SCIENCE AND THE FUTURE OF THEOLOGY: CRITICAL ISSUES

by Arthur Peacocke

Abstract. The ambivalent reputation of theology as an academic discipline is attributed to the often circular character of its procedures based on presumed authoritative sources. Recently, science too has come under the shadow of "postmodernist" critiques but, it is argued, has been able to withstand them successfully and make epistemologically warranted claims to be depicting reality—thereby vindicating human rationality. Evolutionary epistemological considerations also reinforce confidence in the more general deliverances of the human exploration of reasonableness through inference to the best explanation (IBE). The consequences of applying IBE, with its associated criteria, in theological investigation are considered in relation to theology as it is and as it might be. A number of issues critical for the development of a credible theology are identified. In spite of the challenging and somewhat negative view of contemporary theology to which this leads, hope is expressed that a genuinely credible "evangelical," "catholic," and liberal theology may yet emerge for the new millennium.

Keywords: authority; "bridge" model; critical issues (I–XIV); dissonance; evolutionary epistemology; human environment; inference to the best explanation (IBE); methodology; postmodernism; rationality; reasonableness; relativism; scientific realism; theology.

THE INTELLECTUAL REPUTATIONS OF SCIENCE AND THEOLOGY

Seventy or so years ago the mathematician-philosopher Alfred North Whitehead (quoted by Brooke 1991, 1) considered that the future course of

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history would depend on the decision of his generation as to the proper relations between science and religion—so powerful were the religious symbols through which men and women conferred meaning on their lives and so powerful the scientific models through which they could manipulate their environment. We, in a later generation, certainly still have the same *pragmatic* task with religious fundamentalisms still inflaming the political and international scene. Furthermore, the technological applications of science are generating environmental effects, such as global warming, that are already threatening biological and human life. Even more basic is the intellectual task of integrating the search for *intelligibility*, epitomized by the natural sciences, and that for *meaning*, enshrined in the world religions. These hard thinking tasks in our societies are, or should be, undertaken supremely in our universities—and paramount will be the relating at the intellectual level of the distinctive explorations of science and of theology, the intellectual articulation and justification of religious beliefs.

However, too often the science and theology dialogue has been dominated by what I might call the "bridge" model. Just as a bridge can throw an apparently frail but actually immensely strong bond between the solid rock of the lands on either side of a stretch of water, so the interaction of science and theology has been conceived of as building such a bridge between two solid established disciplines. Across the bridge dialogue is conceived to occur with the hope of achieving at least consonance and, maximally, integration. However, that picture represents only the Christian medieval enterprise of relating a natural philosophy to a revealed theology, much as it might appeal to any neo-Barthians still around.

Be it noted too that, in those medieval times, one had to change vehicles halfway across the bridge as reason was left behind and the deliverances of a revealed faith took over in going from science to religion. The reverse route from theology to science was soon rendered impassable, from the point of view of the scientists at least, by certain notorious interventions of the church in purely scientific matters. Since the Enlightenment, this bridge building has proved to be hazardous, and the attempt has often been abandoned altogether. For although the foundation on the science side of the gulf seemed solid rock enough, to the modern mind, that on the side of theology was regarded as but shifting sand, having little solid rational basis.

For many decades now—and certainly during my adult life in *academe*—the Western intellectual world has not been convinced that theology is a pursuit that can be engaged in with intellectual honesty and integrity. Our unbelieving contemporaries have been and still are often the "cultured despisers" with whom Friedrich Schleiermacher felt impelled to deal in the early years of the nineteenth century. There are also many wistful agnostics who respect Christian ethics and the person of Jesus but also believe that the ontological baggage of Christian affirmations can be discarded as not referring to any realities.

This deep alienation from religious belief of the key formers of Western culture of recent times has been almost lethal to a Christianity which has nearly always based its beliefs on authorities of the form "The Bible says," "The Church says," "The Magisterium says," even, at least in the past, "Theologians say"! Educated people know that such authoritarian claims are circular and cannot be justified, because they cannot meet the demand for validation of their claims from any external universally accepted stance. No one expressed it better than John Locke (1660, Book IV, XVIII, 3):

> For our simple ideas, then, which are the foundation, and sole matter of all our notions and knowledge, we must depend wholly on our reason; I mean our natural faculties; and can by no means receive them, or any of them, from traditional revelation. I say, *traditional revelation*, in distinction to *original revelation*. By the one [original revelation], I mean that first impression which is made immediately by God on the mind of any man, to which we cannot set any bounds; and by the other [traditional revelation], those impressions delivered over to others in words, and the ordinary ways of conveying our conceptions one to another.

Traditional revelation is, for him, revelation from God that is handed down from its original recipient through others by means of already-designating words and signs. His subsequent percipient comments on the relation of faith and reason could not be more relevant (1660, Book IV, XVIII, 10):

> Whatever God hath revealed is certainly true; no doubt can be made of it. This is the proper object of faith: but whether it be a *divine* revelation or no, reason must judge; which can never permit the mind to reject a greater evidence to embrace what is less evident, nor allow it to entertain probability in opposition to knowledge and certainty. There can be no evidence that any traditional revelation is of divine original, in the words we receive it, and in the sense we understand it, so clear and so certain as that of the principles of reason; and therefore *Nothing that is contrary to, and inconsistent with, the clear and self-evident dictates of reason, has a right to be urged or assented to as a matter of faith, wherein reason hath nothing to do*.

I find myself warming to such passages as one for whom the inheritance of the Enlightenment is regarded as irreversible in its effects on theology—not in the exaltation of "Reason" alone to Olympus but in the pursuit of reasonableness, of reason based on experience, of probability as being the "very guide of life," as the redoubtable Bishop Joseph Butler asserted: "For surely a man is as really bound in prudence to do what *upon the whole* appears, according to the best of his judgement to be for his happiness, as what he *certainly* knows to be so" (1736; emphasis added).

Science Withstands the Postmodernist Critique

In my view, the "modern," Enlightenment situation, one almost may say plight, of theology—as not meeting the epistemological standards of rational inquiry—continues. However, more recently, for causes obscure and (to me) themselves irrational, the very word *rationality* has come under a cloud of suspicion. The gale of postmodernism blows in from who knows what alien strand and not only removes, it would claim, any need for a

bridge between science and theology at all, but pulverizes the foundations on each side into shifting quicksands.

Or so it is said.

"Relativism rules" is all the cry, so that some theologians are seduced into retreating into spelling out the "grammar" of their received, confessional, indeed parochial (even when called "catholic"), traditions and are thereby self-exonerated from justifying their beliefs in the arena of public discourse. So the supporting base for structures on the theological side are deemed to have quailed before the onslaught of postmodernist relativism. We shall return to this state of theology later.

But, now, what about the other side of the water? Scientists still go on their way believing that they are exploring a reality other than themselves; that, even after the demise of positivism, their researches still aim to enable them to depict reality, namely, the entities and processes of the natural world; that they do so fallibly, making use of metaphors and models that are revisable; and that, because their procedures make it possible to predict and sometimes even to control natural processes, their efforts are getting them nearer to depicting nature with such increasing verisimilitude as is vouchsafable to finite human minds.

They would point out that even the postmodernist literary critic or sociologist relies on solid-state physics being true enough for his PC to function as a word processor! I well remember, at a 1979 meeting convened by the Church and Society section of the World Council of Churches at M.I.T. on "Faith, Science, and the Future," the indignant reply of an Australian astronomer to delegates from the "South" who, based on their unhappy experience of multinational corporations using technology to exploit their countries, criticized the content and integrity of science. He affirmed—with some passion, it must be said—that "quantum theory does *not* change as you go south across the equator."

The philosophical debate concerning scientific realism that raged some ten years ago has quietened down considerably. Some kind of real reference of scientific terms involving entities and processes, and often theories, seems to be widely accepted, with "realism" preceded by adjectives such as *qualified, critical, skeptical, dialectical critical, convergent,* even *metaphysical*. All of them are characterized by not being naive—that is, not regarding terms in scientific theories as *literal* descriptions of the entities and processes to which they refer, not believing that there are facts to which all scientific propositions correspond if they are true, and not thinking scientific language can exhaustively describe an external world. I said "some kind" of realism. Jarrett Leplin, who in 1984 edited a comprehensive volume on the question, in his "Introduction" expressed the judgment that "like the Equal Rights Movement, scientific realism is a majority position whose advocates are so divided as to appear a minority" (Leplin 1984, 1; for a wider-ranging critique see Gross and Levitt 1994). I judge that, as against

(say) instrumentalism, realism is still the majority view of philosophically informed practising scientists who would not pursue their exacting profession if they did not think they were uncovering real aspects of the underlying mechanisms and relationships in the natural world. (Those most at risk would be the cosmologists, whose theories are and always will be grossly underdetermined by the facts. Theologians need to remember this in dialogue with them!)

This firm, yet appropriately circumspect, character of scientific realism (that is, realism as a proposal about science as such, not because it is "scientific" in any other sense) is accurately captured in an exposition of Ernan McMullin (in Leplin 1984, 26):

> The basic claim made by scientific realism . . . is that the long-term success of scientific theory gives reason to believe that something like the entities and structure postulated in the theory actually exists. There are four important qualifications built into this: (1) the theory must be a successful one over a significant period of time; (2) the explanatory success of the theory gives some reason, though not a conclusive warrant, to believe it; (3) what is believed is that the theoretical structures are *something like* the structures of the real world; (4) no claim is made for a special, more basic, privileged, form of existence for the postulated entities.

Basically, scientific realism is "a quite limited claim which purports to explain why certain ways of proceeding in science have worked out as well as they [contingently] have" (1984, 30). As McMullin admits, the qualifications ("significant period," "some reason," "something like"), although vague, seem to be essential to a defensible scientific realism. Their vagueness is, in fact, largely dispelled by consideration of the use of metaphors and models in science. In any case, he was able to mount a formidable case for scientific realism based on the historical fact that in many parts of natural science (e.g., geology, cell biology, chemistry) there has been over the last two centuries a progressive and continuous discovery of hidden structures in the entities of the natural world, structures that account causally for the observed phenomena.[1]

Leplin (1997) has more recently developed a sustained argument for a realist interpretation of science based on a new analysis of the concept of predictive novelty. The successful prediction of novel empirical results can be explained only by attributing some measure of truth to the theories that yield it (and to the referential character of the theory's terms). Moreover he contends, I think convincingly, that science proceeds by a combination of induction and inference to the best explanation (IBE). His understanding of scientific realism is, too, worth noting:

> To interpret a theory realistically is only to suppose that its explanatory mechanisms capture some of the features of natural processes well-enough not to be misleading as to how the effects these mechanisms explain are actually produced. A realist interpretation claims that the theory reveals some significant truth about real processes, where "significance" is relevance to explanatory ends, and "some" is a measure proportionate to those ends. (Leplin 1997, 104)

My only major caveat about his convincing contribution arises from his concentration on physics, whereas if he had given more weight to the historical sciences—such as geology and biology, which are trying to work out what has happened in the past to the Earth and to living organisms—he would have had to recognize that inference to the best explanation of a wide range of data dominated such sciences but without being able to rely on novel predictions. For example, Lyell's geological uniformitarianism and Darwin's key proposal of natural selection as the mechanism of biological evolution were both arrived at and substantiated by such inference long before more direct, confirmatory experimental observations were available. Leplin, in fact, recognizes this in relation to the attempts to construct a Grand Unified Theory of the forces that are now the focus of fundamental physics. In this context, he reckons that "we are witnessing changes of evaluative standards that elevate explanationist desiderata over novel predictive success" (1997, 184). By "explanationist" he means not just inference to the *best* explanation among competing ones, but inference to a *good* explanation that is self-recommending (by precluding rivals) and coherent (in this case) with the rest of physics. It will be useful to bear these considerations and criteria in mind when we come back to theology.

But how has all this consensus among philosophers of science, and even more among scientists, withstood the gales of postmodernism? I would judge—very well indeed. In concord with that Australian astronomer at the WCC meeting, it is still the experience of scientists in all fields that in global congresses the criteria for good science transcend all ethnic, religious, political, and social backgrounds. Clearly, these latter affect the provision of grants, the scientific questions selected for study, and the imaginative and intellectual resources available to scientists—but not the accepted *content* of science.

American academics need no reminding of how the postmodernist critique of science was false-footed by the famous hoax in which Alan Sokal published, in the American cultural-studies journal *Social Text*, a parody article crammed with nonsensical, but unfortunately authentic, quotations about physics and mathematics by prominent French and American intellectuals of the postmodernist school. In their significantly entitled *Intellectual Impostures,* Sokal and Jean Bricmont (1998) recount the full story, give critiques of the writings of many of these same intellectuals, and provide valuable essays on "Epistemic Relativism in the Philosophy of Science" and on "Chaos Theory and 'Post-Modern Science,'" showing particularly that the last named is a vacuous concept. To be sure, the role of the social context in the historical development of science cannot be controverted. Individuals and groups of scientists depend and feed on social resources of funds, institutions, symbols, and concepts and the general *Zeitgeist* of society, like everyone else. But the justification of scientific

theories and of the putative existence of the entities and processes to which they refer is subject to a subsequent rigorous sifting in the scientific community that eventually makes their enterprises an exploration of reality.

A medical scientist, Henry Harris (1981, 40), could stress that, although it is true in physics that Einstein's equations superseded those of Newton, yet this

> is no argument at all for the notion that all scientific conclusions are similarly bound eventually to be displaced. I do not believe that it will ever be shown that the blood of animals does not circulate; that anthrax is not caused by a bacterium; that proteins are not chains of amino acids. Human beings may indeed make mistakes, but I see no merit in the idea that they can make nothing but mistakes.

The "Legend," as Philip Kitcher (1993, 3) calls it, that science delivers *the* true story of the world in some ahistorical way by using *the* scientific method, has to be recognized as just that; but it also has to be accepted as a more accurate view of the scientific process that

> Flawed people, working in complex social environments, moved by all kinds of interest, have collectively achieved a vision of parts of nature that is broadly progressive and that rests on arguments meeting standards that have been refined and improved over centuries. [The] Legend does not require burial but metamorphosis. (Kitcher 1993, 390)

Let us return to that bridge hopefully spanning the gulf between science and theology. It now seems that the science side is certainly not quicksand but much more like the lava flow from a volcano, which inexorably moves forward in a fluid manner (often fierily destructive of preconceptions) but leaves behind an increasingly solid base of established knowledge about the natural world. My conclusion, so far, is that in the event science has proved a bastion against the gales of postmodernism and serves to preserve, and even restore if we strayed so far, a conviction that the processes of human rational inquiry, fallible though they are, are not always fated to be engulfed in relativism, social contextualization, and even nihilism. By its very success in withstanding the weasel words that lead to abandoning any search for *justified* belief about what really is the case, science challenges humanist disciplines, including theology, to live up to its epistemological standards in relation to the data and intellectual histories specifically relevant to those disciplines.

Evolution and Human Rationality

There has, of course, been much debate about whether or not any basis for a common rationality is now possible in these nonscientific disciplines. None of us wants to be a foundationalist, which in theology involves fideism and fundamentalism.[2] So which way do we go from here? Curiously, certain perspectives in modern biology indicate that the exercise of human rationality is not likely to be fruitless and end up in an unreliable, relativistic circularity of affirmation. For, as I earlier put it:

Evolutionary biology can trace the steps in which a succession of organisms have acquired nervous systems and brains whereby they obtain, store, retrieve and utilize information about their environments in a way that furthers their survival. That this information so successfully utilized must be accurate enough for their survival has led to the notion of 'evolutionary epistemology' [Munz 1985; Radnitzky and Bartley 1987]. This finds a warrant for the reality of reference of the content of such awareness of living organisms, especially human beings, in their actual successful survival of the naturally selective processes. Awareness and exploration of the external world reach a peak in *Homo sapiens* who, through the use of language, primarily, visual imagery and, later, mathematics, is able to formulate concepts interpreting the environment. . . .

The natural environment, both physical and social, is experienced and becomes a possible object of what we then call 'knowledge'—that which is reliable enough to facilitate prediction and control of the environment, and so survival. Our sense impressions must be broadly trustworthy, and *so must the cognitive structures whereby* we know the world—otherwise we would not have survived. . . . In human beings a number of cognitive functions, that are also to be found in animals and that individually make their own contribution to survival, are 'integrated into a system of higher order,' to use a phrase of Konrad Lorenz.[3] (Peacocke 1991, 73, 76, emphasis added)

In a nutshell, our cognitive faculties *qua* biological organisms must be accurate enough in their representations of reality to enable us to survive. In the case of human beings, these cognitive faculties include the representations of external reality we individually and socially make to ourselves. Hence, these representations have at least the degree of verisimilitude to facilitate survival in the external realities of our environments. The extent to which evolutionary biology will actually help us understand the cognitive processes whereby this reliable knowledge about the environment was acquired is still an open, indeed confused, question. However, there can be little doubt that there is a continuity in the evolution of *Homo sapiens* between (a) the cognitive processes that allow a physically relatively poorly endowed creature to survive against fiercer predation and in a variety of environments; (b) the processes of ordinary "common sense" ratiocination applied in everyday life; and (c) the ability to think abstractly and to manipulate symbols in mathematics, art, science, music, and the multitudinous facets of human culture. As Sokal and Bricmont say in their defense of science as a practice yielding reliable knowledge (1998, 54):

[T]he scientific method is not radically different from the rational attitude in everyday life or other domains of human knowledge. Historians, detectives and plumbers—indeed, all human beings—use the same basic methods of induction, deduction and assessment of evidence as do physicists or biochemists. Modern science tries to carry on these operations in a more careful and systematic way. . . . Scientific measurements are often much more precise than everyday observations; they allow us to discover hitherto unknown phenomena; and they often conflict with "common sense." But the conflict is at the level of conclusions, not the basic approach.

The central consequence for this inquiry is an enhancement of our confidence in the reality-referring capacity of our cognitive processes that

evolution has provided. It warrants the postulating of the existence of a general rationality in *Homo sapiens* which yields, for the purpose of living, reliable knowledge and justified belief. This encourages an examination of the nature of the selfsame perceived cognitive processes. This warrant for such an examination has recently also been strongly emphasized by Wentzel van Huyssteen, who writes that "our mental capacities have their roots in organic evolution and it is important to study these roots to learn something about the genesis and development of our ability to know and interrelate with our world" (1998a, 137).

This approach goes back much earlier to Karl Popper,[4] Konrad Lorenz, and especially Donald Campbell, who first named the approach as "evolutionary epistemology." However, biology as such gives few clues about the evolution of human cognition. Moreover, this enhancement by evolutionary considerations of confidence in the possibility of human ratiocination providing reliable knowledge does not in itself exonerate us from inquiring into the validity of the actual content of the deliverances of human ratiocination and also from asking about the criteria that should operate. To this we must now attend.

Reasonableness through Inference to the Best Explanation

We are obtaining from evolutionary epistemology the stimulus to take again seriously the results of the processes of human cognition and rationality. Can we discern any features of these processes that are common to biological survival, everyday experience, *and* the explanatory accounts we give of the activities that constitute human culture in *inter alia* the sciences, the humanities, and theology? It is hardly necessary to remind the reader of books entitled *Higher Superstition* (Gross and Levitt 1994) and *Intellectual Impostures* (Sokal and Bricmont 1998) about the present postmodernist *Zeitgeist* and academic political correctness, of the controversies that rage around such a seemingly innocent question. I have given grounds why I think science has been able to resist the siren calls of postmodernism. The continuity of its procedures with those of reasonable decision making in ordinary life, which can now be attributed to their common biological origin, is significant for our estimate of human rationality in general. When these two kinds of exercise of human rationality are analyzed, I think a strong case can be made for asserting that such deliberations are not purely deductive, nor purely inductive, but a composite of a particular kind, namely, inference to the best explanation (IBE—sometimes called abduction). This latter is described thus in Peter Lipton's key work (1991, 58, 188):

> According to Inference to the Best Explanation, our inferential practices are governed by explanatory considerations. Given our data and background beliefs, we infer what would, if true, provide the best of the competing explanations we generate of those data (so long as the best is good enough for us to make any inference

at all). . . . One of the main attractions of the model [of IBE] is that it accounts in a natural and unified way both for the inferences to unobservable entities and processes that characterize much scientific research and for many of the mundane inferences about middle-sized dry goods that we make everyday.[5]

It is pertinent to recall the conclusion of Paul Thagard (1978, 92) to his article important in the general recognition of the significance of IBE that a "final merit" of IBE is that

it makes possible a reunification of scientific and philosophical method, since inference to the best explanation has many applications in philosophy, especially in metaphysics. Arguments concerning the best explanation are relevant to problems concerning scientific realism, other minds, the external world, and the existence of God. Metaphysical theories can be evaluated as to whether they provide the best explanation of philosophical and scientific facts, according to the criteria of consilience, simplicity and analogy.

Decisions have, of course, to be made about which is the best of competing, plausible explanations, but note that strict falsifiability *à la* Popper is not emphasized nor any absolute requirement for novel predictions. This allows theology to adopt more readily this model of explanation, which is so adequate to science and everyday life. What are the criteria for deciding which is the "best" explanation among any set of plausible proposals—that is, the one "which would, if true, provide the most understanding"[6] of the field in question? In this context, Philip Clayton speaks of the "explanatory virtues" (1997, 385) rather than direct talk about "truth criteria" (see also his 1989, ch. 6). His (and Lipton's) list of general *desiderata* for helping to decide between scientific explanations include theoretical elegance (beloved of theoretical physicists but making biologists wary!), simplicity, coherence, precision, provision of causal mechanisms, fitting a given phenomenon into the broadest possible theoretical structure (a "unified explanatory scheme" [Lipton 1991, 121, 182f., 188]) and, it is assumed, fit with the data.[7]

Bearing in mind the intention to use IBE in theology, I prefer to distinguish the following as the criteria for deciding on a "best" explanation:

1. *Comprehensiveness*—the best explanation accounts for more of the known observations by giving a unified explanation of a diverse range of facts not previously connected. There are converging lines of argument based on different kinds of data with which the best explanation fits. Such data will, for theology, comprise human experience, including (though not exclusively) those designated as "religious."
2. *Fruitfulness*—the best explanation can often, but (note) not always, suggest new and corroborating observations. The best explanation is not *ad hoc*, just to one specific purpose.
3. *General cogency and plausibility*—because the best explanation fits with established, background knowledge (compare Lipton's "unified explanatory scheme").

4. *Internal coherence and consistency*—no self-contradiction.
5. *Simplicity or elegance*—avoiding undue complexity.

In IBE, as John Wisdom (1953) had put it, "The process of argument is not a *chain* of demonstrative reasoning. It is a presenting and representing of those features of a case which severally co-operate in favour of the conclusion."

It would be naive to think that these criteria depicted with such a broad brush do not need thorough analysis, justification, and development. Often they have to be held in mutual tension with each other. Their discussion has been grist to the mill in the last few decades of the philosophy of science and, more widely, of epistemology. I cannot pretend to do justice to that complex discussion—though I do note that the term "inference to the best explanation" seems to be broadly acceptable to the practitioners of a wide range of disciplines in the sciences and the humanities. I also observe that the emphases on internal coherence (4) and on fit with established, background knowledge (3) agree well with the contextual, pragmaticist coherence theory of M. Rescher, expounded and deployed recently by Niels H. Gregersen (1998, 181–231) in relation to the current dialogue between theology and science. Such considerations seem to me to be part of the necessary amplification of those criteria. As Philip Clayton has rightly said (1997, 387):

> This theory of explanation reflects a more general paradigm shift regarding the rationality of both scientific and meta-physical debates . . . in place of foundationalist understandings of knowledge it presupposes a coherentialist framework. This brings inference to the best explanation into close contact with the "holistic view" [Kitcher 1993, 182] of scientific explanation.

The direction in which such proposals are leading appears to me to be entirely in accord with the critical realist view I have myself espoused[8] and, I think, with the postfoundationalist stance of J. Wentzel van Huyssteen (1998b, 13–49) with the gravamen he lays on all epistemologies to create what he calls "interdisciplinary spaces"—especially between theology and science.

Theology Today and Tomorrow

Earlier I drew attention to the parlous state of the reputation of theology as an intellectual discipline. A large proportion of educated people do not find Christian (or any) theology reasonable—it is not seen by them as realizing the standards of modern intellectual life, not least in its relation to science. It is thought to have been tried in the balance and found wanting.

So I would describe the first key critical issue for theology, exemplified supremely in its relation to the natural and human sciences, as the following:

I. Dare theology proceed in its search for even provisional "truth" by employing the criteria of reasonableness that characterize the rest of human

inquiries, in particular the sciences? In the natural and human sciences, a strong case has been made that they achieve their aims of depicting, revisably and metaphorically, the realities of the natural and human worlds by inference to the best explanation (IBE). Because of the epistemological revolutions of our time, it is now essential that the theological pier of the bridge to science be subject to the same demands for epistemological warrant and intellectual integrity as other disciplines, especially science—and to relinquish the unestablished confidence of, for example, neo-orthodoxy, that it is divinely authorized.

Theology needs to be, as Hans Küng (1991, 161–62) has put it, "truthful," "free," "critical," and "ecumenical"—a theology that deals with and interprets the realities of all that constitutes the world, especially human beings and their inner lives. Dare theology, by using IBE, enter the fray of contemporary, intellectual exchange and stand up and survive in its own right? To do so, it has to become an open exploration in which nothing is unrevisable.

The bridge model for the science-and-theology enterprise must be replaced by the sense of a *joint* exploration into a common reality, some aspects of which will prove, in the end, to be ultimate—and pointers to the divine. Let us now look at how theology is actually practiced.

Theology as It Is. What do we find?—a variety of theological procedures that do *not* meet these criteria:

1. *Reliance on an authoritative book.* "The Bible says." Even those not given to biblical literalism and fundamentalism still have a habit of treating the contents of the Bible (now mostly two thousand or more years old) as a kind of oracle, as if quotations from past authorities could settle questions in our times. Although it is unlikely that many readers of this journal hold this view, it is the one that, whatever they themselves believe, ordinary Christians think clergy and ministers *ought* to believe (and are paid to do so!). Yet, the library of books we call the Bible itself is constituted by a self-critical dialogic process of constantly revising, repudiating, and extending the work and experience of earlier generations; we see this even within the period of authorship of the New Testament itself.

2. *Reliance on an authoritative community.* "The Church says," "The Fathers said," "The Creeds say," "The Magisterium says." Here the religious community listens and talks only to itself, following the "cultural-linguistic" (or "regulative") pattern espoused by George Lindbeck (1984). According to this interpretation, the doctrines of the Christian church function to establish the framework for that community's conversation which elucidates the grammar of its own internal discourse without ever exposing itself to any external judgment of reasonableness. At its best it can be faith seeking understanding (*fides quaerens intellectum*), but even this prescinds from rational justification of the faith. I would urge that the

only defensible theology is one that consists of "understanding seeking faith" (*intellectus quaerens fidem*), in which "understanding" must include that of the natural and human worlds which the sciences have *inter alia* unveiled. (I am, of course, not meaning to exclude the aesthetic and other experiences of humanity from this "understanding.") There can be within communities of faith a kind of submission to what is regarded as a revelatory dogmatism or doctrinal fundamentalism. It is often taken for granted that what "the gospel" was was precisely understood and universally agreed upon—when in fact it wasn't. The "Word," it is often said, has been given by God to the community of Christians and has had to be expounded—but its authenticity as the Word *of God* was never established. So, however much the faith (*fides*) is explicated and enriched within the community, it fails to equip itself with the means whereby it can convince those outside it to take seriously its affirmations. For it has foregone and repudiated what I would regard as the God-given *lingua franca* of human discourse—the use of criteria of reasonableness, as in IBE. If we follow Lindbeck's recipe, how can Christian communities ever convince the outside world that they proclaim any kind of "truth" comparable in cogency to that which that world recognizes and, in their application of science, also utilizes?

3. *Reliance on a priori truth.* In some forms of philosophical theology, the internal "basic truths" held by the Christian community are regarded almost as a priori truths arrived at by pure ratiocination. This kind of foundationalism is rare today because of the wider recognition of the cultural conditioning of what can seem to be a priori. Clearly, such a theology would find it very difficult to come to terms with the world whose realities are discovered by the sciences.

Theology as It Might Be. If theology is to meet the intellectual standards of our times by, for example, utilizing IBE, and not by relying on authorities or claimed a priori notions, it will have to take account of:

S —the realities of the world and humanity discovered by *Science;*

CRE —the Jewish and Christian communal inheritance of claimed, *Classical Revelatory Experiences* (in the Scriptures, liturgies, aesthetic expression, music, and so forth); and

WR —the perceptions and traditions of other *World Religions*.

Hence the "data" of theology are:

S + CRE + WR

II. Here we have, regretfully, to put on one side *WR*, but let it be noted at this point that a second critical issue for Christian theology in relation to the sciences is the perception of how other religions have related and are relating to the scientific worldview and what can be learned from that. But for our present purposes let our data be taken to be

S + CRE

III. If we put these together, I think we are faced with our third critical issue, namely, that a very radical revision of past notions concerning what Christians can in future hold as credible, defensible, and reasonable becomes imperative. We have had, as it were,

CRE→*T*, where *T* is orthodox Christian *Theology*.

But now, we need to have

S + *CRE*→*RT*, a radically *Revised Theology*,

which, I am suggesting, will not live at all comfortably with the *T* as promulgated by church bodies and in most pulpits. Eventually, of course, we need

S + *CRE* + *WR*→*GT*, a *Global Theology*.

What are we aiming for, in the nearer future, in that *RT*? What will its truth deliver for the person of the twenty-first century?

It is useful to remind ourselves what religion in general is about, and I am attracted to a recent definition made by Gerd Theissen (1999, 2) of religion as "a cultural sign language which promises a gain in life by corresponding to an ultimate reality." I am also attracted to what could be regarded as an elucidation of this definition by David Pailin, who suggested that we should want to give people

> the conviction that the basic structure of reality is such that it is appropriate for people to feel "at home" in it because it is basically a purposive process that, in a significant way, respects human values, both treasuring what has been achieved and fostering further achievements. And, theists maintain, this conviction is based on, and can only be based on, the reality and activity of God. (Pailin 2000, 149)

If this is broadly what theology should be explicating and for which it should be providing the warrant, how should the dialogue and interaction of the sciences with theological formulations of the content of religious experience and traditions of community be conducted?

IV. It is here that we encounter a fourth set of critical issues concerning the methodology of this process. Those of us engaged in the science-and-theology interaction must be committed to certain norms:[9]

1. To avoid importing spurious spiritualizations into our discourse. This is *one* multileveled world; there is no evidence for any other ontologies than those emerging from the natural world. Hence, no magic, no "science fiction," and no fudging to avoid offending notions held simplistically in ignorance of this picture.
2. To be explicit when our language is metaphorical and not be afraid to be agnostic when the evidence does not warrant positive assertions.
3. To avoid fallacies—genetic, naturalistic, and that of "misplaced concreteness" (not all words refer to real entities; they often refer to relations and properties).
4. Not to use marginal and speculative science (an example would be the cascades of paper discussing Hawkins's speculations).

5. Not to be selective of our science by choosing the parts favorable to our theologies.
6. Not to over-socially contextualize science; most people see that science works.
7. To keep a historical perspective but not be bound to the idea that past issues have simply reappeared today. The boundaries of "science" and "religion" are shifting all the time.
8. To distinguish theology, the study of the intellectual content of religious beliefs, from religion, which is about individual and communal experiences. (Is the theology/religion relation paralleled by that of science/technology?)
9. Not to claim for theology credibility based on its long history; it has to meet today's challenges.
10. Not to be tempted to discern prematurely coherences and consonances between science and theology, since the latter may be explicating a prophetic dimension in religion which refers to the as-yet-unknown future.
11. To recognize that much of religious language is functional in society rather than referential, as it should be in theology (it is hoped).

I cannot help wondering if, in spite of the honest efforts of many of us, we have really always maintained such standards.

Further Critical Issues for Theology. There are other tough issues that Christian theology has to consider in the light of the sciences.

V. This is *one world*. A monistic naturalism is overwhelmingly indicated by the sciences. Everything is constituted of "parts," of whatever current physics discovers underlies all matter/energy. This need not be epistemologically reductionist about the many levels in the world, including human beings—who are seen as psychosomatic units, not ontologically distinct bodies and minds and souls (according to both the cognitive sciences and the Bible). With respect to the mind/brain relation, "dual-aspect monism" and, even more so, "emergentist monism" are defensible positions congenial to Christian understandings of human nature. But no "ghosts in the machine." The only dualism now defensible appears to be the distinction between the Being of God and everything else (all-that-is, all that is created). Talk of the "spirit" or of the "soul" of human beings as distinct entities appears to be precluded, as is talk of the "supernatural," and holistic language is generally more appropriate.

VI. This one world is an interconnected web of processes that are increasingly intelligible to the sciences. These processes are more subtle and rational than we could ever have conceived. Their creativity is inbuilt, for

theists, *by God*, and it is becoming increasingly incoherent to have a view of God as intervening in these processes to fulfill God's purposes. This is the now notorious problem of God's action in the world and how to conceive of it.

VII. Because of VI, the historical evidence for miracles (disruption of the regularities of nature by God) is usually inadequate to testify to them. Can our theology continue to depend at all on the assertion of the occurrence of miracles in that sense? This will call for rethinking our traditional ways of regarding the virginal conception (the "virgin birth") and the bodily resurrection of Jesus.

1. Does the affirmation of the Incarnation have to be closely related to the virginal conception in view of the weakness of the historical evidence for it, its biological implausibility, and its derogating from the full genetic humanity of Jesus?
2. Does the affirmation of the Resurrection have to depend on the "empty tomb"—especially as it is clear our bodies are, in principle, not resurrectable (our constituent molecules are soon dispersed and enter those of other living organisms and other people), so the transformation of Jesus' body leaving an empty tomb could never give us any particular hope for our own resurrection if that, too, were to be a transformation of our actual individual bodies?

VIII. Human nature is under the leash of our biologically conditioned and biologically created genes. What is the relation of this to "original sin"? After all, God created us with those biologically derived genes.

IX. Human beings seem to be "rising beasts" rather than "fallen angels." There is no evidence for a past paradisal, fully integrated, harmonious, virtuous existence of *Homo sapiens*, so how should this shape our understanding of the "work of Christ" as "redemption"? Should we not now be regarding the "work of Christ" less as the restoration of a past state of perfection than as the transformation into a new as-yet-unrealized state? How did and does the life, death, and claimed resurrection of Jesus make any difference?

X. If God is all the time creating in and through the processes of the world, so they are in themselves God's action, then the understanding of God's immanence in the world has to be held in a much stronger sense than ever before. God is closer to natural reality than previously conceived. God is indeed the "one in whom we live and move and have our being" (Acts 17:28). God's relation to the world is through and through sacramental, both instrumentally and symbolically in revelation of God's self. So is not a "sacramental pan*en*theism" called for as representing the closeness of God in creation and yet God's basic "otherness"? We certainly

need more dynamic metaphors for that relation than have usually been propounded in the past.

XI. The role of chance and its interplay with necessity (law, regularity) is a real feature of the processes now uncovered by science, whereby new entities have appeared in the world. This needs to be incorporated positively into our account of how God creates. Does God explore or experiment creatively?

XII. Human death. Death of the individual is now seen as part of God's created processes whereby the living creatures preceding humanity and humanity itself have come into existence. So how can the "wages of sin" be "death" (Romans 6:23 AV)? —and what does this imply for many classical understandings of redemption/atonement as the "work of Christ"?

XIII. If there is life on other planets, as is at least possible, what does this imply for the uniqueness of Jesus as Redeemer, Lord, Savior, and *Logos* incarnate?

XIV. The relation of God to time is an issue that has greatly exercised many of us as we relate the perceptions of modern relativistic physics to classical notions of eternity and of God's supposed "timelessness." Suffice it to say there is no agreement—some accept a Boethian view in which God perceives past, present, and future with an eternal immediacy, while many of us believe that the future does not have any kind of existence the content of which an omniscient God could logically know. On this latter view, God alone will certainly be present to all future events, but what they will be is open and not determined and not known to God. The discussions of eschatology have to be set in the context of this unresolved dichotomy of views. Furthermore, we have to ask, on what is much Christian theological talk of eschatology and the future based? Cosmology predicts with very great certainty the demise of this planet and all life on it, including ours. What then is the cash value of talk about "a new heaven and a new earth"? The only propounded bases for this seem to me to be the imaginings of one late-first-century writer (in Revelation) and the belief that the material of Jesus' physical body was transformed to leave an empty tomb. I have already indicated that the latter is at least debatable and the former can scarcely be evidence. So what is left is belief in the character of God as Love and that God has taken at least one human being who was fully open to the divine presence into the divine life—the resurrection and ascension of Jesus. Is not all the rest of Christian eschatology but empty speculation?

Verdict. The foregoing critical issues (I to XIV) consist of both methodological and substantive challenges to Christian theology as it reflects on the nature and character of the cosmos that the sciences have unveiled.

Intellectually educated, thinking people, if they are still attached in any way to the Christian churches, are, as it were, hanging on by their fingertips as they increasingly bracket off large sections of the liturgies in which they participate as either unintelligible, or, if intelligible, unbelievable in their classical form. There is an increasingly alarming dissonance between the language of devotion, liturgies, and doctrine and what people perceive themselves to be, and to be becoming, in the world. For they now see themselves increasingly in the light of the cognitive sciences and of the historical sciences (cosmology, geology, biology), those that create the "epic of evolution."

Hitherto apologetic based on science by Christian thinkers has been a well-expressed reinventing of the wheel that strengthens Christians who are wobbling in their faith, but it is not convincing the general, educated public. It is still too entangled in worn-out metaphors and images. I myself have argued for a more dynamic view of God's continuous action in the processes of the natural, including human, world—the action of a God who is indeed transcendent, incarnate, and immanent, in whom the world exists and who is its circumambient Reality. Be that as it may, what we all have to do in this interaction of theology with the sciences is, by argument and imagination, develop a notion of God, belief in the reality of whom, with all that this entails, can coherently embrace what we now know from science about the cosmos, this planet, and our own and other species. Theology—which I still take to be wisdom and words about God—has to develop concepts, images, notions, and metaphors that represent God's purposes and implanted meanings for the world as we actually now find it to be through the sciences.

We require an open, revisable, exploratory, radical, (dare I say it?) liberal theology. This may well be unfashionable among Christians who seem everywhere to be retreating into their fortresses of classical Protestant Evangelicalism, traditional (Anglo-) Catholicism, and/or so-called biblical theology. Nevertheless, transition to such a theology is, in my view, actually unavoidable if Christians in the West, and I suspect eventually elsewhere, are not to degenerate in the next millennium into an esoteric society internally communing with itself and thereby failing to be the transmitter of its "good news" (the *evangel*) to the universal (*catholicos*) world.

Hence, a paradox: To be truly evangelical and catholic in its impact and function, the church of the new millennium will need a theology that, in its relation to a worldview everywhere shaped by the sciences, will have to be genuinely liberal and even radical. For such a Christian theology to have any viability, it may well have to be stripped down to newly conceived essentials and so be minimalist in its asseverations. Only then will Christian theology attain that degree of verisimilitude with respect to ultimate realities which science has to natural ones—and command respect as a vehicle of *public truth.*

A Hopeful Afterword

To conclude, I want to indicate why I am full of hope, in spite of the gargantuan task facing Christian theology as it enters its third millennium—a hope based on the perennial character of God's creative engagement with the world. Some years ago, after referring to evolutionary epistemology and how (a) in culture, human beings have developed artifacts helping them to transmit knowledge; (b) in the processes of cultural change, the new has emerged in humanity ("biology" has become "history"); and (c) human intersubjectivity develops in culture with a naturally evolved capacity for self-awareness, I observed that, natural as all this process is, oddly enough there are signs of a kind of misfit between human beings as persons and their environment that is not apparent in other creatures (Peacocke 1991, 77). We alone in the biological world, it seems, individually commit suicide; we alone by our burial rituals evidence the sense of another dimension to existence; we alone go through our biological lives with that sense of incomplete fulfillment evidenced by the contemporary quests for "self-realization" and "personal growth." We have aspirations and what appear to us as needs that go far beyond basic biological requirements for food, rest, shelter, sex, and an environment in which procreation and care of the young is possible. Human beings seek to come to terms with death, pain, and suffering, and they need to realize their own potentialities and learn how to steer their paths through life. The natural environment is not capable of satisfying such aspirations, and the natural sciences cannot describe, accurately discern, or satisfy them. So our presence in the biological world raises questions outside the scope of the natural sciences to answer. For we are capable of happiness and miseries quite unknown to other creatures, thereby evidencing a dis-ease with our evolved state, a lack of fit which calls for explanation and, if possible, cure.

Subsequently (Peacocke 1993, 231–32, 252–53) I noted that the biological endowment of human beings does not appear to be able to guarantee their contented adaptation to an environment which is, for them, inherently dynamic. For they have ever-changing and expanding horizons within which they live individually and socially, physically and culturally, emotionally and intellectually. In particular, when one reflects on the balanced adaptation of other living organisms to their biological niches, the alienation of human beings from nonhuman nature and from each other appears as a kind of anomaly within the organic world. As human beings widen their environmental horizons, they experience this "great gulf fixed" between their biological past environment out of which they have evolved and that in which they conceive of themselves as existing or, rather, that in which they wish they existed. We may well ask: Why has, how has, the process whereby there have so successfully evolved living organisms finely tuned to and adapted to their environments failed in the case of *Homo*

sapiens to ensure this fit between lived experience and the environing conditions of their lives? It appears that the human brain has capacities which originally evolved in response to an earlier environmental challenge but the exercise of which now engenders a whole range of needs, desires, ambitions, and aspirations that cannot all be harmoniously fulfilled.

Such considerations raise the further question of whether or not human beings have really identified what their *true* environment really is—that environment in which human flourishing is possible. Such is the depth of human *angst* and tragedy that it would clearly be unwise to expect to be able to answer such questions from within the scope of biology—even though modern biology is digging deeply into our origins and has uncovered genetic foundations for more of our personal and social behavior than had been anticipated earlier.

We know only too well that these needs are not satisfied within our grapplings with our biological and even our social environments, and we experience a kind of gap between our yearnings and the actualities of our situations. There seems to be an endemic failure of human beings to be adapted to what they sense as the totality of their environment—an incongruity eloquently expressed by that great nineteenth-century Presbyterian preacher, Thomas Chalmers, in his 1833 Bridgewater Treatise: "There is in man, a restlessness of ambition; . . . a dissatisfaction with the present, which never is appeased by all the world has to offer . . . an unsated appetency for something larger and better, which he fancies in the perspective before him—to all which there is nothing like among any of the inferior animals" (1834, 129–30). Does not the human condition therefore raise the profound question of what humanity's true environment really is? Thus it was that St. Augustine, after years of travail and even despair, addressed his Maker: "You have made us for yourself and our heart is restless till it rests in you" (*Confessions*, Book 1[1], 1). Augustine's Maker is ours, too, and no one who has asked has not received, and no one who has sought has not found (Matthew 17:7). So let us knock, and it *will* be opened to us.

NOTES

1. For a recent useful survey of the status of realism in the philosophy of science and among scientists, broadly in accord with the judgments made here, see McGrath 1998, ch. 4.

2. "*Foundationalism*, as it is generally defined today, is the thesis that all our beliefs can be justified by appealing to some item of knowledge that is self-evident or indubitable. Foundationalism in this epistemological sense therefore always implies the holding of a position inflexibly and infallibly, because in the process of justifying our knowledge-claims, we are able to invoke ultimate foundations on which we construct the evidential support systems of our various convictional beliefs. These 'foundations' for our knowledge are accepted as 'given,' and therefore are treated as a privileged class of aristocratic beliefs that serve as ultimate terminating points in the argumentative justification for our views" (Van Huyssteen 1997, 2, 3). An example follows.

One of the most recent thorough attempts to restore rationality to theological procedures is that of Nancey Murphy in her *Theology in the Age of Scientific Reasoning* (1990—page numbers below refer to this work, with emphases sometimes added). Her transfer of the research program notion of Lakatos from science to theology runs the risk of reverting to the foundationalism

many wish to eschew. For her, a Lakatosian research program starts with a "central organizing idea" as its hard core. This can be "the God of Jesus as the all-determining reality" (p. 176) or "the trinitarian nature of God, God's holiness, and God's revelation in Jesus" (p. 184). Such a research program should "develop theories (auxiliary hypotheses) concerning all the *traditional* theological loci" (p. 176); it must be "faithful to any authoritative pronouncements *within the relevant communities"* (p. 176) and "in many cases" to the "dogmas of a *particular communion*" (p. 185). It must relate "the doctrines to available data" (p. 176), as one would expect for any program described as "research," but these data are drawn from "revelation" or the Scriptures, or (in her own case) from this last and "the varied results of discernment" (p. 188). All of which sounds to me not only as very foundationalist but also as very cultural-linguistic, *à la* Lindbeck (1984), falling within that explicating of the "grammar" within a particular faith community which would entail that theology had no public forum.

3. Lorenz 1977, 113. He identifies these functions as: perception of form; representation of space, especially through sight; locomotion; memory, or storage of information; voluntary movement with feedback; exploratory behavior; imitation (and so learning); and transmission of individually acquired knowledge between the generations.

4. The development of Popper's thought in this respect is well described by W. W. Bartley III (in Radnitzky and Bartley II 1987, 18–20). He dates Popper's public discussion of the role of biology in elucidating human cognition from 1960 and refers (pp. 20–23) to the key contributions of Lorenz (n. 3 above) and of Campbell (1974). The latter's key essay of 1974, "Evolutionary Epistemology," is reproduced in Radnitzky and Bartley II (1987, ch. 2), and also goes back to an earlier 1960 essay of his, "Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes" (ch. 3 in that volume).

5. See also Philip Clayton (1997) for a persuasive argument for its application to theology, especially in its interaction with science.

6. Lipton 1991, 186. He calls this the "loveliest" explanation. The "likeliest" explanation—the one most warranted by the evidence—he rightly regards as not conducive to finding the best explanation for the model can then tend to triviality.

7. Compare the criteria proposed by Thagard (1978): consilience, simplicity, and analogy. An explanation is better than another if it is more consilient (explains more classes of facts than the other); simpler (has fewer *ad hoc* auxiliary hypotheses); and can point to more plausible analogies.

8. Initially and explicitly in my *Creation and the World of Science* (1979, 21–23); then more fully in *Intimations of Reality* (1984, ch. 1); and subsequently in other publications.

9. I have incorporated, with gratitude, some of the "Ten Commandments" of Willem Drees, expounded in his 1998 Idreos Lectures in Oxford and later published in *Science and Spirit* 4 (1998): 2–4.

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