

## SCIENCE AND RELIGION

**In pursuing research at the boundary between science and religion, the Foundation seeks to unite credible and rigorous science with the exploration of humanity's basic spiritual and religious quests. Working closely with scientists, theologians, medical professionals, philosophers and other scholars, the Foundation encourages substantive dialogue in order to stimulate research and reflection on the relationship between science and religion. The Foundation especially seeks to stimulate rigorous scholarly/scientific advances that increase understanding of the ultimate aspects of human purpose, and of the vast potential for creativity and progress, which can be inspired by the collaboration of science and religion.**

Many of the projects supported by the Foundation have provided leading scholars with the opportunity for sustained reflection on important topics at the boundaries of science. Take the case of Paul Davies, a leading British physicist who published *The Mind of God* in 1992, one of the classic explorations in the field of science and religion. The book explored the degree to which scientific evidence pointed to a rational foundation for the universe and the sense in which this foundation could be referred to as "God." For these and other explorations, Davies won the Templeton Prize in 1995.

In 1998 Davies chaired a meeting of leading scientists and theologians on the topic of "Many Worlds." He was joined for the meeting in the Bahamas by Freeman Dyson, Sir Martin Rees, Lee Smolin, Nobel laureate Christian de Duve and others, all of whom collaborated on a popular book of essays titled, appropriately, *Many Worlds*. The deep question behind the symposium was that of design. We live in a universe that appears to have been designed for life. But this might be an illusion. There could be many worlds and we happen to occupy one where life is possible. The Many Worlds hypothesis explains, or explains away, perhaps, the mysterious fine-tuning of this world for life.

Davies chaired a subsequent initiative a year later in Sante Fe, New Mexico, on Complexity and Design. Leading thinkers like Stuart Kauffman, Harold Morowitz, and Gregory Chaitin joined Davies in an open-ended exploration of the origins of design and complexity in nature. A few months later the Foundation announced a multimillion-dollar initiative to fund mainstream scientific research projects focused on the question of "fine-tuning." Long-range research projects took root in major universities in America and around the world: Stanford, Tufts, MIT, Princeton, New South Wales, Cambridge, and others.

Recipients of grant funds included leading scholars such as Andrei Linde, Bernard Carr, Neil Turok, and Mario Livio. Dr. John Donoghue of the University of Massachusetts, Amherst, received funds to look at the strange possibility that the laws of nature may vary throughout the universe; maybe we cannot extrapolate the laws discovered locally to the entire universe. Says Donoghue in an interview with *Science & Theology News*, "Everybody thinks that the universe is the same everywhere. This would make our part of the universe not so special anymore."

### **"IT from BIT: Why Is There Something Rather Than Nothing?"**

There is probably no scientist in the 20th century who pondered questions of ultimate reality more deeply than physicist John Archibald Wheeler, who brought quantum mechanics from Europe to the first generation of American physicists. Wheeler is known for his speculative imagination and willingness to go far outside the box in the quest for ultimate explanations. His colorful expression "It from Bit" encapsulates his richest speculation, namely that the world, which he has nicknamed "It" somehow arises from a primordial substrate of information or what the computer scientists have nicknamed "Bit."

It was thus fitting that Wheeler was celebrated in a major conference sponsored by the Foundation in Princeton in March 2002. Appropriately, the conference was chaired by Freeman Dyson, also known for his imaginative approach to physics. The conference titled *Science & Ultimate Reality: Celebrating the Vision of John Archibald Wheeler and Taking It Forward into a New Century of Discovery* gathered a "Who's Who" of major scientific and cultural figures for a rich weekend exploring the boundaries of physics. Participants included Anton Zeilinger, Wojciech Zurek, Bryce DeWitt, Max Tegmark, Charles Townes, Andreas Albrecht, Andrei

Linde, Joao Magueijo, Stuart Kauffman, Lisa Randall, Lee Smolin, Owen Gingerich, Marcelo Gleiser and a host of others. There were heated exchanges on everything from quantum gravity to the anthropic principle. Jaroslav Pelikan, Sterling Professor Emeritus of History at Yale University and one of the great humanities scholars of our time, concluded with "The Heritage of Heraclitus: John Archibald Wheeler and the Itch to Speculate."

The speculations of Wheeler and others that there are undiscovered "information-generating" processes in nature is currently a hot topic in science. Wheeler was most interested in how such processes might create "something from nothing" but the same question arises at higher levels. Somehow the laws of nature give rise to rich complex structures like cells. Recent advances in science have made it possible to begin thinking about how this occurs. The buzzword for this new field is Emergence, the topic of another symposium held in Granada, Spain, also sponsored by the Foundation in the summer of 2002. Chaired again by Paul Davies, leading scholars like Rodney Brooks, John David Chalmers and George Ellis convened to consider just how it is that complex things "emerge" in nature. Even the simplest living cell is far too complex to be the result of a chance assemblage of atoms, coming together in just the right way. Somehow there are "pattern generating" mechanisms that assist in the process by which atoms and molecules form cells. But what are these mechanisms? Are they also fine-tuned for life? And what is their nature? Where did they come from? Are they chance features of one of many universes? Are they the "fingerprints of God," pointing toward a purposeful intelligence behind the mystery of our existence?

### **How Tall Is the Ladder of Fine-tuning?**

The recognition that the universe is fine-tuned for life has been primarily an argument from physics, highlighting the role that the fundamental laws of physics play in preparing the universe for the organic chemistry on which life is based. Gravity, for example, is the force which holds stars together and drives the creation of the chemical building blocks of life. The physics of stars includes the possibility that they die by exploding, a process that spreads their rich chemistry throughout space, where it can be incorporated into planets like Earth. If such planets have stable orbits around long-lived stars, like our sun, life will have time to emerge. But the planet also has to be just the right distance from its sun for water to exist in liquid form, yet another requirement for life.

All this relates to the physics of the universe. Physics, however, as the most "fundamental" of the sciences, focuses on the simplest and most basic laws of nature. As one works their way "up" from this basis, we encounter the laws of chemistry, biochemistry, and finally biology. The creative ladder that leads to life may rest on a foundation of physics, but it reaches upward into biology, and maybe even beyond. There are many steps on the ladder from atoms to life, and many processes by which the simple grows ever more complex. What is the nature of these processes? Are they, like the laws of physics, surprisingly "friendly" to life? Ninety years ago, Lawrence J. Henderson, Professor of Biological Chemistry at Harvard University, pioneered research on this question. His seminal volume, *The Fitness of the Environment*, highlighted the many unusual properties of water that made life possible, from floating when it froze (to protect life in the seas) to dissolving so many toxins (to carry wastes from the body). Like Wheeler's unanswered question about how we get "It from Bit," Henderson's question about how "It" gives rise to life remains unanswered. It is a deep question and one that biochemistry is just beginning to explore. Henderson suggests that the universe is finely tuned for life at all levels of the mysterious ladder that leads from physics to biology: "The whole evolutionary process, both cosmic and organic, is one, and the biologist may now rightly regard the universe in its very essence as biocentric."

In a gathering reminiscent of the Wheeler celebration, Henderson's legacy was highlighted at Harvard in a major scientific conference in October, 2003, chaired by Owen Gingerich and Charles Harper. Leading physicists, chemists and biologists from around the world presented research papers examining the route that nature took from atoms to life, looking for tell-tale signs of directionality and "design." Participants included George Whitesides, Martin Nowak, Jack Szostak, Guy Oriesson, John Barrow, Paul Davies, Christian de Duve, Simon Conway Morris, Harold Morowitz, Edward Oakes, and others.

The Henderson conference was the first step in the development of a multimillion-dollar research grants program funded by the Foundation. The goal of the ambitious program is to extend the Cosmology and Fine-Tuning program into the realm of biochemistry.

A key presentation at the Henderson meeting was that of Georgetown University theologian John Haught, whose *God After Darwin* represents one of the most thoughtful and effective reconciliations of evolutionary science and the Judeo-Christian doctrine of creation. The presence of Haught at this meeting was not incidental, but rather represents, in a nutshell, what the Foundation is most eager to explore, namely the exciting possibility of convergence in scientific and religious views of the world.

### **The Greatest Question of Our Time: What Is the Nature of Nature?**

A newly launched initiative at the University of California, Santa Barbara, asks the central question of our time: What is the nature of Nature? Is nature just atoms and molecules, and thus without intrinsic value, to be exploited however we please? Are human beings just complex assemblages of molecules that have evolved in such a way that they labor under the delusion that their lives have purpose, that it matters what they do? Is the universe a big accident?

There is little within science that offers optimistic answers to these questions, for science is not equipped to address questions of purpose. Religious views of nature, by contrast, are more encouraging. Life is special; human beings are important; what we do matters; the world is a creation of God and has value. In fact, God's creation is continuing still. The scientific and religious views of nature, including human nature, are not so much at odds with each other, as they are disconnected from each other. But these different views must become an integrated whole. The great philosopher Alfred North Whitehead put it like this: "The future of civilization depends on the way the two most powerful forces of history, science and religion, settle into relationship with each other."

The new initiative at the University of California, Santa Barbara, under the creative direction of Jim Proctor, is taking up the challenge laid down by Whitehead. The *New Visions of Nature, Science and Religion* project will look for the connections and points of contact that will join scientific and religious visions. The potential value of the insights that could emerge are both numerous and critically important. Take cloning, for example. Science is on the verge of being able to clone humans but this extraordinary achievement raises deep ethical and theological questions. Consider environmentalism. Our modern way of life takes an enormous toll on the limited resources of the earth—water, fuel, food, air. Should people come to see nature as a ground that is sacred for both science and theology, to develop what has been called an "ecospirituality?" Or would such a move be naïve and counterproductive? Such debates are important.

The *New Visions of Nature, Science and Religion* project calls for a revisioning of both biophysical and human nature, in a manner informed by scholarship and considerate of both science and theology. The deep and fascinating questions at the core of the Foundation's mission promote conversation between science and religion. The questions are important, relevant, and largely overlooked. The relevance and excitement of this conversation is bringing together many of the world's leading scholars-skeptics, fence-sitters, and true believers—into its intellectual orbit, like protoplanets around an emerging star, in anticipation of good things to come.