

Christian Theology and the Scientific Disciplines

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This paper will propose two ways that Christian theology can relate to both the natural and the social sciences.¹ I will argue that the fundamental relation ought to be one of complementarity, but also that theology and the sciences ought to challenge each other. I envision such challenges as resulting not in stalemates or irreconcilable conflict, but in fruitful modifications of theology and the scientific disciplines.

Perhaps it is best to begin by recalling that it is part of Christian faith that God is both the Creator of nature and the One who has been revealed through the prophets and through Jesus the Christ. Therefore, since God does not contradict himself, the truths of nature and the truths of revelation should not be in conflict. If they seem to be, it is because either revelation or nature have been misunderstood. This, of course, cannot be proved — it is part of Christian and especially Catholic faith. In the past seemingly intractable conflicts have emerged, for example the conflict between the Genesis account of creation and the theory of evolution, or the Jewish-Christian belief that the universe had a beginning with the scientific belief — common before the Big bang theory — that the universe was eternal.

These conflicts, while not entirely resolved, have proved to be more apparent than real. Consider the conflict between Genesis and evolution. For centuries the Genesis narrative was read as largely historical, though certain elements of it (e.g. the talking serpent, the length of one day of creation) might be interpreted symbolically. A literalistic reading of Genesis 1-11 corresponds with the idea that God, in inspiring the sacred writers, *dictated* the words to them, so that the account had to be inerrant down to the last details. This is still the notion of inspiration held by many fundamentalists, and by Muslims of the Quran. But Catholic and mainline Protestant theologians no longer read Genesis 1-11 this way. Rather it is thought that God, in inspiring the authors, allowed them to use the literary conventions, scientific knowledge, cosmology, and concepts current in their day. The literary genre of Genesis 1-11 is usually classed by scripture scholars not as history or science, but myth — that is, a symbolic narrative dealing with God and the origins of the world. We cannot expect a myth to provide an accurate scientific or historical account of the creation of the world and humanity (though many would still hold for the historicity of a first human pair). Rather Genesis 1-11 is read as a largely symbolic account of God and God's relations with human beings. As such it reveals not scientific truths, which human beings can figure out for themselves, but spiritual and theological truths necessary for salvation, for example that God is the creator and sustainer of the world, that the world God made is good, that human beings are made in God's image (a symbol fraught with many levels of meaning), that the relationship between humans and God has been

damaged by sin. For such truths the most appropriate revelatory vehicle is symbol and story, not philosophy or science. For what would have happened if God had tied the revelation to a particular scientific or philosophical view of the cosmos? Either the account would have been so far in advance of its time as to appear incredible, or it would have soon been outdated, and so also incredible. Both scientific accounts and philosophical language have a relatively short “shelf life,” as any reader who has struggled with the meaning of medieval philosophical language can testify. But stories and symbols speak to every generation, and convey a fecundity of meaning that concepts do not. To read Genesis 1-11 then as primarily a scientific account of origins is to misunderstand it. Evidence for this can be found in Genesis itself; Genesis 1 shows God creating the animals first, then human beings; Genesis 2 shows God creating first the man, then animals (as companions), then woman. Thus at the level of scientific fact, there is a contradiction in Genesis. Interestingly enough, the ancient editors who composed our present book of Genesis (about 500 B.C.) from several preexisting narratives let the contradiction stand rather than trying to harmonize it — an indication that they thought the primary meaning of the sacred text did not lie on the level of what we would now call scientific or historical fact:

Thus the apparent conflict between the theory of evolution and the traditional reading of Genesis 1-11, which was initially a challenge to theology from the sciences, has resulted in a more subtle theology, which distinguishes (but does not entirely separate) the truths of revelation from the truths ascertainable by science and history. Christians can understand evolution (both cosmological and biological) as the process through which God creates, while reading Genesis for insight about God and the human condition.

The second conflict referred to above, between the scientific belief in an eternal universe and the Jewish and Christian doctrine that the universe had a beginning in time, also appears now to have been an apparent conflict but not an actual one. But in this case the change occurred in science, which developed the Big Bang theory. It is too early to conclude that the Big Bang theory implies that there was an absolute beginning, or that the universe was made from nothing, but the theory in its present form certainly seems to be consonant with these beliefs. As Robert Russell has commented, if one were to ask what a creation from nothing would look like to an astronomer, the answer is: it would probably look like the present Big Bang theory. Conflicts then, between theology and one or another of the sciences may prove to be only apparent, as knowledge of the sciences or our understanding of theology progress,.. A permanent contradiction between theology and the sciences would, I think, seriously undercut the Christian faith that God the creator is also God the revealer.

One way of relating science and theology might be called the way of complementarity. Scientific knowledge is by its nature limited to knowledge of the natural world. The body of knowledge of a particular scientific discipline is limited to the area of that discipline. Christian theology, in turn, is knowledge based on revelation, as interpreted by the Church, and is concerned with truths about God and God's relation to humanity and the universe. Theology does not claim to possess a significant body of knowledge concerning the workings of the physical world, though some theological doctrines may imply claims about the physical world (e.g. that it is open to the activity of God). Thus it would seem that the sciences and theology might complement each other: the sciences tell us about nature, theology about God and the what is beyond nature — the transcendent. But such a position could be interpreted to mean that scientific claims and theological claims never impinge on each other, that science and theology concern two completely separate worlds of reality and discourse; hence that neither has anything to say to the other. This is the so-called "two worlds" theory. But a consistent claim of Christian theology has been that *God acts in and through nature*. God answers prayer, works miracles, is made present through the sacraments, and, as the second person of the Trinity, even became incarnate in the human being Jesus of Nazareth. Furthermore, a long standing claim of both Jewish and Christian theology has been that since the natural order has been created by God, traces of God's design and order can be found in the visible universe itself, which reflects and points back to its Creator (cf. Psalm 19, Romans 1:20). Thus, though there is a distinction between the natural and supernatural orders, they are not entirely separated as the two-worlds theory maintains; rather, they interpenetrate each other. If this is so, then science and theology should have something to say to each other. Some scientific claims may carry theological implications or be open to theological criticism; conversely, theological claims may carry scientific implications and be open to scientific criticism. Complementarity, then, in my understanding, involves dialogue and mutual criticism, as well as the idea that both the scientific and theological disciplines complete 'each other, and combine to give a more comprehensive view of the world than either could by itself. Depending on the scientific discipline which is in dialogue with theology, and which theological school is being discussed, different kinds of complementarity are possible between science and theology. In the following three examples, I illustrate three kinds of complementarity based on three different scientific disciplines.

The first concerns physics. Astronomical physics has, in the last twenty years or so, discovered that the physical laws and constants of our universe must be precisely balanced to an incredible degree of precision for life to emerge. If any one of the laws and constants, for example the relative strength of the four basic forces, or the resonance of atoms like carbon, were slightly different, life could not have emerged in the universe. To have life, there must first be elements heavier than hydrogen. These have to be built up in the interior of stars, a process which takes billions of years. But then the stars have to explode to get the elements out into space so they can be utilized. Furthermore, some stars at least have to burn at a steady rate for millions of years so that life can emerge and evolve from organic molecules. In order for all these conditions to be fulfilled, physical laws and constants have to be balanced. To take one example, the strength of gravity has

to precisely balance the initial rate of expansion of the universe at the moment of the Big Bang. If the rate of expansion were too great, or the force of gravity too weak, stars and galaxies would not form and life could not emerge. If the rate of expansion were too slow, or gravity too strong, the universe would have expanded for a few billion years, but then recollapsed before stars had time to produce the heavy elements, explode them into space, and a second generation of stars emerge on whose planets life could evolve. How closely did the strength of the gravitational force have to balance the initial rate of expansion? About one part in 10^{60} .² This is an incredibly small possibility, about like hitting a quarter on the other side of the universe with a rifle, or, to use Fred Hoyle's analogy, like a tornado going through an aircraft junkyard and assembling a 747 ready to fly. And yet this is just one of the balances which have to be within one percent or less in order for life to emerge; there are dozens of others.³ Now, physics can discover that this balance of forces exists in the universe, but it cannot answer the question: Why is it so? There are a number of possibilities: (1) it is a coincidence (but an impossibly small one); (2) there are really 10^{60} other universes out there for which we have no evidence, and we live in the only one which could produce life; (3) our universe was designed so that life could emerge. There is really no clear scientific basis for choosing one or another of these answers. But, as John Polkinghorne has argued, it happens that theology has a coherent answer to the problem, that does not involve believing in an impossibly small coincidence or believing in septillions of other universes for which we have no evidence. Our universe is structured so precisely because it was designed by a designer: God.

Perhaps it will be said that this claim makes sense if one already believes in God, but does not follow if one does not. But a number of physicists, such as Fred Hoyle and Paul Davies, who have been hostile to organized religion, and especially to Christianity, have been led by the evidence to conclude that the universe must have been designed by a super-intelligence. Hoyle, a life-long atheist and opponent of Christianity, who originated the steady state theory because he felt the Big Bang theory looked too Christian, had his atheism shaken on discovering that the resonance of carbon atoms and oxygen atoms was very precisely balanced, and that if this had not been the case, very little carbon would have been produced in stars, and life could not have emerged. Hoyle commented:

Would you not say to yourself, "Some supercalculating intellect must have designed the properties of the carbon atom, otherwise the chance of my finding such an atom through the blind forces of nature would be utterly minuscule?" Of course you would. ... A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts are so overwhelming as to put this conclusion almost beyond question.⁴

Similarly, physicist and recent Templeton Prize winner Paul Davies, who still is extremely critical of institutional religion and suspicious of conventional notions of God, has concluded that the evidence precludes the universe emerging by chance. "To me, the contrived nature of physical existence is just too fantastic to take on board as simply 'given'. It points forcefully to a deeper underlying meaning to existence. Some call it

purpose, some design.”⁵ While Davies is reluctant to use the word “God,” his thought seems to call for some kind of a cosmic designer.

In this example, then, astrophysics, in its pursuit of knowledge, seems to have raised a question: *Why* are the physical laws and constants of the universe so precisely balanced that life can emerge? This question is by its nature meta-scientific, and beyond the ability of astrophysics qua astrophysics to answer. But traditional Jewish, Christian, and Islamic theology does provide an answer: the universe was designed by a Creator, God, both to express God’s goodness and beauty, and to make possible the existence of creatures who are capable of fellowship with God: human beings. This kind of complementarity may be called a complementarity of explanation: theology provides an explanation which is beyond the purview of disciplines which restrict themselves to the natural order, while disciplines like astrophysics greatly enrich our knowledge of how God’s creation has come to be. Science and theology each provide a partial explanation; together they provide a more comprehensive and unified explanation. Second example of the complementarity of science and theology is drawn from economics. As a (social) science, economic analysis attempts to be value neutral and to exclude unquantifiable “externals” which cannot be factored into calculations, such as the drawdown of natural resources, the costs of pollution, the human costs of unemployment, and political events. Thus economists make predictions of the form: “given these data, these economic trends are likely to occur.” But economists, it seems to me, cannot entirely avoid questions such as: What is a *good* economy? What kind of economy should we aim to construct? One with high growth? With full employment? With low inflation? One which preserves the environment? These questions impinge even on technical economics, for example, on how one measures economic growth. Present indices of economic growth, such as the GNP, exclude resource drawdown, environmental damage, the human cost of unemployment, as unquantifiable. But in excluding these considerations, economists are already introducing subtle value judgments into their practice. Is an economy which the GNP indicates is growing by 2 percent a year, but destroying the environment in the process, *really* growing at 2 percent? But an, answer to, this kind of question and others like it which are raised by the practice of economics cannot be found within economics itself. To answer such questions, one must posit certain values about human life, the environment, etc. How does one arrive at these values? Probably by an analysis of ethics, that is to say, by philosophy. But ethics in turn requires certain assumptions about the ultimate goods, values, and goals of human life, and such assumptions usually entail theology. For example: what value should the economy assign to the preservation of wild nature? What value to the human development of indigent, marginalized, or unemployed persons? What value to the welfare of future generations? Are there some economic practices or values which are, contrary to divine laws? Perhaps it is possible to practice technical economics without consideration for such larger questions, but economics as a discipline seems naturally to lead to such value-questions, which cannot be answered by economics alone, but must entail philosophical ethics and to some extent, theological ethics. .

In this example, then, the complementarity in view is an ethical complementarity. Economics, like sociology and other social sciences, strives to be value-neutral, but

probably cannot avoid covertly introducing values into its method and practice. If so, it needs to be complemented by disciplines which explicitly deal with values: philosophy, and to a some extent, theology.

My third example concerns psychology. Most psychological systems since Freud (excepting that of Carl Jung and a few others) have eschewed discussion of spiritual factors in the human psyche and have been based more or less on mechanical models of human behavior. Freud's psychology and the behaviorism of B.F. Skinner are examples. So, I believe, is modern cognitive theory, which likens the brain to a computer, the mind to a computer program, and so on. Such systems have usually dismissed religion as some sort of fiction. For Freud religion was a remnant of humanity's childhood, due to fear and wish fulfillment (*The Future of an Illusion*). Yet, while such theories may explain certain immature forms of religious behavior, they do not succeed in explaining the beliefs and behavior of mature, intelligent religious persons (e.g. Mother Theresa, Gandhi), of whom there are many. In particular, they ignore mystical experience and the virtually universal testimony by religious persons to the experience of aid by a higher power, or "grace" in Christian theological language.

I would argue that by systematically minimizing or ignoring the religious dimension of human psychology, modern psychology shows itself to be seriously one-sided and incomplete.⁶ In fact it fails to account adequately for a great deal of pertinent data. Religion is one of the most widespread, oldest, and important forms of human psychological behavior. Virtually every culture has been or is religious, except the culture of modern Western intellectuals. Furthermore, religion is not merely a kind of luxury, which people practice after their basic needs have been fulfilled (*pace* Abraham Maslow's hierarchy of needs). For many persons religious authenticity is more important even than bodily survival. And religion, far from withering away in the hard light of scientific reason, as Freud thought it would, is growing; even many scientists are embracing religion. Why is religion so important to human beings? Why do so many people in various denominations, religions, and even non-religious groups like Alcoholics Anonymous, testify to the experience of aid by a higher power? Is not the most obvious explanation that there really is a divine provider to whom human beings respond? Without wishing to minimize the achievements of modern psychology, which explains a good deal of human behavior, I would suggest that it needs to be complemented by an appreciation of spirituality and of theology to adequately explain the religious aspect of the human psyche.

The kind of complementarity I am suggesting here, then, involves a complementarity of explanation — wider explanations are needed beyond those given by reductionistic psychologies. But more than that is the need for a complementarity of data: the data to which theologians pay attention is simply ignored by most branches of psychology. Conversely, theologians need to be aware of the data (and interpretations) published by psychology. Much religious behavior is certainly affected by the kind of natural (or pathological) psychological needs analyzable by psychology. This need, for the sciences to appreciate the data of theology, and vice versa, I think applies especially to certain social sciences, such as psychology, sociology, and history.

As suggested above, the way of complementarity might suggest that science and theology are two independent spheres or realms of cognition which fit together like complementary voices or colors. And while I think that is partly true, it is not the whole story. If God and nature interact, then a comprehensive picture of almost any aspect of nature or human life will require cooperation between theology and one or another of the sciences. But a genuine interaction of disciplines must allow for interdisciplinary challenge, sometimes fundamental challenge. The sciences have certainly challenged theology. For the last century or more theologians have encountered scientific systems which were hostile to religion. The mechanist physics of the nineteenth century allowed little place for spirit, soul, or God. Many of the apologists of evolutionary biology have been and still are materialists, hostile to religion (e.g. T.H. Huxley, James Watson, Francis Crick, Jacques Monod, Richard Dawkins, Stephen Jay. Gould, Carl Sagan). This has also been true in psychology (Freud, Skinner), economics (Marx), and the social sciences. On the whole, the result has been salutary for theology, which has not been able to merely repeat past arguments, but has had to reexamine its foundational assumptions and sharpen its arguments to survive. Because of this, better theology has been done in this century than in any since the thirteenth. I think it is also true that the sciences can benefit from well meant, constructive criticism from the camp of the theologians.

Theologians, of course, can have no quarrel with legitimate scientific data. But scientists do not deal only with raw data; to be meaningful, the data must be placed within the context of an interpretative paradigm. A track in a cloud chamber is meaningless outside of the complex paradigm of elementary particle theory. A fossil fragment dislodged from a shelf of limestone is meaningful once it is properly located in time and according to its genus and species. The infinitesimal perturbations of electromagnetic radiation from distant stars might be dismissed as noise, unless they match the predictions of a complex interpretative framework, within which context they are interpreted as evidence for distant planets.

Now most or all of the interpretative paradigms used in the sciences contain philosophical and theological assumptions. And these assumptions may be open to challenge. Let me provide three examples: from physics, economics, and psychology.

The great success of modern science has been due largely to the fact that it narrowed its investigation of causes to those causes which were material and quantifiable. Isaac Newton wrote in the preface to the first edition of the *Principia Mathematica*: “moderns, rejecting substantial forms and occult qualities, have endeavored to subject the phenomena of nature to the laws of mathematics. ...”⁷ Substantial form, in Aristotelian and Thomistic philosophy, was a holistic or formal cause, which integrated an entity as a whole. These, along with any spiritual causes, were set aside by early modern physics, at first as a method of investigation. But so great was the success of this method that within a few generations the method was becoming a metaphysical outlook; by the eighteenth century, thinkers like Baron d’Holbach held that only material causes existed. Twentieth century physics has largely followed this. So, for example, in his book *Cosmos*, Carl

Sagan declares, echoing the Christian doxology: “THE COSMOS IS ALL THAT IS, WAS, OR EVER WILL BE.”⁸ By “Cosmos” here Sagan means of course the physical cosmos.

The natural bias of modern physics, stemming from its method, has been towards materialism (i.e. the belief that only material causes exist), and ontological reductionism, that is, the belief that entities are no more than the sum of their parts; no holistic causes exist. Both these beliefs are philosophical assumptions. There may be spiritual causes (not measurable by science) besides material causes, and there may be holistic or formal causes (which perhaps can be measured by science). Thus a theologian might ask Carl Sagan “How do you know that only the physical cosmos, and nothing else, exists?” Materialism and reductionism are closely associated with another idea, *scientism*, the belief that everything can be explained by scientific method, and that what cannot be so explained, does not exist. This belief has attracted widespread criticism by philosophers and theologians in the last century, but still persists. Recently Oxford zoologist Richard Dawkins, in opposing the establishment of a chair of science and religion at Cambridge University, declared that theology was a “non-subject” and continued: “What has [religion] ever said that is of the smallest use to anyone? When has it said anything that is demonstrably true? The achievements of theologians don’t even mean anything. If all the achievements of [religion] were wiped out tomorrow, would anyone notice the smallest difference?”⁹

Over the years, materialism, ontological reductionism, and scientism have been subjected to criticism by philosophers and theologians, with the result that philosophically minded physicists are now sensitive to the limitations of these assumptions. If one grants the assumptions of materialism, reductionism, and scientism, then Dawkins and Sagan are right: religion is a delusion and theology a non-subject. If one does not grant them, then there is room for a discussion between religion and science, theology and physics. Partly as a consequence of this, partly as a result of developments in physics itself, there is new interest in holistic causes (especially among physicists who are also religious), and what might be called the physics of interconnectedness, rather than a physics of atomism and reductionism. Such a physics has been designed by the late David Bohm, whose view of quantum mechanics was influenced by his studies with J. Krishnamurti.¹⁰ Especially since the advent of the Big Bang theory, there is also an openness among many physicists to reality which is non-material. Astrophysicist George Ellis, a collaborator of Stephen Hawking, in a recent book, *Before the Beginning: Cosmology Explained*, describes the cosmos in the light of Big Bang cosmology, but also insists that the existence of moral absolutes must be included in a description of cosmology, and that the only way to account for them is to ground them in God (Ellis is a Quaker).¹¹ Here we see theological arguments directly affecting cosmological description.

I have already indicated above what kind of challenges might be directed to economics by theology. In brief, the challenge is: to ground economics in a credible theory of the human and common good. Let me give two examples regarding this. (1) Modern accounting does not depreciate the drawdown of natural resources, though it does depreciate capital (factories, equipment, etc.) As a consequence, if oldgrowth forests are cut down and sold

as whole logs to Japan, the GNP goes up, because there is no accounting category which represents the loss of the forests, a natural resource, which are presumed, in accounting theory, to be free. Also, there is no entry made for future clean-up costs, or for the decrease in the quality of life due to pollution. The modern measurement of GNP would not, I believe, show any decrease even for a Chernobyl type disaster (except for the direct cleanup costs), which poisoned some 25 percent of the cropland of the Ukraine. The Exxon Valdez oil spill increased the GNP of Alaska and the nation, because of the money spent in clean-up, which was entered in the books as a service. This system is obviously perverse, and needs to be rectified by factoring in both resource drawdown and future pollution costs. The problem, of course, is that these factors cannot be conveniently measured (recall that science deals only with what is measurable), and so are avoided in accounting calculations. (2) Typically, finance is taught as if the principal or only goal of the corporation is to maximize shareholder return. This ignores other possible obligations, such as preservation of the environment, welfare of employees, the real value to the larger community of the product being produced, etc. Again, the problem is to tie the economic theory to a larger concept of the human and collective good or goods. But these have traditionally been dismissed as “externals” because they could not be measured. The result is an unreal quality about modern economics: the stock market soars while more and more persons are out of work; the GNP goes up even as natural resources are consumed. I recognize that for economists to take seriously such a challenge from theology would take decades of work, and a revision of fundamental assumptions in economics, but that is the whole point of interdisciplinary dialogue.

Again, the challenges to psychology from theology are implicit in what was said above. Academic psychology is too beholden to mechanistic models, and ignores religious experience and even factors such as free will, and so is seriously one-sided. This is probably due to its desire to be seen as scientific. The hard sciences have, from the beginning, excluded spiritual reality from the domain of scientific data, and psychology is simply following this tradition. Yet from a theological point of view (and other points of view as well), the reduction of human beings to mechanistic or computer-like systems is ultimately dehumanizing, and does not do justice to the full reality of humanity. Recently this argument has also been made by some psychologists. Roger Sperry, a Noble laureate and Professor of psychobiology, has argued that consciousness, as an emergent property of the brain, exerts downward causal control over the neurons of the brain:

Instead of excluding mind and spirit, as had been the rule for all of us in brain-behavior science for many decades, my new logic required that mental and “spiritual” forces be reinstated at the top of the brain’s causal control hierarchy as real interactive “emergent” properties of brain processes and given primacy in determining what a person is and does. For science, it put the long banished conscious, mental forces back in the brain — and “in the driver’s seat as the crowning achievement of some 500 million years or more of evolution.”¹²

This has inaugurated what Sperry terms the “mentalist” revolution in psychology. More recently, neuro-physiologist and Nobel Laureate Gerald Edelman has published

extensive research indicating that the physiology of the brain itself does not support the mechanistic models or computer models in vogue in present cognitive theory, and that this theory needs to be seriously modified.¹³

I do not deceive myself that theological challenges to the sciences are going to carry much weight among most scientific practitioners. But some scientists themselves, often religiously minded scientists, are beginning to take theological challenges seriously, and shape their research and writings accordingly. We are, I believe, in the first phases of revolution in scientific thinking, in which the dialogue between science and theology is starting to bear fruit, a fact which holds great promise both for the sciences, and theology. As Australian biologist Charles Birch observes:

The mechanical images no longer fit. They are giving way to quite a different image of the universe and ourselves. This discovery is being made simultaneously by a science, a philosophy, and a theology as yet little known. Its new images are no longer mechanical; they are organic and ecological. The universe turns out to be less like a machine and more like life. This constitutes a new revolution in science, philosophy, and theology in our time.¹⁴

I would like to end this paper by recalling a quotation from the great early chemist, Robert Boyle, whose scientific discoveries enriched his religion, and whose religion explained the ultimate reasons for the design in nature revealed by science. Boyle wrote:

When with bold telescopes I survey the old and newly discovered stars and planets ... when with excellent microscopes I discern nature's curious workmanship; when with the help of anatomical knives and the light of chymical furnaces I study the book of nature ... I find myself exclaiming with the psalmist, How manifold are thy works, O God, in wisdom hast thou made them all!¹⁵

Footnotes

1. Hereafter, “theology” will mean “Christian theology.”
2. See John Barrow and Frank Tipler, *The Anthropic Cosmological Principle* (Oxford: Oxford univ. Press, 1988), 411.
3. See *ibid.*, or John Leslie, *Universes* (London: Routledge, 1989) for an account of some of the necessary balances.
4. Cited in Owen Gingerich, “Is there a role for Natural Theology Today?” in *Science and theology: Questions at the Interface* (Grand Rapids: Eerdmann, 1994), 40.
5. “Physics and the Mind of God,” The 1995 Templeton Prize Address, from *First Things*, Aug./Sept., 1995, 34.
6. Neurologist Oliver Sacks (author of *Awakenings* and *The Man Who Mistook His Wife for a Hat*) recently confessed at a symposium on “Reductionism in the Natural Sciences” that he had been depressed for ten years, because of (in the words of a reviewer) the “gathering momentum of mechanistic, programmed, computational explanations of the human mind. He had been oppressed no less by the radical reductionism of molecular biology and genetics ...” From John Cornwall, “Mind in Nature,” a review of the work of Gerald Edelman, in the *London Tablet*, Oct 24, 1992, 1324-1326.
7. From *Mathematical Principles of Natural Philosophy*, trans. by Andrew Motte, rev. by Florian Cajori, in *Great Books of the Western World*, vol. 34, (Chicago: Encyclopedia Britannica Ins., 1952), 1.
8. *Cosmos*, (N.Y.: Random House, 1980), 4.
9. Quoted in the *Toronto Star*, Oct. 14, 1995, p. R.-
10. See *Wholeness and the Implicate Order* (London: Routledge and Kegan Paul, Ark Book, 1980).
11. London, New York: Bantam/Bowerdean, 1993.
12. Roger Sperry, “The New Mentalist Paradigm and Ultimate Concern,” in *Perspectives in Biology and Medicine*, 29, 3, Part I, Spring, 1986, 416-417.
13. See Gerald Edelman, *Bright Air, Brilliant Fire* (New York: Basic Books, 1991)
14. Birch, p. xi.
15. *Some Motives and Incentives to the Love of God*, in *Works*, vol 1 (London, 1744), 167, cited in Norma Emerton, “Arguments for the existence of God from Nature and Science,” in *Science and Theology: Questions at the Interface* (Grand Rapids, Eerdmans, 1994), 76.