

Editorial

This issue of *Zygon* contains papers on the theme "From Artificial Intelligence to Human Consciousness," most of which were initially presented at the annual conference of the Science and Religion Forum in Great Britain (meeting in Canterbury), in April 1984.

What could be the most fundamental of all problems that could compete for the attention of a Science and Religion Forum? Among them, surely, must be that nexus of problems that underlie that ancient question, What is Man? The contemporary version of that notorious conundrum could probably be stated as: What exactly is the special feature of *Homo sapiens* that gives members of this species their distinct *spiritual* propensities, causing them to be, characteristically, *religious* animals; and what is the status of these religious notions or attitudes? A forum of scientists and religious thinkers has to return to this question repeatedly since, precisely for such a body, science and religion are *not* separated frames of knowledge to be maintained mutually orthogonal but are facets of truth that, somehow, must be brought to bear upon one another in reasoned, sensitive, patient discourse. We confess to being religious people. But what *is* religion? What *is* faith, wonder, worship, love? Can there be scientific answers, for we are also scientifically educated people? And, since these religious idiosyncrasies of ours manifestly arise out of our higher faculties, our conscious mind in particular, what *is* this phenomenon called consciousness which is so unique to human beings? Or, is consciousness indeed really so unique?

It was to this group of questions that the 1984 conference of the Science and Religion Forum was addressed. In the course of the ten years or so of its existence, the Forum has turned its attention to a variety of very different matters, some of more practical character, others more academic, some of long-term interest, others of more short-term importance. Among the more practical issues have been "Science and Religion as Partners in Education," "Man's Responsibility for Nature," and the "Ethical Challenge of Contemporary Biology"; among the more academic was the interesting pair of topics "Theologians take account of Developments in Science," and "Creation: The Physicist's View." In moving from one topic to another, it has been the practice of the Forum not to be bound by any rigidly imposed program but to decide each successive conference topic just one year in advance, so as to be responsive to current thinking and concerns. Hence the choice of topic for the 1984 conference—a topic which, owing to its centrality (as already noted above) had been worked upon twice before by the Forum: in 1975 ("The Problem of Consciousness") and in 1980 ("New Perspectives on Man").

But what is there new that could possibly be said about a problem that is thousands of years old? Indeed, a great deal. We have to keep ourselves up-to-date on at least two fronts. On the one hand there is the increasing scientific knowledge, these days, of man as a physical system—his brain, especially; on the other there is the increasing sophistication of computer systems that so successfully simulate aspects of human intelligence. Brain science is advancing very rapidly; at the same time, artificial intelligence (AI) is increasingly being put forward as a model for the understanding of human functions. The profundity of the problem does not make it immune to the effects of new

knowledge or new ideas. The problem of consciousness can, therefore, bear repeated examination.

Further evidence (since these conferences of the Forum) that this problem is very much alive was the selection of this topic for the prestigious BBC Reith Lectures, broadcast in August/September 1984, by John Searle, professor of philosophy at the University of California, Berkeley. These lectures are now available in print under the title, *Minds, Brains and Science*. In his opening sentences Searle held up the problem of consciousness as one of the biggest remaining unsolved problems for the philosopher. The subjects of AI, brain science, and the problem of free will were all prominent in his subsequent presentation. (The problem of consciousness he believed to be solved, now, by his approach to it; the problem of free will, in contrast, could probably not be solved, ever, he thought.) Most of us, probably, would disagree sharply with Searle's handling of these matters; but his lectures do highlight the resurgent importance that the subject of consciousness has, at the present time.

It is customary practice, in planning the program for conferences of the Forum, to bring together invited speakers from a range of disciplines—in particular, from philosophy, from theology, and from one or more of the sciences. In the present instance, the theological contribution was made by Keith Ward; his paper (“Consciousness and the Soul”) is unfortunately not available for printing here, but the other papers are reproduced here essentially as they were given. By their publication in *Zygon*, they reach a far wider audience than the limited group that met in April, in Canterbury; at the same time, the opportunity is afforded to all of us to study and learn from them.

Expertise in artificial intelligence is represented here by Donald Michie and Margaret A. Boden. Both are authors of books on this subject, and both are still very active in this field. Boden is also a philosopher and psychologist, and she chose to contribute primarily as such. Michie has laid out in some detail, with explanatory diagrams, and very impressively, the extraordinary power that present-day computer-based machine intelligent systems can have. With built-in, constantly modifiable expert knowledge, held in virtually instantly accessible memory, and with almost instant logical processing functions, these systems are incomparably more sophisticated, more advanced, than the sort of standard devices that mindlessly carry out preprogrammed instructions. The ability of these expert systems to handle, analyze, and reach conclusions from data of enormous volume and complexity, at least in limited contexts—and even to be able to justify those conclusions when required to do so—greatly exceeds that of a human brain. As Michie has remarked: “the professionals are in no doubt . . . they don't confuse old fashioned control-engineering, however highly tuned, with artificial intelligence, which is a different craft altogether.” It is this craft which Michie's paper endeavors to explain. It is not surprising that such AI systems are credited by some people with an “understanding” of the data they employ (the chess-games; the oil-rig behavior, including instant advice in the event of emergencies; the medical case-histories, and the intelligently supported proposals for the hospital treatment of patients). It is for us to judge how far these powers reflect on the powers of the human brain itself and also how far these systems will take us in the future. Michie has provided some useful further reading in his references.

Boden has long maintained that AI systems of this sort *must* and *do* have much to teach us about the workings of the human mind. In her paper, however, she has most usefully focused upon an often overlooked, but quite

profound aspect of intelligent thought (including, obviously, scientific enquiry), namely, the most basic underlying motivation of our mental achievements: the sense of wonder. Wonder is widely accepted as a religious emotion. But it is also a mainspring of intelligent enquiry: the sense of wonder that we feel before we have unraveled the detailed explanation of phenomena. Wonder is thus simultaneously both a part of the ground of religious devotion and the source of the thrust of scientific analysis. With the continual advance of our intelligent understanding of the world and our accumulation of knowledge about it, wonder is not made irrelevant, but its focus continually alters. Wonder is often under threat. Narrow reductionist accounts of phenomena tend to poison, within us, the sense of wonder; but we let it go only at our peril. The sense of wonder is really as precious as intelligence itself.

Turning to brain science, represented here by Donald M. MacKay, a great deal has been added during the past decade or so to our knowledge of brain organization by essentially new tools of research, such as the use of radioactively marked metabolite molecules followed by microautoradiography of tissue slices. Meantime, the patient use of microelectrode probes has continued to uncover remarkable facts, such as the existence of particular banks of highly specialized cells, each responding specifically to a certain angular orientation of a straightedge image on the retina, and thus corporately involved, it would seem, in the fundamental processes of pattern recognition. MacKay is, however, at pains to stress a different aspect of brain science, namely, the consequence of the *interrelation* of brains. Brains do not function in isolation. A brain, together with its various sensory perceptors and efferent systems, is an information processing system which acts in relation to its environment, particularly in relation to those other information processors (other brains-cum-bodies) with which it is in touch. This interrelatedness as well as the multivariant grounds for action or nonaction that arise directly from these relationships constitute such information processors as *persons*. Careful consideration of the situations that can arise in any such network of mutually related information processors leads easily to a fully consistent picture of the free will that these interrelated information processors have. (It is very interesting that MacKay presents a solution precisely where Searle considered this impossible!) On this topic, and related matters, MacKay has himself written a good deal—though in a large number of separate publications; it is extremely useful, therefore, that he has provided his paper with quite a comprehensive list of references.

The remaining important facet of modern science that we wished to have reflected in the conference papers was that of animal intelligence and animal consciousness. For this, we sought an animal scientist, preferably a zoologist or other biologist, but, in the event, were unable to secure one for the Canterbury meeting. As author of the fourth paper, I am an ordinary physical scientist member of the Forum. I try to show that the faculties that we consider distinctively human are not discontinuously different from animal faculties; rather, the whole evolutionary ladder shows a gradual development of successive emergent faculties, culminating in our human consciousness, human sensitivities, and human responsiveness to God.

With the four Science and Religion Forum papers we include a fifth paper by Grant R. Gillett, whose thesis is so germane to this topic of consciousness and intelligence that it complements the other four papers most usefully. Gillett argues that, although the characteristics of persons are manifested only when their nervous systems are working properly, in order to speak of the mind and

soul of a person one must go beyond what can be understood in purely physical terms. Yet, this does not necessarily lead to splitting a person into material and mental/spiritual substances or to a "ghostly" view of human beings.

Gillett's paper was developed out of work done at the Ian Ramsey Centre, established in January 1985, at St. Cross College in Oxford, England. This centre, under the direction of A. R. Peacocke, has been established for the study of ethical problems arising from scientific and medical research and practice, and of underlying philosophical and theological issues. Issues that particularly engage its attention at present are those of the nature of human personality (in relation to specific ethical problems), the beginning and ending of life (considered together), and humanity's relation to nature (with the need this generates for an environmental ethic).

In attempts to understand the nature of human personality, the problem of consciousness—together with its associated topics of the nature of free will, ethical responsibility, religious belief, and religious experience—remains as central as ever and, to use Boden's word for it, as *wonderful* as ever, the more we examine and reexamine it. Our understanding today is undoubtedly much superior to that of our forebears, but the study is nowhere near an end. Animal physiology, ethology, and brain science are still pouring out new information; brain science in particular still has a long, long way to go. Computer systems are still far from any ceiling to their development; knowledge engineering is still a very young science. Thus within, say, a five-year period the whole of this subject would merit a further fresh examination. Speaking for myself, I do not think that our current type of AI systems (even the knowledge-based expert systems) will serve as usefully as models of human intelligence as those we have in the form of our cousins in the animal kingdom. But AI will have much to teach us, particularly as we can follow exactly what is happening in a man-made system in a way which is not open to us when we are studying biological systems. Whatever that balance may be, however, it will remain imperative for philosophers, logicians, theologians, and all kinds of scientists to contribute their differing and complementary insights. Such is the nature of a really fundamental problem: it requires to be looked at repeatedly and from all angles.

As we progress in our understanding of the detailed mechanisms of our human faculties, shall we cease to wonder in proportion as mystery is dispelled? I hope not. Rather, let us appreciate all the more the marvel of what reality turns out to be, not losing faith but increasing in our awe of that Ultimate Mystery whom we acknowledge as the source of all these things, and to whom we acknowledge we are responsible—free, intelligent, conscious agents, as we are.

John H. Robertson