

Time and Social Theory

Barbara Adam



Temple University Press
Philadelphia

Temple University Press, Philadelphia 19122
 Copyright © Barbara Adam 1990
 Published 1990
 Printed in Great Britain

All rights reserved. Except for the quotation of short passages for the purposes of criticism and review, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publisher.

Library of Congress Cataloging-in-Publication Data

Adam, Barbara, 1945-
 Time and social theory/Barbara Adam.
 p. cm.
 Includes bibliographical references and index.
 ISBN 0-87722-788-8
 1. Time—Sociological Aspects. I. Title.
 HM208.A33 1990 90-40870
 304.2'3—dc20 CIP

Contents

<i>Acknowledgements</i>	vii
<i>Introduction: Time is a Fact of Life</i>	1
1 TIME IN SOCIAL THEORY: DESTINY, NECESSITY, AND ENIGMA	9
The diversity of contemporary approaches	13
Dualisms and disciplinary isolation rejected	16
Making distinctions philosophy's way	20
All time is social time	42
Reflections	45
2 FROM THE MEASURE OF MOTION TO ENTROPY	48
The Newtonian measure	50
Relative time and quantum temporality	55
Thermodynamic change	61
Reflections	65
3 RHYTHMICITY: SOURCE OF LIFE AND FORM	70
Biorhythms: the clocks that time us and know time	72
Organisms and the machine metaphor	76
Living change	81
Reflections	87
4 HUMAN TIME STUDIED	91
Aspects of mind	91
Time budgeted	94
Orientations and perspectives	96
The life cycle	98

Social change and order	100
Reflections	102
5 INDUSTRIAL TIME AND POWER	104
Timed social life	104
Social time controlled	110
Waiting	121
Reflections	125
6 TIME TRANSCENDED	127
Life unto death and beyond	127
The extended present and the myth of eternal return	133
The future: expanded, colonised, and lost	138
The past: possessed, recorded, and constructed	142
Reflections	147
7 TIME FOR SOCIAL THEORY: POINTS OF DEPARTURE	149
Social time and natural time revisited	150
Knowing through metaphors	157
Resonance and non-hierarchical levels	161
Simultaneity and extended time-spans	165
<i>References</i>	170
<i>Index</i>	183

Acknowledgements

I would like to express my gratitude to Martin Albrow and the Department of Sociology, University College Cardiff, for supporting the initial research and to the ESRC for making this research possible by granting me a pool award for the period of 1983-6. I want to thank Paul Atkinson for having been such a wonderful supervisor and Jan Adam and J. T. Fraser for having scrutinised my grasp of theoretical biology and physics respectively. Many people have encouraged me during these years. I thank them all. The following persons, however, need to be acknowledged individually for their significant role in the writing of this book. I am deeply grateful to Ronald Frankenberg and Michael Young for their support of my work and for persuading me to turn the thesis into a book. My very special thanks go to my husband and colleague Jan for his sustained listening, his insightful and perceptive responses and, most importantly, for his critical reading of the manuscript. My children Miriam and Tobias need a special mention since this book would not have been written without their wholehearted support, help and willingness to be self-sufficient. Last, I want to express my gratitude and appreciation to Anthony Giddens for his inspiring work on time and for making time a legitimate topic of investigation for social theory. His thoughts proved relevant for nearly every aspect of time I endeavoured to highlight and discuss and thus provided the provocative backcloth against which my own understanding developed.

Barbara Adam

society. Time, timing, tempo, and temporality emerged as fundamental aspects of both nature and human social organisation. Temporality, rhythmicity, time as measure or parameter, the time aspects of organisation, were all found to be integral to social time generally and to our present reality. It has become apparent, however, that these neutral concepts have to be imbued with particular meanings if they are to be appropriate for the description of specific levels of our being and environment. Transcendence and relations of power have been suggested as possible concepts with which to enrich the neutral terms so that they may become meaningful expressions of human time generally and industrial time in particular. To recognise the significance of this extended view entails that we leave this more substantive conceptual focus and reflect more specifically on the implications of our findings for social theory.

7

Time for Social Theory: Points of Departure

In this treatise we have taken on board the challenging idea that a theory of time is a necessary pre-condition to social theory. To accomplish this task I have allowed our investigation to be guided by the theories, studies, and implicit utilisations of time in the social and natural sciences. Explored in these multiple expressions, time emerged as a fundamentally transdisciplinary subject and necessitated an understanding that is no longer containable within the traditional assumptions and categories of social science. We now need to reflect on the implications of these findings for social theory. This entails refocusing on some issues and re-assessing a few of the classical social theory traditions in the light of our findings. It requires that we spell out the limitations of the classical practice of abstraction and dualistic theorising for an understanding of 'social time' and that we question the tradition of claiming time exclusively for the human realm by locating it in mind, language or the functional needs of social organisation. This involves us in a re-evaluation of the dualistic conceptualisation of natural and social time and the closely related idea that all time is social time. It necessitates further that we explore the role of metaphors and focus explicitly on the social science convention of limiting the time-span of concern to a few hundred years.

Whilst there emerges a strong sense of a new direction for social theory the individual components do not yet fit together to form a cohesive whole. According to Gebser (1986: 375-6) an appreciation of the limits of existing approaches invariably precedes the slow and difficult process towards a new method of understanding. We must not be surprised, therefore, that our extensive reconceptualisation does not culminate in a polished new theory but merely a first step in that direction; it identifies points of departure and indicates the potential for future development.

Social time and natural time revisited

In order to adjust the meaning of social time in the light of this research, we need to remind ourselves of the traditional conceptualisations of natural and social time. Sorokin and Merton (1937) may be said to have provided the 'definitive' classic statement on the distinction between social and natural time. They associate the physical time of diurnal and seasonal cycles with clock time and define this time as 'purely quantitative, shorn of qualitative variation' (p. 621). 'All time systems', Sorokin and Merton suggest further, 'may be reduced to the need of providing means for synchronising and co-ordinating the activities and observations of the constituents of groups' (p. 627).

Whilst social theorists are no longer united in the belief that all time systems are reducible to the functional need of human synchronisation and co-ordination they seem to have little doubt about the validity of Sorokin and Merton's other key point that, unlike social time, the time of nature is that of the clock, a time characterised by invariance and quantity. Despite significant shifts in the understanding of social time, the assumptions about nature, natural time, and the subject matter of the natural sciences have remained largely unchanged. In other words, the development in the conceptualisation of social time has not been accompanied by one of natural time with the result that our understanding of natural time, as this exploration has shown, is grossly out of tune with contemporary natural science understanding. Even where the importance of the physical and biological aspects of time are appreciated for social life, they are not theorised or in any way related to that life (Bergmann 1983; Elias 1982a, b, 1984; Schöps 1980; Schutz and Luckmann 1973). Social time seems defined against 'an other' which appears to be no more than a convenient backcloth against which to describe and define a more complex understanding of social time. Everything social time is thought *not* to be (or not only to be) is classified as 'natural time'.

In contradistinction to social science analyses this research shows that most of what social scientists preserve exclusively for the human realm is generalised throughout nature. It demonstrates that the characteristics identified with natural time are in fact an exclusively human creation. Past, present, and future, historical time, the qualitative experience of time, the structuring of 'undifferentiated change' into episodes, all are established as integral time aspects of the subject matter of the natural sciences and clock time, the invariant measure, the closed circle, the perfect symmetry, and reversible time as our creations. This investigation thus establishes natural time as very different from

its social science conceptualisation. Furthermore, it shows that it matters what assumptions social scientists hold about natural time and the subject matter of the natural sciences in general as these not only affect the definition of social time but also the understanding of the nature of 'the social'. Since our traditional understanding of natural time emerged as inadequate and faulty we have to recognise that the analysis of social time is flawed by implication. However, the difficulty extends beyond the need to achieve a more appropriate understanding of natural time since the assumptions associated with this understanding are embedded in the more general theories that social scientists hold about nature.

A brief expansion of these general social science assumptions about nature will clarify this point. Nature as distinct from social life is understood to be quantifiable, simple, and subject to invariant relations and laws that hold beyond time and space (Giddens 1976; Lessnoff 1979; Ryan 1979). This view is accompanied by an understanding of natural time as coming in fixed, divisible units that can be measured whilst quality, complexity, and mediating knowledge are preserved exclusively for the conceptualisation of human social time. On the basis of a further, closely related idea it is proposed that nature may be understood objectively. Natural scientists, explain Elias (1982a, b) and Giddens (1976), stand in a subject-object relationship to their subject matter. Natural scientists, they suggest, are able to study objects directly and apply a causal framework of analysis whilst such direct causal links no longer suffice for the study of human society where that which is investigated has to be appreciated as unintended outcomes of intended actions and where the investigators interpret a pre-interpreted world. Unlike their colleagues in the natural sciences, social scientists, it is argued, stand in a subject-subject relation to their subject matter. In addition to the differences along the quantity-quality and object-subject dimensions nature is thought to be predictable because its regularities - be they causal, statistical, or probabilistic - are timeless. The laws of nature are considered to be true in an absolute and timeless way, the laws of society historically developed. In contrast to nature, human societies are argued to be fundamentally historical. They are organised around values, goals, morals, ethics, and hopes, whilst simultaneously being influenced by tradition, habits, and legitimised meanings. These general social science assumptions, first formulated by leading proponents of the German *Geisteswissenschaften* (human sciences) such as Rickert and Dilthey, inform the social science understanding of social and natural time. Because it is postulated that the physical world is subject to laws, that natural processes entail no element of choice, purpose, or meaning, and that nature can be quantified and studied objectively it is suggested

that the past and future are irrelevant and that the B-series of time is therefore the appropriate conceptual tool for the natural sciences.

We can now appreciate that the task is not simply to adjust our understanding of natural time. An extension of focus that includes an understanding of the times of nature necessitates a change in the social sciences' fundamental assumptions about nature or, as Luhmann (1980: 32) puts it, a shift in the base assumptions of sociological theory. The evidence presented in this book supports my proposition that an improvement and widening of our understanding of social time without a radical change in the assumptions that underpin our present scientific knowledge is not enough. It makes clear that natural scientists no longer hold this nineteenth century view of nature. It demonstrates that the social sciences' practice of understanding of the physical and biological realm in contradistinction to the human social world is consistent with, and supportive of, the contemporary dualistic understanding of natural and social time. It affirms that these underlying assumptions are steeped in the Newtonian, mechanistic understanding of nature and natural time, an understanding where particles move in reversible time to invariable laws, within an absolute time that defines our uniqueness. It suggests that this Newtonian understanding is perfectly complemented by the basic assumptions of classical philosophy which had been adopted by social theorists for their various time classifications. The philosophical approach is dominated by Cartesian dualism which separates not just mind from body, but repetition from process, quality from quantity, form from content, subject from object, the individual from the collective, the A-series from the B-series, cyclical from linear time, and traditional from modern conceptualisations and structures of time. Barnes (1971: 545), commenting on the work of Lévi-Strauss, suggests that in order to 'escape from an amusing but ultimately sterile ballet of symbols in which history and anthropology, synchrony and diachrony, consciousness and unconsciousness, continuity and discontinuity, reversible and irreversible time dance endlessly round each other until the audience decides to go home, we have to break down the dichotomies, establish continua and feed in more facts.' When we do, the picture changes and the simplified dualities lose their meaning: thinking in opposites ceases to be a viable theoretical option. As we have seen in the first chapter, social scientists who seek to take account of time in their theories recognise the need and make a commitment to overcome dichotomies and dualisms. They do so, however, without letting go of the assumptions upon which dualisms are built. Thus, the best that can be achieved is a reconceptualisation of dualisms into genuine, mutually defining dualities (Giddens 1981, 1984; Hopkins 1982; Jaques 1982; Lauer 1981). Predictably, the new approaches do not solve the problem

but end up with new dichotomies and continue to pose irresolvable difficulties with respect to time, as I have demonstrated throughout this investigation. Recognising time as both condition and outcome, reversible and progressive, *Dasein* and *durée*, quality and quantity, resource and commodity merely shifts the focus from dichotomies to isolated pairs. It provides no means for a conceptualisation of the connections between multiple pairs, their continuity and discontinuity, or their mutual implication. Theories of dualities are impervious to ecological principles or to such ideas as resonance and implication.

We need to recognise further that most dualisms entail an implicit hierarchical evaluation which has remained untouched by the dualism-duality conversion. Dichotomies are usually not value-neutral and thus need to be appreciated as not only fundamentally inclusive of their counterpart but also ranked in order of importance and priority. As scientific classifications these polarities thus read objective over subjective, mind over matter, social over biological or physical time (or vice versa depending on who does the prioritising), modern over traditional time, and commodity over event-based time. Contemporary physicists such as Capra (1976) and Chew (1968) propose that the practice of making one aspect more important than others is no longer tenable and in need of re-evaluation. Capra (1982: 83-9) and Briggs and Peat (1985: 216-7) demonstrate the importance of the idea of 'bootstrapping' for an understanding where issues of fundamentality, priority, and importance are recognised to be relative, a property of the framework of observation.

The Newtonian-Cartesian understanding causes yet another difficulty. Elias insists that we need to understand time as an immense synthesis rather than an abstraction. However, the conceptual tools that are being used to understand this synthesis are, as we have seen, based on an understanding of reality that abstracts bits, particles, aspects, units, events, or periods in order to understand them. It is becoming obvious that the wrong conceptual tools are being used if we seek to grasp and theorise synthesis, qualitative rhythmicity, intensity, and acausal relationships with the aid of Newtonian and Cartesian assumptions. The complexity of social time cannot be understood by focusing on aspects in isolation if that focus excludes an awareness of the bearing of diurnal, seasonal, menstrual, and metabolic cycles; the variety of time structurings; the irreversible exchanges in relations of incomplete autonomy and dependence; the relationship we have to all those time aspects of existence; and the time we have created as an independent reality: all are implicated in any one aspect we focus on. We could think of the difference of approach in terms of focus and isolation. When we are focusing the rest of our visual field is not disappearing in the way it does when we are isolating and abstracting some part or event in order to

study it. It is the difference between an embedded understanding where both the thinker and the object of understanding remain an integral aspect of the totality, and one that severs those infinite connections. Our traditional understanding of social time and the convention of claiming for the human social realm what are qualities of all nature are linked to assumptions that separate society from nature and enforce choices on an either/or basis. A different picture emerges, however, once we put the Newtonian and Cartesian understanding aside and concentrate on the infinite connections and relations. With such a shift of focus and emphasis, existing assumptions and classifications begin to become meaningless.

These thoughts lead us once more to a closely related, historically persistent idea, an early version of which was put forward by Durkheim (1915) in *The Elementary Forms of Religious Life*. It simply states that all time is social time, meaning human social time. That this assertion, in its social science meaning, is no longer tenable has been amply demonstrated in this treatise. Yet it is worthwhile to look at this idea once more since it may help to shed light on the limitations of current approaches for a comprehensive time-based social science understanding. A summary of this idea may be expressed in the following way. Time is always social time because only humans regulate and organise their lives by time. Only they conceptualise time. Only they use, control, allocate, and sell their time. Only they lead an 'in time' existence and create their own histories and futures.

This research leaves no doubt that there are time aspects which pertain exclusively to human social contexts. But these, as we have seen, need to be distinguished from the more universal principles of time that are to be found throughout nature. Organisational aspects of time, for example, are found at the inorganic, organic, and the human social level, as well as in the design aspects of human artefacts. The organisational principles of time, in terms of sequence, duration, periodicity, rates of change, and synchronisation may be the same for all, but their meaning and expressive form change with the context. The same applies to an 'in time existence', which is led by simple organisms, plants, animals, and humans alike because it relates not exclusively to calendars but to being bounded by external rhythms. The difference here lies in how the being relates to that rhythm or, in the case of Western societies, whether the rhythm has been abstracted from the natural rhythms within which other beings organise their social existences. All beings, it has further become apparent, are their own past, present, and future. The difference lies in the degree to which they are aware of this fact and the way they relate to it. This research suggests that clock time, and the Newtonian time-reversible t -coordinate, are the only time aspects that can be exclusively designated human social constructions. All other aspects, irrespective of

whether or not they are conceptualised, are also integral aspects of nature. Human time therefore needs to be understood to include the times of nature. In agreement with Mead (1959), we could view time as socially constituted in interaction since the symmetry-breaking process of interaction is one of the sources of time. But Mead's socially constituted time is very different from that of Bergmann, Elias, Durkheim, or Sorokin and Merton. In other words, the idea of time as socially constituted depends fundamentally on the meaning we impose on 'the social', whether we understand it as a prerogative of human social organisation or, following Mead, as a principle of nature.

The idea that time is not separable from the meaning of time, that it always symbolises something that is socially formulated, is a more complex one to untangle. Without getting drawn into the complex philosophical debates about the existence of reality outside language, it can be argued that in instances where language comes to be equated with reality we are no longer in a position to conceptualise a number of things. We are left without bases from which to account for meaning variance, to understand non-language-based nature, and to translate from one system of meaning to another (Giddens 1976: 17–18). Furthermore, it leaves no room for understanding novelty and creativity; and it denies to the rest of nature experience, meaning, and consciousness. In the light of contemporary scientific understandings of reality, Mead's (1959) conceptualisation, and the research presented here, we find that the tradition of equating time with its symbol is no longer tenable. There may be good reasons for such an exclusive stress on the symbol. It is possible, as Hägerstrand (1985: 8–12) points out, that social scientists have linked time so intimately to the symbol of time because this is quite simply the very form on which they have been focusing. More importantly non-symbolic expressions of reality are traditionally understood to be outside the disciplinary boundaries of the human social sciences. These reasons may explain the convention but they cannot justify it. We can accept that for us to be able to talk and think about time necessitates our putting it into words. If this is all that is being expressed, it is not very much; if it equates reality with the symbol, it goes too far. There is no need to deny that all humans formulate meanings symbolically or that this is a fundamentally social process. There is an urgent need, however, to appreciate that time is an aspect of nature, and that nature encompasses the symbolic universe of human society. Once we recognise ourselves as bearers of all the multiple times of nature, and once we allow for nature to include symbolic expression, the gulf between the symbolic knower and nature as an external (unknowable) object can be dispensed with. The mutually exclusive dichotomies of nature and culture, subject and object become irrelevant.

From the evidence presented in the last four chapters we emerge as activity-matter, causal as well as non-local communication networks, biological clocks that beat in 'off-beat' to the rhythms of our earth, and as beings that grow and decay dynamically in interdependence with other systems of change-order. Recognising ourselves as having evolved, and thus *being* the times of nature, allows for the humanly constituted aspects of time to become one expression among the others. Biologists have dispelled the idea that only humans experience time or organise their lives by it. Waiting and timing in nature presuppose knowledge of time and temporality, irrespective of their being symbolised, conceptualised, reckoned, or measured. Yet, once time is constituted symbolically, it is no longer reducible to the communication of organisms or physical signals; it is no longer a mere sensory datum. For a person to have a past and to recognise and know it entails a representational, symbolically based imagination. Endowed with it, people do not merely undergo their presents and pasts but they shape and reshape them. Symbolic meaning thus makes the past infinitely flexible. With objectified meaning we can not only look back, reflect, and contemplate but we can reinterpret, restructure, alter, and modify the past irrespective of whether this is done in the light of new knowledge in the present, to suit the present, or for purposes of legitimisation.

Kinget (1975: 43) speaks of a 'living past' and sees our assumptions about it demonstrated in the practice of psychotherapy which is premised on trust in the possibility of reshaping the past in the present. Looked at in this way, time may be viewed as having evolved as an aspect of (Meadian) sociality in the universe. The way humans - as a species or as members of specific societies, groups, and families - symbolise time and relate to it, may then be understood as a specific explicated form of something that is uniquely implicated in all of nature. This understanding was first articulated by Mead shortly before his death. Mead began to formulate what contemporary natural scientists have substantiated for us: the mutual implication of sociality and temporality and its applicability to all of nature. In other words, contemporary natural scientists have provided the substantive evidence for Mead's theory that nature fundamentally includes human social life, and that natural and social time are therefore not mutually exclusive but implicating.

The exclusion of non-symbolic expressions from social science analysis has not only resulted in a highly problematic conceptualisation of nature and natural time but it has also meant the omission of artefacts and technology from social science. As Carlstein (1982: 8-9) points out, 'social scientists have commonly refused to see 'dead things' as social or have left them aside for the natural scientists. Social scientists have also commonly

refused to look upon artefacts as social in the sense that they impinge on how individuals interact with each other. These 'dead things' are, at best, seen as symbols and are not considered to be genuine ingredients in social situations and processes.' Yet, with respect to time, it is difficult to see how we can understand society without the time aspects of those 'dead things', those created artefacts and machines that shape our lives and our understanding of reality. There can be no longer any doubt that our conceptualisations of time are deeply influenced by them. Furthermore, our artefacts have become mediators and filters through which we not only live our lives with others in our environment but understand and symbolise that life and ourselves. They have become metaphors. As such they deserve our most careful attention.

Knowing through metaphors

There is strong evidence to suggest that we are self-conscious by virtue of mediation, that we recognise ourselves through an external or externalised 'other'. It is likely that animals, as sentient and mortal creatures that share the world of humans, are one of the earliest sources for questions about the nature of human being. As bases of self-understanding they suggested answers that were consequently formulated in language, expressed in paintings, and encoded in sacred rituals. Animals are both familiar and distinct, and their powers - comparable but never the same as those of humans - a source of quality. Berger (1980: 5) designates that relationship metaphoric since, 'within this relationship what the two terms - man and animal - shared in common revealed what differentiated them. And vice versa.' In our contemporary Western world animals are no longer a dominant metaphor for self-recognition. In the age of machines natural metaphors are, to a large extent, replaced by our own creations.

Every new phase of technological development, it seems, has served as a tool for self-understanding and led to new conceptualisations of reality. During the seventeenth and eighteenth century the clock constituted the prime metaphor. The universe was understood as a giant clockwork and its inhabitants were conceptualised as functioning to its principles. During the nineteenth century the principles of steam technology were embraced as additional sources for self-understanding. The imagery involved people 'letting off steam' and the need for 'safety-valves' to avoid dangerous social explosions. Emotions and social interactions were likened to a steam engine functioning under pressure with a need for the steam to escape in order to avoid disaster. During the last twenty years the computer has been elevated to the position of dominant metaphor. Its

principles are used for the conceptualisation of mind and for all operations that involve the transfer of information.

The process from the invention of a new artefact to its use as a metaphor seems to follow a pattern.

Each technological innovation offers a new kind of human experience. At first, it is entirely strange, and difficult to grasp; but we quickly find in it sufficient familiar features to act as points of reference, and we then explore it, savour it, come to terms with it, and assimilate it into the pattern of our everyday life. We learn to live with it. Once it is established in this way, it can be the basis of a metaphorical transfer: we then see previously *familiar* things in terms of this novelty. We have acquired a new perceptual tool. (Edge 1973: 35)

Through metaphors we evoke the inner connections between things but that is not all. We have a tendency to reify metaphors to a point where we lose sight of the human authorship. Frequently the distinction between the metaphor, its source, and its name gets blurred or lost. Reified, metaphors lose their usefulness as a conceptual tool for social science. It is therefore important for us to keep a clear distinction between the tool and that which we grasp with its aid.

Since metaphors play such a central role in our theories it is pertinent for us to learn to 'see' what has thus far been invisible: the design principles of artefacts that guide and structure our understanding. Only once we become fully aware of them can we use the metaphors to our full advantage. The Newtonian machine technology has emerged as a particularly unsuitable metaphor for an understanding where time is allowed to become a prominent feature of social analysis, and much of the discussion in the previous chapters has shown the severe limitations of the machine-clock metaphor. In this last chapter I want to focus briefly on the differences between the technology of lenses and the post-Newtonian technology of holograms so that we may appreciate their respective principles and recognise their existing and potential role for social theory. The purpose of this brief excursus to holography is therefore not to seek the implications for a conceptualisation of social time but to explore the potential for a social theory that takes account of time.

Holography has shifted understanding from causal, sequential, linear connection chains to interference patterns and from mechanical interaction, organisation, and transmission of information of individual parts to mutual implication. Whilst the lens remains a powerful metaphor for an analysis of isolated parts, holography allows an understanding of the sort of interconnectedness and mutual implication we have encountered in Chapters 2-6. The hologram is therefore proving an excellent metaphor

for a whole, encoded and implicated in the 'parts', since the information it stores is not located in the individual parts but in their interference pattern. Any one part of a hologram contains, implies, and resonates information of the whole. The focus here is not on individual particles in motion, crossing time and space in succession, but on all of the information gathered up simultaneously. In contradistinction to Newtonian mechanics and geometric optics where the part is different from the whole in an absolute way and where the emphasis is on substance, holography focuses on information gathered from the whole of the object under investigation. It has dispensed with the absolute distinction of wholes and parts. Three aspects of the hologram metaphor are thus initially important for understanding in social science: its non-sequentiality, its individual-whole relationship, and its multiperspective focus.

In order to appreciate the difference between the metaphors we need to explore the principles that underpin their respective designs. With lens-photography an image is created on the plate in such a way that each point on the object corresponds to a single point on the image on the plate. The object stands in a 1:1 relation to the image. In case of the plate being broken, the broken-off part would be missing from the image. 'By thus bringing the correspondence of specified features of object and image into such sharp relief,' writes Bohm (1983: 144), 'the lens greatly strengthened man's awareness of the various parts of the object and of the relationship between these parts. In this way, it furthered the tendency to think in terms of analysis and synthesis.' In holography, laser light beams are fired in phase before being split and sent along different paths. A reference beam goes to the plate directly while the other beam picks up the reflections from the entire object. It illuminates the object 'in the round' and from all aspects. Once the light beams are reunited on the plate they are no longer in phase but interfere with each other and thus produce an interference pattern on the plate. This pattern in no way resembles the object but has its features encoded. In contradistinction to the photographic plate each region of the holographic plate carries the encoded information of the whole. If part of the holographic plate gets damaged, no part of the image gets lost. Briggs and Peat (1985: 271) explain the difference. 'The pattern is not in 1:1 correspondence with the object because the phase information from each region of the object is recorded throughout the holographic plate. Thus, if a portion of the plate is lost, the total image is retained.' Because the memory is distributed over the whole of the holographic plate, each part contains the whole *Gestalt*. From the encoded pattern a three-dimensional image can then be recreated by shining the reference beam onto the plate and viewing it from the other side. The object is thus recognised in its totality

rather than having its individual features matched piece by piece. The principle of splitting light-waves that are in phase, thus creating both a reference beam and another beam carrying multiperspectivist information, appears to be very similar to the process by which we recognise ageing, growing, and change of any kind since one way to know change is by reference to something relatively unchanging, or something that changes more slowly. If all processes occurred 'in phase' we could not know them in relation to each other. We would have no basis from which to recognise change.

Derived from the Greek 'holo' which means whole and 'gram' which means to write, a hologram 'writes the whole' (Bohm 1983: 145). This encoding of the totality in every tiniest aspect of itself represents a departure from all previous Western, science-based understandings of the relationship of parts to wholes. Here the sum can neither be said to be more than the part nor can it be argued to determine the part as in the case of organic holism. The language of causal determinism is misplaced in a holism where the connections are simultaneous and where everything implies everything else. Simultaneity, mutual implication, and complexity, the time aspects that pose such insoluble difficulty for traditional social theory, appear manageable for a theory based on holographic principles. Holographic principles are therefore eminently more suitable than the technology of clocks and lenses for an understanding in which time is allowed to play a central part. Understanding through opposites, abstraction, analysis, and synthesis seem no longer to be the only options for social theory.

Whilst holography is more suited to an understanding that takes account of the multiplicity of times than any of the mechanically based metaphors, it must be noted that it too is dominated by our sense of sight, thus emphasising stability and spatiality. Its principles, however, apply to all wave phenomena from light and water to sound and electromagnetic energy. Contemporary holography therefore provides merely the first visually based step in the direction of this particular way of understanding. The potential of the holographic principles are explored, studied, and conceptualised in physics, biology, neurophysiology, acoustics, and in brain and consciousness research, to name just a few areas. Only social science, it seems, has so far ignored the theoretical potential of this metaphor. This book is not the place to begin this task in earnest. To grasp the full implications for social theory is beyond the capability of one person; it needs the effort of many theorists. At the present, merely the potential is apparent for a time-sensitive, truly contemporary social theory. In the absence of such a post-Newtonian framework of meaning the 'level-approach' emerges as superior to that of classical Cartesian dualisms and Newtonian mechanics.

Resonance and non-hierarchical levels

From this research, all the times we have encountered so far emerge as implicated in our contemporary social time. We *are* time and this fact unites us with all other rhythmically organised beings. Together with plants and animals we *are aware* of time and experience it. As human beings we *have a relationship* to time and we reckon time. As members of Western industrial societies we *create time* as a resource, as a tool, and as an abstract exchange value. We thus express what is separated in academic disciplines: the times of the different realms of being. A conceptualisation in terms of levels seems therefore well suited to explain and theorise the multitude of times entailed in contemporary life. To think of these times as expressions of different levels of our being avoids the need to discuss one aspect at the expense of all others. It means that we do not need to choose on an either/or basis. It encourages us to see connections and not to lose sight of the multiplicity while we concentrate on any one of those multiple expressions.

Despite these important advantages, however, there are difficulties associated with the conceptualisation of social time in terms of levels. These relate to our tendency to reify the levels, to conceptualise them hierarchically, and to postulate clear cut-off points between them. The three, as we shall see, are closely interconnected. Beginning with the problem of reification, we must recognise that we do not live, as Schutz and Luckmann (1974: 47) suggest, 'in all those dimensions simultaneously', and that the levels do not, as Elias (1982b: 1000) proposes, stand in relation to each other. It is our understanding in terms of levels that is in need of being connected and related. *Dasein* (and nature in general) can be conceptualised in terms of levels because we *are* oscillating molecules and rhythmically organised beings with identities as well as beings that constitute, know, measure, and create time. A second difficulty relates to our understanding each 'higher' level expression of time as containing the one 'below' which means that we inadvertently create a hierarchy from simplicity to complexity, from the earlier to the later development, and from the lower to the higher number. This may be an immensely useful way to conceptualise both the continuities and irreducible differences of the times relevant to the physical, biological, and human social realm but our traditional usage gets in the way when we want to explain resonance and mutual implication; when we want to express the idea that any new order changes not only the meaning of that which precedes it but the old order itself. Level, as descriptive metaphor for the multiple times of our existence, thus needs to be applied in a way that does not suppose any fundamental mode of description. It needs to

allow for everything to be connected and implicated without a claim of pre-eminence of any one. I refer the reader back to the idea of bootstrapping, where physicists insist not merely that none of the properties of any part of the web of interconnections are elementary but accept no fundamental entities whatsoever: no fundamental laws, equations, or principles. Physicists, like the phenomenologists before them, insist that reality is not revealed to us in some pure form; that we do not observe nature *per se* but nature exposed to our method of questioning. The 'observed' hierarchy needs therefore to be recognised as part of the framework of observation and as soon as it gets in the way of conceptualising mutually implicating connections we need to discard it and replace it with a non-hierarchical conceptual framework.

The recognition that our observations are framed by our questions and theoretical assumptions applies equally to 'level' approaches that postulate clear 'cut-off' lines and conceptualise levels analogous to physical, tiered structures. Korzybski's (1924) three 'time binding levels', Lovejoy's (1960) four 'levels of being', and Fraser's (1982, 1981b) six 'time levels of existence' are examples of theories of discontinuous levels. Thus, Korzybski characterises the human, animal, and vegetable realms in terms of their synthesis-forming capacity as time-, space-, and energy-binding, respectively, whilst the physicist Fraser proposes six stable, integrative time levels of nature: three for the physical universe, one for life forms, and two for the human realm. Not the number of levels or their content are at issue here since these might be varied according to the degree of the analysis' generality but their static developmental stages where the level 'below' is denied aspects that characterise the level 'above'. In other words, whilst theories of time levels are theoretically of interest and echoed in many subsequent social science conceptualisations - including those of Sorokin (1964) and Elias (1982a, b, 1984), for example - they deny to non-human nature what we have found to be central: the importance of past, present, and future extension; of history, creativity, temporality, time experience, and time norms. If time differences are conceptualised with reference to stable, integrative levels then this prevents any understanding in terms of resonance and feedback loops. With discrete, unidirectional levels, consciousness cannot be shown to resonate throughout all of nature; and what we think of as 'human time' stays falsely imprisoned at that level. I have not yet found a satisfactory way of coping simultaneously with hierarchical nesting and implication, with enfoldment and resonance. In the meantime, however, a cautiously applied conceptualisation in terms of levels is to be preferred to an understanding of social time where mutually exclusive choices have to be made.

I have contended repeatedly that it matters how we understand, for

example, the invention of clocks or the standardisation of world time in relation to what preceded them. Conceptualised as successors they replace; as additions they leave everything else intact. The findings of this exploration, however, cannot be encompassed by either of these solutions since each new development appears to affect what exists already. Let us take clock time as an example.

Once this created time is related to as a resource to be used, allocated, controlled, spent, or sold it affects our relationship to death, the timing of our activities, our institutions, our technology, our understanding of reality, and our practices of work, leisure, and even sleep. Our environment, too, and even our bodies, are different because of it. It is open to our daring how far we extend this principle to all of nature. There certainly does not seem to be any one obvious point after which it could be argued to no longer apply. Taken to its full extreme it would mean that we understand self-reflective consciousness, language, clock time, and the atom-bomb, for example, as part of nature, and every aspect of our present world as different from what this world was before their evolution and invention. Such an understanding, it seems to me, is in the spirit of Mead's approach in *The Philosophy of the Present* where he presents his alternative to scientific positivism and Cartesian dualism. It appears closely related to Mead's conceptualisation of the past, present, and future, of temporality, and of his principle of sociality. To show the links and make this connection more visible it will be helpful to outline Mead's position once more but this time with a special focus on the issue under discussion, namely, that the novel is never a mere addition but changes the whole.

Mead creates a sense of levels, but his levels appear fluid without clear edges or cut-off points. His principle of sociality, as the 'capacity of being several things at once' (1959: 49), and as the process of adjustment that occurs at the conjunction and interpenetration of old and new, is also understood as both the source and essence of consciousness. Mead sees the genesis of an organism's ability to be in different perspectives and times at once in the capacity of interpenetration. A sense of level emerges when Mead conceptualises this consciousness in its 'lowest' form as a kind of plant and animal 'feeling' in conjunction with purposive action, and in its 'highest' form as human ideation (1959: 140-75). We can see here how Mead understands consciousness as a continuum grounded in emergence and the principle of sociality, displaying different characteristics in plants, animals, and humans. In similar fashion he conceptualises a progression of meaning from the physical world of signals via an ever-widening gap which, in turn, allows for interpretation and translation between those signals, right 'up' to the human world of symbols. To Mead everything has its own organism-, species-, and level-

specific time framework. Humans are not exempt from this and, on the basis of this understanding, he allows for no overarching universal time standard since beings can only know from within their perspective. The fact that a world-wide community has created a particular abstracted time and uses it as a universal measure and absolute framework for dating, he suggests, does not make it any less part of the perspective of that community. Mead clearly argues for an environment-, level-, and perspective-specific time for all beings and the fluidity of his 'levels' can therefore only be appreciated in conjunction with his writings on the ontological status of the past, present, and future (1959: 1-67). To Mead the past is irrevocable to the extent that events cannot be undone, thoughts not unthought, and knowledge not unknown. In this irreversible form, he contends, the past is unknowable since the intervening knowledge continuously changes the meaning of that past and relentlessly recreates and reformulates it into a new and different past. He argues this on the basis of the proposition that only emergence in the present has reality status. He does not accord the past and future such a status because they are real only with respect to their relation to the present. In Mead's thought the past changes with respect to our experiencing it in the present and the meaning we give to it. In contradistinction to the past, he conceptualises the reality of the present as changing with each emergence. When Mead (1959: 65) writes that 'emergent life changes the character of the world just as emergent velocities change the character of masses', his analysis is consistent with contemporary approaches in physics and biology and with the findings of this exploration: it recognises that each emergence irreversibly affects everything else. At this point, however, we encounter in Mead's work the same unresolved limitations I described above with reference to the conceptualisation of hierarchically nested time levels. The difficulty occurs when we seek to bring together Mead's idea of irreducible, unidirectional, inclusive levels with his theory of sociality and his proposals that the emergent does not merely change the meaning of all past and future, but all of present reality and its possible futures.

Bearing in mind the conceptual difficulties and limitations of the level approach, we can see that an understanding through levels achieves a number of things. It emphasises the complexity of time and imposes order on the multiple expressions. It prevents us from focusing on one or two aspects of time at the expense of others. In addition to the more obviously social components, it establishes the centrality of the physical, living, technological, and artefactual aspects of social time. It stresses and affirms connections and relationships. It brings to the surface both the continuities and the irreducible aspects of social time. It helps us to avoid confusing the time aspects of our social life with those of nature and

machines. It enables us to see the connection between transcendence and the human creations, between the creation of time and its control, and between the reification of clock time and relations of power. In the absence of more appropriate theoretical frameworks the level approach appears a useful conceptual tool and preferable to an understanding based on stages of succession and mutually exclusive or inclusive dualities.

Simultaneity and extended time-spans

We now need to extend the level-based understanding of social time by incorporating an awareness of the simultaneity of multiple time-spans. This research shows that theoretically relevant rhythms span the spectrum from neural to cosmic ones, from the imperceptibly fast to the unimaginably slow. These time-spans seem to be paralleled by a division of labour in the sciences with quantum physics at one end of the scale, astronomy at the other, and the social sciences and history occupying the middle ground. Each discipline thus seems not only to have its own bounded sphere of competence but a concomitant subject-specific time-scale. In contradistinction to the status quo, this exploration demonstrates that the discipline specific boundaries to the human time-scale are major limiting factors to our understanding since the entire range of rhythms have a bearing on human social time. It impresses on us the need to extend the time-scale not only to the micro and macro dimensions, but also to both the past and the future. It suggests further that the multiple time-spans have to be conceptualised simultaneously.

Giddens's work moves us closer towards this goal, even though his time-scale of analysis does not transgress the middle range of traditional social science. It presents a strong case for the need to recognise that *durée*, *Dasein*, and *longue durée*, his three planes of temporality, bear on any one moment of structuration simultaneously. The social science focus on any one, Giddens (1981: 19-20) argues, must therefore always imply the others. To him these time planes of daily life, life-time and history are bound by the structural practices of social systems and this may well be one of his reasons for remaining firmly located in the middle-range time-scale of the social science tradition. But could we not regard science and technology as social structural practices? If this were considered reasonable, then even by Giddens's own criteria the time-span of social science analyses would need to be enlarged to an evolutionary scale. Such an extension would not conflict with his antipathy towards evolutionary approaches in social science since he is objecting to the inherent

determinism and not the magnitude of the time-scale. Giddens's (1981: 21-3, 1984: 228-44) arguments against evolutionism provide no grounds against either a conceptualisation of the influence of our evolved biological being on present social existence or an extension of our time-scale of understanding. Thus, when I stress the importance of extending the time-scale in order to include evolutionary considerations and beyond, it is not the apparent determinist mechanisms of change I want to stress as important but those silent, sedimented aspects of our socio-biological being that have come to be taken for granted. I am suggesting that the time of our body is not exhausted by our finitude but carries within it our entire evolutionary history. To accept the importance of our evolutionary past for the present is no different in principle from accepting that our history forms an ineradicable part of our social being. This study shows the significance of the evolutionary aspects of social life and questions the validity of their systematic exclusion from social analyses. Contemporary thinkers from a wide range of fields arrived at an understanding that recognises the implication of our past in the present; in other words, that our personal and social history forms an ineradicable part of us. I can find no good reason why we should exclude our biological and cosmic past from the acceptance of this general principle. In death experiences, as we have seen, these connections are revealed and the established boundaries of scientific understanding challenged.

There is yet another reason for extending the traditional time-scale of social science. If biologists recognise that their time-scale of understanding needs to be vastly extended so that they may conceptualise whole networks of feedback loops and symphonies of rhythms, then time-scales of an even greater magnitude ought to be encompassed by the science that seeks to understand a species that has created artefacts that outlast it for thousands of years. We need theories that are adequate to our scientific, technological world with its vast past and future extension. When global telecommunication, nuclear technology, and space travel form an integral part of reality, we can no longer act, research, think, and theorise as if we were still part of a pre-industrial world or the pre-nuclear reality of the founding fathers of our discipline. This is not merely a restatement of the moral point presented earlier where I argued that the time-scale of concern and responsibility ought to be equal to the life-time of our creations and their effects but an argument about social science analyses. I am proposing that we need to take on board the time-scales of our technologies if our theories are to become adequate to their subject matter: contemporary industrialised, science-based technological society. Giddens's concept of time-space distancing might prove useful here despite its association with the storage capacity of information

which makes the present application of the concept primarily past, rather than past and future orientated. There seems to be no reason why the concept of time-space distancing, with its link to power, could not be exploited to theorise influences on the long-term future. Such an extension would allow us to understand the present as present past and present future, where each change affects the whole.

To emphasise time-space distancing, the past and future extension and its constitution in the present is, however, not enough. We also need to engage with the natural scientists' understanding of physical reality and grasp the principles entailed in contemporary technologies in order that our creations may cease to control our destinies. Computers and nuclear power are technologies that operate in time-frames outside the capacity of our conscious experience. Nanoseconds, life-times of particles and the life-time of radioactivity can be calculated mathematically but they cannot be known experientially. Yet these technologies are used on a national and global basis. They actually and potentially affect humanity as a whole but our conventional conceptual tools are not adequate to the task of understanding their implication. As Rifkin (1987: 15) correctly points out, 'when many of the decision-making activities of society take place below the threshold of human consciousness, social time, as measured by the clock, becomes irrelevant.' To grasp the mathematical abstraction which affects our lives so deeply requires different theories. It demands post-Newtonian and Cartesian frameworks of meaning. It entails that we begin to understand the principles that underpin our theories and that we recognise the relativity of our frameworks of observation. It necessitates that we shed our reifying tendencies, that we learn to look at the structures of our own thinking and to treat them like empirical data. Furthermore, our contemporary technological, science-based world requires theories that unify and relate what has been separated for over three hundred years. A brief return to the division of cyclical and linear time will help to illustrate the point.

It is a central tenet of this treatise that cycles and lines are artefacts of observation and that their separation into independent entities is intimately tied to Newtonian scientific understanding. Oscillations, rhythmicity, and cycles of recurrence have been shown not to exist in isolation but as unidirectional outcomes of the divisions of cells, combinations of molecules, chemical interactions, social transactions, and relationships of incomplete interdependence between beings, their environments, and other beings. Even the most repetitive action entails asymmetry and direction both within it and in the relation to its environment. Washing-up, the ultimate monotonous activity, serves as a good example. As a directional activity it has a beginning and an end. Its

water cools. Dirty dishes get clean and the water dirty. The repetition of movements cleans different articles and, although the sequence of the action may always be repeated in the same order - glasses, cutlery, plates, pots - the action in its repetition can never be the same. Everything involved in it has irrevocably changed in the intervening period. Whether we understand such an activity as primarily linear or cyclical does not depend merely on the aspect that has been isolated for observation, but also on the time distance from which the observation takes place. The action could be viewed as linear whilst the act may be considered as cyclical. Observation of the activity over a period might reveal it as cyclical whilst a historical perspective is likely to show up its directional linear changes. Whether we are dealing with habits, routine actions or rituals and myths, reality is constituted as stability through change through their performance. We therefore need to recognise the separation of linearity and cyclicity as relative to the focus and the framework of observation and not locate it with Leach (1968: 125) in logically distinct experiences. Curvature, folding back upon itself, completing cycles but never returning to exactly the same starting point, these are principles of nature; and absolute perfection, the closing of the circle rather than the continuity of cycles, the human endeavour; whilst the separation of cycles from lines, repetition from transformation, history from evolution, and nature from society is an expression of classical science and post-Enlightenment thinking. Only when the distinction between natural cycles, the perfected circles, and the conceptual separation of repetition and change have been made explicit, however, is it possible to relate natural time to social time; chronology, calendar, and clock time to both the rhythms of nature and relations of power; the resource to the experience; and the commodity to the measure. This way of understanding is also necessary before Giddens's (1979: 31) statement that 'life passes in transformation' becomes compatible with his preoccupation with routine; and before we can establish a relation between his (1981: 51) insistence that 'the transformative capacity of human action lies at the heart of power', and his (1981: 134) argument that the 'clock is the very expression of commodified time'. None of these statements, however, can be related in a meaningful way to the idea of 'reversible time'.

The conceptualisation of social life in terms of reversibility makes no sense when even physicists concede that repetition of the same is a mathematical possibility only. In 1896 Boltzmann calculated the *Wiederkehrzeit* (recurrence time) of 1cm² of air as 10¹⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰⁰ years. This means that the likelihood for one cubic centimeter of air to return in exactly the same composition is calculated as ten to the power of ten trillion years; a mathematical expression for 'as good as never' (Eigen

1983: 37-41). Thus, it can be argued that only in conjunction with the recognition of its *idealised* basis in Newtonian physics, and the consequent conceptualisations of reality in terms of it, does 'reversible time' become a meaningful theoretical tool. If physicists have calculated that it takes that long for just one cubic centimetre of air to repeat itself in the same composition, then the idea of repetition of the same should most certainly be considered meaningless for a human social activity or event. This applies even more so to 'reversible time'. There can be no un-living, un-knowing, un-thinking or un-doing. We cannot grow younger, and it is quite clearly impossible to separate a cooked apple pie back into its ingredients of whole apples, sugar, water, butter, and flour. When physicists regard the mere repetition of the same virtually impossible within the existence of our earth, then surely it is safe for social theorists to discard the concept of 'reversible time' as inappropriate for the explanation of the social world.

At the end of this study, time is still a fact of life but it has emerged as a multi-layered, complex fact of life; multiple in its forms and levels of expressions. As time, timing, tempo, and temporality we can recognise some of the complexities of that which is ultimately indivisible. As measure, sense, boundary, resource, and commodity we may know some of the functions which time fulfils in our lives. Through entropy, ageing, and growth we may grasp time as irreversible and directional. Through its rhythmicity life becomes predictable. Thus, the focus on time helps us to see the invisible. It makes our seeing and understanding transparent and shows that the physical reality of our creations underpins our theories. It reveals that technology and artefacts not only shape our lives but our knowledge; that the dead things which are so conscientiously excluded from social analyses are not only implicated in our daily existence but constitute our social theories. They therefore need to be moved to the centre stage of social theory. We need to allow the implications of contemporary living to penetrate the depth of our understanding, to connect the complexity of our being to the meanings we impose on it, and to recognise our existing social theories as relics of a bygone age. The focus on time helps us to identify points of departure. As such it is no longer a luxury; it has become both a necessity and our destiny.

References

- Adam, B. E. 1987: *Time and Social Theory*. PhD thesis, University of Wales, Cardiff.
- Adam, B. E. 1988: Social time versus natural time, a traditional distinction re-examined. In M. Young and T. Schuller (eds), *The Rhythms of Society*. London and New York: Routledge, 198-226.
- Adam, B. E. 1989: Feminist social theory needs time. Reflections on the relation between feminist thought, social theory and time as an important parameter in social analysis. *The Sociological Review*, 37, 458-73.
- Adam, B. E. 1991: Time and health implicated, a conceptual critique. In press *Time and Society*.
- Adam, B. E. 1992: Perceptions of time. Forthcoming in T. Ingold (ed.), *Humanity, Culture and Social Life*. London: Routledge.
- Archer, M. S. 1982: Morphogenesis versus structuration: on combining structure and action. *British Journal of Sociology*, 33, 455-83.
- Aries, P. 1976: *Western Attitudes toward Death. From the Middle Ages to the Present*, transl. P. M. Ranum. London: Marion Boyars.
- Aschoff, J. (ed.) 1965: *Circadian Clocks*. Amsterdam: North Holland.
- Aschoff, J. (ed.) 1981: *Biological Rhythms*. Handbook of Behavioural Neurobiology, vol. IV. New York: Plenum Press.
- Aschoff, J. 1983: Die innere Uhr des Menschen. In A. Peisl and A. Mohler (eds), *Die Zeit*. Munich: Oldenburg Verlag, 133-44.
- Atkinson, P. 1981: Time and cool patients. In P. Atkinson and C. Heath (eds), *Medical Work, Realities and Routines*. Westmead, Hants: Gower, 41-54.
- Ballard, E. 1975: 'Alms for oblivion'. An essay on objective time and experienced time. In P. H. Bossert (ed.), *Phenomenological Perspectives. Historical and Systematic Essays in Honour of Herbert Spiegelberg*. The Hague: Martinus Nijhoff, 168-87.
- Ball, R. S. 1892: *Time and Tide. A Romance of the Moon*, London: Society for Promoting Christian Knowledge.
- Ball, S., Hull, R., Skelton, M. and Tudor R. 1984: The tyranny of the 'Devil's Mill': time and task at school. In S. Delamont (ed.), *Readings on Interaction in the Classroom*. London: Methuen, 41-57.
- Barnett, L. 1957: *The Universe and Dr. Einstein*. New York: William Sloane.
- Barnes, J. A. 1971: Time flies like an arrow. *MAN*, (NF) 6, 537-52.
- Bateson, G. 1980: *Mind and Nature: A Necessary Unity*. Glasgow: Fontana/Collins.
- Becker, E. 1973: *The Denial of Death*. New York: Free Press Macmillan.
- Berger, J. 1980: *About Looking*. London: Writers and Readers.
- Berger, J. 1984: *And Our Faces, My Heart, Brief as Photos*. London: Writers and Readers.
- Berger, P., Berger, B. and Kellner, H. 1974: *The Homeless Mind*. Harmondsworth: Penguin.
- Bergmann, W. 1981a: *Die Zeitstrukturen Sozialer Systeme: Eine systemtheoretische Analyse*. Berlin: Duncker & Humblot.
- Bergmann, W. 1981b: Zeit, Handlung und Sozialität bei G. H. Mead. In *Zeitschrift für Soziologie*, 10, 351-63.
- Bergmann, W. 1983: Das Problem der Zeit in der Soziologie: Ein Literaturüberblick zum Stand der 'zeitsoziologischen' Theorie und Forschung. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 35, 462-504.
- Bergson, H. 1910: *Time and Free Will*. London: Swan Sonnenschein.
- Blumenberg, H. 1979: *Arbeit am Mythos*. Frankfurt am Main: Suhrkamp.
- Blyton, P. 1985: *Changes in Working Time: An International Review*. London: Croom Helm.
- Bohm, D. 1983: *Wholeness and the Implicate Order*. London: ARK.
- Booth, N. S. Jr. 1975: Time and change in African traditional thought. In *Journal of Religion in Africa*, 7, 81-91.
- Bossert, P. H. 1975: *Phenomenological Perspectives. Historical and Systematic Essays in Honour of Herbert Spiegelberg*. The Hague: Martinus Nijhoff.
- Bourdieu, P. 1979: *Algeria 1960*. Cambridge: Cambridge University Press.
- Bourke, V. J. (ed.) 1983: *The Essential Augustine*. Indianapolis: Hackett.
- Braudel, F. 1980: *On History*, transl. S. Matthews. London: Weidenfeld and Nicolson.
- Briggs, J. P. and Peat, F. D. 1985: *Looking Glass Universe. The Emerging Science of Wholeness*. London: Fontana.
- Brown, F. A. Jr., Hastings, J. W. and Palmer, J. D. 1970: *The Biological Clock*. New York: Academic Press.
- Buckely, P. and Peat, D. F. 1979: *A Question of Physics. Conversations in Physics and Biology*. Toronto: University of Toronto Press.
- Buckley, W. 1967: *Sociology and Modern Systems Theory*. New Jersey: Prentice Hall.
- Burger, H. (ed.) 1986: *Zeit Natur und Mensch*. Berlin: Berlin Verlag.
- Cancik, H. 1983: Die Rechtfertigung Gottes durch den 'Fortschritt der Zeiten'. Zur Differenz jüdisch-christlicher und hellenisch-römischer Zeit- und Geschichtsvorstellungen. In A. Peisl and A. Mohler (eds), *Die Zeit*. Munich: Oldenburg Verlag.
- Capek, M. 1971: *Bergson and Modern Physics*. Dordrecht, Holland: Reidel.
- Capra, F., 1976: *The Tao of Physics*. London: Fontana.
- Capra, F. 1982: *The Turning Point*. London: Wildwood House.
- Carlstein, T. 1982: *Time Resources, Society and Ecology. On the Capacity for*

- Human Interaction in Space and Time*, vol. I: Pre-Industrial Societies. London: George Allen & Unwin.
- Carlstein, T., Parkes, D. and Thrift, N. (eds) 1978: 3 volumes: I. *Making Sense of Time*, II. *Human Activity and Time Geography*, III. *Time and Regional Dynamics*. London: Edward Arnold.
- Chew, G. F. 1968: 'Bootstrap': a scientific idea? *Science*, 161, 762-5.
- Clark, P. A. 1982: *A Review of the Theories of Time and Structure for Organisational Sociology*. Birmingham: The University of Aston Management Centre, Working Paper Series.
- Cloudsley-Thompson, J. L. 1961: *Rhythmic Activity in Animal Physiology and Behaviour*. London: Academic Press.
- Cloudsley-Thompson, J. L. 1980: *Biological Clocks. Their Functions in Nature*. London: Weidenfeld & Nicholson.
- Cloudsley-Thompson, J. L. 1981: Time sense of animals. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 296-311.
- Conrad-Martius, H. 1954: *Die Zeit*. Munich: Kösel.
- Coser, L. A. and Coser, R. L. 1963: Time perspective in social structure. In A. W. Gouldner and H. P. Gouldner (eds), *Modern Sociology. An Introduction to the Study of Human Interaction*. London: Rupert Hart-Davis, 638-51.
- Cottle, T. J. and Klineberg, S. L. 1974: *The Present of Things Future. Explorations of Time in Human Experience*. New York: Free Press, Macmillan.
- Couch, C. J. 1984: *Constructing Civilisations*. London: Jai Press.
- Critchlow, K. 1979: *Time Stands Still. New Light on Megalithic Science*. London: Gordon Fraser.
- Crook, J. H. 1980: *The Evolution of Human Consciousness*. Oxford: Clarendon Press.
- Cupitt, D. 1985: *Only Human*. London: SCM Press.
- Dawe, A. 1981: The Two Sociologies. In K. Thompson and J. Tunstall (eds), *Sociological Perspectives*. Harmondsworth: Penguin Education, 542-54.
- Delamont, S. and Galton, M. 1986: *Inside the Secondary Classroom*. London: Routledge & Kegan Paul.
- Denbigh, K. G. 1981: *Three Concepts of Time*. Berlin: Springer-Verlag.
- Dossey, L. 1982: *Space, Time and Medicine*. London: Shambala.
- Dunne, J. S. 1973: *Time and Myth. A Meditation on Storytelling as Exploration of Life and Death*. London: SCM Press Ltd.
- Durkheim, E. 1915: *The Elementary Forms of Religious Life. A Study in Religious Sociology*, transl. J. W. Swain. London: George Allen & Unwin.
- Eames, E. Ramsden 1973: Mead's concept of time. In W. R. Corti (ed.), *The Philosophy of George Herbert Mead*. Winterthur, Switzerland: Amriswiler Bucherei, 59-82.
- Edge, D. O. 1973: Technological metaphor. In D. O. Edge and J. N. Wolfe (eds), *Meaning and Control*. London: Tavistock, 31-59.
- Eigen, M. 1983: Evolution und Zeitlichkeit. In A. Peisl and A. Mohler (eds), *Die Zeit*. Munich/Vienna: Oldenburg Verlag, 35-57.

- Eliade, M. 1959a: *Cosmos and History. The Myth of Eternal Return*, transl. W. R. Trask. New York: Harper & Row.
- Eliade, M. 1959b: *The Sacred and the Profane*, transl. W. R. Trask. New York: Harper & Row.
- Eliade, M. 1965: *The Two and the One*, transl. W. R. Trask. London: Harvill.
- Elias, N. 1982a: Über die Zeit, transl. H. Fliessbach and M. Schröter. *Merkur*, XXXVI, 9, 841-56.
- Elias, N. 1982b: Über die Zeit (Part 2), transl. H. Fliessbach and M. Schröter. *Merkur*, XXXVI, 10, 998-1016.
- Elias, N. 1984: *Über die Zeit*, transl. H. Fliessbach and M. Schröter. Frankfurt a. M.: Suhrkamp.
- Evans-Pritchard, E. E. 1969: *The Nuer* (first published 1940). Oxford: Oxford University Press.
- Evans-Wentz, W. Y. (ed.) 1957: *The Tibetan Book of the Dead*. Oxford: Oxford University Press.
- Feather, N. 1959: *An Introduction to the Physics of Mass, Length and Time*. Edinburgh: Edinburgh University Press.
- Fischer, R. 1981: Biological Time. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 357-82.
- Folkard, S. and Monk T. (eds) 1985: *Hours of Work. Temporal Factors in Work Scheduling*. Chichester: John Wiley.
- Fraisse, P. 1979: Time in psychology. In F. Greenaway (ed.), *Time and the Sciences*. Paris: UNESCO, 71-84.
- Frankenberg, R. 1988: Your time or mine? An anthropological view of the tragic temporal contradictions of biomedical practice. In M. Young and T. Schuller (eds), *The Rhythms of Society*. London and New York: Routledge, 118-153.
- Franz, M.-L. v. 1970: *Zahl und Zeit. Psychologische Überlegungen zu einer Annäherung von Tiefenpsychologie und Physik*. Stuttgart: Ernst Klett Verlag.
- Fraser, J. T. 1975: *Of Time, Passion and Knowledge. Reflections on the Strategy of Existence*. New York: George Braziller.
- Fraser, J. T. (ed.) 1981a: *The Voices of Time. A cooperative survey of man's view of time as expressed by the sciences and the humanities*, sec. edition. Amherst: University of Massachusetts Press.
- Fraser, J. T. 1981b: Towards an Integrated Understanding of Time. Introduction to the Second Edition, *The Voices of Time*. Amherst: University of Massachusetts Press, xxv-xlix.
- Fraser, J. T. 1982: *The Genesis and Evolution of Time*. Brighton: Harvester Press.
- Fraser, J. T. 1987: *Time the Familiar Stranger*. Amherst: University of Massachusetts Press.
- Fraser, J. T., Haber, F. C. and Mueller, G. H. (eds) 1972: *The Study of Time I*. Berlin: Springer-Verlag.
- Fraser, J. T. and Lawrence, N. (eds) 1975: *The Study of Time II*. Berlin: Springer-Verlag.
- Fraser, J. T., Lawrence, N. and Park, D. (eds) 1978: *The Study of Time III*. Berlin: Springer-Verlag.

- Fraser, J. T., Lawrence, N. and Park, D. (eds) 1981: *The Study of Time IV*. Berlin: Springer-Verlag.
- Friedlander, E. 1965: *Psychology in Scientific Thinking*. New York: Philosophical Library.
- Fröbe-Kapteyn, O. (ed.) 1952: *Mensch und Zeit. ERANOS Jahrbuch XX*. Zurich: Rhein-Verlag.
- Fromm, E. 1980: *The Fear of Freedom* (first published 1942). London: Routledge & Kegan Paul.
- Gale, R. M. (ed.) 1978: *The Philosophy of Time*. Brighton: Harvester Press.
- Gardner, M. 1982: *The Ambidextrous Universe. Mirrors, Asymmetry and Time-reversed Worlds*, 2nd edn. Harmondsworth: Penguin.
- Gebser, J. 1986: *Ursprung und Gegenwart*, 3 volumes, 2nd edn. Munich: Deutscher Taschenbuch Verlag.
- Geiger, T. 1970: *Vorstudien zu einer Soziologie des Rechts*. Berlin: Luchterhand.
- Geyer, R. F. and Zouwen J. van der, (eds) 1978: *Sociocybernetics: An Actor Orientated Social Systems Approach*. The Hague: Martinus Nijhoff.
- Giddens, A. 1976: *New Rules of Sociological Method*. London: Hutchinson.
- Giddens, A. 1979: *Central Problems in Social Theory. Action, Structure and Contradiction in Social Analysis*. London: Macmillan.
- Giddens, A. 1981: *A Contemporary Critique of Historical Materialism. Power, Property and the State*. London: Macmillan.
- Giddens, A. 1984: *The Constitution of Society. Outline of the Theory of Structuration*. Cambridge: Polity Press.
- Giddens, A. 1987: Time and social organisation. In *Social Theory and Modern Sociology*. Cambridge: Polity Press, 140-65.
- Glaser, B. G. and Strauss, A. L. 1980: *Awareness of Dying*. New York: Aldine.
- Gorman, B. S. and Wessman, A. E. (eds) 1977: *The Personal Experience of Time*. New York: Plenum Press.
- Grant, J. and Wilson, C. (eds) 1980: *The Book of Time*. Westbridge: Westbridge Books.
- Greenaway, F. (ed.) 1979: *Time and the Sciences*. Paris: UNESCO.
- Green, H. B. 1972: Temporal attitudes of four Negro subcultures. In J. T. Fraser, F. C. Haber and G. H. Mueller (eds), *The Study of Time I*. Berlin: Springer-Verlag, 402-17.
- Grof, S. 1985: *Beyond the Brain. Birth, Death, and Transcendence in Psychotherapy*. Albany, NY: State University of New York Press.
- Grof, S. and Grof, C. 1980: *Beyond Death. The Gates of Consciousness*. London: Thames and Hudson.
- Gunnell, J. B. 1968: *Political Philosophy and Time*. Middletown, Conn.: Wesleyan University Press.
- Gurvitch, G. 1963: Social structure and the multiplicity of times. In E. A. Tiryakian (ed.), *Sociological Theory, Values, and Sociocultural Change*. London: The Free Press of Glencoe, 171-85.
- Gurwitsch, A. 1922: Über den Begriff des embryonalen Feldes. *Archiv für Entwicklungsmechanik*, 51, 383-415.

- Hägerstrand, T. 1975: *Dynamic Allocation of Urban Space*. Farnborough: Saxon House.
- Hägerstrand, T. 1985: Time and culture. In G. Kirsch, P. Nijkamp and K. Zimmermann (eds), *Time Preferences: An Interdisciplinary Theoretical and Empirical Approach*. Berlin: Wissenschaftszentrum, 1-15.
- Hamner, K. C. 1981: Evidence for the Biological Clock. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 281-95.
- Hampe, J. C. 1979: *To Die is Gain. The Experience of One's Own Death*, transl. M. Kohl. London: Darton Longman & Todd.
- Hawking, S. W. 1988: *A Brief History of Time. From the Big Bang to Black Holes*. London and New York: Bantam Press.
- Hegel, G. W. F. 1952: *Phänomenologie des Geistes* (first published 1807). Hamburg: Felix Meiner Verlag.
- Hegel, G. W. F. 1967: *The Phenomenology of Mind*, transl. J. B. Baillie. New York: Harper and Row.
- Heidegger, M. 1960: *Sein und Zeit* (first published 1927). Tübingen: Max Niemeyer Verlag.
- Heidegger, M. 1972: *On Time and Being*, transl. J. Stambaugh. New York: Harper & Row.
- Heidegger, M. 1980: *Being and Time* (first published 1927), transl. J. Macquarrie and E. Robinson. Oxford: Blackwell.
- Heim, A. 1892, Notizen über den Tod durch Absturz. *Jahrbuch des Schweizer Alpenklub*, 27: 327.
- Heinemann, G. (ed.) 1986: *Zeitbegriffe. Ergebnisse des interdisziplinären Symposiums 'Zeitbegriff der Naturwissenschaften, Zeiterfahrung und Zeitbewusstsein'*. Freiburg: Karl Alber Verlag.
- Heinemann, K. and Ludes P. 1978: Zeitbewusstsein und Kontrolle der Zeit. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Sonderheft 20/78, 221-43.
- Heirich, M. 1964: The use of time in the study of social change. *American Sociological Review*, 29, 386-397.
- Hildebrandt, G. (ed.) 1976: *Biologische Rhythmen und Arbeit*. Berlin: Springer-Verlag.
- Hoagland, H. 1981: Some biochemical considerations of time. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 312-29.
- Hohn, H.-W. 1984: *Die Zerstörung der Zeit. Wie aus einem göttlichen Gut eine Handelsware wurde*. Frankfurt a. M.: Fischer Alternativ.
- Hopkins, H. 1982: *The Subjective Experience of Time with Particular Reference to Time-Bound Institutions*. PhD thesis, University of Lancaster.
- Horton, R. 1967: African traditional thought and Western science. *Afrika*, 37, 176-9.
- Huber, B. 1972: Some thoughts on creating the future. *Sociological Inquiry*, 44, 29-39.
- Husserl, E. 1964: *The Phenomenology of Internal Time Consciousness*, transl. J. S. Churchill. The Hague: Martinus Nijhoff.

- Illich, I. 1976: *Limits to Medicine*. London: Marion Boyars.
- Infeld, L. 1953: Albert Einstein. In *Makers Of Modern Science*. New York: Charles Scribner.
- Ingold, T. 1986: *Evolution and Social Life*. Cambridge: Cambridge University Press.
- Jahoda, M., Lasarsfeld, F. P. and Zeisl, H. 1978: *Die Arbeitslosen von Marienthal* (first published 1932). Frankfurt a. M.: Suhrkamp.
- Jantsch, E. 1985: *The Self-organizing Universe. Scientific and Human Implications of the Emerging Paradigm of Evolution*. Oxford: Pergamon Press.
- Jaques, E. 1982: *The Form of Time*. London: Heinemann.
- Joas, H. 1985: *G. H. Mead. A Contemporary Re-examination of his Thought*, transl. R. Meyer. Cambridge: Polity Press.
- Jones, R. S. 1983: *Physics as Metaphor*. London: Abacus.
- Kalmus, H. 1981: Organic evolution and time. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 330-52.
- Kastenbaum, R. 1961: The dimensions of future time perspective. An experimental analysis. In *Journal of General Psychology*, 65, 203-18.
- Kaufmann, F.-X. 1970: *Sicherheit als soziologisches und sozialpolitisches Problem*. Stuttgart: Enke.
- Keenoy, T. 1985: *Invitation to Industrial Relations*. Oxford: Blackwell.
- Kerenyi, K. and Jung, C. G. 1970: *An Introduction to the Science of Mythology*, transl. R. F. C. Hull. London: Routledge & Kegan Paul.
- Kern, S. 1983: *The Culture of Time and Space 1880-1918*. London: Weidenfeld & Nicolson.
- Kinget, G. M. 1975: *On Being Human. A Systematic View*. New York: Harcourt Brace Jovanovich.
- Klages, L. 1934: *Vom Wesen des Rhythmus*. Kampen auf Sylt: Kampmann.
- Korzybski, A. 1924: *Time-binding: The General Theory*. Lakeville, Conn.: The International Non-Aristotelian Library.
- Koselleck, R. 1985: *Vergangene Zukunft. Zur Semantik geschichtlicher Zeiten*. Frankfurt a. M.: Suhrkamp.
- Kübler-Ross, E. 1971: *Interviews mit Sterbenden*. Stuttgart: Kreuz Verlag.
- Kübler-Ross, E. 1986: *On Death and Dying*. London: Tavistock.
- Landes, D. S. 1983: *Revolution in Time. Clocks and the Making of the Modern World*. Cambridge, Mass.: Harvard University Press.
- Landsberg, P. T. (ed.) 1982: *The Enigma of Time*. Bristol: Adam Hilger.
- Larson, D. B. 1965: *New Light on Space and Time*. Portland Oregon: North Pacific.
- Lauer, R. H. 1981: *Temporal Man. The Meaning and Uses of Social Time*. New York: Praeger.
- Lawick-Goodall, J. van 1971: *In the Shadow of Man*. Boston: Houghton Mifflin.
- Lawrence, N. 1978: Levels of language in discourse about time. In J. T. Fraser, N. Lawrence and D. Park (eds), *The Study of Time III*. Berlin: Springer-Verlag, 22-52.
- Leach, E. A. 1968: Two essays concerning the symbolic representation of time. In E. A. Leach, *Rethinking Anthropology*, London: Athlone Press, 124-36.

- Leonard, G. 1981: *The Silent Pulse*. New York: Bantam.
- LeShan, L. L. 1952: Time orientation and social class. In *Journal of Abnormal and Social Psychology*, 47, 589-92.
- Lessnoff, M. 1979: *The Structure of Social Science*. London: George Allen & Unwin.
- ✓ Levine, R. V., West, L. J. and Reis, H. T. 1980: Perceptions of time and punctuality in the United States and Brazil. *Journal of Personality and Social Psychology*, 38, 541-50.
- ✓ Levine, R. V. and Wolff, E. 1985: Social time: The heartbeat of culture. To understand a society, you must learn its sense of time. *Psychology Today*, 1985, 29-35.
- Lévi-Strauss, C. 1966: *The Savage Mind*. London: Weidenfeld & Nicolson.
- Lévi-Strauss, C. 1978: *Structural Anthropology*. Harmondsworth: Penguin.
- Lewis, J. D. and Weigert, A. J. 1981: Structures and meanings of social time. *Social Forces*, 60, 433-62.
- Lifton, R. J. 1969: *Death in Life*. New York: Vintage.
- Lifton, R. J. and Olson, E. 1974: *Living and Dying*. New York: Praeger.
- Lovejoy, A. O. 1960: *The Great Chain of Being. A Study of the History of Ideas* (first published in 1936). New York: Harper.
- Lovelock, J. E. 1979: *Gaia. A New Look at Life on Earth*. Oxford: Oxford University Press.
- Lucas, J. R. 1973: *A Treatise on Time and Space*. London: Methuen.
- Luce, G. G. 1977: *Body Time. The Natural Rhythms of the Body*. St. Albans, Herts: Paladin.
- Lüscher, K. K. 1974: Time: a much neglected dimension in social theory and research. *Sociological Analysis and Theory*, 4, 104-17.
- Luhmann, N. 1971a: *Politische Planung. Aufsätze zur Soziologie von Politik und Verwaltung*. Opladen: Westdeutscher Verlag.
- Luhmann, N. 1971b: Die Knappheit der Zeit und die Vordringlichkeit des Befristeten. In *Politische Planung*. Opladen: Westdeutscher Verlag, 143-64.
- Luhmann, N. 1978: Temporalization of complexity. In R. F. Geyer and J. van der Zouwen (eds), *Sociocybernetics. An Actor-Orientated Social Systems Approach*. London: Martinus Nijhoff, 92-113.
- Luhmann, N. 1979: Zeit und Handlung - Eine vergessene Theorie. *Zeitschrift für Soziologie*, 8, 63-81.
- Luhmann, N. 1980: *Gesellschaftsstruktur und Semantik. Studien zur Wissenssoziologie der modernen Gesellschaft*. Frankfurt a. M.: Suhrkamp.
- Luhmann, N. 1982a: *The Differentiation of Society*, transl. S. Holmes and C. Larmore. New York: Columbia University Press.
- Luhmann, N. 1982b: The future cannot begin. Temporal structures in modern society. In *The Differentiation of Society*. New York: Columbia University Press, 271-89.
- Luhmann, N. 1982c: World-time and system history. In *The Differentiation of Society*. New York: Columbia University Press, 289-324.
- Lukes, S. 1978: Methodological individualism reconsidered. In A. Ryan (ed.), *The Philosophy of Social Explanation*. Oxford: Open University Press, 119-29.

- Lyman, S. M. and Scott, M. B. 1970: *A Sociology of the Absurd*. New York: Appleton-Century-Crofts.
- Lynd, R. S. and Lynd, H. M. 1929: *Middletown. A Study of Contemporary American Culture*. New York: Harcourt, Brace.
- Lynd, R. S. and Lynd, H. M. 1937: *Middletown in Transition. A Study of Cultural Conflicts*. London: Constable.
- Mandelbaum, M. 1978: Societal facts. In A. Ryan (ed.), *The Philosophy of Social Explanation*. Oxford: Open University Press, 105-118.
- Mannheim, K. 1972: *Ideology and Utopia* (first published 1936). London: Routledge & Kegan Paul.
- Marcuse, H. 1966: *Eros and Civilisation. A Philosophical Inquiry into Freud*. London: Allan Lane.
- Martins, H. 1974: Time and theory in sociology. In J. Rex (ed.), *Approaches to Sociology. An Introduction to Major Trends in British Sociology*. London: Routledge & Kegan Paul, 246-96.
- Mbiti, J. S. 1985: *African Religions and Philosophy* (first published 1969). London: Heinemann.
- ✓ McCann, J. 1970: *The Rule of St. Benedict*. London: Sheed and Ward.
- McTaggart, J. M. E. 1927: *The Nature of Existence*, vol. II, book V. Cambridge: Cambridge University Press.
- McTaggart, J. M. E. 1968: Time. In R. M. Gale (ed.), *The Philosophy of Time*. Brighton: Harvester Press, 86-98.
- Mead, G. H. 1959: *The Philosophy of the Present* (first published 1932), A. E. Murphy (ed.), Preface by J. Dewey. La Salle, Ill.: Open Court.
- Mead, G. H. 1962: *Mind, Self and Society. From the Standpoint of a Social Behaviourist* (first published 1934), C. W. Morris (ed.). Chicago: University of Chicago Press.
- Mead, G. H. 1967: *The Philosophy of the Act* (first published 1938), C. W. Morris (ed.). Chicago: University of Chicago Press.
- Melbin, M. 1978: City rhythms. In J. T. Fraser, N. Lawrence and D. Park (eds), *The Study of Time III*. Berlin: Springer-Verlag, 444-70.
- Melbin, M. 1987: *Night as Frontier. Colonizing the World after Dark*. New York: Free Press, Macmillan.
- Melges, F. T. 1982: *Time and the Inner Future. A Temporal Approach to Psychiatric Disorders*. New York: Wiley.
- Merlau-Ponty, M. 1962: *Phenomenology of Perception*. London: Routledge & Kegan Paul.
- Michener, C. D. 1974: *The Social Behaviour of the Bees*. Cambridge Mass.: Harvard University Press.
- Michon, J. A. and Jackson, J. L. (eds) 1985: *Time, Mind, and Behaviour*. Berlin and New York: Springer-Verlag.
- Michon, J. A. 1985: The compleat time experimenter. In J. A. Michon and J. L. Jackson *Time, Mind, and Behaviour*. Berlin and New York: Springer-Verlag, 20-52.
- Mitford, J. 1963: *The American Way of Death*. New York: Fawcett.
- Moody, R. 1977: *Leben nach dem Tod*. Reinbek: Rowohlt.

- ✓ Moore, W. E. 1963: *Man, Time and Society*. New York: John Wiley.
- Moore, W. E. 1974: *Social Change*. New York: Prentice Hall.
- Needham, J. 1981: Time and knowledge in China and the West. In J. T. Fraser (ed.) *The Voices of Time*. Amherst: University of Massachusetts Press, 92-135.
- Needham, J. 1988: Time and Eastern Man. *Cultural Dynamics*, 1, 62-75.
- Neisser, U. 1976: *Cognition and Reality. Principles and Implications of Cognitive Psychology*. San Francisco: W. H. Freeman.
- Nichols, H. 1891: The psychology of time. *American Journal of Psychology*, 3, 453-529.
- Nietzsche, F. 1980: Kritische Studienausgabe in 15 Bänden, G. Colli and M. Montinari (eds). Munich: Deutscher Taschenbuch Verlag.
- Nowotny, H. 1975: Time structuring and time measurement. On the interrelation between timekeepers and social time. In J. T. Fraser and N. Lawrence (eds), *The Study of Time II*. Berlin: Springer-Verlag, 325-42.
- Nowotny, H. 1985: From the future to the extended present: time in social systems. In G. Kirsch, P. Nijkamp and K. Zimmermann (eds), *Time Preferences: An Interdisciplinary Theoretical and Empirical Approach*. Berlin: Wissenschaftszentrum, 1-21.
- Nowotny, H. 1989: *Eigenzeit. Entstehung und Strukturierung eines Zeitgefühls*. Frankfurt a. M.: Suhrkamp.
- Noyes, R. 1971: Dying and mystical consciousness. *Journal of Thanatology*, 1, 25-58.
- Noyes, R. 1972: The Experience of dying. In *Psychiatry*, 35, 174-203.
- Oakeshott, M. 1985: *On History and Other Essays*. Oxford: Blackwell.
- Ornstein, R. 1972: *The Psychology of Consciousness*. San Francisco: W. H. Freeman.
- Ornstein, R. 1975: *On the Experience of Time*. New York: Penguin Books.
- Osis, K. and Haraldsson, E. 1982: *Der Tod: Ein Neuer Anfang. Visionen und Erfahrungen an der Schwelle des Seins*. Freiburg: Bauer Verlag.
- Ouspensky, P. D. 1959: *Tertium Organum*. New York: Knopf.
- Pattman, R. 1985: *Concepts of Time and Labour in Marxism, 19th Century Political Economy and Reformation Protestant Theology*. Unpublished paper.
- Payk, T. R. 1979: *Mensch und Zeit. Chronopathologie im Grundriss*. Stuttgart: Hippokrates Verlag.
- Peisl, A. and Mohler, A. (eds) 1983: *Die Zeit*. Munich: Oldenburg Verlag.
- Pelletier, K. R. 1982: *Unser Wissen vom Bewusstsein*, transl. W. Stifter. Munich: Kösel Verlag. (Originally published 1978, *Toward a Science of Consciousness*. New York: Dell.).
- Petri, H. and Zepf, I. (eds) 1982: *Geht uns die Zeit verloren? Beiträge zum Zeitbewusstsein*. Bochum: Studienverlag Dr. N. Brockmeyer.
- Phipps, E. W. J. 1980: Bodytime. In J. Grant and C. Wilson (eds), *The Book of Time*. Westbridge: Westbridge Books, 128-60.
- Piper, M. 1978: *Erwachsenenalter und Lebenslauf: Zur Soziologie der Lebensstufen*. Munich: Kösel Verlag.
- Pirsig, R. M. 1979: *Zen and the Art of Motorcycle Maintenance*. London: Corgi.
- Plessner, H. 1952: Über die Beziehung der Zeit zum Tode. In O. Fröbe-Kapteyn

- (ed.) *Eranos Jahrbuch 1951. Band XX. Mensch und Zeit*. Zurich: Rhein Verlag, 349-86.
- Popper, K. R. 1979: *The Poverty of Historicism*. London: Routledge & Kegan Paul.
- Portmann, A. 1952: Die Zeit im Leben der Organismen. In O. Froebe-Kapteyn (ed.), *Eranos Jahrbuch 1951. Band XX. Mensch und Zeit*. Zurich: Rhein Verlag, 437-58.
- Powers, J. 1982: *Philosophy and the New Physics*. New York: Methuen.
- Prigogine, I. 1980: *From Being to Becoming. Time and Complexity in the Physical Sciences*. San Francisco: W. H. Freeman.
- Prigogine, I. and Stengers, I. 1984: *Order out of Chaos. Man's New Dialogue with Nature*. London: Heinemann.
- Rammstedt, O. 1975: Alltagsbewusstsein von Zeit. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 27, 47-63.
- Rawlence, C. 1985: *About Time*. Based on the Channel 4 Television Series. London: Jonathan Cape.
- Reinberg, A., Andlauer, P., DePrins, J., Malbecq, W., Vieux, N. and Bourdeleau, P., 1984: Desynchronisation of the oral temperature. Circadian rhythm and intolerance to shift work. *Nature*, 308, 272-4.
- Ridley, B. K. 1980: *Time, Space and Things*. Harmondsworth: Penguin.
- Rifkin, J. and Howard, T. 1985: *Entropy. A New World View*. London: Paladin.
- Rifkin, J. 1987: *Time Wars. The Primary Conflict in Human History*. New York: Henry Holt.
- Rinderspracher, J. P. 1985: *Gesellschaft ohne Zeit. Individuelle Zeitverwendung und soziale Organisation der Arbeit*. Frankfurt a. M.: Campus Verlag.
- Rosen, R., Pattee, H. H. and Somorjai, R. L. 1979: A symposium in theoretical biology. In P. Buckley and D. F. Peat (eds), *A Question of Physics. Conversations in Physics and Biology*. Toronto: University of Toronto Press, 84-123.
- Roth, J. A. 1976: *Timetables. Structuring the Passage of Time in Hospital Treatment and other Careers*. Indianapolis: Bobbs-Merrill.
- Russell, J. L. 1981: Time in Christian thought. In J. T. Fraser (ed.), *The Voices of Time*. Amherst: University of Massachusetts Press, 59-77.
- Rutenfranz, J. 1978: Arbeitsphysiologische Grundprobleme von Nacht- und Schichtarbeit. *Rheinisch-Westfälische Akademie der Wissenschaften, Vorträge N 275*. Berlin: Westdeutscher Verlag, 1-50.
- Ryan, A. 1979: *The Philosophy of the Social Sciences*. London: Macmillan.
- Saussure, F. de 1960: *Course in General Linguistics*, C. Bally, A. Sechehaye and A. Reidlinger (eds). London: Peter Owen.
- Schaltenbrand, G. (ed.) 1963: *Zeit in nervenärztlicher Sicht*. Stuttgart: Ferdinand Enke Verlag.
- Schmied, G. 1985: *Soziale Zeit. Umfang, 'Geschwindigkeit' und Evolution*. Berlin: Duncker & Humblot.
- Schöps, M. 1980: *Zeit und Gesellschaft*. Stuttgart: Ferdinand Enke Verlag.
- Schon, D. A. 1963: *Displacement of Concepts*. London: Tavistock.
- Schuller, T. 1984: *A Chronosociological Approach to Employee Participation*. Unpublished paper.
- Schuller, T. 1986: *Serving Time: 60,000 Hours at Fords*. Unpublished paper.

- Schutz, A. 1971: *Collected Papers. Vol. I, The Problem of Social Reality*, M. Natanson (ed.). The Hague: Martinus Nijhoff.
- Schutz, A. and Luckmann, T. 1973: *The Structures of the Life-World*, transl. R. M. Zaner and H. T. Engelhardt Jr.. London: Heinemann.
- Schwartz, B. 1979: Waiting, exchange and power: the distribution of time in social systems. *American Journal of Sociology*, 79, 841-70.
- Shallis, M. 1983: *On Time. An Investigation into Scientific Knowledge and Human Experience*. Harmondsworth: Penguin.
- Sheldrake, R. 1983: *A New Science of Life*. London: Paladin.
- Sheldrake, R. 1985: Collective memory, time and evolution. In C. Rawlence (ed.), *About Time*. London: Jonathan Cape, 194-202.
- Sheldrake, R. 1986: A new approach to biology. In S. Kumar (ed.), *The Schumacher Lectures Vol. II*. London: Sphere, 202-18.
- Simmel, G. 1980: The problem of historical time. In *Essays on Interpretation in Social Science*, transl. G. Oakes. Manchester: Manchester University Press, 127-45.
- Spengler, O. 1926: *The Decline of the West*. New York: Knopf.
- Sorokin, P. A. 1964: *Sociocultural Causality, Space and Time. A Study of Referential Principles of Sociology and Social Science*. New York: Russell & Russell.
- Sorokin, P. A. and Merton, R. K. 1937: Social time: A methodological and functional analysis. *The American Journal of Sociology*, 42, 615-29.
- St. Augustine 1978: Some questions about time. In R. M. Gale (ed.), *The Philosophy of Time*. Brighton: Harvester Press, 38-55.
- Stacey, M., Batstone, E., Bell, C. and Murcott, A. 1975: *Power, Persistence and Change. A Second Study of Banbury*. London: Routledge & Kegan Paul.
- Staikov, Z. (ed.) 1982: *It's About Time*. Sofia, Bulgaria: Bulgarian Sociological Association.
- Starkey, K. 1988: Time and work organisation: a theoretical and empirical analysis. In M. Young and T. Schuller (eds), *The Rhythms of Society*. London and New York: Routledge, 95-117.
- Stegmüller, W. 1969: *Hauptströmungen der Gegenwart*. Stuttgart: Alfred Körner Verlag.
- Stüttgen, A. 1988: *Heimkehr zum Rhythmus*. Munich: Friedrich Pfeil.
- Sudnow, D. 1967: *Passing On. The Social Organisation of Dying*. Englewood Cliffs, NJ: Prentice-Hall.
- Teilhard de Chardin, P. 1959: *The Phenomenon of Man*. London: Collins.
- Tiryakian, E. A. 1970: Structural sociology. In J. C. McKinney and E. A. Tiryakian (eds), *Theoretical Sociology. Perspectives and Developments*. New York: Appleton-Century-Crofts, 111-36.
- Thom, A. 1967: *Megalithic Sites in Britain*. Oxford: Oxford University Press.
- Thompson, E. P. 1967: Time, work-discipline, and industrial capitalism. *Past and Present*, 36, 57-97.
- Thrift, N. 1985: Review article, A. Giddens: The constitution of society. *Sociology*, 19, 609-24.
- Toda, M. 1978: The boundaries of the notion of time. In J. T. Fraser, N. Lawrence and D. Park (eds), *The Study of Time III*. Berlin: Springer

- Verlag, 370-90.
- Vester, F. 1979: Time and biology. In F. Greenaway (ed.), *Time and the Sciences*. Paris: UNESCO, 53-70.
- Waddington, C. H. 1957: *The Strategy of Genes*. London: Allen & Unwin.
- Waddington, C. H. 1959: *Towards a Theoretical Biology*. Edinburgh: Edinburgh University Press.
- Walker, R. C. S. 1982: *Kant*. London: Routledge & Kegan Paul.
- Weber, M. 1989: *The Protestant Ethic and the Spirit of Capitalism* (first published 1930), transl. T. Parsons. London: Unwin Hyman.
- Weigert, A. J. 1981: *Sociology of Everyday Life*. London: Longman.
- Weiss, P. 1939: *Principles of Development*. New York: Holt.
- Weiss, P. 1973: *The Science of Life*. Mount Kisco, NY: Futura.
- Wendorff, R. 1980: *Zeit und Kultur. Geschichte des Zeitbewusstseins in Europa*. Wiesbaden: Westdeutscher Verlag.
- Wendorff, R. 1984: *Dritte Welt und Westliche Zivilisation. Grundprobleme der Entwicklungspolitik*. Wiesbaden: Westdeutscher Verlag.
- Wessman, A. E. and Gorman, B. S. 1977: The emergence of human awareness and concepts of time. In B. S. Gorman and A. E. Wessman (eds), *The Personal Experience of Time*. New York: Plenum Press, 1-58.
- Wever, R. 1979: *The Circadian System of Man*. New York: Springer-Verlag.
- Whitehead, A. N. 1969: *Process and Reality* (First published 1929). New York: Free Press.
- Whitrow, G. J. 1959: *The Structure and Evolution of the Universe*. London: Hutchinson.
- Whitrow, G. J. 1980: *The Natural Philosophy of Time*. Oxford: Clarendon Press.
- Whitrow, G. J. 1988: *Time in History. The Evolution of our General Awareness of Time and Temporal Perspective*. Oxford: Oxford University Press.
- Whorf, B. L. 1956: *Language, Thought and Reality*. Cambridge, Mass.: MIT Press.
- Wilson, E. O. 1971: *The Insect Societies*. Cambridge, Mass.: The Belknap Press of Harvard University Press.
- Yaker, H. 1972: Time in the biblical and Greek worlds. In H. Yaker, H. Osmond and F. Cheek (eds), *The Future of Time*. London: Hogarth Press, 15-36.
- Yaker, H., Osmond, H. and Cheek F. (eds) 1972: *The Future of Time*. London: Hogarth Press.
- Young, M. 1988: *The Metronomic Society*. London: Thames and Hudson.
- Young, M. and Schuller, T. 1988: *The Rhythms of Society*. London and New York: Routledge.
- Young, M. and Schuller, T. 1990: *Life after Work*. In press.
- Zerubavel, E. 1979: *Patterns in Hospital Life*. Chicago: University of Chicago Press.
- Zerubavel, E. 1981: *Hidden Rhythms. Schedules and Calendars in Social Life*. Chicago: Chicago University Press.
- Zerubavel, E. 1985: *The Seven Day Cycle. The History and Meaning of the week*. New York: Free Press Macmillan.
- Zohar, D. 1983: *Through the Time Barrier. A Study in Precognition and Modern Physics*. London: Paladin.

Index

- A-series of time (McTaggart) 20-2, 23, 24, 76
- absence and presence, in social relations 117
- absolute time (Newton) 50-1, 66
- act/action distinction (Schutz) 35-6
- Adam, B. E. 15, 23, 25, 34, 43, 90, 93, 134
- ageing 70, 89, 98-9
- alienation 19
- allocative resources (Giddens) 118, 119
- ancient societies
- concepts of time 133-8
- see also traditional societies
- animals
- consciousness of time 79
- metaphoric function of 157
- anthropologists, studies of time 2, 96-8, 102-3, 134
- Archer, M. S. 85-6
- Aries, P. 131, 132
- art, prehistoric, as means of transcending time 137
- artefacts
- social nature of 156-7
- see also megaliths
- Aschoff, J. 74, 75
- atomic clocks 53
- Augustine, St 20, 33-4, 39, 144
- authoritative resources (Giddens) 118, 119
- authority, value of time linked to 114
- awareness of time see consciousness of time
- B-series of time (McTaggart) 20-1, 23, 24, 30, 56, 69, 70, 76, 152
- see also clock time
- Ball, R. S. 48
- Ball, S. 105
- bargaining, industrial 111-19
- Barnes, J. A. 152
- Barnett, L. 55
- Bateson, G. 78
- becoming see emergence of present
- Benedictine monks, timetables of 105-6
- Berger, J. 75, 81, 145-6, 157
- Bergmann, W. 10, 11, 12, 13, 14, 18, 21-2, 37, 42, 43, 44, 45, 53, 89, 94, 98, 123, 150, 155
- Bergson, H. 20, 24, 26, 27, 30, 31, 41, 44, 76, 82
- biological time 7, 49, 70-90, 166
- biorhythms 72-6
- Blumenberg, H. 135
- Blyton, P. 95, 111
- body clocks 72-6
- Bohm, D. 7, 67, 159, 160
- Boltzmann, L. 168
- 'bootstrapping' 153, 162
- boundaries, time 30, 32-3

- Bourdieu, P. 134
 Bourke, V. J. 33
 Brazil, punctuality in 108
 Briggs, J. P. 61, 153, 159
 Brown, F. A. 74
 buildings, symbols of future security 138-9
 bureaucracies, timetables in 106
 calendar time *see* clock time
 Cancik, H. 133
 Capek, M. 24
 capitalism, industrial
 deferred gratification and 125
 time and 111-13, 115-16, 118-19
 see also alienation;
 commodification of time
 Capra, F. 58, 59, 61, 67, 78, 153
 carers, timetables of 106-7
 Carlstein, T. 56, 156
 causality, time and 57-8
 change
 in classical physics 51
 in organisms 81-7
 and time 9, 11
 valued in traditional societies 97
 see also social change
 Chew, G. F. 153
 children
 deferred gratification 124
 sense of time 79
 China, clock measurement of time 115
 chronobiology 72
 circadian rhythms 74
 circle, symbolic function of 136
 Clark, P. A. 95
 classical physics
 continued dependence of social theory on 89-90, 152
 irrelevance to biological change 84
 treatment of time 50-5, 66, 67, 68
 clock time
 associated with natural time 150
 contrasted with biorhythms 75-6
 contrasted with 'time in events' 30, 32
 contrasted with time of intent 17
 effect of its emergence on human life 163
 exclusive concentration of social theorists on 3, 41
 in industrial societies 104-26
 interpretation of 5
 invariability of 106, 109, 117
 irrelevance to biological time 81
 reality denied by Mead 38, 41
 spacial characteristics 54, 76
 in studies of social change 101
 in studies of temporal orientation and perspective 96-7
 and time of myth and ritual 136
 in time-budget studies 95
 use by scientists 7
 see also B-series of time; *temps*
 clocks
 in classical physics 53-4
 as measure in studies of time perception 92
 as metaphor for time 157
 see also atomic clocks;
 physiological clocks
 Cloudsley-Thompson, J. L. 73, 74
 collective unconscious 130, 144
 commodification of time 10, 14-15, 19, 112-13, 115, 118-19, 132
 computers
 change in concept of future and 140
 as metaphors 157-8
 see also information
 consciousness
 of birth and death 30-2
 as a time dimension 22
 time formed by 15, 16-17
 see also self-consciousness; stream of consciousness
 consciousness of time 21, 156
 in contemporary physics 59-60
 in organisms 79-80
 see also experience of time
 conservation of energy 61-2
 control, social *see* social control

- control of time, social 110-20
 Coser, L. A. 13
 Coser, R. L. 13
 Cottle, T. J. 124, 133
 Couch, C. J. 133
 creation, human, as means of transcending time 136-8
 Critchlow, K. 135-6
 critical theory 5
 cultural differences, punctuality and 108
 Cupitt, D. 144
 currency, time as a 114, 115
 cycles of change, biological 78, 82-3
 cyclical time 17, 26, 133-8, 167-8
 daily life, use of time 94-6
Dasein 10, 14, 25, 26, 28, 30-1, 32, 76, 119, 120, 127, 128, 130, 131, 133, 142, 161, 165
 see also *durée*; *longue durée*
 death
 awareness of 135, 141
 experience of 127-33
 deferred gratification 124-5
 Delamont, S. 105, 106
 Denbigh, K. G. 48, 55, 77, 83
 diachronic analysis 6, 16, 45
 directionality of time *see* irreversibility of time; reversibility of time
 disorder, tendency of systems to 62-3, 67
 disputes, industrial 111-12
 dissipative structures 63-4, 65, 67, 68, 69, 82
 Dossey, L. 136
 dualisms, in treatment of time 16-19, 23-4, 41, 45, 46, 90, 149, 152
 Dunne, J. S. 128, 134
 duration, in classical physics 50
durée 10, 14, 24, 25-7, 28, 30, 41, 76, 118, 165
 see also *Dasein*; *longue durée*
 Durkheim, E. 13, 102, 154, 155
 dying
 attitudes to 131-2
 experience of 129-30
 ecological time (Evans-Pritchard) 96
 Edge, D. O. 158
 Eigen, M. 168-9
Eigenzeit (local time) 55-6, 81
 Einstein's theory of relativity 41, 55-7, 66, 81
 Eliade, M. 135
 Elias, N. 10, 12, 14, 15, 17-18, 21, 22-3, 28, 34, 37, 42, 45, 46, 53, 67, 128, 150, 151, 153, 155, 161, 162
 emergence of present 19, 24, 27, 38, 39-40, 100, 164
 see also presencing
 employment, time bargaining in 111-19
 'encapsulated past' (Oakeshott) 144, 145
 energy
 conversion of, in thermodynamic laws 61-2
 matter and, in quantum physics 58-9
 use by organisms 82
 use in machines 77
 entropy 62-3, 67, 68, 77, 82, 83
 equilibria of systems, variations in 63-4, 65
 eternal return, myth of 134
 Evans-Pritchard, E. E. 96, 97
 Evans-Wentz, W. Y. 129
 'events in time' 30, 67, 95
 see also 'time in events'
 evolutionary change 29, 82-3, 165-6
 exchange value of labour time 111-18
 experience of time 92-4, 92, 95
 by children 79
 see also consciousness of time
 Feather, N. 48
 feedback loops, in functioning of organisms 78, 81, 166
 finitude of existence 127-33, 141

- Fischer, R. 79, 88
 form, biological 83-6
 Foucault, M. 118, 143
 Fraisse, P. 92
 Frankenberg, R. 124
 Fraser, J. T. 53, 67, 74, 162
 functionalist approaches to time 11, 19, 42
 future
 actions as specific to 35
 attempts to control 138-42
 created in present 24
 fundamental to human time 21
 integral to natural time 23
 orientations to 96-7
 in quantum physics 59
 reality questioned 33-4
 see also protensions; waiting
 Futurists 139-40

 Gale, R. M. 33
 Galton, M. 105, 106
 Gardner, M. 63
 Gebser, J. 71, 149
 geographers, use of space-time 56, 66
 Germany
 idealist philosophy 5
 psychology of time 93
 punctuality in 108
 Giddens, A. 10, 11, 14-15, 16, 18, 19, 25-30, 37, 46, 98, 137, 138, 143-4, 146, 151, 152, 155, 165-6
 on biological time 70, 81, 88, 89
 on industrial time 111, 112, 113, 115, 117-20
 on repetition and reversibility of time 44, 62, 66, 134, 168
 theory of structuration 84, 85, 86
 on time-space distancing 56, 60, 117-18, 166-7
 Gorman, B. S. 93
 Greek philosophy, idealism/
 empiricism dualism 4
 Green, H. B. 98
 Grof, S. and C. 128, 129-30
 Gunnell, J. B. 43

 Gurvitch, G. 13, 110, 121-2
 Gurwitsch, A. 84

 Hägerstrand, T. 10, 56, 66, 97, 110, 138-9, 155
 Hampe, J. C. 129
 Haraldsson, E. 129
 Hawking, S. W. 48, 57
 Hegel, G. W. F. 9
 Heidegger, M. 10, 20, 28, 29, 30-1, 32, 41, 44, 76, 128, 130, 133, 136, 142, 146
 Heim, A. 129
 Heinemann, K. 13, 115-16, 117, 125
 Heirich, M. 100
 Heisenberg, W. K. 7
 hierarchical ordering of time
 levels 153, 161-2
 historical nature of human
 society 151
 historical time 2, 3
 historical understanding 147
 Hoagland, H. 79
 Hohn, H.-W. 14, 15, 17, 19, 89, 97, 111, 112, 113, 114, 116, 117, 118, 124-5, 139
 holographs, as metaphors 158-60
 home, timetables in the 106-7
 Hopi Indians, concept of time 22, 96
 Hopkins, H. 14, 15, 16-17, 19, 42, 152
 horizons, past and present as 31-3
 Horton, R. 97
 Howard, T. 62
 Huber, B. 97, 98
 human time 91-103
 Husserl, E. 20, 31-2, 42

 identity, loss of, on death 130
 Illich, I. 132
 'in time', existence 6, 30, 32
 industrial societies
 consciousness of time in 24, 27, 67
 social time in 104-26
 see also traditional societies

- Infeld, L. 49
 information
 increase/decrease with
 evolution/entropy 62, 63, 82, 83
 storage capacity of 117-18, 119
 storage in holograms 159-60
 time perception and exchange
 of 92
 see also computers
 Ingold, T. 24, 83
 insuring for the future 139
 integrative levels of time 162
 intent
 not unique to humans 34
 time axis of 17
 interactionism
 approaches to time 19
 social change in 101
 invariability of timetables and clock
 time 106, 109, 117
 irreversibility of energy
 transformations 62
 irreversibility of time 19, 40, 97, 167-8
 ageing and 99-100
 information exchange and 92
 see also reversibility of time

 Jahoda, M. 95
 Jantsch, E. 138
 Jaques, E. 10, 12, 14, 15, 17, 18, 20-1, 22, 34, 37, 44, 45, 152
 Jones, R. S. 48, 54, 57, 67, 75, 133
 Jung, C. 130, 144

 Kant, I. 20
 Kantian theory, treatment of
 time 12
 Kastenbaum, R. 96
 Kaufmann, F.-X. 97
 Keenoy, T. 111
 Kern, S. 139, 140
 Kinget, G. M. 156
 Klages, L. 81, 133, 136
 Klineberg, S. L. 124, 133
 Korzybski, A. 162

 Koselleck, R. 98, 142, 145
 Kübler-Ross, E. 129

 labour market, time bargaining
 in 111-19
 Landsberg, P. T. 48
 language
 existence of reality outside 155
 human awareness of time
 and 92-3
 Larson, D. B. 48
 lateness, punctuality and 108
 Lauer, R. H. 13, 14, 15, 18, 19, 44, 66, 124, 152
 Lawick-Goodall, J. van 102
 laws of nature and society 65, 151
 Leach, E. A. 97, 168
 lenses, as metaphors 158-9
 LeShan, L. L. 96
 Lessnoff, M. 151
 levels of time 44-5, 46, 68, 161-5, 164-5
 Lévi-Strauss, C. 10, 25, 27, 28, 29, 62, 66, 134, 137, 152
 Levine, R. V. 108
 life cycle 98-100
 life-plan 32
 life-spans of organisms 87-8
 life-world 32, 42
 light, speed of 57, 66
 linear time 134, 138, 167-8
 contrasted with cyclical time 17
 in studies of social change 101
 local time (*Eigenzeit*) 55-6, 81
longue durée 10, 14, 25, 26, 28, 165
 see also *Dasein*; *durée*
 Lovejoy, A. O. 162
 Luce, G. G. 72, 74, 79
 Luckmann, T. 32, 42, 44, 141, 150, 161
 Ludes, P. 13, 115-16, 117, 125
 Luhmann, N. 9, 11, 15, 18, 19, 23, 24, 25, 34, 36, 37, 44, 45, 49, 58, 60, 63, 65, 66, 97, 101, 116-17, 123, 146, 152
 Lukes, S. 81
 Lund School 66

- Lüscher, K. K. 13, 96
 Lynd, R. S. and H. M. 100
- McCann, J. 106
- machines
 in classical physics 52-3, 63
 lifespans contrasted with
 organisms' 71-2
 as metaphors 76-81, 157-8
 non-dissipation of energy in 63-4
 see also computers; steam engines
- McTaggart, J. M. E. 20-1, 22, 23,
 24, 30, 69
- Mandelbaum, M. 81
- Mannheim, K. 97
- Martins, H. 13, 100
- Marx, K. 10, 61, 111, 118, 119, 132,
 146
- Marxism
 approaches to time 19, 42
 theory of social change 101
- Mead, G. H. 10, 13, 19, 24-5, 30,
 31, 34, 35, 37-41, 42, 44, 45, 46,
 49, 60, 63, 67, 82, 86, 87, 100,
 101, 102, 143, 155, 156, 163-4
- measure, time as a 49, 50
- measurement of time 11, 17-18, 49
see also clocks
- mediating role of time, between
 goods and labour 118-19
- medical treatment
 dying and 132
 waiting for 124
- medieval period *see* Middle Ages
- megaliths, significance of 135-6
- Melges, F. T. 93
- memory
 human 26
 not unique to humans 34
- Merton, R. K. 13, 99, 102, 150, 155
- 'message-bearing survivals'
 (Oakeshott) 146
- metabolism, biological 78-9, 88
- metamorphosis, biological 83, 85-6
- metaphors for time 157-60
- Michener, C. D. 102
- Michon, J. A. 92
- Middle Ages
 change in concept of future 139
 familiarity with death 132
 monasteries, timetables in 105-6
 money value of time 113-14
- Moody, R. 129
- Moore, W. E. 9, 13, 19, 66, 95,
 98-9, 101, 106, 123
- morphogenesis 83-5
- mortality, awareness of 127-33
- motion, connection with time, in
 classical physics 50-1
- musical scores, as transcending
 time 27-8
- myths
 significance of 135
 as transcending time 27-8
- natural time 48-69
 contrasted with social time 4, 21,
 150-7
 variable rhythms in 74-5, 108
 see also clock time
- Needham, J. 115
- Neisser, U. 93
- Newtonian physics *see* classical
 physics
- Nichols, H. 91
- Nietzsche, F. 133-4, 136
- Nowotny, H. 97, 98, 116, 117, 134,
 140-1
- Noyes, R. 129
- nuclear annihilation, destruction of
 future through 141
- Nuer, concept of time 96
- Oakeshott, M. 142, 143, 144, 145,
 146
- object/subject relationships in natural
 world/human society 151
- objectivity
 in classical physics 7
 of time 20-1
- observer
 role of, in time distinctions 22
 time relative to 55-6, 59-60, 64-5,
 66

- 'on time' 107, 108, 109
- order, time and 9, 11
- organisations, time and timetables
 in 95, 101-2, 106
- organisms, time and *see* biological
 time
- orientation, time 96-8
- Ornstein, R. 91, 92
- Osis, K. 129
- Parsons, T. 76
- part-whole relationship, in
 holograms 158-60
- particles, in quantum physics 58-9
- parts, biological/machine 78
- passage, from old to new systems 40
- past
 'acts' as specific to 35
 fundamental to human time 21
 integral to natural time 23
 preservation and
 reconstruction 24, 39, 142-7,
 156, 164
 reality questioned 33-4
 sole source of
 self-knowledge 35-6
 see also memory; retentions
- Peat, F. D. 61, 153, 159
- Pelletier, K. R. 128, 129
- perception of time *see* experience of
 time
- perimeters, time 30, 32-3
- 'perpetual present' 134
- perspective, time 96-8
- phenomenological approaches to
 time 19, 31-3, 31-7, 42
- philosophical approaches to
 time 10, 20-42
- Phipps, E. W. J. 88
- physics
 absence of fundamental
 entities 153, 162
 concepts of time 7, 48-69
 new theories for understanding
 contemporary 167
 see also classical physics; quantum
 physics; thermodynamics
- physiological clocks 72-6
- Piper, M. 99
- Pirrig, R. M. 52
- planning, social 97-8
- Plato, theory of forms 85
- Plessner, H. 134
- pollution, as dissipated energy 62
- Popper, K. R. 81
- Portmann, A. 70-1, 78, 84
- positivist social theory, treatment of
 time 11-12
- postponement of gratification 124-5
- poverty, and deferred
 gratification 124-5
- power
 conferred by ownership of recorded
 information 117-18, 144
 industrial time and 6, 109-20
 time-space distancing
 and 117-18, 119
 waiting and 123-4
- Powers, J. 48
- prehistoric societies, concepts of
 time 133-8
- presence and absence, in social
 relations 117
- presencing 24, 31, 69
see also emergence of present
- present
 created by multiple biorhythms
 74
 more real than past or
 future 33-4, 38-9
 past reconstituted in 39, 143, 156,
 164
 'perpetual present' 134
 psychological 92, 93
- Prigogine, I. 7, 48, 51, 52, 61, 63-5,
 67, 68, 78-9, 106, 144
- protensions 31, 32
- Protestant ethic, time-management
 and the 113, 115
- psychological studies of time 91-4,
 103
- psychotherapy, reshaping of the
 past 156
- punctuality 107-9

- puritanism, time-management and the 113, 115
- qualitative/quantitative nature of social/nature time 151
- quantitative social research 11
- quantum physics
causality and time in 57-60
treatment of time 66-7
- Rammstedt, O. 26
- recording of past 142-4
see also writing
- recurrence *see* repetition
- reflexivity, human, and time 9, 10
- reification
of metaphors 158
of time 120, 125-6, 138, 161
- relativity
of rate of change 29
of time 20-1, 55-60, 66, 81
of time measurement 41
- 'remembered past' (Oakeshott) 145
- repair capacity of organisms 78
- repetition
in biological change 84-5
in social change 86
time and 6, 19, 25-9, 62, 97, 133-4, 136, 167-8
- reproduction, social 27
- resource, time as 95-6, 104-26
- retentions, 31, 32
- reversibility of time 25-9
in classical physics 51-2, 53-4, 66, 81
impossibility of 35, 168-9
possible only in abstract 52, 64
in traditional societies 22, 134, 138
see also cyclical time; irreversibility of time
- rhythms
biological 72-6, 81, 88-9
natural 32-3, 88-9
temporal, varying between different organisms 154
- Ridley, B. K. 48
- Rifkin, J. 62, 72-3, 104, 106, 140, 167
'right time' 122-3
- Rinderspracher, J. P. 111, 133
- rituals, repetitive function of 136
- Roth, J. A. 95
- routine *see* repetition
- Russell, J. L. 133
- Ryan, A. 151
- Schaltenbrand, G. 93
- schemata, representational 93
- Schmied, G. 133
- school life, timed nature of 104-7, 110-11
- Schöps, M. 11, 13, 14, 15, 18, 19, 21, 44, 45, 70, 89, 101-2, 150
- Schuller, T. 95
- Schumpeter, J. 140
- Schutz, A. 10, 13, 19, 26, 32, 34-6, 36-7, 42, 44, 141, 145, 150, 161
- Schwartz, B. 124
- scientific method, in social theory 48-9
- security, motivation for colonisation of future 139
- sedimentation (Giddens) 10, 25
- self-consciousness
possible only in reflective mode 35-6
and time 9, 10
- sequencing *see* timing
- Shallis, M. 57, 58
- Sheldrake, R. 78, 83-7, 133, 145
- simultaneity of multiple time levels 165-6
- 'social age' (Piper) 99
- social change, time and 99-101
- social class, deferred gratification and 124-5
- social control, time and 6, 11, 19, 117-18, 144
- social interaction, clock time used for 18
- social planning 97-8
- social scientists, concern with time 1-8

- social status
passages 99
value of time linked to 114
waiting and 123-4
- social theory
treatment of time 9-49
use of biological metaphors 80-1
- social time
all time reducible to 6, 42-5, 154-5
connection with natural time 4, 21, 48-9, 90, 150-7
as a social construction 17
timing and control of 104-26
- sociality (Mead) 19, 38, 40, 42, 86, 102, 156, 163
- sociologists, concern with time 1-8
- Sorokin, P. A. 13, 99, 102, 150, 155, 162
- sources of time 43, 53
- space-time, curved 56-7, 66
- spacial characteristics of clock time 54, 76
- Spencer, H. 61, 76
- Spengler, O. 13
- stability, time and 9, 11
- Stacey, M. 100
- Staikov, Z. 94
- Starkey, K. 111
- state, capacity for social control through recorded information 117-18, 144
- status, social *see* social status
- steam engines, as metaphors 157
- Stegmüller, W. 28
- Stengers, I. 48, 51, 52, 61, 63, 64, 68, 78-9
- stream of consciousness 35-6
- strikes, industrial 111-12
- structural time (Evans-Pritchard) 96
- structuration (Giddens) 10, 14, 16, 25, 27, 29, 84, 85, 86, 165
- Stüttgen, A. 72
- subject/object relationships in natural world/human society 151
- succession, time axis of 17
- sun, as source of biorhythms 73
- surveillance, by state through information storage 117-18, 144
- suspension of time, on death 130
- symbolic expression of time 53
- symbolic nature of time 15, 18, 43-4, 53, 155, 156
- synchronic analysis 6, 16, 45
- synchronisation, clock time and 106, 107-9
- systems theory 123
- t*-coordinate of time 55, 65, 89, 154
- T* time operator (Prigogine) 65, 69, 144
- Tagwerk* (day[s]work) 112
- Takt* (metronomic beat) 81
- Taylorism 113
- technology
change in concept of future and 139-40
as means of transcending time 137, 143
new theories for understanding 167
see also machines
- temporality 63
A-series of time and 20
as essential aspect of nature 23-5
excluded by diachronic analysis 6
excluded from positivist social theory 12
experienced by all organisms 89
see also *durée*
- temps* (H. Bergson) 24, 25, 30
- tenses 20, 37
see also future; past; present
- thermodynamics 61-5, 67, 68, 69, 77, 79, 82
- Thom, A. 135
- Thompson, E. P. 111, 113, 115, 116, 117
- 'time in events' 30, 38, 67, 69, 95, 116
- 'time off' 114
- 'time on one's hands' 114
- time-budget studies 94-6

- time-scales
 - multiplicity of 88, 165-9
 - proper to natural processes 121-2
- time-space distancing
 - (Giddens) 10, 117-18, 119, 137, 138, 166-7
- timelessness 134
- timetables 104-9
- timing 156
 - of change in machines 52-3
 - of change in organisms 77
 - and social change 101-2
 - of social life 104-9
- Tiryakian, E. A. 13
- Toda, M. 93
- traditional societies
 - ascription of cyclical/reversible time to 22, 27, 29, 133-8
 - conceptions of time 96-7, 98
 - consciousness of time in 24, 67
 - high presence in social relations 117
 - see also* Hopi Indians; industrial societies; Nuer
- transcendence of time 127-48
 - through control of social time 110
 - in traditional societies 120
- transdisciplinary study of time 8, 18, 90, 149
- unconscious, collective 130, 144
- use of time, in daily life 94-6
- Vester, F. 76, 78, 82
- Waddington, C. H. 84
- waiting 121-5, 126, 156
- wave-particles, in quantum physics 58-9
- wealth, value of time linked to 114
- Weber, M. 113, 115
- Weigert, A. J. 99, 121, 125, 131
- Weiss, P. 78, 84
- Wendorff, R. 72, 93, 139
- Wessman, A. E. 93
- Wever, R. 74
- Whitehead, A. N. 82
- whole-part relationships, in holograms 158-60
- Whorf, B. L. 21, 96, 97
- Wilson, E. O. 102
- Wolff, E. 108
- work, paid, time bargaining in 111-19
- world-time 15, 116-17
- writing
 - as means of transcending time 137
 - potential for social control 144
- Yaker, H. 98, 133
- Young, M. 14, 17, 18, 37, 72, 74, 95, 143
- Zerubavel, E. 13, 101, 106
- Zohar, D. 59
- Zwischen* (Between) 31