

Book Reviews

**John D. Barrow and
Frank J. Tipler**
*The Anthropic Cosmological
Principle*

Oxford University Press, 1988
706pp., Paperback, £9.95. (Also
available in Hardback)

Few Christians who take their science seriously can be unfamiliar with William Paley's famous illustration of the 'argument from design' by reference to a watch as an artefact. Almost as many will be aware of Richard Dawkins' ebullient effort to show that Paley is 'wrong, gloriously and utterly wrong' by homing-in on the old idea that Darwinian Evolution somehow debunks theism and arguing that such evolution is not so improbable after all.

Meanwhile an increasing number of astronomers and physicists have been taking a rather broader view of the problem—a cosmic view, no less. Whether one takes Newton's deistic approach, irreverently dubbed 'God must prod' and taken to its extreme by the California Creationists, or the full-blown theistic view that it's all God's doing anyway, and it is the business of science to find out how He does it, the broader view, naturally (in both senses of the word) gives a wider perspective.

This careful consideration of physics from the scale of quarks to space-time and gravity, of astronomy from planets to clusters of galaxies or even clusters of ('ob-

servable') universes and of cosmic history from 10^{-43} seconds to $10^{10.000000,000000,000000,000000}$ years presents two imperious conclusions. First, Helmholtz' famous Heat Death of the Universe prediction looks a reasonably good bet at any rate for our 'observable' universe (but unlike global warming is nothing to worry about!) and secondly, the physics of fundamental particles requires certain constants to be so precisely adjusted that it is astonishing that life exists at all, let alone develops to homo-sapiens, blind watchmaker or no blind watchmaker.

This is precisely what the Anthropic Principle in its simplest form—The Weak Anthropic Principle (WAP)—is all about. Our universe is as it is—neither much bigger nor smaller, much older nor younger—because it is *our* universe. If it were otherwise we would not be here (nor very probably would any other creature). Suddenly, despite Copernicus, we appear to be central. The whole show seems to be just as it is for us to be here and able to enquire of it.

Taken simply as the logical statement, if the universe were not such that enquirers could exist there would be no enquiry, the WAP is a tautology and all the speculations about how else it might be and what other universes are possible are no more than that—speculations that can neither be verified nor falsified. But Barrow and Tipler choose to give the Principle a scientific content and so to make it a scientific

tool like other Principles such as the various conservation Principles of physics or the Narrow and Wide Cosmological Principles.

Having regard to our dependence on the unique chemistry of carbon (and its great sensitivity to Dirac's famous Large Number Coincidences) they define the WAP as follows:

'The observed values of all physical and cosmological quantities are not equally probable but they take on values restricted by the requirement that there exist sites where carbon-based life can evolve and by the requirement that the Universe be old enough for it to have already done so.'

They stress that it is our observations they are talking about so it is simply saying that that which we find to be the case must be consistent with our own existence; a statement which though hardly revolutionary is important for the perspective change it invites. Of course the words 'not equally probable' invite meditation on the authors' world view and 'evolve' declares something about it.

If the WAP be thought weak indeed, the authors have much more in store. The Strong Anthropic Principle (SAP) is defined thus:

'The Universe must have those properties which allow life to develop within it at some stage in its history.'

This postulate, it is pointed out, can either have a teleological implication and so be a religious conviction or it may be seen as an interpretation of the growing recognition that the observer plays a vital role in giv-

ing objective meaning to quantum phenomena. The illustration of the latter in popular textbooks is Schroedinger's Cat, but I am in some sympathy with Stephen Hawking who is quoted as saying that he always reaches for his gun when he hears of this beast.

The Final Anthropic Principle (FAP) is an even bigger challenge to credibility but don't let that put you off. The mathematical resolution of this paradox is as gripping as any 'whodunnit'. The FAP says:

'Intelligent information-processing must come into existence in the Universe, and, once it comes into existence, it will never die out.'

It is hardly necessary to say that the authors do not reckon with the awesome 'Armageddon Now' lobby at the one extreme or the God and Father of our Lord Jesus Christ at the other. Neither human folly and wickedness nor the Word made flesh have a place in their argument. But the book is all the more use for that. Most of us would write very differently even if we had the authors' encyclopaedic knowledge and skill in theoretical physics, but to see mind, and optimistic mind at that, at the end of so long a tether can only be good for those whose faith is in Christ. For me it was very enjoyable too to travel in wholly other fields than my own faith or journeyings as a professor of physics had taken me into before.

Thinkers who will be at home with the whole will be rare and may be surprised at the relatively elementary science described in some places when others require a

nodding acquaintance with, for example, the language, not to say the equations, of Cauchy-Riemann geometry. But I beg you, do not be put off even if half the seven hundred pages can only be skimmed or even skipped. The chapters are largely self contained, which gives rise to some repetition but it makes it possible to get out of the deep-end of some and still enjoy and benefit from splashing in the shallow, but certainly not trivial, text of others.

The first couple of hundred pages take us from Empedocles in the fourth century BC to Teilhard de Chardin, in a scholarly historical overview of the relevant philosophy that is not only a joy to read but, with its many hundreds of references is a valuable resource for Christians in Science. From there on I experienced the stimulating and increasingly slightly mystified comprehension which Eddington's *Nature of the Physical World* gave me as a schoolboy (and made me try my hand at physics, glorying in the aptness of 'I don't pretend to understand the Universe—it's a great deal bigger than I am'; a lovely epigram from Carlyle the authors introduced me to).

I've written twelve hundred words and still haven't let (Schrödinger's) Cat out of the bag which is as it should be. You'll just have to beg, borrow or buy the book for yourself. At under £10 it's extraordinary good value. But I must finish with a story I heard Dingle tell on introducing a lecture by Eddington on his theory of large numbers. A man went into a restaurant and asked the waitress for an egg and a kind word. Soon she brought the egg

and as she turned to go he touched her arm and said, 'What about the kind word?' She bent and whispered in his ear 'Don't eat it!'

Robert Boyd

David A. Pailin
God and the Processes of Reality: Foundations of a Credible Theism

Routledge, 1989
x+235pp., Hardback, £29.50.

Process thought has commended itself to many who are interested in developing a dialogue between science and theology. However, in spite of its popularity in the U.S.A., it is still relatively little-known in Britain. This book could go a long way to making it better known and understood in this country. In eleven demanding chapters, David Pailin offers us a careful and self-critical exposition of process theism. His approach is largely based on the work of Whitehead and Hartshorne but reference is also made to other significant process thinkers such as Cobb and Ogden.

The later chapters of the book will probably be of more immediate interest to many readers of this journal, tackling, as they do, God's relationship with the material cosmos and the human race. However, the earlier ones should not be overlooked. They combine an attractive presentation of process theism's concept of God with a careful critique of classical theism.

Pailin suggests that the demands of human reason and the discoveries of modern science render many of the assumptions of classical theism

problematic. The cumulative effect of his critique is to raise serious doubts about the coherence of classical theism. However, it has to be said that the god of the philosophers bears little resemblance to the God who has revealed himself in Jesus Christ. While it is true that they have often been confused in western theology, it is not immediately obvious that the demolition of the one should lead to the dismissal of the other.

The god of classical theism is rejected as 'a static, self-centred, only self-knowing absolute' (p. 33). But, if the god of Aristotle is unacceptable, what does process theism propose to put in its place? Pailin is emphatic that God must be understood as a living, personal agent.

According to process metaphysics any attempt to describe God must be dipolar in structure: it must be characterized by the fact that 'God is not only the origin of all possibilities. The divine experience includes the reception of all actualities' (p. 62). In biblical language, God is the Alpha and the Omega. God must reconcile past and future in his being. But there are different ways of doing this. Classical theism achieved this by giving priority to the past: God is the static eternal origin of all things and all change is defection. Process theism proposes a polar relation between the essence and the actuality of God. Thus God is, in principle, necessary, absolute, unchanging, infinite, and eternal. However, in practice, the actuality of God is contingent, relative, etc. (p. 70). Unfortunately, Pailin dismisses a third approach, namely, that God is

triune.

The dipolar concept of God leads to a panentheistic understanding of the relationship between God and the cosmos. In order to maintain an appropriate degree of reciprocity between God and creation, process thought holds that everything is in God (pan-en-theism). The analogy suggested by Pailin is that of the relationship between self and body.

Pailin puts great stress on the divine creativity. His picture of God is of a restlessly creative being who never rejects what he has created but is never satisfied with it either. This marks a clear departure from what has become the orthodox Christian doctrine of creation. Instead of a specific divine act of creation, Pailin envisages creation as an eternal relationship between God and the non-divine.

Pailin insists that God be seen as a personal agent. But God does not originate physical reality. Does he direct it? The logic of process thought forces him to admit that 'God is not to be thought of as attempting to direct, lure, or persuade the evolutionary process to develop any specific forms' (p. 153). Instead, God influences the fundamental processes of nature so that, in certain regions, there is a tendency towards increasing complexification. Unfortunately, the work of Prigogine offers us a non-theistic explanation of such localized increases in complexity. Divine activity can no longer take refuge in that gap!

What about divine activity in human history? According to Pailin the eminently personal, supremely responsive process god 'does not

make specific responses to particular events in human lives' (p. 171). Instead God's role in history is restricted to that of a blind 'general urge towards the actualization of ever higher experiences of value' (p. 172). Nevertheless, this god is by no means irrelevant to humankind: the conclusion of all his arguments is that 'The human has worth because of the divine' (p. 217).

I have serious reservations about the position Pailin has adopted. To begin with he insists that Christianity is a faith in need of a metaphysics. With Aquinas, traditional theism adopted the metaphysics of Aristotle. To satisfy today's needs we must adapt Christianity to the metaphysics of Whitehead. However, as I see it, Christianity is not a human attempt to make sense of the world so much as a response to God's revelation of himself. Metaphysics is important, but for the Christian theologian it must arise from revelation. Pailin rejects this approach on the grounds that any revelation must be expressed in language which already makes metaphysical assumptions. This is true, but the history of theology bears witness to the fact that such assumptions need not ensnare the Gospel. On the contrary, the Christian revelation has clearly demonstrated its capacity to transform the metaphysics of the cultures in which it has been proclaimed.

But, granted the need for a secular metaphysics, is process thought the one to choose? Its advocates emphasize its compatibility with modern science. However, this compatibility is debatable. Whitehead's work is hard to reconcile with conventional

interpretations of both relativity theory and quantum mechanics. Similarly process understandings of life and human personality would entail major revision within the life sciences. As for its methodology, some of its advocates revel in an *a priori* approach which is quite alien to natural scientists.

Pailin has not allayed my doubts about process thought but he has produced a challenging and thought provoking account of that option. I would certainly recommend it to anyone wishing to improve their understanding of process theism.

Lawrence H. Osborn

Edited by Paul Davies
and Julian Brown
*Superstrings: A Theory
of Everything?*

Cambridge University Press, 1988
234pp., Paperback, £6.95.

Although physicists study all aspects of both matter and energy, many theorists are attracted to the reductionist principle. Beginning perhaps with Occam's razor there has been a never-ending search for the basic elements that constitute matter. Particles have become ever smaller: molecules contain atoms, atoms contain nucleons, nucleons contain quarks . . . is there at the end a particle or an entity that is so small it is the basic building block of all matter? This book is about such a search in recent years and, in particular, about superstring theory, which is highly topical and claims to be a fundamental model for all the forces in the universe.

The first chapter is an amazingly short (only 69 A5 pages) introduc-

tion to theoretical physics from Newton's mechanics through Einsteins's relativity, Dirac's relativistic quantum mechanics, Gell-Mann's quarks, Feynman's quantum electrodynamics, Lee and Yang's parity violation, Kaluza-Klein's unsuccessful attempt to unify gravity and electromagnetism, Glashow-Salam-Weinberg's successful unification of the weak force and the electro-magnetic force, and, finally, Schwarz and Green's version of superstring theory. It is a terrific tour-de-force, but very readable and well illustrated.

If the reader can survive this obstacle race, he will enjoy what follows: nine transcripts of interviews with leading theoretical physicists from the United States and the United Kingdom, including three Nobel laureates, originally broadcast by the BBC on Radio 3 in 1988. Of these nine, seven are enthusiastic advocates of superstring theory, but two (Feynman and Glashow) doubt the basis of the theory and are highly sceptical of its usefulness. Hence the question mark in the title!

Each of the interviews is self-contained and so can be read in any order, making this a book to delve into from time to time, rather than read at one go. On the other hand the same questions are discussed over and over again, so it would be tedious to describe each interview here. Instead I shall summarise some of the ideas of the enthusiasts and indicate the attitude of the sceptics.

The basic problem in modern physics for the reductionists is that we have two incompatible theories to

explain the universe: on the one hand Einstein's theory of gravity, general relativity, explains large scale phenomena in terms of the curvature of space-time in four dimensions; on the other hand, quantum mechanics is the theory of everything that happens in the microscopic domain of atoms, molecules and elementary particles. String theory aims to overcome the inconsistency between gravity theory and quantum mechanics. To do this it has to leap over the enormous gap between the size and energy of elementary particles to the fantastically small and highly energetic Planck scale of quantum gravity. In size a nucleon is typically 10^{-15} m, but the Planck length which characterizes one of the little strings is only 10^{-35} m! In energy, or mass, the recent discoveries at CERN of the W and Z particles that mediate the weak force brought us to masses 80 times that of the proton. But these are negligible compared with the Planck mass of 10^{19} protons! No wonder the sceptics regard such a theory as highly speculative.

String theory began in the 1960's as a possible theory of the strong nuclear force. As such it was abandoned when quantum chromodynamics successfully described the strong interactions in the 1970's, but Schwarz, with his collaborators Scherk and Green, converted the original theory into the superstring theory by incorporating supersymmetry. This related the two different classes of elementary particles, bosons and fermions, and led to the modern ten-dimensional string theory. In this theory the tiny strings are closed loops that vibrate in all

the extra (more than 4) dimensions, producing many different modes. The elementary particles—quarks, electrons, neutrinos, etc.—correspond to the (almost) zero-mass modes of the string, since the natural scale of mass in the superstring theory is that of gravity, 10^{19} GeV.

One of the criticisms of superstring theory is that it has not made any predictions of new particles that might be accessible to experimenters. A possible long shot is the prediction of fractionally charged particles with Planckian masses that might conceivably be discovered in magnetic monopole or dark matter detectors. Unfortunately, the chance of this discovery being made is very small and so the defenders of the theory fall back on its mathematical beauty and its potential for development in the future to justify its exploitation.

The main argument of the sceptics is that there is a great wealth of experimental data on the elementary particles to be explained and it is not being tackled by the superstring theorists. The latter start with their quantum gravity and attempt to come down to the 'massless' elementary particles, while the sceptics prefer to start with the known experimental facts and work up to a comprehensive theory. These have certainly been remarkably successful over the past sixty years. Is it time for a change? By reading this most enjoyable book from time to time you will be able to make your own judgement on the likely direction of theoretical physics in the next century.

Roland Dobbs

James Lovelock

The Ages of Gaia: A biography of our living Earth

Oxford University Press, 1988
252+xxpp., £13.50.

This book is a sequel to the one which originally publicized Jim Lovelock's controversial Gaia hypothesis nearly ten years ago. In the intervening years the hypothesis has been the subject of trenchant criticism and equally outspoken support from biologists, philosophers and theologians. It has even been woven into a major science fiction novel and a television thriller! Now Lovelock has written a new exposition of the hypothesis, updated in the light of more recent scientific research and the major criticisms of his earlier work.

The central thesis of his work is that the evolution of life is tightly coupled to the evolution of its physical environment. It follows that the global system of life and its environment may itself be regarded as the largest manifestation of life. Lovelock summarises this in the assertion that the Earth itself is alive. Life on Earth forms a single global super-organism.

About half the book is devoted to a brief history of life and its environment in the light of this hypothesis. Lovelock focusses on several key aspects of our physical environment in which the existence of life may play a major regulatory role. These include the chemical composition of the atmosphere, planetary temperature, rainfall levels, and oceanic salinity. Gaia clearly has major implications for our understanding of the earth sciences. It also affects the way one looks at the life sciences.

ces, e.g., the tight coupling of life with the environment favours a 'punctuated equilibria' view of evolution.

In a chapter entitled 'Gaia and the Contemporary Environment,' Lovelock examines several contemporary environmental concerns in the light of the Gaia hypothesis. These include the greenhouse effect, acid rain, ozone depletion, and nuclear waste. In each case, Gaia offers a novel perspective from which to view the problem. His conclusions ought to be studied with care by all who are concerned with our environment. However, some of what he says is likely to prove controversial. For example, he dismisses the problems of nuclear waste with the suggestion that 'breathing is fifty times more dangerous than the sum total of radiation we normally receive from all sources' (p. 177). He maintains that the greatest environmental threat comes from bad farming practices. However, the threat is not to life as such but only to the continued existence of humankind (and the higher animals). Lovelock is wary of an environmentalist lobby which he regards as anthropocentric and anti-authoritarian.

The major criticisms of the Gaia hypothesis are that it is teleological and that biological regulation of the environment is much less extensive than Lovelock would have us believe. Lovelock demolishes the former criticism by means of a computer simulation called Daisyworld. This demonstrates that biological regulation of the environment does not entail teleology. He is less successful with the latter criticism. His response is to refer the critics to his

positive exposition of the history of Gaia. However, that exposition is peppered with admissions of its speculative nature: his vision of a living Earth takes him far beyond the evidence we currently have.

In the course of his exposition of Gaia, Lovelock drops a number of hints about his approach to science. Perhaps the most striking of these is his assertion that a scientific theory 'is no more than what seems to its author a plausible way of dressing up the facts and presenting them to the audience' (p. 42). Such a crude expression of empiricism is surely indefensible and, indeed, seems quite inconsistent with Lovelock's own hypothesis.

Finally, Lovelock attempts to examine the religious implications of Gaia. This has apparently been forced upon him by the considerable correspondence following his previous book. He offers us his personal response to the religious inferences which many have drawn from Gaia. As one might expect, given his vigorous denial that the hypothesis is teleological, Lovelock rejects all attempts to identify Gaia with God. Furthermore, he denies that Gaia is sentient. However, he quotes approvingly a passage from Gregory Bateson which suggests the existence of a super-mind analogous to Gaia.

Positively, Lovelock suggests that, 'Living itself is a religious experience' (p. 204). If so, one wonders what point there is in speaking of religious experience. He suggests that a truly scientific theology would free itself of dogmas such as the presupposition that God exists!

The commendable holism of his science clearly does not extend to the Enlightenment alienation of faith and knowledge.

As a gesture of goodwill towards traditional Christianity, he suggests that Gaia may be identified with the Virgin Mary! All one can say is that this shows remarkably little understanding of the place of Mary in Christian thought and devotion. This excursion into religion is the least satisfactory aspect of an otherwise fascinating book.

In conclusion, Gaia remains vulnerable to the sceptics. However, it is an enthralling vision which offers a wealth of testable predictions for life and earth scientists to pursue. Furthermore Lovelock writes in a clear non-technical English. The result is an interesting and thought-provoking book which will be accessible to layman and specialist alike.
Lawrence Osborn

Alan Jiggins
Human Future?

Scripture Union, 1988
144pp., £3.95.

'For society as a whole and for most individuals in it, the ultimate authority, the ultimate standard and the ultimate solution are now technological in character. We will define this attitude as *technicism*. . . technicism describes faith in the ability of technology to solve all our problems (and) is the faith which, in most of our public and private life, has replaced faith in God.'

With this as his starting point, Alan Jiggins (a former lecturer in Applied Nuclear Physics) sets out

first to describe the ways in which technicism permeates all areas of our society, secondly to compare the modern attitude towards knowledge and technology with the biblical understanding of man's relationship with and responsibility towards creation; and thirdly to discuss how individual Christians and the church might better fulfill the mission of bringing 'the presence of God into a society which is rapidly losing its sense of need'. In no way, however, does he view technology itself as anti-God, for he clearly states his assumption to be that our technological ability 'is a gift from God to be used responsibly as part of our stewardship of creation.'

The author covers a lot of ground, which is commendable, touching upon how sport, hobbies, leisure, education, advertising, the role of the worker, medicine are all under the threat of technicism; and he is surely right when, in his final section discussing the church's response, he questions the notion of there being a divide between the sacred and the secular—this division 'is not a biblical one; right through the Old Testament we see God concerned with every aspect of His people's lives'.

Unfortunately, though, Mr Jiggins doesn't go into any of these matters at any great depth, and I constantly felt I was being told rather than shown. For example, in mentioning how the technicism affects the attitude towards education he cites the 1986 Green paper on education which 'deals primarily with economic needs and manpower requirements rather than educational opportunities. Its emphasis is on the

need to train specialists who will restore our economic fortunes . . . The purpose of education now seems to be to turn people into a new type of "techno-person". It's splendid that he draws attention to this matter, but I feel he missed out by making a bald statement as he did, rather than quoting from the Green Paper itself to illustrate and drive home his point.

Later, in discussing the Christian response to technicism, he suggests that it will be a risky business because 'we will have to make decisions in areas where there's no clear cut answer, only choices between the lesser of evils . . . Decisions we will take or agree to will perhaps be condemned from the study desk and also quite possibly by God.' He backs up this view by quoting Bonhoeffer: 'The free responsibility of free men depends upon a God who demands bold action as the free response of faith, and who promises forgiveness and consolation to the man who becomes a sinner in the process'. Excellent stuff, which should be taken on board by us all. But it really does deserve considerably longer and deeper discussion than the author accords it, since we are here in the area of our images of God, our presuppositions, and whether we really accept freedom as opposed to legalism to be the 'God-dimension'.

I think, perhaps, it would be best to regard 'Human Future?' as more in the nature of a prolegomenon to the issues of technicism and the Christian response to it. We have here, as it were, an aerial survey. A follow-up book is now required where we can tramp through the

territory itself and explore the issues at much greater length and depth.

Richard Skinner

**Jahrbuch der Karl-Heim
Gesellschaft
Glaube und Denken
Brendon Verlag, Moers
1988, 143pp.**

To the growing number of academic societies dedicated to the theological giants of the 19th and 20th centuries a new one was added in 1988, formed to advance the dialogue between theology and science, faith and the world in the spirit of Karl Heim (1874-1958), whose teaching career culminated in his appointment as Professor of Systematic Theology at the University of Tübingen in 1920, a position he held until his retirement in 1948. The title of the yearbook of the Karl Heim Gesellschaft, *Glaube und Denken* (Faith and Thought) reflects this purpose. The title is borrowed from the first volume of Heim's massive six volume *Der Evangelische Glaube und Das Denken der Gegenwart* (The Evangelical Faith and Thought of the Present: Basics of a Christian Life-Orientation), which appeared over a period of two decades between 1931-1952. The first volume, *Glaube und Denken*, was published in English under the title, *God Transcendent: A Foundation for a Christian Metaphysic* (London: Nisbet & Co., 1935). According to the yearbook editor Hans Schwarz of the University of Regensburg, the Karl Heim Gesellschaft aims neither to erect a theological platform nor to offer a '... simplified or uncritical restatement of Heim's positions, but

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in line with Heim's intention, to articulate a thinking faith that is approached through the Gospel and which stimulates thinking within and beyond' (p. 9).

The selection of essays in this inaugural issue is true to that goal, bringing together articles about Heim, articles with reference to Heim's thought, and those that do not explicitly mention him by name, but carry on the conversation between Christian faith and contemporary thought.

The article by Sigurd Martin Daecke of the Technische Hochschule in Aachen, 'Gott im Hinterhaus des Weltgebäudes?' (Is God in the Backhouse of the World Building?), provides a good introduction to Heim's basic theological perspective. He investigates Heim's relational understanding of reality as an attempt to overcome the opposition between science and theology which, in 1904 when Heim's *Weltbild der Zukunft* (World View of the Future) was written, seemed insurmountable. Daecke casts Heim in the role of a visionary whose relativized view of the objective world anticipated by a few years both the scientific perspective of Einstein and the philosophy of Whitehead. In this respect he compares Heim to Teilhard de Chardin.

Daecke cites Heim's affinity for the view of the physicist James Jeans, that matter is not something that is, but something that occurs in the space-time continuum as the starting point for Heim's relational perspective. Objectivity is not a given of the world itself. Such a given-ness is rather to be found in the relational

character between person and world. The world itself is therefore not a starting point for understanding reality, since such a starting point can only begin in the relation that exists between the perceiving self and the world which is perceived. The I-thou relationship also becomes the basis for understanding the relationship between humanity and God, and between God and the world. Thus any investigation of reality, whether by science or theology, shares a common relational presupposition. This relational understanding at the same time maintains the tension between immanence and transcendence, yet does away with the need for a spatial view of heaven and hell, one of the key obstacles perceived by Heim as standing between theology and a scientific worldview.

Gunther Wenz of the University of Augsburg picks up the theme of Heim's I-thou relational scheme in the discussion of time in his article 'Was ist also "Zeit"? Notizen zu einem Welträtsel' (What is Time? Notes on a World Puzzle). Wenz notes that the understanding of the universe as an open, temporal process whose history is directed to a large extent by singular, unrepeatable events in time. This view, which has emerged through the theories of thermodynamics, relativity, and quantum mechanics, has a parallel in the New Testament understanding of history which underscores the singularity of God's action in time. Thus a linear and open view of history and time has been bequeathed to the West, in contrast to a view that is cyclical and closed or deterministic.

Heim saw this common understanding of time as a contact point for the relationship between theology and science. As time is relativized, so is the relationship between individual and world. Time, as recognized by Augustine, Kant, and Fichte, is also subjective. It has meaning only in relation to the individual as a temporal being who perceives it. But time also stands in relation to the eternal; not in opposition to, but as an expression of it. For this reason theology has something important to contribute to scientific theories of time.

Adolf Köberle's essay, 'Karl Heims Vorgänger' (Karl Heim's Predecessors), is of a totally different nature. He places Heim in the context of a series of Swabian native sons who occupied the systematics chair at Tübingen; Johann Tobias Beck (1843–1878), Robert Kübel (1879–1894), Theodor Häring (1894–1920), followed by Heim in 1920. Köberle sees this 'Swabian tradition' as a possible explanation for the unusual move of the Swabian cultural minister in by-passing the first choice on the faculty senate's list, Rudolf Otto, and choosing the runner-up Heim, then at the University of Münster, to fill the vacant position in 1920. What Köberle offers is an interesting and sympathetic look into the perspectives of these forerunners. Köberle knows of what he speaks; as a student of Heim and as his successor he was the last to uphold the Swabian tradition in the systematics position at Tübingen, being followed upon his retirement in 1965 by Gerhard Ebeling. Köberle's own recollections add a personal touch.

The remaining essays take up the task of relating credibly Christian faith and modern thought. Hugo Staudinger, who teaches the history of science at the University of Paderborn and the only non-theologian among the contributors, argues in his article, 'Menschliches Nachdenken und christlicher Glaube' (Human Reflection and Christian Faith), that the major obstacle to be overcome is the lack of an adequate metaphysic capable of mediating theology and science. Historically, he holds late medieval nominalism responsible for separating faith and reason by making faith irrational, thereby creating the chasm which has not been bridged, despite efforts of prominent Catholic as well as Protestant theologians, not to mention the efforts of well-intentioned scientists. The seriousness of the problem is indicated by two propositions that have become generally accepted as inherent to the scientific enterprise; methodological atheism and a setting aside of the question of meaning and focusing instead on cause, effect, and use. Yet by cutting itself off from philosophical and theological reflection, such a position guarantees that the world cannot be understood.

Staudinger calls instead for a 'trinitarian metaphysic' that sees humanity as a social creature in relation to others analogous to the relationships within the trinitarian Godhead. The love which is active among the persons of the Trinity is also active among human beings in relation with each other and the world. For that reason humanity is the crown of creation. This love is also the nature of God's creative

work. the anthropic principle indicates the intentionality of creation which is a reflection of divine love.

Although Staudinger is certainly correct in noting the metaphysical gap between science and theology, in my view his proposal begs the question he raises. At the end of his essay he states that in order for such a metaphysic to take hold, the two obstacles in science, methodological atheism and shunning the question of meaning, have to be overcome. But the connection between overcoming these obstacles and the proposal that he makes is not clear. He does not seem to argue that a trinitarian metaphysic is a means of overcoming these barriers so much, as that such a metaphysic cannot work as long as they are in the way. Also, the term 'trinitarian metaphysic' is a bit problematic. What Staudinger develops seems to be not so much a trinitarian *metaphysic*, but a metaphysic with reference to a trinitarian God whose primary characteristic is love.

The article by the Bamberg theologian Rainer Lachmann, 'Die Trinitätslehre in religionsdidaktischen Sicht' (The Doctrine of the Trinity in the Perspective of Religious Education), carries the discussion of the Trinity in another vein. Lachmann directs his attention toward religious instruction in the German educational system and notes both the lack of the Trinity as a theme in current Protestant religious instruction, and the absence of adequate instructional models for the Trinity in both Protestant and Catholic education. He lists seven reasons for the omission that may broadly be summarized as a difficulty in translating

the concept meaningfully for today's world. The problem is compounded by the fact that belief in God generally can no longer simply be assumed. As a way to address both issues Lachmann suggests an emphasis in religious instruction on the Spirit; more concretely on the Spirit of the crucified and resurrected Jesus as the Spirit of love and life grounded in the sovereign love of the creator God. He sees points of contact in this approach with the life situation of students in their 8th and 9th school years, which could be developed into a more complete trinitarian understanding. Lachmann addresses a particular theological concept, but perhaps the difficulty he notes is symptomatic of the larger problem of translating meaningfully traditional Christian symbols in a world that no longer assumes their validity.

Friedemann Hebart, formerly of the Luther Seminary in Adelaide, Australia, takes up what by now has become a familiar theme, in his 'Schöpfungsglaube und Schöpfungswissenschaft' (Creation Faith and Creation Science). The positions of this debate are well rehearsed. Hebart attempts to give a balanced discussion by placing the issues in historical perspective, and concluding that while religion needs to avoid dogmatizing particular world views and creating a 'God of the gaps', science needs to avoid the tendency of absolutizing its own results, a theme that appears in other essays of this volume as well. His most provocative thesis is the suggestion that by challenging science on its own ground, creationists unintentionally present a theistic or even deistic concept of God, thereby

robbing Christianity of its christo-centric character. His concluding ten theses can basically be summarized as faith is faith and science is science; the two can peacefully coexist as long as one does not try to do the job of the other.

The yearbook of the fledgling Karl Heim Gesellschaft promises to be a welcome addition to the ongoing discussion between theology and science. More contributions by non-theologians would help bring the dialogue within the pages of the journal itself. If nothing else, the first issue is an important sign of the seriousness with which contemporary German theologians take the task of speaking the language of faith meaningfully in the contemporary world.

Russell Kleckley

S. J. Gould
'An Urchin in the Storm'

Collins Harvill, 1988
246pp., £11.50.

The preface to 'An Urchin in the Storm' is a spirited defence of the art of book-reviewing; this is hardly surprising as 'Urchin' is a collection of book reviews. While this might seem an unpromising format, most of the reviews stand successfully as essays covering a wide range of topics.

The book consists of five groups of essays under the broad titles of Evolutionary Theory, Time and Geology, Biological Determinism, Four Biologists (reviews of four biographies) and In Praise of Reason. What is interesting is not so much the themes within these groups, but

those which emerge across them, and the way these reveal something about Gould's personal outlook on science.

An example of this is his treatment of the related subjects of determinism and reductionism, two prevalent modes of thought in the scientific world. Both are directly discussed in essays on sociobiology, intelligence testing and mysticism, and they make an appearance in several others. He is quite open in admitting that part of his unease over the role determinism and reductionism play in science, and in particular biology, is due to his political views. He explains his position by pointing out that the myth of the purely objective scientist and science is precisely that, a myth. Thus when talking about field work in Geology:

'... the charming notion that true science can only be based on unbiased observation of nature in the raw is mythology.' (p. 98)

Such unbiased observation is impossible. Science, as a human activity is affected by human values and attitudes, as is book reviewing! So, we are invited to assume that the stance he takes on particular issues in science is a product of more than the raw data at hand. He is open about other influences which shape his opinions that we might be aware of them and make allowances for them if necessary. But he also expects us to examine the arguments he advances, whether we share his general perspective or not, and come to a conclusion as to whether they hold any water on their own merits. He is convinced that in biological determinism he has hit on bad sci-

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ence as well as an abuse of science. The following serves as an example:

... let us not be so disrespectful of thought that we dismiss the logic of arguments as nothing but an inevitable reflection of biases—a confusion of context of discovery with context of justification. If we thought that biological determinism was pernicious but correct, we would live with it ... We have campaigned vigorously against this doctrine because we regard determinist arguments primarily as bad biology—and only then as devices used to support dubious politics. (p. 151, in a review of Lewontin et al, 'Not in our Genes')

With the critique of reductionism, there is no corresponding retreat into mysticism. This is particularly clear in the review of Capra's 'The Turning Point', whose reasoning Gould finds 'simplistic and even antirational at too many points' (p. 218). Gould prefers to employ an 'explanation at different levels' approach:

... the notion of hierarchical levels that cannot be reduced, one to the next below, is no appeal to mysticism ... New levels require an addition of principles; they neither deny nor contradict the explanations appropriate for lower levels.' (p. 69)

What Gould seeks is a thoroughly materialistic Science, offering a hierarchical set of explanations within its area of competence, accepting the legitimacy of other disciplines investigating other areas, such as the social sciences. Interestingly, while the status of theological explanations is not dealt with explicitly, one gets the impression that

Gould feels that theology really has no role to play today; it belongs to a bygone age.

This collection of essays covers a wide range of topics besides those discussed above. For the most part the essays are clear and often entertaining. However, one never quite gets away from the feeling that one is reading a collection of book reviews. I would be inclined to wait for the paperback edition.

P. C. Knox

Lewis Wolpert and Alison Richards
A Passion for Science

OUP, 1988

206pp., Hardback, £15.00.

The persistent stereotype of the scientist as coldly impersonal and rather less than human cannot be sustained after reading this book, which developed from a series of interviews on the BBC between Professor Wolpert and a number of scientists: 8 from the life sciences, a chemist, a mathematician, two theoretical physicists and a cosmologist. Only one (Dorothy Hodgkin the chemist) is a woman. Each chapter deals with a particular scientist, whose work is placed in context by a brief introductory survey, written in layman's terms.

What emerges from the interviews is that science, like any other human enterprise, develops by intuition, chance, confusion, overcoming prejudice, dogged persistence in the face of repeated failure and the contempt of peers. It is also very evident that the scientists interviewed seemed to have a strong conviction that they were studying a 'real world'—out

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there', notwithstanding the views of certain philosophers of science.

For example, Michael Berry, a theoretical physicist, when questioned about his relationship to the experimental physicist replied, 'Very close, of course. Physics describes the real world. It isn't a sort of low level mathematics, which it would become if one lost contact. It's very important always to realize that there are phenomena, that there is a world outside our heads that we're trying to explain. Otherwise it's a curious game, a form of self-indulgence which I think is intellectually not very worthwhile.'

What, then, of the pursuits of mathematicians? Christopher Zeeman: 'What dictates research in science is the world; you're trying to understand what's there. But what really dictates research in mathematics is elegance . . . (mathematicians) do it because of its intrinsic beauty.' Is it, then, merely a form of self-indulgence? Zeeman again: 'It may well be that it's a property of human beings, that only human beings can think maths. But I think it's probably true that any intelligence in the universe would have this language as well. So maybe it's . . . not greater than, but more universal than, the human race.'

The book offers many fascinating insights as to how these particular scientists (and doubtless others too) see themselves and their work. Perhaps the final word may be left to the neuropsychologist Richard Gregory. When asked about his interest in popularising science, he said, '. . . it's like giving a party . . . you have far more fun yourself because you're kicking it around with other people.

This is what science should be like—not working in cupboards and getting amazingly aggressive about other people who think a bit differently, but treating it as a tremendously exciting game . . .'

Altogether a refreshing book and well worth reading—by scientists and non-scientists alike—and giving to a young person beginning to think seriously about science as a career; and perhaps even more so, to someone who has rejected it because of its dehumanising caricature.

Apart from those already mentioned, the scientists interviewed were Abdus Salam, Martin Rees, Francis Crick, Sydney Brenner, Gunther Stent, John Maynard Smith, Stephen Jay Gould, Anthony Epstein and Walter Bodmer. The book also has a useful index whereby attitudes and concepts referred to by the different scientists may be compared.

D. A. Burgess

David Hay
Exploring Inner Space: Scientists and Religious Experience
Mowbray, London, 1987
252pp., £7.95.

This is a revised and expanded version of a book first published in 1982. The author was until recently the Director of the Alister Hardy Research Centre at Oxford. The most useful part of the book is concerned with relating and analysing 'over 5,000' experiences that are described as 'mystical' or 'numinous'. Surveys show how relatively common it is for people to have had at least one striking experience of a sense of a reality other than, or larger than, ordinary material and psychological life. The

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basic question usually asked was one originally asked by Sir Alister Hardy. People were asked if they had ever 'been aware of or influenced by a presence or power, whether they call it God or not, which was different from their everyday selves'. The percentage who answer positively varies in different groups and, of course, in different surveys, but it is never negligible. In one survey 46% in Wales and 28% in East Anglia gave positive answers. In another survey the total reporting some such experience of good or evil was up to 48%. Just how this experience was understood varied greatly and was by no means always, or even usually, seen in terms of an experience of a personal God. It is not made clear how far the numerous personal experiences quoted here are typical or chosen for their relative clarity or conciseness.

One conclusion is expressed like this 'the impression one gets, on the basis of recent research, is of a perfectly natural kind of human awareness, differing certainly in many respects from everyday sensory awareness, but having valued outcomes which enhance people's ability to survive.'

When the author asks why, in that case, not everyone has such experiences, he turns the tables on Freud, suggesting tentatively that 'the absence of religious experience could be like every other impoverishment, an alienation of people's natural powers'. He could have quoted Romans 1 rather than Freud. There Paul states that people 'suppress the truth' of the awareness of God's eternal power and Godhead. He does not relate these surveys to belief that there is a personal God.

The use of the phrase 'inner space' in the title shows just how ambiguous these experiences are and the question which is posed on the cover, 'Is God still possible in the 20th century?', is not answered. The surveys were nearly all carried out in Britain.

A. N. Triton

Lewis Thomas
*The Wonderful Mistake:
Notes of a Biology Watcher*
Oxford University Press, 1988
289pp., Paperback, £6.95.

Michael Ruse
Philosophy of Biology Today
State University of New York Press,
1988
155pp., Casebound, \$29.50.
Paperback \$9.95.

These two books are very different. I will take the second first. Michael Ruse is Professor of History and Philosophy at Guelph in Canada, and he writes as a professional. His coverage is fairly wide: Evolutionary Theory, Population Genetics, Molecular Biology, Challenges to the Paradigm, Teleology, Systematics, Human Biology, Philosophical Implications, Other Topics, and Other Lands are his chapter headings. All this is dealt with in 84 pages, for there is an Introduction of four pages and a Bibliography of 53, as well as an Index of 11! It is not surprising therefore that there is not a great deal of substance in the book; in fact I gained the impression that here is an author who loves talking, and in a rather rarefied way. It seems to be a hobby of his to quote as many references as possible, and it is as a source of refer-

ences therefore that I would chiefly recommend this book, though they are not critically evaluated.

Prof Lewis Thomas's volume is philosophical too, but in quite a different way. Evidently a biologist, his book would make excellent leisure or even bedtime reading. It consists of 56 essays which began in a series in the *New England Journal of Medicine* at the invitation of the editor, which amounted to an 'open invitation to let fly with whatever I felt like writing about'. The Lives of a Cell, A Fear of Pheromones, Organelles as Organisms, Your Very Good Health, Some Biomythology, On Warts, On Committees, and On Thinking about Thinking are some of his titles. My favourite was a fine take-off entitled 'On Transcendental Metaworry (TMW)'—the reader can guess what it was about. There is nothing here dealing specifically with faith and its concerns, but essays such as these can serve a useful purpose in starting a train of thought.

Douglas C. Spanner

**Arthur Peacocke and
Grant Gillett, ed.**

***Persons and Personality,
A Contemporary Inquiry***

Basil Blackwell, 1987

222pp., Hardback, np.

This book contains essays growing out of a conference on the nature and concept of the person, which took place at the Ian Ramsey Centre in Oxford. The Ian Ramsey Center was established at St. Cross College, Oxford, at the beginning of 1985 under the leadership of Arthur Peacocke. The Centre's aim is the interdisciplinary study of ethical

problems arising from scientific and medical research and the philosophical and theological foundations undergirding these issues. People from various disciplines, scientific, theological, philosophical, historical and legal were asked to analyze the concept of the person out of interaction with their respective disciplines. The conviction underlying this book is that no significant progress can be made in ethical understanding unless the nature of personality is made more clear in relation to scientific and humanities oriented disciplines.

The essay by Peter Atkins, a scientist, and Richard Swinburne, a philosopher of religion, provide two very different alternative ways to understand the nature of the person. Atkins boldly states his confidence in 'the omnicompetence of science' so that only a scientific explanation of the person is possible. This means that personality is a chance coming together of material parts of such complexity that personality develops. This concept of the person involves the ethical position that what conduces to survival is identified with the right and good.

Swinburne puts forward the Cartesian position that the human comprises two distinct components, the body and soul. The soul is the inner spiritual part, interacting with the body, but not able to be identified with physical events. It is argued that because we can conceive of this spiritual part existing apart from the body, mental events cannot be reduced to physical events, and, therefore, life after death is possible by the soul being given another embodiment.

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The two positions outlined above show that the notion of person is not clearly understood. David Wiggins analyzes the concept of person with more philosophic precision. His analysis proceeds from the notion of a person as a biological entity, subject of consciousness, and a bearer of ethical attributes. The term person cannot be referred to only as a definition. The sense of what a person is can only be known through experiential encounter with persons. Through such conceptual clarity, Wiggins gives a more elaborated exposition of personal reality. One could wish that a more concerted attempt had been made to integrate the knowledge science claims to have of the person with the metaphysical and poetic elucidations, not only in this essay but in others.

John Macquarrie, with characteristic clarity, writes a chapter on 'A Theology of Personal Being'. For him a person is unfinished, always changing, growing, and so creating itself. Here we have a connection to the notion of transcendence, or going beyond what we are, and the transcendence of the world in change. Also stressed is the embodied nature of personal existence, comprising psychophysical unity of embodied spirit. Finally, Macquarrie points to the communal dimension of personal existence, that a person is constituted by an 'I' and 'thou' relation. Ethical notions, such as care and responsibility for ourselves, others, and the world arise from this understanding of the person.

In 'Christian Theism and the Concept of a Person', Adrian Thatcher investigates the concept of the person and its application to an

understanding of a personal God. He is concerned to show that a Christian conception of God does not require a Cartesian dualism. A person, as embodied existence, does not have its existence in an inner essence or mental substance. Eternal being, therefore, must be conferred, as it does not inalienably reside in the human person. Thatcher asserts that the Christian doctrines of creation, incarnation, resurrection, and ascension give credence to a nondualist view.

The diverse manners in which person and personality are viewed in this book can only enrich our understandings. This approach to a basic issue certainly provides a model for other investigations, as the value of this study amply shows.

James S. Nelson

Robin Mckie ***The Genetic Jigsaw***

Oxford University Press, 1988
160pp., Paperback, £4.95.

This little paperback is written by a scientific journalist and is easy to read and well spiced with human stories. The initial chapters provide an accurate and understandable account of human molecular genetics and its application to disease. Single gene inheritance is illustrated by a chapter on Huntingtons disease and this is balanced by a chapter on the commoner mental illnesses, manic depression and schizophrenia. Whereas Huntingtons disease is always caused by a change in a gene localized to chromosome 4, these other mental illnesses clearly behave in a much more complicated

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manner. The chapter faces up to these complexities and points out the potential benefits of research in this area, but includes the views of those who believe the usefulness of the approach is over estimated.

It is the later chapters however that would be of chief interest to readers of this journal. One is devoted to the commercialization of recombinant DNA research and the possible impact of this in 10–20 years time. Academic scientists are frequently naive in this area and more interested in their scientific reputation than in financial gain. In the USA, and to a lesser extent in the UK, the potential commercial gains to be expected from the development of molecular techniques are quite apparent to business entrepre-

neurs who have no hesitation in exploiting them commercially with a view to major future profits.

The ethics of these developments are important and Christians need to come to terms with them and work out a just stance. Other ethical issues highlighted by the book include: genetic screening prior to employment, screening of fetuses with a view to abortion of the abnormal and the more future and hypothetical prospect of pre-embryo screening and genetic manipulation.

The issues are discussed rationally and fairly but from a secular viewpoint. The book can be recommended to those who want to update themselves on these important matters.

Caroline Berry