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Cosmologist John D. Barrow Wins the 2006 Templeton Prize

John D. Barrow, a noted cosmologist whose writings about the relationship between life and the universe, and the nature of human understanding, have created new perspectives on questions of ultimate concern to science and religion, has won the 2006 Templeton Prize. The prize, valued at 795,000 pounds sterling, approximately \$1.4 million, was announced on March 15th in New York.



Photo by Karen Marshall
John M. Templeton, Jr., M.D. congratulates Templeton Prize winner Prof. John Barrow at the press conference in New York City.

Barrow, 53, who serves as Professor of Mathematical Sciences at the University of Cambridge, has used insights from mathematics, physics, and astronomy to set out wide-ranging views that challenge scientists and theologians to cross the boundaries of their disciplines if they are to fully realize what they may or may not understand about how time, space, and matter began, the behavior of the universe (or, perhaps, "multiverses"), and where it is all headed, if anywhere.

His work – including 17 books translated into 27 languages and written in accessible, lively prose, hugely popular lectures, and more than 400 scientific papers – has illuminated understanding of the universe and cast the intrinsic limitations of scientific inquiry into sharp relief. It has also given theologians and philosophers inescapable questions to consider when examining the very essence of belief, the nature of the universe, and humanity's place in it.

As Thomas Torrance, himself a Templeton laureate (1978), wrote in his nomination of Barrow, "The hallmark of his work is a deep engagement with those aspects of the structure of the universe and its laws that make life possible and which shape the views that we take of that universe when we examine it. The vast elaboration of that simple idea has led to a huge expansion of the breadth and depth of the dialogue between science and religion."

In particular, Barrow's engagement with frontier science and mathematics, developing multidisciplinary perspectives on subjects such as the mysteries of nothingness and infinity, and the potentially intelligible realms of the laws of Nature and the limits of scientific explanation, has jarred religious and scientific perspectives in such a way as to open pathways of understanding which may allow both to comprehend each other more fully.

(Continued on page 3)

From the Director's Desk



“You made all the delicate, inner parts of my body and knit me together in my mother’s womb. Thank you for making me so wonderfully complex! Your workmanship is marvelous—and how well I know it” (Psalm 139:13-14, NLT).

In Psalm 139, David expresses his astute awareness of the wholeness of God’s creation, from the cosmic expanse to his innermost being.

His deeply appreciative words

convey an overwhelming awe of the wonderful complexity of the physical creation of which he is a part—a creation in which God’s presence and active participation are evidenced all around and within him.

David’s words throughout this Psalm reveal a God who takes great risks to interact with and extend generous freedom to those who are created with the imprint of his hand upon their lives. David’s God unfolds time with his created beings, knowing they can choose to reject him or, worse yet, cause harm by exceeding the limits of their finite knowledge while dabbling with his creation. Yet he still allows them the freedom to tinker with the components of his creation.

Sometimes we manipulate the components of God’s creation by restricting the expression of discovery, while other times we attempt to exceed God with other discoveries that set into motion consequences of which we have no knowledge. Professor Shea’s letter of appreciation for our public lecture series brings to mind a time when attempts to restrict the expression of discovery had significant historical consequences.

Professor William Shea holds the Galileo Chair of the History of Science at the University of Padua where Galileo taught for 18 years. In their text, *Galileo in Rome*, Shea and co-author Mariano Artigas (Oxford University Press, 2004) provide an incisive description of the father of modern science and outcomes of his work: “He belongs to the small group of thinkers who transformed Western culture, and his clash with ecclesiastical authorities is one of the most dramatic incidents in the long history of the relations between science and religion...The new science, which today pervades our entire life, was just emerging, and very few were able to realize what was happening at the time. Most people were not ready to abandon cherished traditional ideas for daring hypotheses that had yet to be proved” (p. ix).

New discoveries continue to emerge in all domains of thought. Some, like those of Galileo and his predecessors, hold great potential for better understanding the wholeness of God’s creation. Perhaps Dr. John Walton’s work in the intersection of linguistics and theology is one such example. Dr. Walton’s study is focused on interpreting Genesis 1 through the eyes of the ancient people who understood God’s creative acts from the

perspective of function rather than structure. How grateful I am to live in a time and place of open expression of discoveries. I highly commend Dr. Walton’s scholarship to you as presented on pages 6-8 of this issue.

Dr. Hava Tirosh-Samuelsón’s article (see pages 8-10) presents yet another method of restricting God’s expression of creation to a conflict model of science and religion. Also of considerable note is the interdisciplinary research that Dr. Tirosh-Samuelsón is leading in the area of transhumanism. With funding from the John Templeton Foundation, Arizona State University’s Center for the Study of Religion and Conflict, under the direction of Professor Linell Cady, will be exploring how the confluence of new developments in the life sciences, technology, and neurosciences presents a transhuman phase in human evolution. Proponents of transhumanism believe that these advancements can liberate humanity from pain and suffering; yet we must ask ourselves if we lose the deeper character of what it is to be human in the process. Transhumanism not only positions human beings to exceed the limits of their finite knowledge, triggering consequences of unknown proportions, such an approach might enable us to craft ourselves into machines that no longer desire a relationship with our Creator. Indeed, God risks much by allowing us the freedom to tinker with the components of creation. What will we do with this freedom?

I wish to thank our lecturers and faithful attendees for making the 2005-2006 Public Lecture Series such a notable success. We look forward to another exciting lecture series next year!

Bill R. Williams

Bill R. Williams
Director

Dear Dr. Williams,

Thank you for the Winter 2005 issue of your newsletter that I have read with great interest.

Allow me to congratulate you on your fine lecture series.

With every good wish,

Prof. William Shea
Galileo Professor of History of Science
University of Padua
Padua, Italy

We welcome letters of up to 200 words. They may be edited for clarity and length. Letters selected for publication may be published or distributed in print, electronic or other forms. Please write to let us know how our educational offerings are impacting your world:

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3300 West Camelback Road, Phoenix, AZ 85017 USA.

Cosmologist John D. Barrow Wins the 2006 Templeton Prize

(Continued from page 1)

The Templeton Prize for Progress Toward Research or Discoveries about Spiritual Realities was founded in 1972 by philanthropist and global financial pioneer Sir John Templeton. Given annually to a living person to encourage and honor the advancement of knowledge in spiritual matters, it is the world's best known religion prize and the largest annual monetary prize of any kind given to an individual. In establishing the prize's monetary value, Sir John stipulated that it always be worth more than the Nobel Prizes as a way to underscore that research and advances in spiritual discoveries can be quantifiably more significant than disciplines recognized by the Nobels.

HRH Prince Philip, the Duke of Edinburgh, will award the prize to Barrow in a private ceremony at Buckingham Palace on Wednesday, May 3, 2006.

In remarks prepared for the news conference, Barrow said, "Astronomy has transformed the simple-minded, life-averse, meaningless universe of the skeptical philosophers. It breathes new life into so many religious questions of ultimate concern and never-ending fascination. Many of the deepest and most engaging questions that we grapple with still about the nature of the universe have their origins in our purely religious quest for meaning. The concept of a lawful universe with order that can be understood and relied upon emerged largely out of religious beliefs about the nature of God" (see article *Illuminating Deceptive Appearances* on page four of this newsletter).

Barrow, who received his doctorate (D.Phil) in astrophysics from the University of Oxford in 1977, first caught wide attention with his 1986 book, *The Anthropic Cosmological Principle*, co-authored with Frank J. Tipler. The book investigates all aspects of anthropic principles in cosmology and other sciences, traversing history, philosophy, theology, astronomy, physics and chemistry. In the subsequent two decades it has become an essential work for those who explore the deep questions at the interface of science and religion, while the anthropic principle has become an inescapable factor in the evaluation of contemporary cosmological theories.

That was followed in 1988 by *The World Within the World*, a wide-ranging study of the origin and development of the concept of the "laws of Nature" in all their forms, and then in 1989 by Barrow's Gifford Lectures at Glasgow University in the centennial year of the celebrated lectures. At 36, he was the youngest lecturer in the history of the series. Based broadly on the emerging interest in "theories of everything," Barrow's talks before capacity crowds employed easy-to-follow reasoning, engaging links between different fields, anecdotes, and eye-opening new ideas to provide a fresh take on the complexity of the universe.

The lectures led to *Theories of Everything: The Quest for Ultimate Explanation*, published in 1991. It continued Barrow's taming of enormous subjects of staggering implications, weaving together considerations from a wide range of topics, raising as many questions as he answers, and showing clearly how it



Photo by Craig Warga

Barbara Small, Templeton Prize Executive Director, Templeton Prize winner Prof. John Barrow, and Dr. Bill Williams, Director of Canyon Institute for Advanced Studies, in New York.

comes about that a "theory of everything," while necessary to understand the universe, is far from sufficient.

His later works have explored a huge range of subjects on the science and religion interface at a level that speaks to lay readers and specialists alike. Topics include the nature and utility of mathematics (*Pi in the Sky*, 1992), the links between the universe and human aesthetic appreciation (*The Artful Universe*, 1995 and *The Artful Universe Expanded*, 2005), and how the universe is peculiarly characterized by what cannot be known about it (*Impossibility: the limits of science and the science of limits*, 1998).

Barrow's research has been at the forefront of many areas of cosmology for thirty years and has most recently been concerned with the ways in which astronomy can test the constancy of the so-called "constants of Nature." Again, these questions have unexpected implications for the nature of life in the universe which are explored in all their ramifications in his book, *The Constants of Nature* (2002).

Barrow's most recent book is *The Infinite Book: A Short Guide to the Boundless, Timeless and Endless* (2005), which might be considered the reciprocal of his earlier *Book of Nothing* (2000). It considers all aspects of the infinite and explores its similarities and differences in the realms of mathematics, science, and theology.

In 2002, Barrow was appointed Gresham Professor of Astronomy at Gresham College in London, a position once held by Sir Christopher Wren. Founded in 1596, it is the world's oldest science professorship.

John Barrow and his wife of 31 years, Elizabeth Mary (East), have three children ranging in ages from 21 to 27. They live in Cambridge.

Templeton Laureate Barrow: Illuminating Deceptive Appearances



Photo by Karen Marshall

On the occasion of winning the 2006 Templeton Prize, John Barrow prepared this essay. Barrow draws an analogy between a recent visit to the Basilica of St. Mark in Venice and conceptions about the universe, concluding that religious concepts and scientific theories of the universe can be both limiting and deceptive in appearance.

A little over a year ago I was in a great church—the Basilica of St Mark in Venice. Its predecessor was raised in the year 832 to house the mortal remains of St Mark the Evangelist, which had supposedly been brought to Venice from Alexandria four years earlier by two Venetian merchants. They are alleged to have hidden the remains of the martyred saint under layers of pork so as to avoid the attentions of Muslim customs officials.

The present Byzantine style Basilica, with its distinctive cluster of low domes, was begun in 1063 and consecrated in 1089.

Today, it sits next to the Doge's Palace on the edge of St Mark's Square, attracting tourists and pigeons rather than pilgrims, complete with a facade to launch a thousand postcards.

After the church had closed to visitors for the day, I arrived in the early evening with a small group of other scientists for a guided tour. When we entered, the church was almost in total darkness. There were a few windows, which were small and far from transparent. We were asked to take our seats in the center of the room, guided by just a few faint floor lights and an occasional electric candle. Above us there was only darkness.

Then, very slowly, the light levels rose, above us and around us, and the interior began to be illuminated by a discreet system of hidden sodium lights. The darkness around us gave way to a spectacular golden light. The arching ceilings above us were covered in a spectacular gleaming mosaic of glass and gold. Between the 11th and 15th centuries, nearly 11,000 square feet of gold mosaic were made, square by square, mixing gold with glass by a delicate process that is still not fully understood, to produce this sparkling golden sanctuary. Appearances can be deceptive.

But, on reflection, what was more striking to me was the realization that the hundreds of master craftsmen who had worked for centuries to create this fabulous sight had never seen it in its full glory. They worked in the gloomy interior, aided by candlelight and smoky oil lamps that illuminated the small area on which they worked, but not one of them had ever seen the full glory of the golden ceiling. For them, like us, 500 years afterwards, appearances were deceptive.

The Ancients Saw Only Through a Glass Darkly

Our universe is a bit like that too. The ancient writers who celebrated the heavens' declaration of the glory of the Lord saw only through a glass darkly. Unbeknownst to them and countless others who followed them, the universe has since, with the help of modern-day scientific instruments, revealed itself to be far bigger, more spectacular, and more humbling than anyone ever imagined it to be.

The universe appears big and old, dark and cold, hostile to life as we know it, dangerous, and costly to explore. Many a philosopher of the past concluded that the universe was meaningless and antithetical to life: a bleak and black realm in which our little planet was a temporary outcome of the blind forces of nature. Yet, appearances may again have been deceptive.

Size Inextricably Bound up with Age

Over the past 75 years, astronomers have illuminated the vault of the heavens in a completely unexpected way. The universe is not only big, but it is getting bigger. It is expanding. Great clusters of galaxies are moving away from each other at increasing speeds. This means that the size of the universe we can see is inextricably bound up with its age. It is big because it is old.

The nucleus of every carbon atom in our bodies has been through a star. We are closer to the stars than we could ever have imagined.

These huge periods of time are important for our own existence. We are made of complicated atoms

of carbon, nitrogen and oxygen, along with many others; maybe one day other forms of terrestrial intelligence will be made of silicon atoms. The nuclei of all these atoms do not come ready-made with the universe. They are put together by a long slow-burning sequence of nuclear reactions in the stars. It takes almost 10 billion years for this stellar alchemy to burn hydrogen to helium, and on to beryllium, and carbon and oxygen and beyond before the dying stars explode in supernovae and spread their life-giving debris around the universe where it finds its way into grains of dust, planets, and ultimately into people. The nucleus of every carbon atom in our bodies has been through a star. We are closer to the stars than we could ever have imagined.

With this knowledge, one begins to understand why it is no surprise that the universe seems so big and so old. It takes nearly ten billion years to make the building blocks of living complexity found in the stars, and because the universe is expanding, it must be at least ten billion light years in size. We could not exist in a universe that was significantly smaller.

The vastness of the universe is often cited as evidence for the extreme likelihood of life elsewhere. While there may be life—even conscious life—elsewhere, sheer size is not compelling; age, too, is a considerable factor. The universe needs to be billions of light years in size just to support one lonely outpost of life. An economy-sized universe, such as the size of our Milky Way Galaxy with its 100 billion stars and possible planetary

systems, might seem spacious enough for all we hold dear. But if the entire universe were the size of our Milky Way Galaxy, it would be little more than a month old. This is barely enough time to pay off a credit card bill, let alone evolve complexity and life from sub-atomic simplicity.

Big and Old Home Must be Dark and Cold

Any universe that is a home for life must be big and old. But this means that it must also be dark and cold. As time passes, the expanding universe gets cooler and cooler, and energies fall as space is stretched. The inferno of the past “big bang” must, after billions of years, be replaced by the dark night sky we see around us that contains just a faint glimmer of microwaves, echoing its hot beginnings, just three degrees above absolute zero of cold, but still detectable in the snow of white noise on an untuned television screen in our living rooms. The dark night sky that provoked so many human responses to our place in the universe is a necessary part of a life-supporting universe.

Life can only arise and persist in a universe that is big and old, dark and cold, with its planets and stars and galaxies separated by vast distances. These are necessary features of a life-supporting universe.

Religious Quest for Meaning Leads to Formal Study

Astronomy has transformed the simple-minded, life-averse, meaningless universe of the ancient skeptical philosophers. This science breathes new life into so many religious questions of ultimate concern and never-ending fascination. Many of the deepest and most engaging questions with which we still grapple about the nature of the universe have their origins in our purely religious quest for meaning. The concept of a lawful universe, with order that can be understood and relied upon, emerged largely out of religious beliefs about the nature of God. The atomistic picture of matter arose long before there could have been any experimental evidence for or against it. Out of these beliefs arose a confidence that there was an unchanging order behind the appearances that was worthy of formal study.

Great questions about the origin and end of the universe, possible sources of all observed complexity, and the potential infinity of space grew out of our religious focus on the great questions of existence and the nature of God. And, like all great questions, they can turn out to have answers that take us down unexpected paths, further and further away from the familiar and the everyday.

Multiverses, extra dimensions, the bending of time and of space—all may reveal a universe that contains more than is needed for life, more even than what is needed for speculation. We see now how it is possible for a universe that displays unending complexity and exquisite structure to be governed by a few simple laws—perhaps just one law—that are symmetrical and intelligible, laws which govern the most remarkable things in our universe—populations of elementary “particles” that are everywhere perfectly identical.

Search for the Universe’s Unseen Hallmark

It is to this simple and beautiful world behind the appearances, where the lawfulness of nature is most elegantly and completely revealed, that physicists look to find the hallmark of the universe. Everyone else looks at the outcomes of these laws. The outcomes are often complicated, hard to understand, and of great significance—they even include ourselves—but the true simplicity and symmetry of the universe is to be found in the things that are not seen. Most remarkable of all, we find that there are mathematical equations, little squiggles on pieces of paper, that tell us how whole universes behave. For there is a logic larger than universes that is the more surprising because we can understand a meaningful part of it and, thereby, share in its appreciation.

Discovering Something Unexpected about an Old Friend

There was a time when we thought everything in the universe was made of the things material that we find on Earth. We have now discovered that this too was only a first guess. More than 70 per cent of the universe is composed of a form of dark energy whose precise identity is unknown. It reveals its presence by its dramatic effect upon the expansion of the universe. Unlike all other known forms of matter, which exert gravitational attractive forces on other forms of matter and amongst themselves, this dark form of energy responds repulsively to gravity, causing all material to accelerate away from it, creating an acceleration in the expansion of the universe that began to occur when it had reached about 75 per cent of its present extent. This discovery about our universe was a surprise—like discovering something totally unexpected about an old friend. Again, appearances were deceptive.

So, with the universe, as it was that evening in St Mark’s, things are not always as they seem when we look upwards. The whole is so much more than the sum of its parts. The architects of our religious and scientific pictures of the universe, and the many commentators on their meanings that followed them, could see only a small part of what exists, and knew only a small part of what can be known about our place in the universe. We begin to see afresh the extraordinary nature of our local environment and the link that attaches life to the vastness of space and time. Appearances can indeed be deceptive

The Complexity of the Human Mind

There are some who say that although we can use our minds to appreciate the order and complexity of the universe around us, there is nothing more to that order than what is imposed by the human mind. This is a serious misjudgment. Were this judgment true, then we would expect to find our greatest and most reliable understanding of the world in the everyday events for which millions of years of natural selection have sharpened our wits and prepared our senses. And when we look towards the outer space of galaxies and black holes or into the inner space of quarks and electrons, we should expect to find few resonances between our minds and the ways of these worlds. Natural selection requires no understanding of quarks and black

(Continued on page 11)

Reading Genesis 1 with Ancient Eyes: What Does it Mean to Create?

By Dr. John Walton



The following is a summary of a lecture presented by Dr. John Walton as part of Canyon Institute for Advanced Studies 2005-2006 Public Lecture Series. Dr. Walton is Professor of Old Testament in Biblical and Theological Studies at Wheaton Graduate School in Wheaton, Illinois. He received his Ph.D. in Hebrew and Cognate Studies from Hebrew Union College—Jewish Institute of Religion in 1981. Dr. Walton's recent

publications include: *Old Testament Today: A Journey from Original Meaning to Contemporary Significance* and *Genesis, New International Version Application Commentary*. His forthcoming text is due for publication in 2007: *Ancient Near Eastern Thought and the Old Testament*.

Genesis 1 as Temple Text in the Context of Ancient Cosmology

If we are to reach an understanding of an ancient text such as Genesis 1, we have to be able to think about the issues the way the ancient people would have thought about them. A foundational issue to consider is the way people think about existence. In the ancient world, they believed that something existed when it had a role and a function in an ordered system. This is in stark contrast to our contemporary way of thinking; we believe that something exists when it has material properties. In our world, to cause something to exist (i.e., to create), involves giving something material properties. In the ancient world, to cause something to exist involved giving it a function and a role. In Hebrew, the word translated “create” (*bara'*) expresses this very idea. So, “In the beginning period (the Hebrew expresses a period, not a point, referring to the seven-day period), God created (gave functions to) the cosmos.” Thus in Genesis 1:2, the narrative starts with no functions (not with no matter), and assigns functions by separating and naming.

On day one, verses 4 and 5 make it clear that a *period* of light is being separated from a *period* of darkness, and each period is being named. Thus on day one, God created not light, but a period of light, (i.e., the basis for time). On day two, God sets up the basis for weather, and on day three, the basis for growing food is established. After the major functions of human existence are established, God assigns functionaries to their various spheres. All of the functions are relative to human existence, and God declares that they are good as they are put in place to function on behalf of humans.

The cosmos is portrayed in the ancient world and in the Bible as a temple, and temples are designed to be micro-models of the cosmos. Temples were built in the ancient world for the gods to rest in, which does not refer to relaxing, but to enjoying and maintaining security and order. With the mention of God's rest on day seven, we can see that the writer of Genesis 1 is also thinking about the cosmos as a temple. God is creating his dwelling place, putting people into it as his images (representatives), and taking up his place at the helm to maintain the order he has established.

In the ancient world, temple dedications were often seven days in duration. During those seven days, the functions of the temple would be proclaimed, the furniture and functionaries would be installed, the priests would take up their role and, at the end, the deity would enter and take up his rest in the temple. If the cosmos is being viewed as a temple, Genesis 1 can be understood as presenting creation of the cosmos in terms of a temple dedication. There is no reason to think of the seven days as anything but normal days. Since the text is not discussing the material creation of the cosmos, the days of Genesis 1 offer no information about the age of the material cosmos. Genesis 1 is about the work God did (*bara'* work), not about the things God made.

The theology of the text presents God as the one who is the founder and CEO of the cosmos. He brought order, established functions, and then set about to maintain the cosmos moment by moment. The insistence on his purposes and his engagement are the polar opposite of a naturalistic view of creation, which has no room for purpose or divine engagement. The theology also speaks to the real issue of creation: who is in charge.

Concordism says the Bible is okay because its statements really are scientifically accurate as far as they go. The above position says the Bible is okay because its observational perspective is adequate as a framework for communicating the functional and theological truths.

Biblical Passages Evidencing “Old World” Science

Genesis 1:6-8. Firmament

The expanse (sometimes called the firmament) set up in day two is the regulator of climate. The ancient Near Eastern cultures viewed the cosmos as featuring a three-tiered structure, the heavens, the earth, and the underworld. Climate originated from the heavens, and the expanse was seen as the mechanism that regulated moisture and sunlight. Though in the ancient world the expanse was generally viewed as more solid than we would understand it today, it is not the physical composition that is important, it is the function. In the Babylonian

Creation Epic, *Enuma Elish*, the goddess representing this cosmic ocean, Tiamat, is divided in half by Marduk to make the waters above and the waters below.

Job 36:27. Water Cycle

Though some modern interpreters have attempted to read this verse as a scientific description of the condensation-evaporation cycle, the context is clearly operating from a different perspective (see verse 32 that describes God filling his hands with lightning bolts that he throws like spears). The two verbs in this verse speak of a process of drawing out or refining (as precious metals would be drawn out in the refining process). It was believed in the ancient Near East that raindrops came from a heavenly stream or ocean, a great body of water that enveloped the earth, and from subterranean waters. Thus, there were waters above and below the earth. It was these waters from which God is seen as drawing out raindrops.

Isaiah 40:22. Circle of the Earth

The picture of the universe described here is the common cosmological view of the ancient Near East. The sky was a dome that arched over the disk of the earth, which sat on top of a primeval ocean. Under the ocean was the netherworld, virtually a mirror image of the space above the earth. Thus, the entire universe was an enormous sphere, cut in the center by the earth. Nevertheless, here it is the earth itself that is described as circular. In Babylonian literature, Shamash is praised as the one who suspends from the heavens the circle of the lands. Likewise, in a prayer to Shamash and Adad, Adad causes it to rain on the circle of the earth. The circle simply reflects the curvature of the horizon (thus, disk-shaped) rather than a sphere (for which Hebrew uses another word). In the ancient world, the earth was consistently regarded as being circular.

Exodus 24:10. Sapphire Pavement

Some first millennium Mesopotamian texts whose traditions are thought to go back to the Kassite period speak of three heavens. Each level of heaven is described as having a particular type of stone as its pavement. The middle heavens are said to be paved with *saggilmud*-stone, which has the appearance of lapis-lazuli. This was believed to give the sky its blue color. The middle heavens were where most of the gods had their residence.

Jeremiah 31:33. Heart/Mind

When God wants to talk about the human intellect, he does not take time to inform his inspired authors that the true organ of thought was the brain. There is no Hebrew word for brain, and neither the Israelites nor any of the other ancient peoples understood the purpose of the brain. The Egyptian priests who mummified bodies carefully preserved all of the important internal organs in canopic jars, but they pulled the brain out with a hook through the nostrils and discarded it as trash. For the ancients, the representation of the heart as the seat of intellect and emotions was not simply figurative speech as it is for us. They knew of no other reality.

Evidences for Function Over Structure

Biblical

1. Understanding of Hebrew *bara* (“create”)
2. Story begins with “functionless” condition (“Formless and void”)
3. Day One: Light to be understood as “period of light” = time
4. Day Two: “Expanse” does not equate to any structure
5. Day Three: Nothing made; two elements functionally related
6. Day Four: Functions are clearly the focus
7. Day Six: Emphasis is on the functions of people
8. Day Seven: Rest and the Temple
9. “It was good” as an assessment of functioning (cf. “it was not good”)
10. Reconstitution of functions after the flood (Genesis 8:22; time, climate and fecundity as in Genesis 1)

Ancient Near East

1. Nothing is made in Babylonian Creation Epic, but the cosmos is organized
2. Decrees of the gods for the function of the cosmos are much more important than material things
3. Connections between temple, cosmos and rest
4. Pictures are functional, not structural (Egypt)
5. Papyrus Insinger lists 18 “creations”—clear functional orientation (birth, sleep, remedies, dreams, summer/winter, succession of generations, etc.)
6. Babylonian Creation Epic V:39-46, time; 47-52, weather; 53-58, water sources and dirt. This is the same sequence of time, weather and agriculture.
7. Temple dedication ceremonies of seven days
8. Temple dedications include proclaiming functions and installing functionaries
9. Existence is defined in terms of having a name and a function
10. Function is a consequence of purpose (of the gods) rather than as a consequence of structure (which was largely indiscernible).

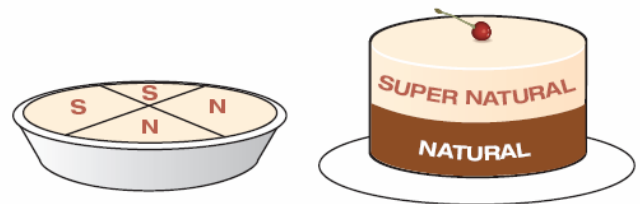
Evolution and Christianity: Pie or Cake?

By Dr. John H. Walton

Evolution has traditionally been seen as a threat because the issue of origins is viewed as a pie that must be divided between “natural” processes and “supernatural” processes. Both scientists and people of faith have viewed the issue in this way. Theists have seen evolution as encroaching on what is attributed to God. Indeed, theistic evolutionists and progressive evolutionists have given God certain pieces of the pie and assigned the rest of the pie to natural processes. Fiat creationists have been committed to “giving the whole pie to God” and viewed any position that gave any space to evolution as a compromise.

Alternatively, the origins issue should be viewed as a layered cake with the natural processes as one layer (say chocolate) and the supernatural processes as a second layer (say, angel food). This is a truer representation of the biblical worldview (which did not dichotomize natural and supernatural as has been characteristic of Western culture since the Enlightenment) and incorporates a strong view of providence that has typically been part of the Christian worldview in most other areas (e.g., weather, history, embryology). The Bible looks at this origins cake from the top with no statements to make about the bottom layer; scientists explore the cake from the bottom having no methods that give them access to the top layer. In this way, evolutionary aspects, or any other natural explanations, being concerned with only the bottom layer, need not detract from the amount of activity attributed to God.

Certainly there are events in history that require that there is no underlying chocolate layer, but that the angel food goes straight through, such as the incarnation and the resurrection. Even in the origins cake moments such as the initiation of the Big Bang or the initiation of life from non-life could arguably be placed in this category (and maybe even some of the irreducible complexities identified by Intelligent Design). This is not just plugging God into the gaps left by science, for God’s activity is represented in the entire top layer.



Beyond Conflict of Religion and Science: The Case of Judaism

By Dr. Hava Tirosh-Samuelson



The following is a summary of a lecture presented by Dr. Hava Tirosh-Samuelson as part of Canyon Institute for Advanced Studies 2005-2006 Public Lecture Series. Dr. Tirosh-Samuelson is Professor of History at Arizona State University in Tempe, AZ. She holds a Ph.D. in Jewish Philosophy from the Hebrew University of Jerusalem and a BA in Religious Studies from SUNY-Stony Brook. She is the author of the award-winning Between Worlds: The Life and Work of Rabbi David ben Judah

Messer Leon and Happiness in Premodern Judaism: Virtue, Knowledge and Well-Being in Pre-modern Judaism. She is also the editor of Judaism and Ecology: Created World and Revealed World and of Women and Gender in Jewish Philosophy. She is currently working on a book tentatively entitled Judaism and Nature (Rowman & Littlefield) and is editing Judaism and the Phenomenon of Life: The Legacy of Hans Jonas (Brill Academic Publishers).

Models for the Relationship of Science and Religion

America is now in the midst of an intense struggle to define its intellectual identity and cultural orientation. One aspect of that struggle is the so-called “warfare of science and religion” which has revolved in recent years around the inclusion of Intelligent Design theory in the science curriculum of public schools. In the most recent case of Kitzmiller vs. Dover, Judge

John E. Johns III ruled that the doctrine of Intelligent Design is not science because “it cannot uncouple itself from its creationist and thus religious antecedent.” Because Intelligent Design was deemed religious, Judge Jones concluded that “it is unconstitutional to teach Intelligent Design as an alternative to evolution in a public school science classroom.” It is doubtful that Judge Jones’s decision will halt further legal battles about science education, since several new cases are now brewing in California, Ohio, and Indiana, but it is clear that Judge Jones’s harshly worded decision perpetuates the inaccurate perception that science and religion are mutually exclusive and necessarily in conflict with each other.

The conflict model goes back to the debate about Darwin in the 1860s. It was articulated in John William Draper’s *History of the Conflict between Religion and Science* (1874) that presented Christianity, and especially Roman Catholicism, as the archenemy of science. In the same vein, the president of Cornell University, Andrew Dickson White composed *Warfare of Science* (1876) and *History of the Warfare of Science and Theology in Christendom* (1896) as part of his attempt to build an institution of higher learning free from the constraints of religious creed. However, alongside the warfare model there were other voices in the 19th century that did not see religion and science as necessarily antagonistic. In fact, historians of the time presented religion as fostering science! Thus, Protestant

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historians claimed that the Reformation stimulated scientific activity, whereas Catholic historians praised the Roman Catholic Church's support for science. Likewise, theologians in the 19th century did not adopt the conflict model. Following William Paley's popular work of natural theology, mainline Anglo-American Protestants regularly invoked science to support their religious beliefs and sought to reconcile science with religion.

By contrast, in the 20th century the conflict model became prominent, in part because Protestant theologians such as Karl Barth, Paul Tillich and Reinhold Niebuhr moved away from the legacy of Paley and virtually ignored science in their theological writings. More importantly, as evangelical, fundamentalist, and Pentecostal churches displaced mainline churches as the center of gravity within American Protestantism, people in these churches felt threatened by science, particularly Darwinism. Some of them stirred mass movements against the theory of evolution. In the 1920s William Jennings Bryan's campaign resulted in legal limits on the teaching of evolution in some public schools, resulting in the trial of John Scopes in 1925 for violating such law in Tennessee. In the 1960s, the Baptist engineering professor, Henry Morris, helped to revive a literal reading of the Genesis account of creation among Conservative Protestants, demanding teaching of "creation science" alongside Darwinism in biology classes. In the 1990s the Presbyterian law professor, Phillip Johnson, revived interest in pre-Darwinian concepts of intelligent design in nature, insisting that public schools incorporate this approach in their science curriculum. The Intelligent Design movement, led by the Discovery Institute in Seattle, has further perpetuated the notion that religion and science are inherently in conflict with each other, a perception shared today by religious practitioners and secularists alike.

This perception of conflict is historically problematic and culturally harmful. In truth, the history of the West is not a story of a dichotomy between science *or* religion, but a story of a complex interplay between science *and* religion. This complex interplay is taken for granted today by many intellectual historians and historians of science whose work fails to attract media attention because it is too nuanced and scholarly. Historians of science have documented that even the most celebrated example of the conflict model, the trial of Galileo, was not a clash between "science" and "religion" but rather a complex affair in which personal relations, rhetoric, and politics were subtly intertwined. Similarly, intellectual historians have noted the shift from "natural philosophy" in the 18th and 19th centuries to "science" in the 20th century. While natural philosophy did not rule out theological considerations, secular scientists in the 20th century have claimed the "scientific method" as a distinct methodology within which references to God are inadmissible. If the conflict model belongs primarily to the 20th century, it is a mistake to believe that religion and science are inherently in conflict with one another.

Medieval Jewish Integration of Religion and Science: Maimonides and Gersonides

The premodern world provides us plenty of examples of Christian, Jewish, and Muslim philosophers for whom there was no conflict between religion and science. For Jewish and Muslim

thinkers, in particular, the interdependence of religion and science was rooted in the belief that the divinely revealed law encompasses all aspects of life, including knowledge of the physical world through the study of science. Hence, the scientific study of God's world was taken to be a religious obligation of the highest order. Only through the knowledge of the laws that govern the world created by God can the individual attain intellectual perfection and come to know God to the extent that God is knowable by humans. Moses Maimonides (1138-1204), a Jewish philosopher, jurist, communal leader, and physician and Levi ben Gershom (Gersonides) (1288-1344), a biblical exegete, philosopher, mathematician, and astronomer, exemplify this approach. Their religious rationalism offers a non-confrontational model for the relationship of religion and science.

Maimonides held that the divinely revealed Scripture, the Torah, is a product of intellectual perfection of its giver, the prophet Moses. Prophecy is not a miracle but a natural phenomenon in which an intellectually perfect person receives communication from God, disclosing how God governs the world. Maimonides asserted that the prophet Moses was the most perfect philosopher whose communication with God was least affected by human embodiment. Suppressing his senses, appetites, and desires, Moses transcended human embodiment so that his body no longer functioned as a "veil" between him and God. Endowed with perfect imagination, Moses communicated his theoretical knowledge in ordinary, human language, accessible to all. For Maimonides, the Torah of Moses is divine because it can be shown empirically (as he attempted to do in his *Code of Jewish Law*) that the Torah perfects the body and the soul of those who adhere to it, resulting in the immortality of the intellect. The task of the Jewish believer is to abide by the laws of the Torah and fathom its hidden, philosophic-scientific truths.

In principle, there can be no conflict between "religion" and "science"; apparent conflicts emerge either because of misunderstanding of the biblical text or due to erroneous scientific theories. A major source of exegetical mistake is a literalist approach to Scripture. Given the ontological gap between God and the created world, God is unlike anything else. Therefore, all references to God must be understood equivocally. To read Scripture literally misconstrues the correct beliefs about God, resulting in idolatry. Science, too, can be erroneous since it is a product of human natural reason rather than divine revelation. Although Maimonides accepted Aristotelian science as authoritative, he limited its validity to processes in the corporeal sub-lunar world. Maimonides, however, felt free to criticize Aristotelian astronomy, as did Muslim scientists in Andalusia, since to engage in science means to be open to correction, revision, and refinement of existing theories. Such inquiry ensures not only the updating of science, but also a deeper understanding of divinely revealed Scriptures.

Gersonides perpetuated Maimonidean rationalism and even radicalized it. Confident that human reason has the power to know the empirical world, Gersonides rejected Maimonides' negative theology. Instead, Gersonides maintained that knowledge of any empirical fact or even a mathematical theorem

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means apprehension of an intelligible (i.e., a concept) that is a constitutive part of the intelligible order (*nomos*) of the world that God thinks continuously. To know the world means to possess some positive knowledge, albeit imperfect, of God. Although God's knowledge of the world is exceedingly more perfect than human knowledge, divine and human knowledge share the same object—the order of the universe. The study of celestial bodies through astronomy enables the scientist to understand God's blueprint of creation that manifests divine wisdom and goodness.

Unlike Maimonides who restricted the teaching of philosophy and science to the intellectual elite, Gersonides believed the philosopher-scientist was obligated to propagate scientific knowledge so that more people could attain intellectual perfection and experience immortality. Gersonides also differed from Maimonides in regard to the phenomenon of prophecy: prophets were not distinguished from philosophers by virtue of their imagination, as Maimonides taught, but by their ability to predict future chance events, an ability that arose from the prophet's scientific or philosophic excellence. Furthermore, prophets were not statesmen who engaged in the political task of legislating laws. Only the prophet Moses was a legislator, and his activity was unique and unrepeatable. The Torah he gave to Israel is a set of directives that "thoroughly guides those who observe it to true felicity." Since the Torah is "a *nomos* perfected to the utmost," its statements are necessarily true; they guide one in scientific inquiry and lead to attainment of ultimate felicity. For Gersonides both religion and science lead to the same single truth, the knowledge of which results in the immortality of the intellect.

Learning from the Past to Address our Current Challenges

The medieval Jewish examples illustrate that religion and science have not always been in conflict. Without idealizing the medieval past or glossing over its difficulties and limitations, these examples can inspire us to seek more useful ways of understanding the relationship between religion and science, which does not force us to make a false choice between science and religion. We will be able to move beyond the perceived conflict between science and religion *if we treat science and religion not as reified entities but as expression of human culture*. Instead of talking about "religion" and "science" in the abstract, we should consider how scientists who were members of religious communities understood themselves, which cultural tools were available to them, and how they operated within specific social institutions. To realize that the relationship between religion and science is always culturally mediated is an important step toward the renunciation of the conflict model.

Another important step is to realize that the interaction between religion and science always involves Scriptural interpretation. The medieval Jewish reader of Scripture sought to fathom the truths of the biblical text and took for granted that the Bible conveys more meaning beyond the written word. This "more" ensured against literalism and regarded a literalist understanding of

Scriptures to be erroneous and even leading to idolatry. To reason with Scripture also presupposes that the engagement with Scripture occurs on many levels, depending on the moral and intellectual perfection of the interpreter. While Scriptural interpretation directs one toward the ultimate end of human life, it does not automatically guarantee it.

The process of Scriptural interpretation invites people to engage the Bible but leaves open what one finds in the process. The scientifically informed reader can help others to fathom the depth of the biblical text, but his or her views, too, are open to corrections, debates, and questioning from other philosophers and scientists. This is a decidedly non-dogmatic, open-ended approach to Scripture that is best understood as an ongoing conversation. In a genuine conversation, we express our views, listen and absorb what our interlocutors say, reject what we regard untrue or unconvincing, rethink our initial positions, and rephrase our views in response to the conversational exchange. Like Scriptural interpretation, the relationship between religion and science is a *dynamic, dialogical process* in which the participants are transformed by the interactive process by being open to each other's views and critically examining themselves from the point of view of the other person. Let us become better conversation partners and renounce the conflict model that threatens to tear apart the fabric of American culture.

Facing the Challenges of Transhumanism: Religion, Science, and Technology

The John Templeton Foundation has awarded \$500,000 to Arizona State University (ASU) for the Templeton Research Lectures on the Constructive Engagement of Science and Religion. The award was given to a four-year project entitled "Facing the Challenges of Transhumanism: Religion, Science, and Technology." Led by Prof. Hava Tirosh-Samuelson (History), an interdisciplinary committee at ASU conceptualized the project that will evaluate the claims of transhumanism through public lectures, symposia, conferences, and an interdisciplinary faculty seminar. The Center for the Study of Religion and Conflict, directed by Prof. Linell Cady (Religious Studies), will administer the project.

"Transhumanism" refers to the new phase in human evolution that has emerged due to the confluence of new developments in the life sciences (e.g., genomics, stem-cell research, genetic enhancement, germ-line engineering), technology (e.g., robotics, nanotechnology, pattern recognition technologies), and neurosciences (e.g., neuro-pharmacology and artificial intelligence). Proponents of transhumanism believe that these advances will liberate humanity from pain and suffering. Yet, many people, especially those committed to a religious outlook, intuitively recoil from the transhuman vision, finding within that vision an affront to human dignity. The project will explore and examine the claims of transhumanism through an interdisciplinary engagement.

Templeton Laureate Barrow: Illuminating Deceptive Appearances

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holes for our survival and multiplication. And yet, we find these expectations turned upon their heads.

The most precise and reliable knowledge we have about anything in the universe is of events in a binary star system more than 3,000 light years from our planet and in the sub-atomic world of electrons and light rays, where it is accurate to better than nine decimal places. And curiously, our greatest uncertainties all relate to the local problems of understanding ourselves—human societies, human behavior, and human minds—all the things that really mattered for human survival. But that is because they need to be complex; were our minds simple enough to be understood, they would be too simple to understand.

New Theories Extend and Subsume Old Theories

In all the science we pursue, we are used to seeing progress. Our first attempts to grasp the laws of nature are often incomplete. These first attempts capture just a part of the truth or they are seen through a glass only darkly. Some think that our progress is like a never-ending sequence of revolutions which overthrow the old order, condemned never to converge upon anything more definitive than a more useful style of thinking. But scientific progress doesn't look like that from the inside. Our new theories extend and subsume old ones. The former theories are recovered in some limited situation—slow motions, weak gravitational fields, large sizes, or low energies—from the new theories. Newton's 300-year old theory of me-

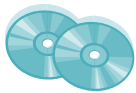
chanics and gravity has been superseded by Einstein's theory, which will be succeeded by M theory or its unknown successor in the future. But in a thousand years time, schoolchildren will still study Newton's theories, and engineers will still rely upon them, just as they do today. These older theories will be the simple limiting form for slow motions and weak gravity of the ultimate theory, whatever it turns out to be.

Religious Conceptions: Shadows of Simplicity

In our religious conceptions of the universe, we also use approximations and analogies to have some grasp of ultimate things. They do not represent the whole truth, but their limitations do not keep them from being a part of the truth—a shadow that is cast in a limiting situation of some simplicity. Our scientific picture of the universe has revealed time and again how blinkered and conservative our outlook has often been, how self-serving our interim picture of the universe has been, how mundane our expectations have been, and how parochial our attempts have been to find or deny the links between scientific and religious approaches to the nature of the universe.

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Sir John Templeton has sought to encourage an impartial dialogue in the firm belief that religion and science can supply mutual illumination and appreciation of the wonders of our universe and inspire us to seek out and comprehend the truth in new ways—a truth that is unfailingly unexpected and so often not at all like it first appears.



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Canyon Institute for Advanced Studies

**3300 West Camelback Road
Phoenix, AZ 85017 USA**

Tel.: +1 602.589.2508

Fax: +1 602.589.2897

cias@gcu.edu

www.canyoninstitute.org

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