World models for the Psychology of Time

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Introduction: Time is Multifaceted

The psychology of time is extremely complex and diverse. Topics of interest span a wide range; there are studies on biological rhythms, duration experiences, and cultural tempos, to give just a few examples. Major theoretical approaches are also wide-ranging; the more prominent ones are cognitive, biopsychological, developmental, psychoanalytic, and social-psychological approaches, along with a few attempts at eclecticism. Organisms currently being studied in some depth include humans, rats, and pigeons. Different investigations also vary on numerous other dimensions.

How is one to make some sense of this diversity? Does one need to? Even a quick glance at the literature on any particular topic of interest reveals numerous failures to replicate, which are difficult to handle in any sort of normal-science framework. A relatively large number of studies are published every year by investigators who do not explicitly note the ways in which the methods and findings differ from other investigators' methods and findings on the topic. Surely any sensible reviewer should decide not to attempt to make sense of such chaos. However, attempts to synthesize are critical to progress in this field, as in others. It is important not to be overwhelmed by the many dimensions represented in research and theorizing on the psychology of time. Time is, after all, a multifaceted concept.

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In attempting to put some order into the chaos, one must adopt a multidimensional perspective on the subject. But as Kaye (1977) so aptly put it in a description of psychology:

Although it would seem that a multidimensional perspective should dictate families of holistic unities, in my vision of reality things are nested within things, relate as things to things (within limits), defy total absorption, and moreover, exist in several contexts simultaneously. (p. 346).

Perhaps this is why most theorizing on the psychology of time, including some of my own, has tended to be severely limited in scope. It is difficult to find any «families of holistic unities», even within a single topic area within the psychology of time. Attempts to broaden the scope have usually resulted in a simple classification of different types of phenomena, with little attempt to interrelate the different categories in any functional, pragmatic way.

Pepper's «World Hypothesis» and Time

In a classic monograph, Pepper (1942; see also 1973/1982) discussed four «restricted» scientific theories that he considered to be relatively adequate. He called them world hypotheses, but I prefer the term world model (as it was used by De Mey, 1982, for example). Pepper also illustrated the corresponding root metaphors that underlie the world models. In the order in which he discussed them, the world models are, formism, mechanism, contextualism, and organismism. (As I note later, this order does not imply any historical, sequential, or hierarchical relationships. There is a recent resurgence of interest in Pepper's work (e.g., Berry, 1984; Frawley, 1982), as well as with the larger question of the general role of mental metaphors (e.g., Gemser & Grunin, 1981; Roeper, 1980). A summary of these world models and the corresponding root metaphors follows, with particular emphasis on assumptions concerning the nature of time. For present purposes, Pepper's discussion of the four world models is especially relevant, because he noted how each of the underlying root metaphors treats the subject of time.

Formism

The root metaphor of formism is similarity, or common-sense perception of patterns of relationships between different particular objects. A formist attempts to analyze the universe by classifying objects, which is done by organizing particulars into categories according to their various properties. Theoretical analyses, then, involve models that represent propositions about relationships between particulars classified either in the same category or in different categories. Further, a formist might observe that every concrete existent object or event is to be located at a date and at a place (Pepper, 1947, p. 174).

One valuable use of a formistic approach in the psychology of time is the classification of different kinds of time or temporal experiences. For example, it is common to distinguish among the following kinds of experiential categories: simultaneity, successive-time, rhythm, duration, and temporal perspective (cf. Block, 1979; Einstein, 1961). More generally, though, a distinction is usually made between physical time and psychological time. In a more extensive and useful classification, Frazer (1915, 1978) discussed five hierarchically nested levels of temporality, which he called atemporality, prototemporality, eotemporality, biotemporality, and zootemporality. As I note later, though, the world model used in Frazer's theoretical account stems primarily from organismism.

Mechanism

The root metaphor of mechanism is a machine. A mechanistic analysis attempts to explain the universe in terms of relationships or laws that hold among its various parts. The laws are usually expressed in terms of relatively simple cause-and-effect relationships occurring synchronously — that is, in a present-time framework — such as in the operation of a lever. In one version, effects occur among parts localized in an absolute space that is moving through time. This was characteristic of the prerelativistic view of Newton, which is often seen as the discrete mechanism. With the advent of the general and special relativities of Einstein came a different kind of mechanistic analysis, which Pepper called consolidated mechanism. In this version, the absolute space and time of Newton were replaced by configurations of elements in a spatiotemporal field. One of the main attractions of mechanistic analyses, in fact, is a complete and rigid determination of configurations in the spatiotemporal fields (Pepper, 1947, p. 207).

The physical model of discrete mechanism was paralleled in psychology by an analysis of complex mental states into elements that
were assumed to be joined by associations based on temporal and spatial contiguity. This paradigm received its major impetus from the work of psychologists like Wundt and Titchener. Behavioral psychologists also adopted a discrete mechanistic view. When consolidated mechanism became popular in physics, the Gestalt psychologists of the 1920s and 1930s adopted this revised world model.

Contextualism

The root metaphor of contextualism is the historic event, not as some past occurrence, but rather as a «dynamic dramatic active event», which is «intrinsically complex, composed of interconnected activities with continuously changing patterns» (Pepper, 1942, pp. 223-233). There are two clarifications that are important. First, contextualism is concerned with diachronic processes—that is, events unfolding over time. In this view, events are best expressed with an emphasis on verbs, such as making, laughing, solving, and so on. (It is typical of some contemporary contextualists to use terms like remembering, as opposed to memory, and thinking, as opposed to thought). Second, the term context stems from the past participle of the Latin verb contingere, meaning «to interweave». The idea of interweaving is particularly appropriate, because it involves complex, interconnected, and continuously changing patterns. Each event, then, contains dynamic, interpenetrating features that change, giving rise to novelty. An event has a certain quality—roughly, its «total characters»—and a certain texture—«details and relations which make up that character» (Pepper, 1942, p. 238).

Pepper (1942) noted that contextualism is often called pragmatism. An influential early psychologist who adopted this kind of approach was James (1890). Contextualism was rejected or ignored during most of the brief history of psychology, especially by behaviorists.

To some extent, the recent interest in contextualism among some experimental psychologists can be traced to Jenkins’s (1974) influential article on memory. Psychologists have only recently begun to re-explore the implications of this kind of world model and its philosophical and metaphysical orientation, which may be seen as a kind of realism interactionism (Ronnow, 1983). Because time and change are two of the most basic ideas underlying contextualism, I argue later that contextualism is the world model of choice for understanding psychological time.

Organicism

The root metaphor of organismism is the organic process. An organismic synthesis notes «the steps involved in the organic process, and the principal features in the organic structure ultimately achieved» (Pepper, 1942, p. 281). Pepper preferred not to emphasize the biological connotations of the term organic, though. In spite of this, the notions of adaptation, resolution of contradictions or conflicts, and internal drives toward integration are central to organismism. In direct contrast to contextualism, organismism holds that time and change are not real, not factual, but derivative. Just as a tree develops from a seed, each phenomenon ends in a form which is implicit in its earlier forms.

Kaye (1977) noted the relatively recent development of general systems theory, which is nearly a prototypical organismic model. The kind of synthesis that general systems theory offers is easily extended to nonliving as well as living systems. Another well-known organicistic view in psychology, one which is quite explicitly biological, is Piaget’s theory of development. However, this approach merges an organismistic world model with aspects of a formalistic model (Hoffman & Nead, 1983).

Comparisons and Combinations

Pepper (1942) referred to formism and mechanism as analytical theories. He noted that formism is relatively dispersive, whereas mechanism is relatively integrative. This, «formism is strong just where mechanism is weak» (p. 146), and there is a tendency for the two to be combined in an eclectic mixture. Pepper also noted that:

The discrete and consolidated species of mechanism seem to repel one another. Yet unless they keep some contact with each other they tend to be projected quite out of mechanism, the one into dispersive formism and the other into synthetic operational contextualism. (p. 187).

Pepper (1942) referred to contextualism and organismism as synthetic theories, but said that contextualism is dispersive and organismism is integrative. It is particularly relevant here to note that he claimed that organismism «conceives itself of inadequacy» (p. 314). One reason he gave was that «organicism takes time lightly or disparagingly; contextualism takes it seriously» (p. 281). Organicism requires progressive
categories, such as time and change, to give it scope; but according to organisation, these categories do not exist, because they are absolute in the absolute and in the absolute is no time, nor change (p. 314).

If there was an issue on which Pepper (1942) was somewhat dogmatic, it was on the feasibility of combining world models. He frequently argued that only confusion can result from mixtures of root metaphors. My own bias is not nearly as strong as Pepper’s; I think that combinations need to be explored, although I recognize that any theorist who does so should be aware of possible drawbacks.

De Mey’s Stages

Without drawing any explicit parallels with the philosophical work of Pepper (1942), De Mey (1982) distinguished four stages which have been accumulated in thinking about information processing (p. 4) among modern cognitive scientists. He considered the later stages to be more complex, more refined, and better able to model the cognitive processes involved in such domains as perception, pattern recognition and picture processing, and communication and language processing. In order of increasing sophistication, he called these stages monadic, structural, contextual, and cognitive. Michon (in press) noted a correspondence between them and Pepper’s world models – formalism, mechanism, contextualism, and organisation, respectively.

The crux of my disagreement with Michon’s (in press) interpretation of Pepper’s (1942) world hypotheses, as well as of my disagreement with De Mey’s (1982) stages, lies in the relationships between the notion of context and the role of a contextualist root metaphor in modern cognitive science and in the psychology of time. Michon and De Mey both asserted that modern cognitive science relies on an organismic root metaphor. Further, Michon detected a hierarchical structure to Pepper’s root metaphor, with organismism embedding the lower root metaphors. I think that this is somewhat misleading. As Michon noted, Pepper’s original description of the root metaphors did not explicitly or implicitly propose a hierarchical organisation. Pepper asserted that:

"It almost seems as if the four hypotheses... had a tendency to pull cognitively toward the center, as if the root metaphor adequacy lay somewhere between mechanism and contextualism. This appearance is strengthened by our previous comments to the effect that formalism seems to be the weaker of the analytical theories, and organismism the weaker of the synthetic theories... We are tempted to assume that whatever system there is in the world is of the mechanistic type, and whatever dynamic reality, of the contextualist sort. (p. 148)."

Pepper (1963, 1967) later proposed a new world hypothesis, which he called selectivism. It greatly resembles contextualism, but it uses a "purposeful structure as a whole for a root metaphor" (Pepper, 1967, p. 14). In a subsequent article, though, Pepper (1973/1982) did not mention selectivism, but limited his discussion of scientific metaphors to the four he had identified in 1942. He also reiterated his belief that none of the four is fully adequate.

World Models of Cognitive Science

In order to clarify some important issues, I first provide a brief history of the creation and evolution of metaphor in cognitive science. Then I discuss several recent developments that represent potentially significant changes in world models underlying cognitive science.

A Brief History

As I noted earlier, psychology emerged from philosophy during a period in which physicists still relied on a discrete-mechanistic world model, and cognitively oriented psychologists like Wundt and Titchener adopted that root metaphor. Somewhat later, the Gestalt psychologists used the root metaphor of consolidated mechanism when that became dominant in physics, but most psychology of the first half of the twentieth century was decidedly behavioristic. It is now widely recognized that modern cognitive psychology arose partly as a paradigm shift from the mechanistic approaches to psychology known as behaviorism and, beginning about 1940, neobehaviorism (Lashman, Lashman, & Butterfield, 1979). Neobehaviorism was seen as unable and unwilling to deal with the complexities of human consciousness, memory, and thought. The main reason was that it was almost entirely based on a discrete-mechanistic root metaphor, and beginning around the middle of the twentieth century the psychological "recovery" was finally shifting away from that world model.

Information-processing models of the 1960s, which dominated cognitive science and are still very influential, reinstated the focus of psychology to the topics of attention and consciousness, memory and
thought. However, the paradigm shift was not as complete as is ordin-
arily thought, because an essentially mechanistic root metaphor was
retained. Instead of using the behavioristic switchboard analogy, hu-
mans were viewed initially as a limited-capacity communications
channel. Later, the analogy shifted to the kind of information-pro-
cessing system embodied in the modern digital computer and its asso-
ciated programs— that is, a general purpose symbol manipulator (Lach-
man et al., 1979). A major innovation was the proposal of control pro-
cesses, aspects of the overall system which were thought to regulate the
processing of information and the resulting activation of internal
representations. However, once a person «decided» to engage in specific
types of control processes, they were assumed to be implemented in a
mechanistic sort of way, much as in a computer program. According
to Roediger (1980), even today most models of memory tend to be
spatial analogies with search», in which information is stored in
locations, and «retrieves» involves a «search» through those loca-
tions. Roediger concluded his survey of memory metaphors in cognitive
psychology with this caution: «In 30 years, the computer-based infor-
mation processing approach that currently reigns may seem as invalid
a metaphor to the human mind as the wax-tablet or telephone-switch-
board models do today» (p. 244).

In short, most current cognitive science is not character-
ized to any great extent by the adoption of either a contextualistic or
an organismic root metaphor. The cognitive paradigm is essentially
mechanistic, although I agree with Hoffman and Nead (1983) that the
metaphor «The mind is a computer» actually merges the categories of
mechanism and formism (p. 517). Thus, most current cognitive
theorizing is not monomorphemic, but can be seen to involve a some-
what tenuous mixture of root metaphors. This is not to deny that in-
creasing numbers of cognitive psychologists are departing from the typ-
ical mechanistic-formistic emphasis in order to explore organismic
tways, contextualistic views, or a mixture of the two. In some ways
Pepper (1942) was perceptive in his claim that contextualism and
organicism are so nearly allied that they may almost be called the same
theory» (p. 147).

Some Recent Changes
Modern cognitive science is now changing in several major ways.
Several major kinds of shifts in outlook either are contextualistic or
may eventually contribute to a reorientation toward contextualism.

World knowledge. Bartlett's (1932) proposal that remembering
involves schemata— continually changing organizations of knowledge
and experiences — and his studies of remembering in natural contexts
over relatively long time periods foreshadowed a major shift in em-
phasis. There is now increasing attention to the importance of what is
variously called world knowledge or schemata. To some extent, it is
this difference that De Mey (1982) emphasized in his analysis of pro-
gress in cognitive science, especially progress by theorists on expert
systems in the field of artificial intelligence. However, the world model
underlying these developments is not necessarily an organismic one. In
stead, the focus on world knowledge can be seen to involve a recognition
of a much broader meaning of the term context, in which it refers
to cognitive structures, or knowledge, supplied by a person as he or
she interacts with the environment. This view of context contrasts
with the older, more traditional view that context is a property of the
external environment, such as the words of a sentence immediately
preceding and following a currently processed part of a sentence.

Distributed memory. The notion that memories are stored in
specific traces has tended to predominate in cognitive science. Alter-
natives have only recently been rediscovered or formulated. One such
view of memory which is still in its infancy, but which will very likely
gain in popularity, is embodied in distributed-memory models (see,
for example, McClelland & Rumelhart, 1985). In these models, mental
states are considered to be patterns of activation in a highly intercon-
nected network of simple units. Remembering, then, involves a reini-
tegration of patterns of activation encoded previously. Current versions
of distributed-memory models seem to rely too heavily on an overall
view which is closest to consolidated mechanism. These kinds of memo-
ry models may become of greater heuristic value if the origination
explicitly were to adopt a more contextualistic metaphor. Perhaps it
may be useful to view the human brain as an incredibly complex,
continually changing hologram, in which new events continually re-
organize the overall pattern, or contexure. Some distributed-memory
models explicitly use a somewhat similar holographic analogy to clarify
the specific mathematical assumptions that they make. Just as distrib-
uted-memory models seem to come closer to describing the physio-
logical substrate of memory than do localized-trace models, they also
seem to be more amenable to a contextualistic view of mind.
Ecological movement. The beginnings of a shift in both scientific metaphor and methods are being expressed by proponents of a new ecological movement in cognitive psychology (see, for example, Bruce, 1985; Neisser, 1976, 1985). This movement emphasizes the functions served by acts of perceiving, remembering, and thinking in complex natural settings, as opposed to relatively simple, well-controlled labora-
tory settings. As Hoffman and Nead (1983) noted, this development is easily viewed in terms of a contextualistic root metaphor. There is still considerable debate on which methods of research are suggested by an ecological emphasis. Neisser (1985) argued, though, that ecological theories should focus initially on theoretically motivated descriptions of the environment. The puzzle of time presents a crucial challenge for this movement, because time is always revealed in and constructed from changes in the environment, both the environment external to and the environment internal to a person.

World Models of the Experimental Psychology of Time

In the early days of psychology, James (1890) espoused a pragmatic, functionalistic approach to the psychology of time which relied on a decidedly contextualistic world model. Guyau (1902) also proposed a cognitive theory in which multiple factors determined subjective time judgments; his account is surprisingly modern (see Michon & Jackson, 1984). Janet's (1928) discussion of duration as the under-
pinning of adaptive actions oriented toward irreversible changes was another early example of a non-mechanistic approach.

However, in the early part of the twentieth century, various mech-
nanistic views, such as "internal clocks" theories, became influential. These theories, along with specific discoveries such as the existence of biological rhythms, were used to explain phenomena outside their natural boundaries. A clear example of this was Hoagland's (1933) attempt to explain duration experiences in terms of the operation of biochemical reactions.

Since that time, of course, there have been many exceptions to this general trend. Fraisse's (1963) influential book contained a mixture of contextualistic and organismic root metaphor. Fraisse said, for example, that direct time judgments are "founded immediately on the changes we experience and later on the changes we remember" (p. 234). But he also discussed various organism-like adaptations to change.

World Models and Time

Gartenstein (1969) also forcefully rejected internal-clock theories of duration experience, but he adopted a mechanistic-formistic meta-
phor, "storage size" in memory. He argued that internal-clock theories could not parsimoniously account for the results of his studies on the importance of information processing—the "codings" of information during a time period. Further, he provided evidence that the remem-
bered duration of a time period is affected by information supplied after the time period. This work, however, occurred during a period when cognitive psychology was still firmly in the grip of a mechanis-
tic-formistic metaphor—the mind as computer. Even though it con-
tained a few of the characteristics of subsequent contextualistic ac-
counts, Gartenstein's (1969) storage-size hypothesis was based on a misleading model of memory and was therefore doomed because of its inability to handle the more dynamic, contextualistic view of psycho-
logical time that is suggested by results of subsequent experiments.

Contextualism and the Psychology of Time

Because contextualism is able to handle effectively the ideas of time and change, it is a world model well suited to the psychology of time. Contextualistic views, however, are not monolithic; they are subject to a range of variation and disagreement, just as other world models are (Georgoulis & Rosnow, 1985; Sternberg, 1984). There are now several distinct, yet somewhat related, contextualistic approaches to the psychology of time. This section discusses the contributions of each, as well as the similarities and differences between them. It is un-
clear which of these slightly different approaches will prove to be fruit-
ful for understanding psychological time. The best strategy would seem to be to explore all of them, including each in various integrated com-
binations.

Contextual-Associations Approach

Before reviewing the more purely contextualistic approaches, it is necessary to examine an approach that may appear contextualistic but is really a mixture of mechanism and contextualism. It hardly needs to be restated that classical theories of memory and time, dating back to the tradition established by Ebbinghaus, relied on a discrete-mecha-
nistic root metaphor. In this general approach, memories were assumed to be stored as elemental traces of experiences, with traces associated
by contiguity. Along with the tendency of some cognitive psychologists to admit the importance of contextual associations has come a renewed interest in variation of contextual elements. For example, mentioned the following different kinds of such elements: background external stimulation, posture, temperature, and the psychological context. Although such a distinction may be useful, it is important to remember that context is always an internal, cognitive construc-

Research on different kinds of contextual factors has found that the remembered duration of a relatively long time period lengthens if there are changes in process context (Block & Reed, 1978) or in environmental context (Block, 1982). These kinds of changes lead to the proposal of a contextual-change hypothesis, which says that remembered duration is a cognitive construction involving an assessment of the remembered amount of change in cognitive context during the time period (Block, 1979, 1982; Block & Reed, 1978). In addition to explaining the effects of contextual manipulations, the hypothesis is able to account for the typical finding of a positive time-of-day effect in duration judgments: The first of two equally long durations is remem-

bered as being longer than the second (see Block, in press). Changes in process context, emotional context, or both probably occur fairly rapidly at the start of a novel experience.

Research on components of event-related brain potentials - aspects of brainwave changes that may be evoked by certain events - has revealed a possible physiological indication of processes involved in contextual changes. Neumayer et al. (1984) speculated that the P300 component is involved in remembering duration. Similarly, Block et al. (1984) proposed that the P300 is involved in what is called context updating or restructuring. The current context of events in a person's cognitive network. This notion assumes that the cognitive network is tuned by previously constructed contextual information. When ongoing processing requires

revision of a person's contextually based schema, the P300 might then reflect this change. The contextual-change hypothesis on remembered duration does not rely on the veracity of this asserted notion, of course, but it is strengthened by the kind of neurological evidence obtained by researchers studying components of event-related potentials such as the P300.

**Intersective-Factors Approach**

Some recent research has shown that different contextual variables interact in affecting the remembered duration of a time period. For example, changes in process context have been found to interact with changes in environmental context (Block, 1982). These and other kinds of contextual changes also play a critical role in jointly determining the experience of time passing - as in the "watched-pots" phenomenon (Block, George, & Reed, 1980). In addition, duration seems to be assessed in a rather holistic manner, as a result of the combined, interacting influence of different kinds of contextual factors, with the possibility that some factors may be more salient than others (see Block, 1985, in press).

Adapting the kind of contextualistic synthesis characteristic of some of the theorizing of Jenkins (1979, 1981), Block (in press) proposed a tetrahedral model in which four general factors interact to affect temporal experience. One factor is characteristics of the experi-

ence, which include such variables as species, sex, personality, inter-

ests, and previous experiences. Another factor is contents of the time period (or sequence of time periods) to which reference is being made. This includes various characteristics of events, such as their number, complexity, modality, and so on. Another factor is activities occurring during a time period (or periods), such as passive nonattending and various types, of active processing. Another factor is the kind of temporal behavior under consideration, which is assessed in experiments by using different kinds of temporal judgment, or estima-

tion, tasks - simultaneity, rhythm, order, spacing, duration, and so on. An understanding of the complexities and contradictions involved in any kind of temporal experience considered as a whole can occur only if all four of these general kinds of factors are viewed as inter-

acting. The context of psychological time, then, appears to be a dynamic flux.
In practice, most experiments on the psychology of time ordinar-ily manipulate only one or two of these general factors. A somewhat limited, but still useful, understanding may result from considering lower-order interactions of factors.

Ecclesiastical-Dialectical Approach

Recently, several psychologists interested in the study of develop-
mental aspects of remembering and temporality have adopted views
that are mostly contextualistic in nature (e.g., Kvale, 1974, 1977;
Riegel, 1977a, 1977b). These theorists have labelled their approach
dialectical. According to Kvale (1977), for example, dialectics uses
a number of different scientific methods — it is methodologically
ecclesiastic — to explore development and interactions by studying
the internal relations between phenomena that exist as aspects of a total-
ity (p. 165). Much of the metaphorical underpinning of Kvale's dialecti-
cal approach seems to be based on an organismic view emphasizing
certain characteristics of living systems. However, in his rejection of
a bureaucratic model of memory, with its characteristic emphases on
fixed structures and relatively stable elements, Kvale departed from
a purely organismic world model in favor of a more contextualistic
one. This is especially true if we consider Kvale's (1974) contextual
theory of memory. He asserted that an event is characterized by its
meaning, which depends on a temporal context and which may be
ambiguous. In addition, he noted that temporal context encompasses
the future as well as the past and the present.

Riegel (1977a) argued that dialectical logic is "the mode of
thinking that alone can deal appropriately with change, development,
and history" (p. 41). Riegel's theory of time is clearly contextual. For
example, he said that "diactical time is like polyphonic music in
which various monophonic sequences are interwoven [italics added]
and in which temporal markings are generated by harmonies and dis-
harmonies of such a composition" (p. 9). His main thesis was that
time always involves at least two interacting event sequences (p. 3).
This implies, at the very least, that time is constructed when a partici-
pant or observer of any event sequence interacts with the events
occurring in it. In particular, Riegel discussed four different kinds of
"planes" or "temporal markings" that result from different kinds of
interactions: inner-biological, individual-psychological, cultural-
sociological, and outer-physical. This notion is somewhat similar to

that represented in the interactive-factors model I discussed earlier;
however, Riegel more explicitly noted the interactions that can occur
within any of the four planes.

Cultural-Antropological Approach

In literature on the psychology of time, it is rare to find a concili-
ation of two apparently different kinds of emphases — one on temporal
conception and one on the ecological significance of temporal behav-
or. The work of Hall (1983), an anthropologist, provided an integrat-
ed description of relationships between time and context. Hall observed
that a crucial distinction among human cultures concerns whether or
not people deal with time and information in a direct, linear manner.
He reviewed many different observations relevant to this distinction,
and he argued that some cultures tend to be monochronic, low-context
cultures, whereas others tend to be polychronic, high-context cultures.
Monochronic cultures are those in which people tend to do one thing
at a time. This reflects a linear conceptualization of time, along with
fairly precise scheduling and social demands of punctuality. Hall re-
ferred to these cultures as low-context ones to emphasize that social
interactions in them require considerable "contexting" — for example,
explicit statements of background information. Other cultures are polyc-
chronic in the sense that many different tasks or approaches to a
problem are ordinarily interwoven. These cultures tend to be high-
context ones, because social networks are extensive enough so that
background knowledge does not need to be provided in a routine
social interaction. To ask whether the temporal conception and the
contemporary contexting are part of the culture or of the people
within the culture would be to ask a rather meaningless question.

A contextualistic understanding of time requires a synthesis including
both the world knowledge, or schemata, supplied by a person — in par-
ticular, temporal concepts — and the patterns of environmental interac-
tion characteristic of a given culture — ecological behavior. As Hall put
it, time is "a cluster of concepts, events, and rhythms covering an
extremely wide range of phenomena" (p. 13).

The Contextual Nature of Temporal Experience

Consider now the basic temporal experiences and concepts of
time, with an emphasis on the general contextual underpinnings of
them and the apparent developmental sequence. This brief theoretical review relies mainly on three sources. First, Block (1979) discussed different kinds of temporal experiences from the perspective of a cognitive view emphasizing contextual factors. Second, as I noted above, Riegel (1977a, 1977b) reviewed concepts of time and space from the perspective of a developmental view emphasizing dialectics. Third, the perspective of an information-processing view has provided considerable evidence supporting a continuum ranging from more automatic to more effortful processes (see Hasher & Zacks, 1979).

Development of Temporal Experiences and Concepts

During the earliest stages of human development, there is apparently little or no separation of relatively stable objects in space from relatively transient events in time. The experience of simultaneity is presumably one of the most psychologically primitive ones, even though the physical concept of simultaneity is much more complex. To a large extent, the processes producing an experience of simultaneity of two (or more) interacting event sequences are probably fairly automatic. These processes provide the most critical basis for all subsequent acts of temporal measurement and judgment. In spite of the relative automaticity, judgment of simultaneity is actually rather complex, in the sense that several physiological and cognitive factors, such as arousal level and attentional focus, interact in affecting the underlying processes. Preoperational children tend to make errors in judging velocity and duration which can be traced, in part, to an inability to coordinate the simultaneities of different events.

With the development of remembering and anticipating abilities of the young child comes the notion of an extended psychological present—the saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time (James, 1890, p. 609). The changes from which we construct the notion of a present are the interweavings of events occurring in different pastness, or movements—activations of different, yet now related, schema forming the contents of consciousness. The experiencing of rhythm, such as in music or speech, is apparently based on such contextual relationships between events forming part of the psychological present (cf. Jones, 1984).

Presumably because the contextual interweaving of events is relatively automatic, even a fairly young child can usually remember the relative order or recency of two events that occurred in the same strand, or relatively constrained progression of events. Yet a preoperational child might have great difficulty remembering the temporal order of events that did not occur in a logical, natural order, or of events that occurred as part of different strands. During the concrete and formal-operational periods of development, remembering temporal-order relationships may require particular encoding strategies as well as relatively effortful reconstructive processes involving relationships between landmark events—easily remembered activities, seasons of the year, and so on (cf. Michon & Jackson, 1984, Underwood, 1977). The child is then able to form the notion of different event sequences crossing each other but converging upon the momentary state of the reflecting observer (Riegel, 1977b, p. 6).

The experienced duration of an event must necessarily depend on an ability to remember the onset of the event, an ability which appears very early in human development. However, as other cognitive abilities also develop, many other factors begin to influence experienced duration, such as anticipation. In addition, a concrete operational child is able to realize that he or she might experience a time period that contains many personally important marker events as relatively long compared to the experience of another observer, such as a parent. In much the same way, the older child realizes that the remembered duration of a time period is a personal reconstruction that may be affected by a wide variety of contextual factors.

During the formal operational period of development, an adolescent is able to form relatively abstract, scientific-like conceptions of time. As a result, time may be viewed in a more absolute way, rather than in a way which is entirely relative to the personal experiences of an individual. It is then that a broad temporal perspective might be attained—a broad-scale way of relating to past, present, and future events, which may be remembered, experienced, and anticipated. Of course, the temporal perspective of any adult is not only constructed from relatively automatic, species-wide temporal experiences, but also from relatively effortful, culturally specific temporal conceptions and beliefs.

Adult Beliefs About Time and Temporal Experiences

A reasonably comprehensive survey of adults' beliefs about time and human temporal experiences was designed and conducted recently.
This conclusion is also supported, although more indirectly, by the responses to statements concerning physical time. On these, reported beliefs varied considerably from one culture to the next. The relatively substantial cross-cultural differences in beliefs concerning more abstract, scientific-like views on physical time may occur because people do not have any first-hand experiences with the conceptions involved.

Timelessness in Altered States of Consciousness

While experiencing a variety of altered states of consciousness, some people have unusual kinds of experiences that are best described as experiences of timelessness. A possible explanation is that people experience the ‘timelessness of existence’ when catenational interconnections between events are synthesized, perhaps automatically by the right cerebral hemisphere (Block, 1979, p. 210). For a variety of reasons, these kinds of experiences are probably not direct experiences of a basic instemporality of the universe. Although some human kinds of temporal experience may involve more simple levels of temporality, we probably only directly experience the qualities associated with the complex level of temporality that Fraser (1975, 1978, 1982) called the nontemporal. This is not to deny that people experience some phenomena resulting from other levels of temporality, such as fluctuations in alertness that are a consequence of instemporality—specifically, biological rhythms.

Fraser (1981) said that experiences of timelessness . . . do not constitute very advanced but, rather, primitive states of the mind (p. 7). (He used the term primitive in its psychodynamic sense.) A contemporary cognitive interpretation is that such experiences are a result of the temporary termination of ordinary processes that contextualize all events and interpretations of events. In other words, this hypothesis says that we experience timelessness if the momentary environmental and psychological conditions lead us to suspend our beliefs about time and to cease actively constructing a context for our experiences. If this view is supported by future evidence, the experience of timelessness may provide an interesting and valuable limiting case for a contextualistic model of time and mind.

Summary and Conclusions

Time is a multifaceted concept, and work on the psychology
World Models and Time

This review focuses primarily on cognitive approaches to understanding experiential and conceptual models of time. Paivio’s (1965) discussion of world hypotheses, or world models, reveals a fascination with the structure and function of cognitive models or concepts of time. The basic metaphor of time can be useful in understanding different ways on the psychology of time. Recent research on memory, temporal perception, and conceptual models suggests that a constructivist approach reveals several such approaches are discussed. Many bases on psychological scales have adopted other world models; it may be better to take an alternative view.


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