• Recently, there has been an explosion in research on time. This book provides a much needed summary of that work. *The Human Organization of Time* will prove a valuable resource to anyone interested in temporal research in organizations.

Leslie PERLOW, *Harvard Business School.*

• Finally a masterful book about time. Bluedorn's work is comprehensive and cutting edge, laying out the interplay of time with fundamental aspects of organizations and individuals. It should be on every serious organizational scholar's bookshelf.

Kathleen Eisenhardt, *Department ofManagement Science and Engineering, Stanford University*
Coauthor of *Competing on the Edge: Strategy as Structured Chaos*

• This is a wonderful and important book, full of fascinating information, insights, conjectures, and constructs. Bluedorn forges a compelling case for the importance of time, and of our roles as current stewards of the temporal commons. From the Big Bang to the Bolshevik revolution to the puzzles of Deep Time, from the social construction of zero to the theory of relativity, from the gates of Trenton State Prison to the gates of Dante's Inferno, *The Human Organization of Time* weaves a compelling fabric of temporal threads. Bluedorn has found power and poetry in time.

ramón aldag, *Department ofManagement and Human Resources, University of Wisconsin*

• *The Human Organization of Time* is a broad look at how we truly think about time. It unifies the many human patterns of time-scale concepts and gives depth and perspective to a complex field. Thorough and insightful, it will become the standard work.

Gregory benford, *Department ofPhysics, University of California, Irvine*
Author of *Deep Time*

• *The Human Organization of Time* stands to be a definitive source for those interested in temporality and time. Bluedorn's knowledge of diverse literatures and his attention both to historical perspectives as well as contemporary theorizing and research is noteworthy. Issues of time and temporality pervade the human experience; Bluedorn helps us to appreciate temporality as a social construction with very real consequences for organizations and their members.

jennifer m. george, *Jesse H. Jones Graduate School of Management, Rice University*

• A remarkable and original contribution to our understanding of the social construction of time and its effects on people and organizations. Playing off against a backdrop of work preoccupied with enduring and stable features of social life, Bluedorn underscores the importance of temporal features—pace, tempo, rhythm, entrainment, and historical turning points.

alan meyer, *Lundquist College of Business, University of Oregon*

The Human Organization of Time

TEMPORAL REALITIES AND EXPERIENCE

Allen C. Bluedorn

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To those who have brought such exquisite meaning to my times; may their times be the best of times always:

To my wife, Betty;
To my sons, John and Nick;
To my brother, Ralph;
To my mother, Evelyn;
To my father, Rudolph, 1905-1988.

most nonexistent, regarding that other major time reckoner in everyday life, the clock, so its system of reckoning the hours tends to be even more reified, even though it is equally a social construction.

THE PROFOUND IMPORTANCE OF TIME

In the seventeenth century both Cervantes and Newton wrote about time. Yet they reached fundamentally different conclusions about this abstruse phenomenon. To Newton, time was abstract and external to events, something that flowed "uniformly." Newtonian minutes were completely homogenous; one was the same as any other. Cervantes saw time differently. Although he might not have believed that all times were different, clearly he believed that not all of them were the same. Hence he wrote, "Que no son todos los tiempos unos (For all times are not the same)," the epigraph introducing this chapter.[8] As already noted, Cervantes' insight forms the basic premise upon which this book is based. Were it false, were Newton to prevail—as he did for several centuries—time would be reduced to a constant flow of banal, dreary, sterile moments, because the Newtonian concept of time was separate from events. Thus devoid of content, it could be characterized only by amount, for being reversible (Whitrow 1980, p. 3), it even lacked direction.

Although fungible Newtonian time has been fruitfully applied in many domains, its variability, being solely in terms of quantity, renders it not unimportant but extremely limiting, an "intellectual straitjacket" (Davies 1995, p. 17). To break out of that straitjacket, the strongest assumption underlying this entire book is that times differ, and they differ in many ways other than quantity, in ways that give time and times much greater potential for variance than Newtonian time. And the variance in times is a most profound sort of variance, so profound that Ilya Prigogine concluded that "time is the fundamental dimension of our existence" (1997, p. 1). Thus we strive to know time, not just to understand it, but to understand ourselves. And then not just to understand who we are or how we came to be, but to recognize the possibilities of who we might become. Because the most important findings of any investigation, empirical or theoretical, are not the discoveries of what is. The most important findings are the possibilities, the intimations of what yet may be. So ultimately this book is about possibilities—profound possibilities.[9]

2

Temporal Realities

> Pythagoras also, when he was asked what time was, answered, it was the soul of this world.
>
> —Plutarch, *Morals* (in Platonic Questions)

As I wrote this book, I purchased a new watch. This would be unremarkable except that one noteworthy feature of the watch led to its purchase: It will never need to be wound nor have its battery changed, for it is solar powered, and according to promotional material, it will run "forever." Forever being a hyperbolically long time in this case, the word represents more the promoter's use of poetic license than a realistic estimate of the watch's likely longevity. More plausible would be a claim that the watch will operate properly without winding or battery changes for the rest of my lifetime. (The warranty was for a much shorter period than "forever.")

This is all well and good, but this watch is worth mentioning because it seems especially infused with human temporality. Its face presents the millennia-old template for reckoning the hours (discussed later in the chapter), a template that is, of course, a social construction. Its solar-powered system directly links the watch to sources of light, especially that fundamental light source, the sun, and by doing so continues a linkage between human time and solar behavior spanning several million years (discussed later in the chapter). And shared with its time-reckoning contemporaries and forebears is the belief that it is measuring something, something real called time. But what is this something, this time? This is the ancient question, a question this chapter addresses. And as if

that question is not challenging enough, still another even more esoteric question will also be examined: Why is there time?

Saint Augustine framed the first question as a paradox in the most famous quotation in all of temporal scholarship: "What is time then? If nobody asks me, I know: but if I were desirous to explain it to one that should ask me, plainly I know not" (1912, p. 239). Things had not gotten much better a millennium-and-a-half later: "It is impossible to meditate on time and the mystery of the creative passage of nature without an overwhelming emotion at the limitations of human intelligence" (Whitehead 1964, p. 73). Perhaps it is for this reason that so few books *focused on time* include a listing for "time, definition" in their indexes—the index to Elliott Jaques's *The Form of Time* (1982, p. 237) being a rare exception that proves the rule. This does not mean that the issue goes unaddressed, far from it, but definitions taking the form "Time is_____"have been avoided. This may be because the problem of time's ontology, of its fundamental nature, seems so intractable that its conceptualization in a simple declarative sentence proves elusive, to say the least. For, as Edward Hall has noted, "It is possible to philosophize endlessly on the 'nature' of time" (1983, p. 13). Fear not. This consideration will not endure "endlessly," just for part of this chapter. And perhaps one reason "time is" statements have been so rare is that time is a collective noun.

IMMODEST SUGGESTIONS OR COSMIC VERITIES?

I have written elsewhere that time "is a collective noun" (Bluedorn 2000e, p. 118). That pithy statement summed up the belief that there is more than one kind of time. For example, Paul Davies thought long and hard about time, especially as it is conceptualized in the physical sciences. Yet despite those labors, he felt time's mystery still: "It is easy to conclude that something vital remains missing, some extra quality to time left out of the equations, or that there is more than one *sort* of time" (Davies' emphasis; 1995, p. 17). So in the physical sciences just as in the social, the possibility is explicitly recognized that there may be more than one kind of time.

Interestingly, many of the categorizations of multiple types of time have been binary, and several category pairs illustrate this point. Isaac Newton's *absolute* time contrasts with Albert Einstein's *relative*, the Greeks distinguished *chronos* from *kairos* (Jaques 1982); Henri Bergson (1959) saw abstract and vital

times; Paul Fraisse (1984), succession and duration; Stephen Gould (1987), John Hassard (1996), and Michael Young (1988), among others, linear and cyclical; McTaggart (1927), A- and B-series; and many (e.g., Clark 1985; Gersick 1994; Orlikowski and Yates 1999), clock-based time and event-based times. This exercise could continue to tedium, but the point is that several binary classification schemes have been developed that propose two forms of time.

A danger inherent in such systems is the tendency to argue that one or the other type is the *real* time, or at least the preferred time, and to thereafter see all phenomena as representatives of the preferred type or as a distortion of it. So when Lewis Mumford wrote that "each culture believes that every other kind of space and time is an approximation to or a perversion of the real space and time in which *it* lives" (Mumford's emphasis; 1963, p. 18), he was arguing that people tend to see their own views of time as the real time. And I argue that a binary classification system exacerbates this tendency, with one choice receiving the imprimatur of "real time" and the alternative being condemned as a "perversion" of it, if it is perceived at all.

Barbara Adam rejected such thinking in favor of dualities (1990, pp. 16-19). So did Wanda Orlikowski and JoAnne Yates, who argued against such false dichotomous thinking by suggesting that these distinctions be properly seen as "dualities, as both/and distinctions" (1999, p. 17). Another way of saying this is that there is no imperative to see such categories as mutually exclusive. Neither partner is the true, real, or even preferred time; instead, they may coexist, intermingle, and even be tightly integrated in specific social systems. This point is illustrated well by Peter Clark's research (1978, 1985), which revealed that both clock-based and event-based times coexisted in English organizations.

But not all analysts employ a binary classification system. Some identify more than two times (e.g., Richard Butler [1995] distinguished four types). Those employing phenomenological and ethnographic approaches have found many examples of many times, ranging from Eviatar Zerubavel's *duty period* (1979, pp. 32-34), to Frank Dubinskas's *developmental and planning times* (1988), to what is probably the most famous such time of them all, Donald Roy's *banana time* (1959-60, p. 162), which was a daily work-group ritual focused on the consumption of a single banana. But these times, colorful and insightful as they may be, are fully nominal-level distinctions, and as such they extend the binary approach of classifying times to systems permitting more than two types.

Some theorists have taken the multiple-types approach further and proposed multiple types of time that are arranged in hierarchies. It is interesting to note that these approaches all seem to rely on a hierarchical view of reality itself. This hierarchical view was evident early in the origins of modern social science, first in August Comte's concept of a hierarchy of the sciences (1970), then in Herbert Spencer's discussion of inorganic, organic, and superorganic evolution (1B99), and again in A. L. Kroeber's discussion of the superorganic (1917). Further, in one of the few early in-depth sociological treatises on time, Pitirim Sorokin distinguished the categories of physicomathematical, biological, psychological, and sociocultural time (1943). (See Gurvitch 1964; Moore 1963; and Sorokin and Merton 1937 for three other relatively early sociological works that focus on time.)

An even more elaborate temporal hierarchy was developed by J. T. Fraser (1975,1999), who proposed a six-level hierarchy that reflects the development of reality, the history of existence. The first three levels in Fraser's hierarchical theory of time are atemporality, proto temporality, and eotemporality, all of which deal with levels of physical reality; to wit, the absolute chaos of electromagnetic radiation at the instant of the Big Bang (the birth of the universe), the realm of particle-waves, and massive objects such as planets and stars, respectively. The fourth level is biotemporality, which is the time associated with living organisms, and among the characteristics of which are short-term time horizons. Following biotemporality in this hierarchy is nootemporality, which is the time of the human mind, with longer, open-ended time horizons. Atop the hierarchy is sociotemporality, the time of a society produced by a social consensus. This theoretical model is described in a set of eight propositions (Fraser 1999, pp. 26-43), the elaboration of which provide many of the model's details, including the points that the hierarchy is a nested hierarchy and that the hierarchy is open-ended, meaning that there is no necessary logic that indicates the time of human societies is the final temporal form that will evolve in the universe. Although not well known in the social science literature on time, this model of time as a hierarchy of nested temporalities is the most complex of the collective noun strategies. Whether it will also be the most successful remains to be seen.[1]

But what about an "is" statement? My assertion that time is a collective noun does not narrow the field greatly, for it describes approaches to defining time rather than time itself. The hierarchical theory of time provides such an

"is" statement, defining time as "a hierarchy of distinct temporalities corresponding to certain semiautonomous integrative levels of nature" (Fraser 1975, p. 435). However, this definition requires the subsequent definition of each temporality for a complete understanding, which eliminates some of the simplicity desired in an "is" statement. Other "is" statements have been provided too, such as Whitehead's (1925b, p. 183), which will be discussed later in this chapter.

So "time is" statements do occur, even if they are rare, and they are likely to be debated as well. And not only the definitions of time are a subject of disagreement; so too is the question of time's direction. For if the second law of thermodynamics holds—and no less an authority than Albert Einstein felt that classical thermodynamics would "never be overthrown" (1949, p. 33)—along with its implication that all energy transformations are irreversible (Coveney and Highfield 1990, p. 150), then time, or at least some times, would have a flow, and that flow would have a preferred direction giving *objective* meaning to the concepts of past and future. Arthur Eddington described this preferred direction as "time's arrow" (1928, p. 69), and the debate about it has raged ever since (e.g., Coveney and Highfield 1990; Denbigh 1994; Fraser 1999; Harrison 1988; Hawking 1988; Novikov 1998; Savitt 1995).

A great deal of this debate focuses on the issue of entropy, which is the level of disorder in a system (Hawking 1988, p. 102; Davies 1995, p. 34), which is held to increase as irreversible processes occur in closed or isolated systems (Whitrow 1980, p. 5). A key point in the debate about time's arrow is whether or not the universe is a closed system. Because the issues of entropy's direction and level in the universe are closely linked to the question of whether the universe is a closed system, and because it would be fairest to say that no one really knows whether the universe is a closed system, a definitive resolution to this debate based on direct empirical evidence seems unlikely in the foreseeable future. This debate is made even more difficult because many different formulations of the second law of thermodynamics can be developed, perhaps twenty or more (Bunge 1986, p. 306). And the subject of the debate is formidable enough already, because it takes us, to use Emily Dickinson's penetrating phrase, "Into deep Eternity!" (1890, p. 116).[2] But who knows? The debate may be resolved satisfactorily sooner than anyone can foresee.

Of course, this debate is about the direction of time's flow, which is a profoundly fundamental attribute of time, whatever position one takes about it.

And if the time's arrow advocates prevail, the direction of time would assume a justified place in the definition of time itself, albeit both issues are likely candidates for continuing debate.

And the word *debate* provides an important insight into our views about time, for whatever side of the debate about time or time's arrow seems to prevail at any moment, that view about time or its direction is a social construction. This is because the various positions held by the debaters would not have occurred if they had lived in isolation for their entire lives. Their views and beliefs occurred only because of the debaters' direct and indirect interaction with other human beings—including their debates over these issues, debates being but one form of social interaction. So the vital point is that all conceptions of time are and always will be social constructions, which is, in Barbara Adam's words, "the idea that all time is social time" (1990, p. 42). After all, all human knowledge, including scientific knowledge, is socially constructed knowledge. But this point does not ipso facto invalidate any or all concepts of time. Their validity rests, instead, on their utility for various purposes, such as prediction and understanding. And as societies and cultures evolve, it is likely, perhaps even incumbent, for their concepts of time to evolve as well. So it would be well to understand *how* concepts of time differ in order to understand them and their differences better. Toward this end, a model of temporal differences is presented next.

A CONTINUUM OF TIMES

Investigations of human time reveal a profound distinction, and although investigators would recognize the respective labels used as kindred concepts, no two analysts appear to have employed the same names for the components of this fundamental dichotomy. As shall be shown, this dichotomy represents the two end points of a single continuum, a continuum anchored by two temporal archetypes: epochal and fungible times.

Fungible Time

In the beginning all human times were epochal times. But for how long it is difficult to determine because human times are intrinsically linguistic phenomena, and the date at which the Hominidae (the taxonomic family of which modern humans are the only living species) developed language is so far un-

known. Estimates for this cultural watershed range from thirty-five thousand or so years ago to perhaps 2 million years or more (Cartwright 2000, p. 202), so the length of the era in which epochal times were the only form of human time remains obscure. But clearly it was for the vast majority of hominid history. The date or at least the era in which epochal time's opposite, fungible time, began can be more confidently dated in thousands rather than millions of years, and in anything like its extreme modern form to within the last ten thousand years. This Janus-faced development deserves the label "Creativity," the capital "C" denoting the culture-changing form of creativity Mihály Csikszentmihalyi reserved for creative acts that change an entire culture or important segments of it (1996, pp. 7-8, 27, 30). In the case of fungible time, the change revolutionized the way humanity would think about the universe and its place within it.

Fungible time is Newton's absolute time, which he described as "absolute, true, and mathematical time, in and of itself and of its own nature, without reference to anything external, flows uniformly and by another name is called duration" (1999, p. 408). The key parts of this statement for the concept of fungible time are "uniformly" and "without relation to anything external." Elaborating directly or indirectly upon these points, other authors have used varying labels to describe this form of time, including abstract time (Bergson 1959), chronos (Jaques 1982), even time (Clark 1978,1985), and clock time (Lee and Liebenau 1999; Levine 1997).

Several of the distinctions drawn by Joseph McGrath and Nancy Rotchford (1983, pp. 60-62) to describe the dominant concept of time held by Western industrialized societies in the twentieth century seem to describe this type of time well. This temporal form is homogeneous, which means that one temporal unit is the same as any other unit of the same type, and this means that such units are conceptually interchangeable with each other. So one second is the same as any other second, one minute is the same as any other minute, one hour is the same as any other hour, and so forth—the term *fungible* referring to things that are substitutable for each other without restriction. It is linear in that it extends "forward and backward without limit" (p. 60), a belief whose coming revolutionized science in the eighteenth and nineteenth centuries. And it is objective and abstract, something that is seen as existing apart from events (i.e., Newton's "without reference to anything external") and as *real*, not just the right stuff, but the *real* stuff. Most readers will be familiar with these

descriptors, even if they have never considered how the industrialized West thinks of time. Indeed, the set of beliefs in this form of time, fungible time, is so deeply held that most westerners accept it as real time—which is the reason I chose *fungible* time as its label.

Several previously cited labels could have been used for this concept, and in many contexts their ability to serve the narrative's lexical requirements would compel their use rather than provoke the use of yet a new label. In this case, however, they all share a common fading: In both scientific and lay usage they have all played a role in developing the West's cultural beliefs about this form of time and have promoted the institutionalization of these beliefs. The mere presence of these labels touches deep convictions within the reader, convictions that generate a reaction that "now we are dealing with *real* time and not that made-up human stuff." For this reason a new label was desirable, so I built the concept for this form of time around the term *fungible time*, which I believe is the first use of this term to conceptualize this entire category or form of time. However, novelty for its own sake was not the primary motivation. Nevertheless, novelty is a virtue in this case because a new term would lack a reifying historical presence. Further, the term also needed to describe the phenomenon aptly, and by association with its more traditional usage, convey the attributes of a temporal form that is dull, dreary, and sterile.

The legal term *fungible* was novel, it emphasized the homogeneity of the form's divisible temporal units, and it communicated a less authoritative posture than words like *absolute* or *universal.* It thus gives both the reader and the analyst a better chance to see this form as a human construction and will seem in no way inherently superior or more profound than the epochal forms. After all, Alfred North Whitehead did write, "In fact absolute time is just as much a metaphysical monstrosity as absolute space" (1925a, p. 8). So despite its traditional authority, fungible time shares at least one vital property with all other forms of human time: It was invented, not discovered.

The Development of Fungible Time. Fungible time did not spring fully grown from an epochal ancestor. Even though it is a recent development in the 7 to 8 million years of hominid phylogeny, it still required a developmental process, one that proceeded steadily at times but was punctuated in others by revolutionary events (see the punctuated equilibrium discussion in Chapter 4 for a general description of such processes). One such watershed event was the development of minutes, seconds, and hours. And we can recognize this development's importance because it provided a way to see reality. (See the discussion of the Sapir-Whorf hypothesis in Chapter 1.)

Minutes, seconds, and hours became part of many linguistic systems and thereafter structured the way human groups saw time—not all human groups, though, because not all human languages included these words. The development of these temporal units led to efforts to measure them, efforts that themselves reinforced the units by drawing people's attention to them and getting people to think in their terms—which likely led people to be concerned about their measurement even more. The culminating measurement effort produced the mechanical clock and its attendant concept of time, a form of time that came to prevail as the dominant concept of time in much of European civilization for the last half, or at least the last third, of the second millennium. Gradually the fungible view came to be articulated in science, as the earlier quotation from Newton illustrates. Indeed, Newton's concept would dominate the scientific view of time until the twentieth century.

By the end of the nineteenth century, fungible time had become the dominant temporality in geology and biology. Uniformitarianism, the doctrine that the forces slowly operating to change the earth today also operated throughout the past in the same way and at the same rate (Asimov 1972, p. 251), was first proposed by James Hutton (1959), then developed and systematized by Charles Lyell (1868). Not only did it become the temporal framework that permitted small short-term effects to produce monumental long-term geologic change; it also made Darwin's (1859) claims for organic evolution by means of natural selection (normally a small short-term effect) possible and then plausible (Eiseley 1958, pp. 246-47). Evolution required time, and not just any time. It required a fungible time that could operate over a span of then unprecedented length. Thus fungible time became dominant in the natural sciences and concomitantly so, if not always smoothly so, in much of Western civilization (see Thompson 1967).

An Illustration of Fungible Time. Benjamin Franklin's famous metaphor "Remember that Time is Money" makes sense only if the variety of time involved is fungible time.[3] Indeed, this statement helped promote the fungible temporal form because it implied that money, a clearly fungible commodity, was interchangeable with time, implying that time was also fungible. Franklin's aphorism lives on in modern financial management as the time value of money.

The time value of money is the idea that the value of a cash flow depends

on when it will occur (Emery, Finnerty, and Stowe 1998, p. 117). For example, it is better to receive a dollar today than to receive it a year from now, because interest can be earned on the dollar once it is received. And with the use of two formulas, an analyst can travel back and forth in fungible time. Travel into the future is made possible by the formula $FV_n = PV(i + r)^n$, where the future value (FV) of a quantity of money at present (PV) increases as a function of the discount rate (r) and the number of time periods (n) (Emery, Finnerty, and Stowe 1998, p. 118-19). ^or example, $1,000 invested today in a bond paying 5 percent per year will be worth $1,628.90 in ten years. Similarly, the formula $PV = FV_n [1/(1 + r)^n]$ allows travel from the future to the past by allowing the present value (PV) of a monetary sum to be calculated for any future sum, provided the discount rate and the number of time periods are specified (Emery, Finnerty, and Stowe 1998, p. 122).

Present value is really a special case of what could be generically called past value. Because financial managers have traditionally been interested in the value *today* of an amount specified at a future date, the value of that amount at times in the past has not concerned them, nor has it usually been calculated, hence the label *present value* rather than *past value.* However, nothing in the formula prevents it from calculating the future sum's value at points before the financial manager's present. So the tradition of stopping at the analyst's present would return the $1,628.90 from ten years in the fixture to $1,000 today by applying the present value formula. To calculate its worth two years ago (twelve years before its future location) at the same discount rate, twelve would be substituted for n in the present value formula rather than ten, by that producing a past value of $907.03. The formula doesn't know when the analyst's present is, it simply calculates the future sum's value for any point *n* periods into the past.

For either the future value or the present value formulas to function properly, the units of time must be completely fungible: Each unit of time, a period, must be equivalent to and interchangeable with any of the other units. Indeed, these units may take on the values of any clock or calendar interval (second, minute, hour, day, week, month, year, decade, century, etc.), and are thus generically fungible. The time value of money as it has been developed in contemporary financial management procedures would be impossible to calculate if the time involved were anything but fungible time. The form of time in the time value of money is just as fungible as the classical physicist's *t.*

Epochal Time

As claimed earlier, originally all human times were epochal. And the absence of clocks early on is not the reason. The absence of minutes and seconds is more determinate, for they are a very recent development, appearing only a few thousand years ago in the multimillion years of hominid evolution. But this is what epochal times are not, so a more positive explanation is required in terms of what they are.

Epochal time is defined by events. The time is *in* the events; the events do not occur *in* time. Events occurring in an independent time is the fungible time concept that Newton described so influentially as absolute time and Whitehead described so critically as a "metaphysical monstrosity." When the time is in the event itself, the event defines the time. To take an everyday example, is it time for lunch or is it lunchtime? Time for lunch could be determined by hunger, making it somewhat epochal, but in much of the industrialized world the time for lunch is usually signaled by the clock, often the arrival of noon, and lunch is the activity that fills a fungible time interval (e.g., noon to 12:30 p.m.). The epochal time analogue, lunchtime, is more apt to be linked to the individual's internal rhythms (e.g., the onset of hunger), external social rhythms (e.g., the flow of work that day), or both, making the definition of lunchtime *whenever the individual or group decides to eat lunch.* The event (eating lunch) defines the time; the time is *in* the event and the social and psychological constructions of it.

Although the lunchtime example is mundane, the principle that time is in the events has been proposed as a universal concept. Whitehead did so: "Time, Space, and Material are adjuncts of events," and "Events (in a sense) are space and time, namely, space and time are abstractions from events" (1925a, pp. 26 and 63). Einstein seemed to do so too: "I wished to show that space-time is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not *in space*, but these objects are *spatially extended.* In this way the concept 'empty space' loses its meaning" (Einstein's emphases; 1961, p. vi). Since in Einstein's view time was part of space-time, just as Whitehead's, his comment points to time being in the events (physical objects in this case). Thus there is nothing necessarily any more contrived or constructed about epochal time than there is about fungible time.

The concept of epochal time and even its label were used by Louise Heath

(1936) and McGrath and Rotchford (1983), its use by the latter leading to its use here. (I have since discovered that Robert Smith [1961, p. 85] also used the phrase.) However, it was several years after choosing this label before I encountered Alfred North Whitehead's "epochal theory of time" (Whitehead 1978, p. 68). Interestingly—and I must admit, reassuringly—the concepts of epochal time in the discussion presented here and in Whitehead's work appear very similar. In Whitehead's formulation, temporality and time's arrow develop because of the becoming and perishing of episodic events and occasions of discrete experience (Lucas 1994, p. 670). Moreover, within this context, Whitehead offered an "is" statement about time: "Time is sheer succession of epochal durations" (Whitehead 1925b, p. 183).

Whitehead's concept of time as a succession of becomings and perishings, then, easily accommodates the realities of development ("becoming") described at the physical, biological, and social levels in contemporary chaos and complexity theory (Marion 1999; Prigogine 1997; Waldrop 1992), and it also accommodates the existence of entropy and entropie processes ("perishing"). Although the "perishing" element of this concept of time seems to take its origin in John Locke's work relating time to "perpetual perishing parts of succession" (e.g., Locke 1959, p. 238), a view cited by Whitehead (1978, p. 29), Whitehead's concept includes the "becoming" side of the coin too. So rather than perpetual perishing alone, poet Delmore Schwartz captured the essence of Whitehead's view of time as a succession of becomings and perishings in the following metaphor: "Time is the fire in which we burn" (1959, p. 67). Fire provides energy (heat) for becoming but also consumes (perishing).

So some times are fungible and others are epochal. But the distinction between fungible and epochal times has gotten lost or at least blurred to contemporary observers. People who work in organizations, which is most people in the industrial and postindustrial worlds, tend to eat lunch at about the same time every day. The routine becomes so habitual that the period even comes to be called the lunch hour (even if it is only thirty minutes long in some organizations), which does attach a content or event meaning to a fungible time span: That hour (or thirty minutes) is qualitatively different from the hours that precede and follow it. But because the lunch hour has become so well institutionalized that it always occurs at the same time, its epochal nature has become intertwined with fungible time, and eating lunch now describes the activity that occurs at a fungible time as well as an event defining it.

This intermixing of fungible and epochal times has happened many times. Consider geology and archaeology. In geology, uniformitarianism placed fungible time at the core of historical geological processes. At about the same time (the nineteenth century), though, an epochal description of geological time began to develop as well. The result is the well-known classification of historical geological events as four broad eras (Precambrian, Paleozoic, Mesozoic, and Cenozoic), periods within the eras (e.g., the Triassic, Jurassic, and Cretaceous periods within the Mesozoic era and the Tertiary and Quaternary periods within the Cenozoic era), and epochs within some of the periods (e.g., Paleocene, Eocene, Oligocene, Miocene, and Pliocene within the Tertiary period and the Pleistocene and recent epochs within the Quaternary period) (Berry 1968, p. 9).

William Berry's description of the principle used to define these different historical intervals helps illustrate the general concept of epochal time itself: "A time unit should mean an interval of time extending from events (or an event) that are unique in time and are used to denote its beginning (these events are included in the interval) to events (or an event) used to denote the beginning of the next time interval" (1968, p. 10). Thus these geological intervals (note that they are not intervals of an equal length in a fungible time sense), are defined by events (e.g., the appearance, expansion, and disappearance of specific species). Even though absolute methods of dating the intervals with methods based on the radioactive decay of elements have provided precise historical dates for these intervals, they are not defined by such dates. This is sometimes confusing to people who are accustomed to thinking in terms of fungible-time historical dates, because the absolute dates do not define the eras, periods, or epochs; physical and biological events do. Indeed, in principle the geologic time intervals could vary around the world in the absolute historical dates of their beginnings and endings, a point more easily seen in archaeology.

Analogous archaeological intervals begin with the three famous ages: Stone, Bronze, and Iron, which, interestingly, were developed by a Danish businessman, Christian Jürgensen Thomsen, who was given the task of organizing the rapidly growing pile of artifacts being sent to the Royal Commission for the Preservation of Danish Antiquities (Boorstin 1983, pp. 605-6). He sorted the artifacts by applying warehousing techniques used in the early nineteenth century, and when his museum opened in 1819, the artifacts went on public display grouped into the now familiar categories of Stone Age, Bronze Age, and Iron

Age. Thomsen had inferred that objects made of the same material were about the same age, and he also reasoned that the stone objects were older than the bronze, the bronze objects older than the iron (Boorstin 1983, p. 606). Thus the ages were defined in event terms: the use of different raw materials to make tools. And just as the geological eras were subdivided into shorter intervals, the Stone Age was later divided into the Paleolithic, Mesolithic, and Neolithic intervals (Oakley 1964); but again the subdivisions were event-based even though radiometric techniques (e.g., carbon-14, potassium-argon) allowed precise calendar dates to be assigned to them.

Although a cursory glance at contemporary organizational life would lead to the conclusion that it is dominated by fungible time, as in geology and archaeology both fungible and epochal time forms coexist. Peter Clark's (1978) observations of the importance of event-based seasons and their use for a firm in the textile industry were interpreted as comparable to the use of events such as changes in cloud formations (i.e., cloudier skies) by the Nuer to determine the end of the dry season (Evans-Pritchard 1940, p. 95). Indeed, ethnographically based organizational research commonly reports epochal times. For example, in a study of a high-energy physics laboratory, Sharon Traweek (1988, pp. 73-74) described many forms of ephocal time, among them "up" time (when the accelerator beam is running) and the "lifetime of a detector" (its life from gestation to obsolescence). In everyday life terms such as work time, playtime, teatime, and prime time all suggest epochal times as well.

The Temporal Heterogeneity Continuum

Although the focus of this discussion has been on the extreme forms of fungible and epochal times, a useful way to consider these two extremes is as the end points of a continuum whose defining principle is the relative distinctness of each form of time along the continuum, its temporal heterogeneity. This is so because some temporal forms have units or periods that are more distinct than others. A quotation attributed to Mark Twain (Least Heat Moon 1982, p. 10) illustrates this point well: "Although the past may not repeat itself, it does rhyme."[4] The lack of repetition can be taken to mean the absence of clonelike similarity, but the reference to rhyming indicates some similarity. To illustrate the point about degree of similarity, two words that rhyme in a poem might share phonetic similarity only by sharing at least one of the same phonemes, but in another stanza, two words might rhyme and also have similar meanings.

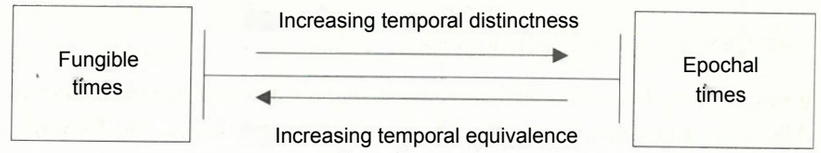

FIGURE 2.1. The temporal heterogeneity continuum

The latter case reveals more similarity than the former. But similar does not mean identical, and different does not require complete distinctness, as depicted in Figure 2.1. Thinking in terms of degrees of difference rather than just two extremes allows more precise statements to be made about the form of time under consideration than if one's conceptual portfolio contained only the two extreme forms.

As with the geological epochs and archeological ages, human times become more epochal as they become more homogeneous within themselves and more differentiated from other periods, units, or types. In analysis of variance (anova) terms, the times become more epochal as the within-unit variance decreases and the between-type variance increases. Movement toward more epochal times is illustrated by phrases such as the "New York minute." This metaphor for the fast pace of life in New York City (see Levine 1997; also see Chapter 4) is so effective because it violates a tacit understanding about minutes: They should be equivalent and interchangeable because they are part of an extremely fungible time system. To indicate that some minutes are different from others violates a deep understanding by transforming a fungible time unit into a more epochal form—perhaps not completely epochal, though, because a "Boston minute" would be more similar to a "New York minute" than a "Los Angeles minute" would be to either (Levine 1997, pp. 148-49). These times do not repeat themselves, but they do rhyme.

So then, which type is the true time? Perhaps the best answer is to say they all are, a position Alan Lightman explained after he had described two different times, concluding, "Each time is true, but the truths are not the same" (1993> P· 27)· -AjH if the truths are not the same, once again we see that all times are not the same.

But why do times exist at all? Why do they differ? What produces these distinctions? And why have temporal differences persisted? To address such questions it is necessary to explore the origins of humanity itself.

THE LAND WHERE TIME BEGAN

Portions of the Great Rift Valley run north and south across eastern equatorial Africa. Passing through parts of contemporary Ethiopia, Kenya, and Tanzania, this geologic structure encompasses the birthplace of the hominids (the family of which modern humanity is the only living representative), and by some accounts it may even be responsible for their very existence. According to Yves Coppens's (1994) interpretation of the evidence, the valley formed about 8 million years ago, resulting in two very different ecological zones to its west and east. To the west, conditions remained humid and heavily forested. To the east, the climate dried, precipitation patterns became organized into seasons, and forest changed into savanna grasslands. As the climate and flora changed, so did the fauna, and humanity's ancestors were part of that faunai change. According to this interpretation, the lines leading to modern *Pan* (chimpanzees) and *Homo sapiens* (us) began to diverge after the valley was formed.

Our line likely began with a genus known as *Australopithecus*, beings who walked erect for at least 3 million years, who manufactured stone tools, and who may have had spoken languages (words fossilize poorly). The australopithecines branched into several species (e.g., *Australopithecus afarensis*, *A. africanuSy A. robustus*, etc.) and eventually gave rise to a second genus, *Homo.* Modern humanity *(Homo sapiens)* is the only living representative of this genus, but it was preceded by *at least* two earlier species, *Homo erectus* and *Homo habilis,* the former seeming to have endured, albeit evolving, for well over 1 million years. Members of this subfamily also walked erect and manufactured stone tools, and its *H. erectus* and *H. sapiens* representatives used fire. Obviously, one species of *Homo* used spoken language, as may have all of its species.[5]

Against this historical backdrop, it is possible to see why the hominids developed a sense of time, temporal concepts, and the ability to perceive temporal aspects of the phenomena amid which they lived. These constructions and abilities provided survival value to help address the need, in Coppens's words, "for adaptation to the new habitat of the savanna, one that was drier and more bare than the preceding one" (1994, p. 92).

But how would developing temporal expertise increase the hominids' ability to adapt to their new environment on the savannas of East Africa? To increase adaptability, temporal expertise would have had to provide the hominids with capabilities they had not possessed before, but not just any capabilities.

They would have had to have been relevant capabilities, such that they would increase the hominids' probability of survival on the veld. As such, two capabilities seem to be conferred by temporal expertise, by forms of socially constructed time, which means all forms of time consciously and unconsciously used by any hominid group. These two capabilities are the abilities to coordinate and to provide meaning.

For example, Bronislaw Malinowski addressed the functions of time as follows: "A system of reckoning time is a practical, as well as a sentimental, necessity in every culture, however simple. Members of every human group have the need of coordinating various activities, of fixing dates for the future, of placing reminiscences in the past, of gauging the length of bygone periods and of those to come" (1990, p. 203). Sixty-three years later Barbara Adam would state it thus: "As ordering principle, social tool for co-ordination, orientation, and regulation, as a symbol for the conceptual organisation of natural and social events, social scientists view time as constituted by social activity" (1990, p. 42). The emphasis on the coordination function is more obvious in these statements, being mentioned explicitly in both of them, and this general function has also been noted in the organization science literature on time (e.g., Guliek 1987, p. 115). Less explicit and less emphasized in the literature is time's role in the creation of meaning. Malinowski and Adam hint at this capability in their statements: "sentimental necessity," "orientation," and "symbol for the conceptual organisation of natural and social events," the last of the three phrases most directly indicating time's role in generating meaning. So both capabilities increase with the development of greater temporal expertise. And in the remainder of this section the more familiar and intuitively plausible temporal function of enhancing the ability to coordinate will be discussed; in the next section, the ability to generate meaning.

Coordination could refer to the ability to coordinate personal activities, but because so much human activity occurs within a social context, much of the coordination function involves temporally ordered interaction with other human beings. Indeed, as Wilbert Moore concluded, "If activities have no temporal order, they have no order at all" (1963, p. 9). Although it is likely that the earliest hominids were social animals—many primates are social, including our closest living primate relatives, the chimpanzees and gorillas—the first forms of time to consciously emerge may have percolated up from prelinguistic knowledge that existed earlier in the lineage.

A basic dichotomy, one still tremendously important for organizing human affairs, may qualify as the first forms of hominid time. And these two forms were certainly epochal. They differed qualitatively in their feel and in their texture, in their meaning and in their purpose, in their importance and in their potential. Daytime was warm and bright, a time for maintaining life by hunting and gathering, the time for successful foraging to stave off hunger and death. Nighttime was different, a cooler, darker domain, a fearful time best spent resting, a time to avoid the things, much more powerful things, that *hunted* during the night. Thus what are likely the first two forms of hominid time, daytime and nighttime, differed not so much in their length—the equatorial periods of daylight and darkness being about the same in the Great Rift Valley and its environs—but in their attributes, and more important, in the expectations, reactions, and beliefs held about them by a nascent humanity. And although the lightness-darkness *cycle* may have been perceived, it is anyone's guess whether the two periods that constitute this cycle were perceived as a single unit *conceptualized* as a "day" this far back, or even when this idea would have developed, a point that reinforces the socially constructed nature of times.

Our hominid ancestors obtained survival value from being able to identify these two forms of time and by organizing their activities with respect to this planetary rhythm. Moreover, they learned to anticipate the onset of the relatively hostile nighttime environment so that they—slower, weaker, and with less visual acuity than their nocturnal predators—would not be caught in the open a long way from the group when the sun went down. There is a technical term for the australopithecine or early hominine in the Great Rift Valley area who was found alone in the open after dark: dinner. Indeed, in the company of a small band of modern hominids in Tanzania, I have heard the lion's roar after dark while camping on the Serengeti plains. Further, late one night everyone was awakened by the screaming of a baboon troop that was spending the night nearby on a large kopje (pronounced "copy," a huge rock formation). After dawn our guide explained that a leopard had passed through the area (camp!), a visitor neither species of social primate would have cared to experience a face-to-face encounter with, either individually or in a group.

Hominids must sleep to maintain their mental contact with the world and to avoid death (Coren 1996b, p. 59), and one wonders whether some hardwired requirement for sleep lies deep within the DNA, thereby conferring survival

value to diurnal creatures like the hominids who are relatively helpless at night, by keeping them relatively inactive at night, hence less vulnerable to predators and accidents. And nothing has really changed in this regard after 7 or 8 million years of hominid evolution. The only way twenty-first-century hominids can function after nightfall is to turn the night into day by artificial means. Without artificial lighting or night vision apparatus, contemporary humans are just as disadvantaged after dark as were their forebears all those millions of years ago. So if being with the local hominid group after dark provided survival value, then the ability to judge distances, hence travel times, combined with the ability to estimate in travel-time terms the time to sundown would enhance survival potential by increasing the hunter's or gatherer's chances of returning to the larger group before the onset of night. Or if the entire group or parts of it tended to forage together during the day, the group's survival potential would similarly be enhanced by such estimation skills because such skills would allow the group to find or create relatively secure sanctuaries before night began. Either way, survival potential would be enhanced by such abilities.

Thus from the beginning of human time there is a link between time and space, making the concept of space-time in contemporary physics (Whitrow 1980, pp. 270-320) less a completely novel development than one that continues a tremendously ancient hominid synthesis of the two phenomena. Notably, at about the same time that Isaac Newton was declaring space and time absolute and distinct, John Locke was anticipating their formal twentieth-century synthesis: "To conclude: expansion and duration do mutually embrace and comprehend each other; every part of space being in every part of duration, and every part of duration in every part of expansion" (1959, p. 269).

The ability to anticipate nightfall, which was reinforced, indeed selected for every twenty-four hours, was likely an important survival adaptation that promoted, however slowly, the ability to anticipate future events over longer time frames. For instance, Donald Johanson and Blake Edgar (1996, p. 92) have suggested that the brains of fruit-eating species are often larger than those of their leaf-eating counterparts. Most directly relevant to the evolution of hominid temporal expertise is their suggestion that fruit eaters need larger brains "to process the more complex seasonal and geographic information about their environment" because "fruits are seasonal and more regionally distributed than leaves" (Johanson and Edgar 1996, p. 92). This interpretation complements

Coppens's (1994) explanation that the emergence of the Great Rift Valley organized precipitation into *seasonal* patterns, which would result in more distinctive seasonal variation in its flora. So at least indirectly the appearance of the Great Rift Valley led to the development of the first forms of human time such as daytime, nighttime, fruit season, dry season, and so forth.[6]

An important cognate question is, at what point in hominid evolution were the first words developed and spoken representing these forms of time? Which came first, the developing expertise or the words? This issue is wrapped up, of course, in the debate about the origins of language itself, something about which, because the issue involves spoken rather than written language, no *direct* evidence exists. So the principal evidence for this debate comes from an analysis of what appear to be the anatomical requirements for speech in modern humans (among them certain brain structures, position of the larynx and hyoid bone, and basicranium structure [Cartwright 2000, pp. 205-6; Johanson and Edgar 1996, p. 106]) and an examination of hominid fossils to see whether similar anatomical features are present. But this is tricky work because the fossil evidence is often frustratingly incomplete, so the debate extends from positions differing over a range of at least two orders of magnitude, from about thirty-five thousand years ago to 2 million years ago (Cartwright 2000, p. 202) —and perhaps longer. For although John Cartwright concluded that attributing language to the australopithecines seems an improbable conclusion, one notes his judgment that it "seems improbable," not that it was impossible (2000, p. 206). And he does note that some australopithecine cranial remains reveal brain asymmetries, such asymmetries believed to be associated with language capability and use.

If I were to choose, I would choose the long view rather than the more recent. For as Terrence Deacon concluded, "These data [evidence for the expansion of hominid brains] suggest that it is unlikely that speech suddenly burst on the scene at some point in our evolution. The ability to manipulate vocal sounds appears to have been in a process of continual development for over 1

million years" (1997, p. 252).

Further, I propose here that whenever spoken language began to emerge, temporal phenomena played an important role in that development—for several reasons involving the social nature of the hominids. My friend Carol Ward, a physical anthropologist, has noted that the only evolutionary function of language is for one hominid to influence other hominids (Ward, personal communication, 2001).[7] As has already been discussed, influencing others about temporal matters would have had important survival implications on the savanna, both long-term and short-term, individual and group. For example, if as seems likely, hunting and gathering were social rather than solitary activities, then a strategic matter would have been for the hunting and gathering parties to decide how far to search and when to begin the trek back to that night's base (or, in another image, when to look for the evening's base). On a longer scale, the ability to discuss when to shift general locations given the seasonality of food sources would have provided survival advantages to groups that could have articulated cues about seasonal shifts perceived by several members of the group. This would also have helped develop an ability to consciously engage longer time frames, from the twenty-four-hour cycle to cycles involving several months. Thus would have developed the concept of the future. How specific or well articulated such ideas and discussions would have been early on is nearly impossible to surmise. Indeed, the first records of even monthly cycles may be only about thirty thousand years old, if one accepts Alexander Marshack's (1964,1972) interpretation of notches carved on antler and bone. So a not implausible conclusion is that temporal matters were important stimuli in the genesis of hominid language. (See Chapter 8 for a discussion of the strategic role linguistic abilities to conceive the future may have played in human evolution.)

And if I were to hazard a guess, I would expect that the ability to anticipate events arose first, and only later with greater language sophistication did the *concept* of a future arise. But long before the sapiens' era, forms of time developed, all epochal, forms that included daytime and perhaps parts of daytime such as sunrise and sunset, nighttime, past, present, and future.

Although *H. sapiens* inherited these forms of time from their hominid ancestors, they did not realize that they were *forms* of time. Just as with twenty-first-century humanity, the earliest of our ancestors did not think of these temporal forms as human creations and likely regarded them as givens, as a part of nature, and at some point probably added to them beliefs about the proper activities for the day and the night. These beliefs were so fundamental that they seldom entered these people's conscious awareness, and with some exceptions, these beliefs were also not taught consciously—though taught they were. They were tacit knowledge, knowledge learned and held unknowingly—though learned and held they were.

MESSAGES SOTTO VOCE

Much of temporal knowledge much of the time is part of the knowledge Michael Polanyi described when he wrote, " *We can know more than we can tell*" (Polanyi's emphasis; 1966, p. 4). It resides in the deepest level of culture, what Edward Hall (1983) called primary culture; Edgar Schein (1992), culture's basic underlying assumptions. And at this level, beliefs and values tend to be held unconsciously, are taken for granted, are treated as reality (Schein 1992, pp. 16-22).

This may explain why time has played such a minor role in the enterprise of social science. Barbara Adam said it well: "Much like people in their everyday lives, social scientists take time largely for granted. Time is such an obvious factor in social science that it is almost invisible" (1990, p. 3). As tacitly, unconsciously held knowledge, it tends to be in the background rather than the foreground (Backoff 1999), so everyone ignores it in the sense that they take it—whatever it may be—for granted, and it becomes a part of a very firmly defined reality. Yet as Schein concluded, "There is probably no more important category for cultural analysis than the study of how time is conceived and used in a group or organization" (1992, p. 114). And one important use is the generation of meaning.

In groups of all sizes time is used to generate meaning. According to Schein, the parts of culture found in the level of basic underlying assumptions define "what things mean" (1992, p. 22). So how does time generate meaning? One answer would be in temporal terms. Someone is early or late, or the pace of activity is fast or slow. Someone handles many things at once or only a few. Things are out of sync. All of these statements convey meaning in explicitly temporal terms. Interestingly, they are also all comparative examples in which one condition (e.g., fast or slow) is related to the other condition. And this leads to a more fundamental explanation of how time generates meaning.

Alfred North Whitehead asserted that "'significance' is the relatedness of things," that experience is too if experience is equated with significance, and that "it is thus out of the question to start with a knowledge of things antecedent to a knowledge of their relations" (1925a, p. 12). Thus for meaning (significance) to be attributed to events, behaviors, and objects, to things in general, they must be seen in their relationships with other things. They can have no meaning as isolated phenomena. An example of how time generates relatedness is seen in the role of the past as analyzed by Quy Nguyen Huy:

"Since one cannot distinguish a figure without a background, the present does not *meaningfully* exist without a past" (emphasis added; 2001, p. 608). The meaning of the present is impoverished without a connection to the past, without a relationship with it. Some of these connections and relationships are tacit but still passed on nonetheless. And several examples illustrate the point that relatedness confers meaning, and that meaning is transmitted and socially constructed.

The investigation of hominid evolution is by definition an effort to reconstruct the past, and by so doing provide a background for the figure of a modern humanity. What may be the most remarkable archaeological discovery in the study of hominid evolution did not involve a single fossilized bone. It was, instead, a trail left by modern humanity's forebears, almost literally, on the sands of time.[8] For in 1978 an expedition led by Mary Leakey discovered a trail of sixty-nine footprints left by at least two australopithecines, perhaps 3.6 million years ago. The prints indicate two individuals walked erect and side-by-side, and the difference in size of the pairs of footprints may reflect the species' sexual dimorphism, hence one walker may have been a male, the other a female (Gore 1997). To the point about relatedness, one should immediately see the connection with hominids today: erect and bipedal, walking side-by-side, just like us.

The way contemporary hominids walk takes on greater meaning knowing that it is an ancient practice, a personal connection that Mary Leakey experienced herself. Writing of behaviors indicated by the footprints of the smaller of the two hominids, she provides a moving example of the potential meaning inherent in making such connections and seeing such relationships:

> Incidentally, following her path produces, at least for me, a kind of poignant time wrench. At one point, and you need not be an expert tracker to discern this, she stops, pauses, turns to the left to glance at some possible threat or irregularity, and then continues to the north. This motion, so intensely human, transcends time. Three million six hundred thousand years ago, a remote ancestor—just as you or I—experienced a moment of doubt. (Leakey 1979, p. 453)

But there is more, for there is evidence that a third individual walked with the other two: "The imprint of a second big toe in several of the larger prints suggests that another individual may have walked in the footsteps of the first, like children do in the snow" (Gore 1997, p. 80). Contemporary hominids are

left to their own counsel to interpret what the possibility of that third individual might mean—both for the relationships among the three walkers and for the connections between the three walkers and twenty-first-century hominid social structures.

Although hominids have been genetically predisposed to bipedal locomotion for several million years, cultural variations seem to exist in how modern hominids walk (Hall 1983, pp. 184-85). Since it is cultural variation—such differences are not determined genetically—they are learned. But how are they learned? A large part of this type of learning would seem to occur through the semi- and unconscious observation and imitation of others in the group and in the subtle reactions of group members to the learners' behavior.

A concept in Anthony Giddens's structuration theory explains how patterns like these are maintained with such regularity and precision. The concept is "duality of structure," by which Giddens meant that "the structured properties of social systems are simultaneously the *medium and outcome of social acts*" (Giddens's emphasis; 1995, p· 19)· He used language to illustrate duality of structure by noting that a speaker uses the syntactical rules of a language to form a sentence (outcome), and that by speaking the sentence according to the rules, the rules themselves are reproduced (p. 19). Applied to cultural distinctiveness in walking styles, a walker unconsciously follows the group's kinesthetic rules for walking and walks in an approximation of them. By so walking, the walker reproduces those rules, both for the walker and for others who can observe and imitate, albeit at the level of unconscious awareness.

To demonstrate that such a process exists with temporal matters, look at your wristwatch or at the nearest clock. Examine that piece of technology, because objects can incorporate the duality of structure as well as values, something Wanda Orlikowski so deftly demonstrated (1992). As mentioned earlier, the watch's dial has long historical roots. But there is something about the watch or clock that is obvious yet so subtle that it is taken for granted. That something is the movement of the hands. Why do they move the way they do? I knew, of course, what the term *clockwise* meant, and had known for a long time, but despite studying time for the better part of two decades this question had never occurred to me until my chance encounter with David Feldman's compendium of perplexing questions about everyday life's arcana, one of which is, Why do clocks run clockwise? And the answer to this question (Feldman 1987, p. 150) is not as arbitrary as one might think.

Before mechanical clocks there were sundials, and sundials were invented in the northern hemisphere. In the northern hemisphere the shadow on the sundial rotated in the direction the world now knows as clockwise. With the development of mechanical clocks and their dials—at first mechanical clocks marked the time audibly with bells rather than visually with a dial and moving hand (Crosby 1997, p. 80), most clocks having only one hand until the mid-seventeenth century (Barnett 1998, p. 78)—clockmakers simply followed the pattern established by the ancient pattern of the sundial and geared the clocks so as to drive the hand, an imitation of the sundial's shadow, in the manner known for generations now as "clockwise" (Feldman 1987, p. 150).

Following this pattern would have helped gain legitimacy for the new form of horologe via mimetic imitation, and Giddens' duality of structure process is also apparent. The fourteenth-century clockmakers followed the "rule" for the sundial's shadow and built clocks whose hands moved in the same way, thereby reproducing and reaffirming the rules. This successfully transferred the sundial shadow's rule, established by both the sundial's design and astronomical behavior, to a mechanical clock rule, a device whose design and behavior present more degrees of freedom to its human architects. And once the transfer of rules from sundial to mechanical clock was made successfully in the fourteenth century, the duality-of-structure cycle has delivered clocks that have run clockwise for over six centuries.[9]

Narrowing now the clocks-and-watches example to the single solar-powered watch on my wrist, the watch that was discussed at the beginning of this chapter, a final example is provided of how relatedness produces meaning. Of course this watch runs clockwise, thereby sharing the linkage to northern-hemisphere shadows on ancient sundials. But being solar-powered, it is an engineering design that returns to the sundial's dependence on the sun for its functioning. Just as this watch receives its energy directly from the sun, so did ancient sundials. And before sundials, the position of the sun in the sky or even its total presence or absence marked the time, the latter dichotomy certainly doing so for the human lineage over millions of years: "The recurrent round of the day was obvious to even the dimmest early hominid" (Barnett 1998, p. 174). Thus, compared with watches driven by batteries or springs, my solar-powered watch more directly shares the ancient hominid practices of involving the nearest star in time reckoning.

But in this case there is even more meaning attached to this watch, not just

to the category of solar-powered watches, or even to this specific model, but to the specific watch on my wrist. Because after first being attracted to the watch for its low-maintenance potential (no batteries to change, no stem to wind), and then by its direct connection to the sun, hence its deep connection to traditional human timekeeping, the potential for adding yet one more complex of relatedness, hence of profound personal meaning, closed the sale.

As the watch was being discussed, the saleswoman happened to remark, "When I get my next watch, I'm going to get this one [pointing to one in the display case], the womans' version of the one you are considering." It was the same watch, just a bit smaller to comfortably fit a womans' wrist. And this was the year in which my wife and I would celebrate our twenty-fifth wedding anniversary. So an idea occurred to me—it has probably occurred to you too—and I suggested to Betty that we buy the pair of watches as part of our twenty-fifth anniversary celebration.

The two watches are now directly related to both our twenty-fifth anniversary and the original marriage ceremony to which that anniversary is finked, and by that fink to each other as well. Betty and I socially constructed this relatedness in the watches within a much larger socially constructed temporal context (i.e., the practice of counting and celebrating wedding anniversaries and of attributing special significance as milestones to counted anniversary years evenly divisible by twenty-five), by that making the watches that much more significant, that much more meaningful. So when I put on my watch each day, not only do I don "a scientific instrument which has encoded within it a heritage extending from deepest antiquity to the recent past" (Barnett 1998, p. 162), I attach to my body a time-reckoning machine infused with extremely powerful socially constructed personal meaning as well. My watch is not for sale.

One of the key points emphasized in Chapter 1 is that all times are not the same, but not only do times differ, those differences make important differences in human experience and meaning. So in the specific case of the past and the present, different pasts lead to different relations with the present, hence different meanings, different experiences, different presents. And this is true for time in general. For example, Barbara Tedlock's (1992) research on Highland Maya (Quiche) time described forms of temporal organization very different from those of Anglo-European culture. Those differences led Edward Hall to summarize her work as indicating the organization of Quiche time produced a totally different "experience of living" (1983, p. 81) from that in Anglo-European

culture. Elliott Jaques was right: "In the form of time is to be found the form of living" (1982, p. 129).

That the past generates meaning for the present through its socially constructed relationships with the present is one example of the principle underlying all the remaining chapters: different temporal realities, different human experiences. So having now described the general capabilities time provides, having considered the nature of time, and in Chapter 1 having developed important reasons for studying time, our attention will shift in all that follows to the overarching issue of the association between temporal differences and experiences. Thus specific ways in which times differ will be described and related to the different human meanings and experiences they produce. Different temporal realities, different human experiences.