techniques we may now treat temporal signatures as independent variables—on

which the perceptual construction and resolution of hazard depends. The investigation of differences between temporal states may suggest ways to deliberately influence temporal perspectives using communication techniques. One of the great questions for future research is the nature of the persistence of time; what does it take to disrupt the characteristic view and how lasting are the effects of disruption?

Endnotes

40. We borrow the term "morphogenesis" from biology because it refers to the process of development where all parts of an embryo are growing and changing in an interrelated and coordinated fashion. The rules of morphogenesis prevent the heart from maturing without the lungs, and so forth.

41. A future study might examine how the social functioning of clocks and calendars creates a temporal objectivity in the minds of individuals. Using what Husserl referred to as "intentional consciousness" we might be able to see how this objectivity gets built up in perception—how these mechanisms grow to represent the entity "time" in the minds of individuals.

42. Coveney and Highfield explain "emergence" as a van Gogh painting where the whole is clearly more than a collection of bold brushstrokes (1995:7).

CHAPTER 7

CONCLUSIONS

This project started with the desire to understand the relationship between images of the future and perceptions of the way environmental processes unfold over time. We have shown the importance of temporal construct as a theoretical explanatory tool for understanding variation in awareness of dynamic processes. In doing so we have made several significant discoveries about the nature of socially conditioned temporal constructs held by individuals.

Of chief importance is the recognition that the temporal signature—which is a personal temporal identity—is a whole collection of temporal elements functioning interdependently. Future perspective alone does not give us enough information to understand the meaning assigned by the individual to his or her perceptions of the unfolding of dynamic processes. The entire temporal perspective—including past and present orientation, depth, density, richness and coherence—must be considered.

Of equal importance is the recognition of the dynamic nature of these elements. As an adaptive mechanism the values assigned to various aspects of the temporal signature are constantly changing while preserving the theme or identifying characteristics that associate it with a

particular individual. This means the properties of temporal progression, tempo and rhythm, must be fundamental to the development of future research.

One of the most significant conclusions that can be drawn from this work is that the proposed model has potential usefulness for understanding why some dynamic processes, environmental and otherwise, can be overlooked or misperceived. With the temporal signature fully characterized it can now be used to help understand not just perception but judgment and decision-making in any field of action. Economists and consumer analysts for example, have long known that future orientation is a part of the framework used in interpretation and decision-making but, lacking a complete model, it has been impossible to clearly define those relationships.

As the twenty-first century approaches it brings increasing change in domestic and international affairs. We are struggling to adapt to trends such as: the aging of the American population; changing family structures; rapid growth of urban areas with increases in crowding, drugs and crime; and the effects of world-wide environmental and epidemiological events.

With the built environment continuing to envelope us, and new technologies continuing to make themselves indispensable to daily life, natural processes external to those man-made constructions become increasingly irrelevant.

The uniform pacing of clocks and calendars obscures the variability that exists in the world around us until it seems to be little more than a romantic artifact of anthropology, relevant only to primitive or tribal cultures. As significant events impact our lives more quickly and more often than ever before, the increasing pace of change forbids us time to develop an image of the future and an appreciation of the past in our own understanding of ourselves.

Yet somehow we adjust expectations, change social traditions, and invent new identities as we create order out of the dynamic moment. What could be a more interesting or useful pursuit than to investigate and try to understand how we adapt to the dynamic realities of our own social constructions? The temporal signature offers the exciting possibility of glimpsing a fundamental identity—powerful enough to shape perception and understanding of the world but subtle enough to go almost entirely unnoticed.

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