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Evolutionist Kenneth R. Miller's "Evidence" for Increasing Information

by Paul G. Humber

Editor's note: Author Paul G. Humber is Executive Director, Skilton House Ministries, Pennsylvania. Contributions to this article were made by Jerry Bergman, member of biology faculty at Northwest State College, Ohio, and Kevin Anderson, Director, CRS Van Andel Creation Research Center, Arizona.

My correspondence with Dr. Kenneth R. Miller, Professor of Biology at Brown University and the first witness for evolution in the recent Dover, Pennsylvania trial, began when I wrote to him on November 22, 2005, stating that "I believe the official Roman Catholic position concerning Jesus is that He was/is God in human flesh. As such, He is the Creator." Then, after referring to Hebrews 1:8–10, which affirms this, I continued,

It is an understatement ... to say that the Lord Jesus was/is a 'creationist.' He is the Wonderful Creator. ... If you believe this, how do you coordinate it with your professional position? ... In other words, when you think scientifically, perhaps you exclude Jesus from nature, but when thinking as a Catholic, you acknowledge Him as the God of nature? I realize these



Cover of Brown Alumni Magazine showing K.R. Miller's photo and the title of a feature article about the school's famous evolutionary professor (Heuman, 2005). Reprinted by permission.

questions are personal, but you have been pretty public about your thinking.

Two days later, Dr. Miller responded, affirming Jesus as his "Savior and as God the creator incarnate," adding, "The question of evolution has nothing to do with that ... processes that seem to have a natural cause (like evolution) can be seen as part of God's providential plan for creation."

On the same day, I wrote that "Creator Christ made, as you probably know, astounding claims! He said, for example, 'I am The Life.' (The Greek here is emphatic, and the biological ramifications should be clear.) He also said, 'Haven't you read that at the beginning the Creator 'made them male and female.' Jesus ... placed the existence of Adam 'at the beginning'—not billions of years after the beginning."

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The Absence of Critical Thinking in the Dover Decision

by Robin Wakefield, M.S.

As a public school science teacher and a practicing ecologist, I teach my students to follow the scientific evidence wherever it leads. In order for students to 1) come to their own conclusions, 2) understand the basic concepts of the topic being investigated, 3) become familiar with the assumptions and belief systems that are required to interpret the evidence, and 4) be familiar with the arguments on all sides and appreciate the fact that there are different kinds of science, they must understand the big picture. The type of science (i.e., empirical science, historical science, hypothetico-deductive science) determines the methods used, and each method has its own limitations and philo-

sophical assumptions.

It appears that the Honorable John E. Jones III and many "expert witnesses for the plaintiff" have never learned the basic tenets of the various scientific methodologies, nor have they grasped the importance of world-view in the interpretation of scientific data. The result of this ignorance was a judgment in the Dover decision that lacks the same critical thinking that the judge accuses the advocates of Intelligent Design (ID) of lacking. He wrote,

By directing students and their families to learn about origins of life with their families...it reminds

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On November 26, 2005, Dr. Miller wrote,

Paul, ... the 'knowledge' possessed by God is of an entirely different sort than that possessed by you and me. The issue here is whether one takes the Bible as a book of science (which you apparently do).

I then responded in this manner:

I do not take it as a book of science, but I do believe it is a book of truth (as did Jesus, John 17:17b). ... When Jesus was walking and talking to two disciples following the resurrection (see Luke 24:25ff), He said to them, 'How foolish you are, and how slow of heart to believe all that the prophets have spoken! Did not the Christ have to suffer these things and then enter his glory?' And beginning with Moses and all the Prophets, he explained to them what was said in all the Scriptures concerning himself.

Amplifying, I added that "Jesus, in other words, had an understanding about the Old Testament, and His disciples on that road began to connect with His understanding (knowledge). In fact, their hearts started burning inside them with the new understanding (knowledge) imparted by Scripture and Jesus."

Dr. Miller concluded this e-mail by claiming that he did not have time to debate, "especially when the scientific evidence is so compelling." I replied, saying that I was "convinced that evolution is an 'emperor without clothes!'" I requested that he "please give me even one example of an increase in genetic information — something that is absolutely necessary to get a new structure (and for evolution to have even one leg to stand on)."

I ended my e-mail with: "Even if you decide not to respond to this, I want to take this brief opportunity to thank you for the time you have given. Thanks."

Examples of increase in genetic information?

On December 1, 2005, Dr. Miller supplied two examples of alleged "increase in genetic information." He wrote, "Here's a perfect example of a very well-documented increase

in genetic information that also results in an increase in fitness by evolutionary means in a controlled laboratory experiment..." at which point he cited Riehle, Bennett, and Long (2001).

Continuing our dialogue, he added the following:

I would also recommend this paper on the whole subject... [Schneider, 2000]. I am certain that you will find a reason to claim that these perfectly sound examples don't count, of course. Such is the nature of argument by those who find science threatening.

Do those who oppose evolution find science threatening? I love mathematics, the language of science. I taught it for over 30 years, 24 years of which were spent at The Haverford School in Philadelphia. Many of my students have gone on to Ivy Leagues schools, including Brown. I have also taught for the University of Phoenix.

Similarly, my colleagues, Jerry Bergman and Kevin Anderson, love science. Dr. Bergman has two PhDs (one in biology) and five masters degrees (most in science). Dr. Anderson has a PhD in microbiology.

Computer simulations

I wrote to Dr. Thomas D. Schneider, the author of the second paper recommended by Dr. Miller. Schneider is connected with the NIH/NCI Center for Cancer Research Nanobiology Program. On December 1, 2005, I sent the following question: "Is your computer simulation of evolution purely theoretical, or is it based on observable, biological data?" Since then I have received fourteen e-mail messages from Dr. Schneider. In the first, he answered, "...yes it is based on observable biological data. R_{sequence} is observed to be close to $R_{\text{frequency}}$."

Dr. Schneider chose to include another of his colleagues in his correspondence with me. He also searched the Internet and discovered that I had written or edited a number of articles, including one that referred to the Law of Entropy and degeneration in nature. Schneider's colleague wrote that this "concept ... is entirely trashed by the fact that a single cell develops into a complete organism in spite of any 'general path of degeneration.'" However, he conveniently omitted the fact that developing ("evolving") persons eventually face old age and death.

Dr. Schneider had added "Excellent point" to his colleague's note, to which I responded that this "point is not excellent because the 'single cell' is so highly complex that the 'complete organism' unfolds in accordance with the instructions supplied by the Creator"

Regarding this discussion, Dr. Anderson (2006) wrote,

I find it interesting that the challenge was to produce examples of genetic 'information' increasing in a biological system. But, what we get with this paper is a demonstration that computer simulations can be programmed to illustrate a mechanism of increasing genetic 'information.' By their very nature, computer simulations will only do what the programmer has instructed.

So, if the ability to 'increase information' has been programmed into the simulation, it should be no surprise that the simulation was capable of achieving this. Therefore, if actual mutations have not been shown to generate an increase of genetic 'information,' then computer simulations cannot be offered as a biological demonstration.

In an online article, Strachan (2003) evaluated Schneider's program. The first part of the abstract reads as follows:

In this paper we assess the validity of the evolutionary simulation described in the paper 'Evolution of Biological Information' (Schneider, 2000), which, it is claimed, demonstrates the evolution of new biological information from scratch with no external intervention, as a set of characteristic patterns developed in nucleotide binding sites. The further claim is made that the amount of information that evolves, a quantity designated R_{sequence} , is approximately equal to the amount that is needed to locate the binding sites, given the number of them on the genome. This quantity is designated $R_{\text{frequency}}$. We find both these claims to be flawed ...

A controlled experiment?

Dr. Miller had also mentioned "a perfect

example of a very well-documented increase in genetic information that also results in an increase in fitness by evolutionary means in a controlled laboratory experiment” (Riehle et al., 2001). To exactly what kind of “increase in genetic information” was Dr. Miller referring?

Six genetic lines of *E. coli* (bacteria) were put under temperature stress (approximately 107°F) for 2,000 generations. There were five genetic events, some of which were duplication events, and others which were deletion events. The deletion events are not promising for increasing information. In the duplication events, the bacterium had two copies where it previously had only one, but how is this increase in information? Sending two copies of the same letter to your senator does not double the information you have given him — nor does it even increase the information by a fraction.

To expand this line of reasoning, Dr. Bergman (2006) adds this:

Another example is double minutes, homogeneously staining regions and other examples of amplification of specific genetic material, often in response to conditions such as drug therapy. These responses are also associated with tumor cell lines. They are either a designed response to drug therapy, or a result of lack of control due to damage to control areas of the cell. No one claims that these increases of genetic material are evidence of evolution or an increase in information.

A second objection I have is that any “benefit” of such duplication is so small as to be essentially nil when compared to the quantum leaps necessary for *E. coli* to evolve to eagles or elephants. Creation scientists do not object to small benefits resulting from genetic variation. A dark-colored peppered moth may have a small advantage over a light-colored one, but no scientist has ever seen peppered moths of any color transform into something that is not a peppered moth. This latter change is the kind that should be expected if evolution were true.

Regarding duplication events, Bergman (2006) also wrote,

Little evidence currently exists to support the belief that gene duplication is a significant source of new genes.... Rather, it is well documented as an important cause of disease and deformity. Many Darwinists accept gene duplication as an important means of evolution because they see no other viable mechanism to produce the large number of genes existing in higher organisms compared to those life forms from which the higher organisms are hypothesized to have evolved. In conclusion, gene-duplication is another example of a just-so story not based on empirical evidence nor documented theory.

Finally, the authors of Miller’s first cited article wrote that “The size and complexity of the genomes of most organisms make studies of the genetic basis of adaptation on a genome-wide scale a formidable

task.” I wholeheartedly agree that it’s a formidable task, because evolutionists have duped themselves (and us) by referring to so-called “simple cells and/or organisms,” but there never has been a “simple cell/organism,” and there never will be.

Heuman (2005) wrote that Dr. Miller “has waged a kind of holy war against claims that the world and all the species in it were literally created ... in the seven days described in Genesis....” However, neither the computer simulation paper, nor the article featuring gene duplication has produced evidence supporting Miller’s conclusion. If this is the best evolutionists can do, then affirmations of evolution’s being a fact is hubris at best or a lie at worst. In my correspondence with Dr. Miller, I wrote that evolution was/is an “emperor without clothes.” The flimsy garments he provided still reveal its nakedness.

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Absence of Critical Thinking

...continued from page 1

school children that they can rightly maintain beliefs taught by their parents on the subject of life, thereby stifling the *critical thinking* that the class’s study of evolutionary theory might otherwise prompt, to protect a religious view from what the board considers to be a threat. (*Kitzmiller v. Dover School District*; p. 44; emphasis added)

Though I understand his concerns in the Dover situation, in my classroom evolutionary theory is not a threat. It is a philosophical approach to answering questions about the origins of life. However,

neither is ID a threat. It, too, is a philosophical approach to answering questions about life’s origins. Macroevolution has as its basis the philosophy that the generation of first life can be explained through natural processes. ID has as its basis the philosophy that life cannot have been generated by natural means; therefore, it must have been designed. Judge Jones ruled that macroevolution is “science” and rightly belongs in the science classroom, while ID is “religion” and has no business in the science classroom. He also seemed to believe that ID inhibits critical thinking by students.

Critical thinking

Let us examine what is meant by critical thinking. To be critical, according to Webster’s New Collegiate Dictionary

(1974), is to relate to the judgment of critics, exercise careful judgment of a matter, and/or exercise judicious evaluation of a subject. To think is to reflect, ponder, meditate, and/or logically evaluate subject matter. To critically think, then, is to carefully and thoughtfully evaluate all sides of an issue or concept, drawing one’s own conclusions based on where the evidence leads.

Respected science educator Al Guenther (1997; p. 1) stated that “many students have fallen into the trap of expecting someone to transfer prepackaged knowledge to them, as much as TV presents them with prepackaged experiences.” For the record, I am a product of the public school system and my science classes were examples of the “transfer-prepackaged” model. We were

wonderful little robots who could regurgitate the differences between science and religion as pontificated from the science classroom pulpits. In turn, our teachers were just repeating the same old mantra, “evolution is science and creation is religion,” with which they were brainwashed.

Missing in my classroom experience was the component of critical thinking. We were handed prepackaged knowledge and were never given the opportunity to ask penetrating questions such as: What assumptions are being made? What biases are being held? Is there another way of interpreting this evidence?

As I got older, I began to realize that what was presented as unquestionable fact was based on limited definitions and unproven assumptions. It was a frustrating experience to realize that I was not given all of the information that I needed to draw my own conclusions. I vowed that I would not allow that to happen in my own classroom.

No secrets

Today, in my classroom, there are no secrets. There is no deferring to parents when talking about origins (most of whom have almost no knowledge about origins science); neither is there a hidden agenda in the instruction of science as it relates to origins. All points of view are presented; science, evolution, and religion are defined; and all relevant assumptions are exposed.

If my students are to be critical thinkers, they must see the big picture and draw their own conclusions. They must be able to ask penetrating questions and, to do this, they need to understand the issues. They realize that scientists, who do not operate in a vacuum, have philosophical biases which affect their scientific interpretations. Students must know that there are differing definitions of science, depending on which scientific method is being used. Defining the term evolution is crucial because, if the term is defined as a change over time (or a change in allele frequency, or natural selection, or speciation), then all biologists, whether they are evolutionists or ID advocates, agree that these processes are observed. When fully outfitted with what they need, students can follow the evidence wherever it leads.

One may ask what Judge Jones was referring to when he used the term evolution. In his ruling, he naively assumed that sci-

ence (narrowly defined) is objective, and that government entities (and scientists) are religiously neutral on the matter of life’s origins. He wrote,

...the endorsement test recognizes that when government transgresses the limits of neutrality and acts in ways that show religious favoritism or sponsorship, it violates the establishment clause. (Kitzmiller p.14)

Therefore, his conclusion was that, because the roots of evolution can be traced to Darwin’s “scientific” explanation, and because ID’s roots have a “religious” history, ID has no business in a public school science classroom.

Let us critically examine these assumptions. Other than a belief in God, Webster’s (1974) defines religion as a commitment or devotion to a faith; or an institutionalized system of attitudes, beliefs, and practices. The Constitutional default meaning, I believe, is that religion is all physically unverifiable beliefs which attempt to answer the questions: Where did life come from? What is life’s purpose? and What is life’s final destiny?

According to the popular myth, apparently endorsed by Judge Jones, Charles Darwin had a religio-philosophical problem with both Genesis and the concepts of heaven and hell (Brentnall and Grigg, 1995). Instead, captivated by the uniformitarian philosophy of James Hutton and Charles Lyell (“the present is the key to the past”), Darwin looked for ways to interpret his observations from a naturalistic world-view. In other words, his philosophy drove his scientific interpretations — not the other way around.

Scientists are attempting to explain where life came from, its purpose, and its destination. Such a quest is by definition religious. Many in the scientific community defend and preach their naturalistic faith with all the muster of an old-fashioned evangelist (Dawkins, 1998). No one was there to witness and measure the beginning of this wonderful and “accidental” creation called life. ID advocates suffer from the same lack of empirical evidence. All “science” must interpret the evidence of life’s origins based on the observer’s religious perspective.

Judge Jones defined science as what can be measured, tested, and observed; this

is empirical science. But the question of life’s origins is historical science, which deals with physically-untestable data which are based on historical interpretations. It is much more limited in its scope than is empirical science, simply because much speculation is involved. My students know that if they were not aware of the different ways of studying science, they would not be able to evaluate the claims of evolution and ID.

Evolution and ID are equally religious. Both attempt to explain life’s origins and why we do the things we do. So, if we were to apply the endorsement test quoted above to Judge Jones’ own decision, we would find that he has transgressed “the limits of neutrality” and acted “in ways that show religious favoritism or sponsorship” (Kitzmiller; p. 14) and has therefore violated the Establishment Clause.

Acknowledgement: I thank Jerry Bergman for providing helpful comments and feedback on previous drafts.

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Correction to Previous Report on Cosmology Conference by Jerry Bergman, Ph.D.

In Del Dobberpuhl's otherwise excellent report on a conference where I was one of the speakers (*Creation Matters* 9(1):1, 2004) he wrote concerning my presentation:

He discussed his own court case against Bowling Green [State] University [BGSU] in which his colleagues and the administration accused him of providing false credentials in his application for a psychology department position.

In fact, BGSU *never* accused me of providing false credentials in my application. What happened was that, *after* I lost my BGSU position, Dr. Jim Davidson alleged that the reason was because I claimed to have credentials in psychology when, in fact, I "*had no psychological credentials.*" The court accepted his claim and ruled that I was terminated due to ethics: viz., falsely claiming to have credentials in psychology.

Davidson's claim is especially ironic in view of the fact that I originally applied for a test and measurement position at BGSU, but was hired in the psychology area. The reason was, as Dr. Robert Reed stated in a letter dated Feb. 21, 1973, my "credentials have been ... evaluated favorably by faculty members in the **Educational Psychology Area**" (emphasis in original). The first classes that I taught at BGSU were

in the psychology area, *and I taught in that area during the entire 7 years during which I was on the faculty there.* I also have a masters in social psychology, and another in counseling psychology. The minor for my doctorate was in psychology, and my dissertation was on an experimental treatment project for second-felony offenders. My graduate course work in psychology includes a total of 131 quarter hours—well over the hours needed for both a masters and a doctorate.

I am also a licensed therapist, which required extensive training in the clinical area plus supervised experience working as a therapist. I first worked under Dr. Ricardo Girona for several years, then Dr. William Beausay at Arlington Psychological Associates, *both licensed psychologists.* Until I was licensed, I was registered with the state board of psychology as a psychological assistant.

The state law requires that, to obtain a license,

the candidate must complete a minimum of ninety quarter hours of graduate credit ... including a minimum of thirty quarter hours in: (a) Clinical psychopathology, personality, and abnormal behavior; (b) Evaluation of mental and emotional disorders; (c) Diagnosis of

mental and emotional disorders; (d) Methods of prevention, intervention, and treatment of mental and emotional disorders. The individual must complete supervised experience ... supervised by a ... qualified professional approved by the committee. (*Ohio Laws and Rules*, 1997, p. 6)

I met these requirements, and was licensed. My license enables me to "diagnose and treat mental and emotional disorders" without supervision (*Ohio Laws and Rules*, 1997, p. 6).

Immediately after I left BGSU, I was hired as an associate professor of psychology at Spring Arbor University in Spring Arbor, Michigan. I also have over 50 publications in the area of psychology, including several books. All of this can be checked by consulting my official transcripts, my work history, and the state license department records.

The court did not bother to check *any* of these records, even though they were part of the court documents, but simply irresponsibly repeated the false claim made by Jim Davidson (who was himself terminated from the university!). They assumed that Dr. Davidson's claim was accurate.

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Transient Lunar Phenomena: Evidence for a Young, Active Moon

by Jonathan Henry, Ph.D.

According to naturalistic origins theory, some 4.6 billion years ago our solar system developed from a vast cloud of gas, dust, and debris called the solar nebula. This scenario is called the nebular hypothesis. As high-energy nebular material collected into planetary bodies, planets heated and became molten. According to the nebular hypothesis, the earth and other planets continue to give off this primordial heat (Henry, 2001, p. 87).

The moon: hotter than expected

The moon, however, being relatively small, would have cooled more rapidly than the earth or larger planets. Since so much time has elapsed since its origin, the moon must be cold throughout, and “essentially dead” with no geological activity (Short, 1975, p. 332; Gamow, 1965, pp. 41–42). There should be virtually no signs of geological activity on the moon.

This conventional view of the moon as cold and dead has been contradicted repeatedly. Lunar mapping by the Clementine satellite showed that, “Most likely, part of the rock is still molten” (Kerr, 1994, p. 1666). Indeed, the first lunar astronauts measured a higher heat flow from the moon than expected, indicating that “the Moon’s interior is much hotter than most thermal models had anticipated” (Short, 1975, p. 184).

Though the moon’s heat flow “is 1/3 of that of the Earth, [t]his is surprisingly large for such a small body, which should have cooled more rapidly than the larger Earth” (Fix, 1999, p. 190). Radioactive decay in the moon’s interior is not believed to contribute significantly to this finding, which continues to be viewed as an anomaly. The straightforward explanation is that the moon has not had time to cool and is therefore younger than 4.6 billion years.

Transient lunar phenomena: signs of a geologically active moon

Through the centuries, observers have reported transient lunar phenomena (TLP), momentary flashes of light apparently due to release of gases or other geologic activity on the moon.



The sliver of the setting moon and clouds that shine at night—noctilucent clouds—photographed July 27, 2003 by astronaut Ed Lu aboard the International Space Station. Image no. ISS007-E-10974, courtesy of Image Science and Analysis Laboratory, NASA-Johnson Space Center. <http://eol.jsc.nasa.gov>

Before the first moon landing by Apollo 11, 579 TLPs had been confirmed (Middlehurst, et al., 1968, pp. 5–45). Many TLPs have been sighted “near the crater Aristarchus and around the edges of many of the circular maria,” showing that the moon “is not completely dormant” (Kitt, 1987, p. 87; Short, 1975, p. 171). Though TLPs have been claimed by some to be spurious, perhaps the result of optical phenomena, many of these events appear to be real. Prior to the first Apollo moon landing, NASA concluded that “the number of [TLP reporting] errors [was] not high” (Middlehurst and Moore, 1967, p. 449). Conclusion: many TLP sightings are genuine.

This conclusion has been denied by some advocates of conventional theory, for if TLPs are real, the moon is not geologically dead. In 1964, NASA organized a network of amateur lunar observers that reported a TLP in progress. Nevertheless, professional opinion was that, “It is far easier to believe that misinterpretations of mundane atmospheric and instrumental effects are responsible” for TLP sightings (Sheehan and Dobbins, 1999, p. 123).

Then in 1971, the Apollo 15 lunar mission found a high concentration of radon-222 gas near Aristarchus Crater (NSSDC, n.d.). The half-life of radon-222 is only 3.8 days, so the gas must have originated near the detection site. “Thermal cracking” is believed to be associated with TLPs (Zito, 1989, p. 419). The thermal cracking is due to outflow of internal heat, or to energy release from sub-

surface radioactivity. It signifies a degree of geological activity which conventional theory has not predicted. Further, this outcome is consistent with the larger than expected outflow of lunar heat mentioned above.

A Continuing Challenge to Conventional Theory

In 1994, about 100 amateur astronomers noticed a 40-minute darkening near the edge of Aristarchus crater. The Clementine lunar satellite was mapping the area, and Aristarchus had really turned redder after the TLP occurred (Seife, 1999, p. 22). However, after correcting the Clementine data for lighting geometry and other effects, the evidence for the 1994 TLP faded (Anonymous, 2000, p. 22). Despite this outcome, the case for TLP in general has not vanished.

In late 1999, Leonid meteors crashing on the moon were sighted as flashes of light (Talcott, 2000, p. 30). This event showed that not all flashes of light appearing to emanate from the lunar surface can be explained away as artefacts of image processing. The case for TLP has become sufficiently strong that long-time lunar observer Patrick Moore (2000, p. 228) has claimed, “The reality of TLP has now been confirmed ...” TLP observers seem to be seeing the activity of a “young” moon, a fact recognized decades ago (DeYoung and Whitcomb, 1978, p. 127), and which has become increasingly evident over time (DeYoung and Whitcomb, 2003, p. 67).

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Karl Pearson – Chief Architect of Statistics and Eugenics

by Jerry Bergman, Ph.D.

The second most important architect of the early eugenics movement was the eminent British mathematician and statistician Karl Pearson (1857–1936). Called the “saint” of biometrika, Pearson made eugenics acceptable to the academic world by translating its goals into the language of science. Pearson graduated with honors from Kings College, Cambridge, with a degree in mathematics in 1879. He then studied law and was called to the bar in 1881.

Early influences

A socialist, he often lectured on Marxism to revolutionary clubs. Pearson also went to Germany for post graduate study and, although critical of Germany under the Kaiser, he changed the spelling of his name from Carl to the German Karl and desired to marry a German woman.

He was later appointed the chair of applied mathematics and mechanics at University College, London, and soon thereafter established an international reputation as a leading mathematician. His publication of *The Grammar of Science* (1900), which covered in detail many areas of science, including an extensive discussion on evolution, also gave him an honored place in science.

Pearson, greatly influenced by Darwin's second cousin, Francis Galton, soon began to apply his mathematical knowledge to biological problems. He attributed his “change in direction to his benefactor Galton” (Stigler, 1986, p. 305). Actually, it was Galton's book *Natural Inheritance* that “won a brilliant disciple in Karl Pearson” (Haller, 1984, p. 12). Pearson developed the field now known as statistics, primarily to research evolution specifically as related to eugenics.

Pearson also vigorously applied the experimental method to his eugenic research. One study dealt with the ability of teachers to rate their students on such qualities as ability, introspection, temper, and handwriting. The study found that correlations between these ratings and certain biological traits, such as height, were between 0.43 and 0.63 (Haller, 1984, p. 13). Pearson concluded from this research that human progress came *only* through class and race

struggles in which the superior races (the Caucasians) won out, supplanting the lower races, such as Negroes (Haller, 1984, p. 14).

Similarities between Pearson and Galton

Both Pearson and Francis Galton, the founder of the science of eugenics, were products of middle class Quaker families and stern fathers. Karl's father, William Pearson, came to London from Wiltshire to practice law, and eventually became a counsel for the Queen. Karl Pearson, it has been reported,



... remembered his father as ‘an iron man’ who rose before dawn to prepare his briefs, rushed to the office after a standing breakfast at nine, returned in the evening to hurry taciturnly through dinner, then promptly retired. If Karl entered his father's study, he would be directed to a chair and left to sit for hours entirely ignored. On vacations, he was made to follow along on fly-fishing tramps but instructed not to cast if fish were about. (Kevles, 1985, p. 21–22)

Both Karl and Galton had mental health problems. Karl's mental health problems were so serious that he had to withdraw from law school, and in 1875 he enrolled in King's College, Cambridge, on a mathe-

matics scholarship, but again he had to leave because of a nervous breakdown. Highly oriented to academic studies, he was very critical of his fellow students because he opined that many of them were in college for reasons other than to learn. Kevles concluded that Pearson was cold, remote, driven, and treated emotional pleasures as a weakness. He seemed not to like many of the things that the upper-middle class persons with whom he associated favored, such as art, literature, and poetry.

Challenging Pearson on a scientific point invited “demolishing fire in return.” Pearson did not have a temper in general—in personal matters his friends claimed that he was very controlled. It was primarily his eugenic theories in which his fire erupted.

If Pearson responded to criticism with polemics, it was because the dissent struck at his secular church When it came to biometry, eugenics, and statistics, he was the besieged defender of an emotionally charged faith [and his research in eugenics and statistics] conformed to the icy distance of his character, reinforcing his propensity for dealing with man in the impersonal group. (Kevles, 1985, p. 36)

Religious doubt

Both Pearson and Galton were also “like so many Victorian undergraduates” in that they were “beset by an agony of religious doubt” (Kevles, 1985, p. 22). His socialist leanings first caused him to conclude that Darwinism, especially as expressed in Herbert Spencer's ideas, provided justification for *laissez faire* capitalism. When the reformers of his day were able to forge Darwinism into a weapon against *laissez faire* capitalism, Pearson switched sides and joined the Darwinists.

Pearson concluded that Darwinism supported socialism because, he assumed, socialism produced a wealthier, stronger, more productive, and, in short, a superior nation. And the outcome of the Darwinian struggle in the long run resulted in the ascendancy, not of individuals, but of the “fittest” nation. Achievement of national fitness, Pearson argued, could better be produced by national socialism because socialism produced na-

tions that were better able to survive in the struggle between nations.

Karl Pearson was connected with a variety of prominent people. Many were well-known socialists involved in various “progressive” movements of the time, such as the free love and birth control movements. These included: the “Bloomsbury Set”; George Bernard Shaw; the founder of planned parenthood, Margaret Sanger; and especially Havlock Ellis (Grant, 1988).

His ideas

Pearson carried his conclusions of heritability far beyond that which was warranted by the data. In 1903, he stated to the anthropological institute that humans “inherit our parents’ tempers, our parents’ conscientiousness, shyness and ability, even as we inherit their stature, forearm and span ... [and] no training or education can create [intelligence], you must breed it” (quoted in Kevles, 1985, pp. 32-33).

Much of the criticism against the theory of eugenics was also directed against Darwinism. The two were highly intertwined, and many scientific critics attacked both ideas as a unit. Kevles claimed that Pearson often displayed a “relentless closed-mindedness,” and “frequently took a club to his scientific enemies and slashingly abused even . . . his methodological friends who queried his biometry or his eugenics” (1985, p. 36).

Danish biologist Wilhelm Johannsen discerned from his empirical research that, barring the use of gene splicing technology (which was unknown in his day), a pure line of beans could not be bred beyond a maximum limit for a given character regardless of how it was manipulated. Pearson responded irrationally against this concept, even dismissing two members of his editorial board when they published articles reporting Johannsen’s research. Pearson’s only argument against Johannsen’s evidence was that reasonable correlational coefficients for intelligence and physical traits existed; therefore, the influence of heredity *must* be similar for both—end of argument. As is well-known, correlations do not prove causation. Morality was merely the “outcome of Darwinian struggle with the ascendancy of the fittest nation” (Kevles, 1985, p. 23). In other words, might makes right.

His stature in science

Pearson was no minor figure in the history of science. His contributions in statistics are crucial to virtually all modern scientific research (Stigler, 1986). He developed not only the *Pearson product moment correlational coefficient*, to which his name is attached, but also *regression analysis*, *multiple correlation*, and *chi square*. He also made numerous important contributions in the area of statistical analysis, including the *goodness of fit theory*, which is a technique that examines how closely a given set of data corresponds to the mathematical curve that one would expect by chance.

More than any other person, Pearson put eugenics on what appeared to be an impressive, solid, scientific foundation.

His motive behind developing these statistical tools was primarily to convince the scientific world of the validity of eugenic ideas. One of Pearson’s last contributions (with Dr. Weldon, a professor of comparative anatomy at Oxford, and Galton in *Biometrika*) dealt with statistical theory clothed with biological terminology.

During most of Pearson’s career, Galton was still highly involved in the eugenics movement. Galton, one of the movement’s chief financial supporters, awarded a research fellowship of 500 £ per year (about what a luxury automobile cost at that time) to study government programs that were designed to improve the racial or mental qualities of future generations. Galton also contributed much of his fortune to the Galton Laboratory for National Eugenics, which was under Pearson’s directorship. When Galton died in January of 1911, the bulk of his 115,000 £ estate (an enormous sum of money at the time) was willed to support eugenic studies. The University College received much of the money and established a Galton eugenics professorship, and a new department called *applied statistics* to study eugenics and other “applied” topics.

This fund enabled Pearson to be freed from his “burdensome” teaching duties to devote himself full time to eugenics research. The new department blossomed,

drawing researchers from around the world. Pearson was then able to select the best scientists and students, who were then required to completely immerse themselves in eugenics work. His students helped with the dozens of eugenics research projects in which Pearson was involved.

Pearson’s students, and those who worked under him, had to be as dedicated as was Pearson, or they were soon forced to leave his lab. Some, trying to emulate Pearson’s pace, suffered nervous breakdowns (Kevles, 1985, p. 39). The lab’s goal was the production of research, and produce they did—between 1903 and 1918 alone,

Pearson and his staff published over 300 research articles plus various government reports and popular expositions of eugenics.

Some of his coworkers questioned the idea that the only way to improve a nation was to insure that its future generations came chiefly from the superior members of the

existing generation, but most said nothing—no doubt partly due to fear of losing their jobs. If “staff members or students had private reservations about the validity of the work, it required rare courage for them to make their doubts known . . . Pearson chose and assigned the research problems, guided their execution, and edited the results. Intellectually, he was as domineering in the laboratory as outside of it” (Kevles, 1985, p. 40). In 1925, Pearson began publishing a journal titled *The Annals of Eugenics*. He continued to contribute both his enthusiasm and his mathematical genius to the cause until he died in 1936.

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Creation Calendar

Note: Items in "Creation Calendar" are for information only; the listing of an event does not necessarily imply endorsement by the Creation Research Society.

July 30–August 4 and August 6–11

Redcloud Family Mountain Adventure

Dynamic programs for adults & children, near Lake City, CO

Sponsored by Alpha Omega Institute, Grand Junction, CO

Contact: (970)523-9943, www.discovercreation.org

August 25–27

Grand Canyon 3-Day Rafting Trip

Canyon Ministries (Tom Vail) and Creation Safaris (David Coppedge)

Registration: \$710 per person (call or email for details)

Contact: David Coppedge, (661)298-3685 bwana@creationsafaris.com

August 31–September 2

Grand Canyon Rafting Trip with guide Tom Vail

Arizona Origin Science Association, Inc.

Registration: \$710 per person (call or email for details)

Contact: Joseph, (480)540-8953 www.azosa.org/

October 31

► Deadline for submission of abstracts ◀

Sixth International Conference on Creationism

Developing and Systematizing the Creation Model of Origins

[to be held August 4–6, 2008]

Contact: Dr. Andrew A. Snelling,

P.O. Box 1208, Springwood, Qld 4127 Australia

aasnelling@ozemail.com.au

Pearson's legacy

Pearson's work had profound effects on the world for years after he died. More than any other person, Pearson put eugenics on what appeared to be an impressive, solid, scientific foundation. Another Pearson legacy is that many of his eugenic ideas were incorporated into school textbooks, especially biology textbooks, spreading racism throughout the world (Chase, 1980, p. 308).

Pearson actively helped to spread the eugenics movement, first to Germany and later to the United States, then to the four corners of the earth. In Munich, Germany, *The International Society for Racial Hygiene* was formed in 1910 with Galton as the honorary President (Mosse, 1981). As Haller stated, "Thus eugenics in Germany began its sad history that, under the Nazis, would justify wholesale sexual sterilization and then euthanasia for the allegedly unfit and would provide part of the justification for the slaughter of four to six million Jews" (1984, p. 20). Galton's successor was Leon-

ard Darwin, the son of Charles Darwin, who was also very active in the eugenics movement for many years. Leonard advocated compulsory sterilization to stop the "danger resulting from unchecked multiplication of inferior types" (Chase, 1980, p. 282).

Summary

Pearson's contributions to research, and especially statistics, are unquestionably first class and so important that they did more than any other person to put the field of research and measurement on a firm foundation. Conversely, he used this science to put eugenics on a respectable footing, leading to the abuses of the holocaust in Europe and the eugenics laws enacted in the United States. His work leaves us with an important lesson in science. In Einstein's words, science without religion is not just lame but dangerous.

Acknowledgements: I wish to thank Jody Allen, RN, and Clifford Lillo, MA, for their comments on an earlier draft of this article.

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*But ask now the beasts, and they shall teach thee;
and the fowls of the air, and they shall tell thee;
Or speak to the earth, and it shall tell thee;
and the fishes of the sea shall declare unto thee...*

Job 12:7–8

Speaking of Science

Commentaries on recent news from science

Editor's note: All S.O.S. (Speaking of Science) items in this issue are kindly provided by David Coppedge. Opinions expressed herein are his own. Additional commentaries and reviews of news items by David, complete with hyperlinks, can be seen at: www.creationsafaris.com/crevnews.htm. Unless otherwise noted, emphasis is added in all quotes.

Foot Facts: Frogs and Flies Fulfill Feet Feats

How do frogs walk on wet leaves without slipping? Eric Jaffe in *Science News* (2006) describes how they have dual-purpose footwear: a mucous film that holds on by wet adhesion, plus microscopic bumps that protrude above the wet layer to make dry contact. Though a frog foot doesn't appear as fancy as that of a gecko, "Now, researchers have evidence that the tree frog's foot may be surprisingly sophisticated."

The frog's prey has fancy feet, too. Corey Binns (2006) explained on *LiveScience.com* how flies can walk on ceilings. It's not a simple feat: "Walking upside-down requires a careful balance of adhesion and weight, and specialized trekking tools to combat the constant tug of gravity." The fly does it with broad footpads loaded with microscopic hairs that increase the surface area of contact, much like the setae on gecko feet. Not only that, the hairs secrete "a glue-like substance made of sugars and oils." To get unstuck, the fly simply peels the pad away like a sticky note. "The combination of the feet hairs' rounded tips, the oily fluid, and a four-feet-on-the-floor rule help the inverted insect take steps in the right direction," Binns summarized.

The article includes a stunning electron micrograph of a fly's foot. We could rhapsodize about the design in a frog leg or fly foot, but you already know the sermon. Instead, we offer, for your amusement, a fly joke. OK. Three hungry flies buzzed around the kitchen at midnight, discovering to their delight a skillet of bologna. After gorging themselves on this unexpected feast, they stopped short with alarm, hearing footsteps. "The human is going to come after us with a swatter if he finds us here," one shouted. Stuffed to the gills, they all waddled out to the handle and tried to use it like a runway. Their flimsy wings could no longer support the added weight, though. One by one, they launched out, only to collapse in a heap on the floor. The moral of this story is, "Don't fly off the handle when you're full of baloney."

Jaffe, E. 2006. Walking on water: Tree frog's foot uses dual method to stick. *Science News* 169(23):356.

Binns, C. 2006. How flies walk on ceilings. *LiveScience.com*, posted: 12 June. www.livescience.com/animalworld/060612_mm_fly_feet.html

Mini-Dinos Found in Marine Sediments

Sauropods were not all the lumbering giants of which we think; they could be the size of a pet dog (images of Deeno in the Flintstones come to mind). This came to light from recent discoveries, announced in Germany, of adult sauropods smaller than human height, ranging five to 20 feet long (see Carey, 2006).

According to Nicholas Bakalar (2006) writing for *National Geographic News*, the unlikely place of their discovery was quite a surprise. Co-author of the study Octavio Mateus (New University of Lisbon) described the puzzle of their location in a quarry loaded with marine sediments.

This was not supposed to happen because all those layers were supposed to be marine layers containing only marine animals. We didn't expect to find dinosaurs, but we did.

To their shame, most of the news reports focused more on the story line than on the facts of the discovery. They went on about how this species used to be large like the heavyweight sauropods, but found

themselves trapped on an island of diminished resources so downsized into dwarfs.

Only *National Geographic* (not particularly partial to hard facts) mentioned the surprise of finding them buried among marine organisms. Even then, Bakalar did not elaborate. Yet this is an important detail of the discovery that should not have been understated. These 11 individuals did not just go to the beach and wait for high tide to come in. They were apparently caught off guard and overwhelmed suddenly by a watery catastrophe along with the sea creatures entombed with them. If this were an isolated case, we might suspect a local misfortune, but is there a pattern emerging?

Carey, B. 2006. Dwarf dinosaur discovered. *LiveScience.com*, posted: 7 June. www.livescience.com/animalworld/060607_dwarf_dino.html

Bakalar, N. 2006. Dwarf dinosaurs discovered in Germany. *National Geographic News*, posted 7 June. <http://news.nationalgeographic.com/news/2006/06/060607-dinosaurs.html>

Plant Hula-Hoop Railroads Build Cell Walls

Solving a long-standing mystery about how plants build cell walls, Stanford scientists imaged molecular machines traveling along hoop-shaped rings around the inside of the cell. Publishing in *Science*, Parédez, et al. (2006) proved that cellulose synthase (CESA), a machine that manufactures cellulose composed of six subunits arranged in rosettes, rides like a rail car on microtubules that encircle the inside of the plasma membrane. From there, the machine extrudes the complex molecule to the exterior, building the rigid cell wall.

Lloyd (2006), commenting on this finding in the same issue of *Science*, seemed happily astonished, not only at the scientific achievement, but at the plants themselves:

In a **remarkable series of biological transformations**, green plants **convert carbon dioxide into cellulose fibers stronger than steel**. These thin threads of polymeric glucose are wrapped around growing cells, lending **structural support** to the plant as it extends further into the environment. **The fibers are not simply secreted into the plant cell wall in a haphazard fashion but are deposited in ordered layers that still allow the cell to expand**. For more than 40 years, it has been known that the alignment of these cellulose fibers (microfibrils) in the cell wall often coincides with cytoskeletal microtubules tethered to the cytoplasmic side of the plasma membrane... Despite this coincidence, there has never been direct proof that microtubules provide **a guidance mechanism for the alignment of cellulose microfibrils**. Now, . . . Parédez et al. . . . provide that proof. (emphasis added)

Lloyd described the cell-encircling hoops as a "microtubule railroad" providing tracks for the cellulose-synthesizing machines. Apparently these tubules can reorient themselves, perhaps in hula-hoop fashion, allowing the machines to stitch cross-hatch patterns of cellulose for added strength.

Should we not gasp and applaud over how a blade of grass stands up? Plants don't just happen. A plant could not grow upward against gravity without a complex, programmed arrangement of tools and parts that build the structure piece by piece in an ordered fashion. Now, we see that this construction process involves railroad tracks and rail cars loaded with organic-chemistry wizards.

The ways the components of the cell wall are manufactured and assembled are wonders in themselves (see Cason, 2001 for a glimpse). Did you realize plants contain a substance stronger than steel? And that they make it starting with just carbon dioxide (a gas) through a "remarkable

series of biological transformations”? What an amazing creation! (We must add the obligatory observation that neither of these papers said anything about how these biological marvels might have evolved.)

Paredez, A.R., C.R. Somerville, D.W. Ehrhardt. 2006. Visualization of cellulose synthase demonstrates functional association with microtubules. *Science* 312:1491–1495.

Lloyd, C. 2006. Microtubules make tracks for cellulose. *Science* 312:1482–1483.

Cason, K. 2001. UGA researchers discover important role for complex plant carbohydrates. University of Georgia New Bureau, posted 26 October. www.uga.edu/news/newsbureau/releases/2001releases/0110/011026RGII.html

Beavers Achieve Environmental Reprieve

In what might be considered an unexpected convergence between geology and zoology, it has been found that beaver dams influence large tracts of land both above and below ground. “Impact of beaver dams wider than thought” announced a headline on *LiveScience.com* (Carey, 2006), summarizing studies by scientists in Rocky Mountain National Park. The dams take water that would otherwise be channeled down narrow passages and spread it out, raising the water table and sustaining plant and animal life during the dry season.

[The] construction projects also spread water downstream with the **efficiency** of a massive once-every-200-years flood. . . . Additionally, beaver dams built away from natural river channels further **redirect water across the valley**, increasing the depth, extent, and duration of small floods. [This suggests that] beavers can create and maintain environments suitable for the formation and persistence of wetlands. (emphasis added)

Without the spreading effect of the dams, small and large floods would largely rush down to the lowlands, leaving mountain valleys dry. The beaver dams help capture and spread the resources into the sides of the mountain valleys where it can be stored in the water table. This moderates the peak- and low-water periods, resulting in enhanced vitality and biodiversity of mountain ecosystems.

See also Roach (2005) on how beavers are inspiring human dam builders. In the fur trade era, these river rats were valued only for hats, as their pelts produced felt for svelte European dudes. Now we know that beavers’ influence is felt in bigger and better ways. Watch the documentary film *Beavers* on DVD (see Lewis, 2003) at home and marvel at another of God’s adorable creatures that is useful as well as ornamental — as we also should be.

Carey, B. 2006. Busy as a beaver: Dams raise water table downstream, too. *LiveScience.com*, posted 5 June.

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http://news.nationalgeographic.com/news/2005/07/0715_050715_hydrobeaver.html

Lewis, D. 2003. Beavers. *Big Movie Zone (BMZ) Reviews*, posted November.

www.bigmoviezone.com/filmsearch/movies/movie_reviews/bmz_reviews.html?uniq=115

Hummingbirds: Small Wonders

Do you enjoy watching the world’s smallest birds, right from your backyard? Healy and Hurly (2006) provided interesting tidbits about them in *Current Biology*.

There are 330 species of these small flyers, noted for their aerobatics and iridescent colors. Typically, they weigh a few grams. The largest is the size of a starling; the smallest (from Cuba) weighs a mere two grams, and is nine centimeters long (mostly beak and tail). Flight muscles comprise 25 to 30% of a hummingbird’s body weight; “a three gram hummingbird beats its wings an astonishing 50-70 times per second,” the authors exclaim. Yet all this capability grows from an egg the size of a

pea.

Some species migrate to the Canadian Rockies while snow is still on the ground, yet manage to keep their eggs 25°C warmer than the ambient air. How? “They are able to deal with cold temperatures because their feathers provide some of the best avian insulation, with more feathers per inch of surface than other small- to medium-sized birds.” Furthermore, they can lower their metabolism to a state of torpor to conserve energy.

Before migrating, they store 72% of their weight in fat, more energy efficient than carbohydrate. This requires some physiological fine-tuning on the inside:

They have the most metabolically active liver known, with the highest levels of enzymes for lipid synthesis along with extremely high rates of intestinal glucose transport, which results in very dilute excreta, invaluable for a nectarivorous animal ingesting large quantities of water in its food. Quite how they are able to produce highly dilute urine is still not known, but it appears that their renal morphology and physiology is more like that of nectarivorous bats and freshwater amphibia than that of non-nectarivorous birds.

Their hovering ability is well known; they can even fly upside down and backwards. This is made possible by “a wing structure unlike that of any other birds, which articulate their wings from shoulder, elbow and wrist: hummingbirds’ wings articulate only from the shoulder.” In the ecology, they fulfill important roles as pollinators.

Another hummingbird feat that has come to light recently is their skill at memory. Another *Current Biology* article (Henderson, et al., 2006) states that,

[They] appear to remember where they have visited hummingbird feeders along the way: the reminder for garden owners to put the feeder containing sucrose solution out is often a bird hovering around the place [where] the feeder was hung the previous year. Secondly, they have been shown to remember information on a more local scale, avoiding flowers they have recently emptied and returning to flowers they have left still containing food.

How is this all possible in such a tiny creature? The authors remark, “Although the rufous hummingbird has a **brain** approximately **the size of a grain of rice**, it puts it to rather good use.” (emphasis added)

Buy a hummingbird feeder and use it as a teaching opportunity for your family. Hold up a stuffed bird of similar size and weight and ask your kids how many systems would need to be added to make it fly like a real hummingbird. Imagine NASA designing a remote sensing, guided hovercraft with a computer the size of a grain of rice, capable to extract energy from sugar water, and able to fly to snowy peaks in Canada. Then imagine their making it able to reproduce itself through pellets the size of a rice grain. Moments like these can help teach young people not to take the wonders of nature for granted.

Healy, S. and T.A. Hurly. 2006. Quick guide: Hummingbirds. *Current Biology* 16(11):R392-R393.

Henderson, J., T. Hurly, M. Bateson, and S. Healy. 2006. Timing in free-living rufous hummingbirds, *Selasphorus rufus*. *Current Biology* 16(5):512-515

Handy Dandy Modus Operandi

Gross and Ghazanfar (2006) take “the prize” for this remarkable statement in *Science*, from a book review of *The Sensory Hand* by Vernon B. Mountcastle (Harvard, 2006):

In one of the first systematic attempts to describe the differences between primates and other mammals, Thomas **Huxley** argued that the former are distinguished by virtue of their adaptation to arboreal life. Central to this arboreal life is **the grasping hand**. Indeed, the primate hand is so **fundamental to how we define ourselves** that some, including **Friedrich Engels**, have claimed that **hand use** (particularly with tools) was the **driving force that gave rise to our sophisticated cognitive abilities**. Though this idea is an

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elegant design is on a par with the eyes and ears. (emphasis added)

Well, since eyes and ears evolved, obviously, hands must have, too(!). In fact, natural selection not only invented the hand, but used it as a driving force for even more natural selection. Now that just drives it out of the park, doesn't it? Darwinian evolution makes hands that make Darwinian evolution make brains. Who needs artists and engineers any more? Darwinian evolution, the masterpiece maker, the masterpiece-maker maker, renders all other makers obsolete. It even makes masterpiece critics who know what "elegant design" means.

The reviewers ended with another quote by Engels, a guy on the

overstatement, our hands do represent a masterpiece of Darwinian evolution; its

dustbin of history known more for his radical economics than knowledge of anatomy: "Man alone has succeeded in impressing his stamp on nature . . . and he has accomplished this primarily and essentially by means of the hand . . . step by step, with the development [i.e., evolution] of the hand went that of the brain." They add, "Mountcastle's book shows us how we are beginning to understand this process."

You can't know you've understood a process at the beginning, but only at the end. Their "masterpiece of Darwinian evolution" statement shows that they understand little, if anything, about the origin of masterpieces. Their choice of guru (Engels) shows that they understand even less about economics — and logic.

Gross, C.G. and A.A. Ghazanfar. 2006. Neuroscience: a mostly sure-footed account of the hand," *Science* 312:1314.

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All by Design

by Jonathan C. O'Quinn, D.P.M., M.S.

The Eyes Have It

Evolution maintains that over time, random genetic mutations in primitive forms of life created adaptations to a variety of habitats. Evolutionary ancestors would thus have given rise to distinct groups of organisms over immense periods of time. As examples from nature make clear, the evolutionary viewpoint is flawed.

Nocturnal eyes are among the most specialized eyes in the animal kingdom. Animals as diverse as cats, seals, crocodilians, and sharks rely heavily on their keen night vision. Their amazing sight is made possible by a natural "mirror" located behind, or sometimes within, the retinae of their eyes. This structure, known as the *tapetum lucidum*, is composed of neatly ordered rows of silvery, reflective plates.

Similar structures are found in other nocturnal animals, even certain spiders such as the wolf spider. These plates act as a

mirror, so that light passing through the retina strikes the plates and is reflected back out of the eye. This re-stimulates retinal photoreceptors, increasing retinal sensitivity and allowing for a much clearer visual image. In brighter conditions, special cells called melanocytes disperse a dense pigment to block this "mirror" and keep perceived light levels from being too intense.

How could this complex structure have evolved on a number of separate occasions? That this could happen in even one species is unimaginable to the thinking person. As Romans 1:20 makes so clear, our loving and holy Creator wishes for the wonders of nature to point us to His power and divinity, leaving us with no excuses.

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