Human Genome Project

Dr. Ray Bohlin takes a brief look at the accomplishment, purpose and consequence of the Human Genome Project.

 *This article is also available in Spanish.*

What's All the Fuss About the Human Genome Project?

In February of 2001, virtually every media outlet, whether TV news, newspapers, radio, Internet news services, or news magazines, was all worked up about the announcement of the completion of the Human Genome Project. In this article we will explore this monumental achievement and what it means for the future of medicine and our understanding of ourselves.

To appreciate this important accomplishment, we need to review a little basic genetics. It may actually astonish most adults just how much genetics the National Institutes of Health assumes we know about our genetic heritage. The educational video from the HGP includes a three-minute review of basic genetic processes like DNA packaging, transcription of DNA into message RNA, and the translation of message RNA into protein. It's no exaggeration to say that when I played this short piece during a lecture for high school students and their parents, mom and dad were left in the dust.

Honestly, I did that intentionally; because we are only in the beginning stages of a genetic revolution that will transform the way we diagnose and treat disease and how we may even alter our genetic structure. These new technologies bring with them numerous ethical and moral dilemmas we have only begun to address and for which there may not be simple answers. If we don't take the time to familiarize ourselves with genetic research and its implications, we risk responding out of fear and ignorance and potentially throwing away crucial medical

advances.

I have contended for a long time that we can no longer afford to remain ignorant of genetic technologies. They simply harbor far too great a power for both tremendous good and tremendous evil. We must work hard to take every thought captive to Christ and see what there is of benefit and what avenues of research and application we need to avoid to preserve human freedom and dignity.

Well let's talk about our genome, the sum total of all our genes. In most of the 100 trillion cells of our body are 46 chromosomes. These chromosomes are tightly coiled and packed strings of a remarkable molecule called DNA (Deoxyribonucleic Acid). DNA is a polymer, a repetitive sequence of four molecules, which I will only refer to by their one-letter abbreviations, A, G, C, and T. The human genome sequence is simply the sequence of these four molecules in DNA from all our chromosomes. If you laid out the DNA from all our chromosomes in each of our cells end to end, it would stretch six feet long.

A gene is a segment of DNA that contains the precise coding sequence for a protein. And proteins do all the real work in our cells. By looking at our completed sequence, it is predicted that our genome consists of 30,000 to 45,000 genes in each of our cells. So, now that we have the sequence, what does it mean? We'll begin answering that question in the next section.

What Does the Human Genome Project Hope to Accomplish?

The National Institutes of Health in cooperation with several international research organizations began the HGP in 1990 in the U.S. There were four primary objectives among the many goals of the HGP{1}.

The first and primary goal of the HGP was to map and sequence the entire human genome. There is a critical and significant difference between a map and the sequence. There are over three billion letters, or base pairs, in the human genome, spread out over 23 pairs of chromosomes. Trying to locate a sequence of say 1,000 letters, the code for a large protein, is a one in a million task. Therefore, researchers needed a refined roadmap to the genome. The map entails particular sequences that can be used like signs on a road map. If the trait a scientist is studying always seems to be present with this marker, the gene involved is probably nearby. In 1995, a detailed map was published with over 15,000 markers, one for every 200,000 base pairs. This will aid greatly in associating genes with particular diseases. And now with the sequence nearly complete, with over 99% accuracy, determining the precise effect of this gene on disease will be even easier.

A second critical goal was to map and sequence the genomes of several important model organisms: specifically, the bacterium E. coli, yeast, the roundworm, fruit fly, and mouse. This information is helpful, because each of these organisms have been used for laboratory studies for decades. Being able to coordinate knowledge of their genomes with cellular and biological processes will certainly inform our study of the human genome and its various functions.

The third important objective of the HGP was to systemize and distribute the information it gathered. Any sequence over 2,000 base pairs is released within 24 hours. The sequence and map data is contained in publicly accessible databases on the Internet. The HGP has also been creating software and other tools for large-scale DNA analysis.

The fourth and final primary goal of the HGP was to study the ethical, legal, and social implications of genetic research. A full 5% of all funds appropriated for the HGP have been earmarked for these kinds of considerations. There are many concerns revolving around the use of genetic sequence data.

Not the least of which are worries about ownership, patenting, access to personal sequence data by insurance companies, potential for job discrimination based on personal sequence data, and the prospects for genetic screening, therapy, and engineering. In the next section we'll begin investigating how the HGP thinks this information can be used.

What are the Long Term Hopes for the HGP?

The completion of the sequence was announced jointly in February 2001 in the journals *Nature*{2} and *Science*{3}. Both *Science* and *Nature* have made these landmark issues available, without subscription, on their websites.

The importance of recognizing the sequence of a particular gene has three important ramifications.{4} The first is diagnosis. Over the last few years, single genes have been found leading to deafness and epilepsy. Numerous genes, however, will influence most diseases in complex ways. Recently, genetic influences have been found in many forms of hypertension, diabetes, obesity, heart disease, and arteriosclerosis{5}. Genetic analysis of cancer tumors may someday help determine the most effective drug therapy with the fewest side effects. Genetic diagnosis has the potential to more precisely prescribe treatments for many medical conditions.

Second, diagnosing ailments with more precision with genetics will also lead to more reliable predictions about the course of a disease. Genetic information about an individual's cholesterol chemistry will aid in predicting the course of potential heart disease. Obtaining a genetic fingerprint of a cancerous tumor will provide information concerning its degree of malignancy. Third, more precise genetic information will also lead to the development of better strategies for prevention of disease.

Many more ailments in newborns can eventually be screened more

specifically to avoid disorders later in life. Currently, babies in the U.S. and other countries are routinely screened for PKU, a metabolic disorder that prevents the breakdown of a specific amino acid found in proteins. This condition becomes toxic to the nervous system, but can be prevented and managed with appropriate diet. Without dietary changes, affected babies face extreme mental retardation. Hopefully, the number of conditions this type of screening applies to can be expanded.

Screening can also be done for adults, to see if they may be carriers of potential genetic conditions. Certain Jewish and Canadian populations regularly obtain voluntary screening for Tay-Sachs disease, a known child-killer. This information has been used to help make decisions about future marriage partners.

Perhaps the greatest benefit will come from what is called gene-based therapy. Understanding the molecular workings of genes and the proteins they encode will lead to more precise drug treatments. The more precise the drug treatment, the fewer and milder will be the side effects.

Actual gene therapy, replacing a defective gene with its normal counterpart, is still very experimental. There are still many hurdles to overcome involving how to deliver the gene to the proper cells, controlling where that gene is inserted into a chromosome, and how it is activated.

Not surprisingly, some have seen the human genome sequence as a vindication of Darwin. We'll examine that contention next.

Did the Human Genome Sequence Vindicate Darwin?

Amid the controversy and exultation over the release of the near complete human genome sequence has been a not so quiet triumphal howling from evolutionary biologists. The similarity

of many genes across boundaries of species, the seemingly messy patchwork nature of the genome, and the presence of numerous apparently useless repetitive and copied sequences all have been laid out for us as clear validations of evolution. Really!

If Darwin were alive today, he would be astounded and humbled by what we now understand about the human genome and the genomes of other organisms.

Let's take a closer look at the claims of one bioethicist, Arthur Caplan{6}, who thought the major news story was missed. So let's just pick a few of the more glaring statements to help us understand that little in his comments should be trusted.

First, Caplan says, "Eric Lander of the Whitehead Institute in Cambridge, Mass., said that if you look at our genome it is clear that evolution must make new genes from old parts."

While it may be true that we can see some examples of shared sequences between genes, it is by no means true that we see wholesale evidence of gene duplication throughout the genome. According to one group of researchers,{7} less than 4,000 genes share even 30% of their sequences with other genes.

Over 25,000 genes, as much as 62% of the human genes mapped by the Human Genome Project, were unique, i.e., not likely the result of copying.

Second, Caplan says, "The core recipe of humanity carries clumps of genes that show we are descended from bacteria. There is no other way to explain the jerry-rigged nature of the genes that control key aspects of our development."

Not everyone agrees. The complexity of the genome does not mean, necessarily, that it has been jerry-rigged by evolution. There is still so much we do not know. Caplan is speaking more out of ignorance and assumption than data. Listen to this

comment from Gene Meyers, one of the principal geneticists from Celera Genomics, from a story in the *San Francisco Chronicle*:

> *'What really astounds me is the architecture of life,' he said. 'The system is extremely complex. It's like it was designed.'*
>
> *My ears perked up. 'Designed? Doesn't that imply a designer, an intelligence, something more than the fortuitous bumping together of chemicals in the primordial slime?'*
>
> *Myers thought before he replied. 'There's a huge intelligence there. I don't see that as being unscientific. Others may, but not me.'{8}*

Jerry-rigged? Hardly! Confusing at the moment? Certainly! But more likely to reveal hidden levels of complexity, rather than messy jerry-rigging.

It will take more than bluster to convince me that our genome is solely the result of evolution. The earmarks of design are clear, that is, if you have eyes to see.

What are the Challenges of the Human Genome Project?

In closing, I would like to address what are many people's concerns about the potential for abuse of this information. While there is great potential for numerous positive uses of the human genome, many fear unintended consequences for human freedom and dignity.

Some are justifiably worried about the rush to patent human genes. The public consortium, through the National Institutes of Health, has made all its information freely available and intends to patent nothing. However, there are several patent requests pending on human genes from the time before the HGP

was completed.

It is important to realize that these patents are not necessarily for the genes themselves. What the patent does protect is the holder's right to priority to any products derived from using the sequence in research. With the full sequence fully published, this difficult question becomes even more muddled. No one is anxious for the courts to try its hand at settling the issue. Somehow companies will need some level of protection to provide new therapies based on genetic information without hindering the public confidence and health.

Another concern is the availability of information about individual genetic conditions. There are legitimate worries about employers using genetic information to discriminate over whom they will hire or when current employees will be laid off or forced into retirement. Upwards of 80-90% of Americans believe their genetic information should be private and obtained or accessed only with their permission. The same fears arise as to the legality of insurance companies using private genetic information to assess coverage and rates. A recent bill (June 29,2000) before Congress to address these very concerns was amended to the Health and Human Services appropriations bill, but was removed in committee. The bill will be reintroduced this session.{9} I would be very surprised if some level of privacy protection is not firmly in place by 2002.

Moreover, many are apprehensive about the general speed of discovery and the very real possibilities of genetic engineering creating a new class, the genetically enhanced. Certainly, there is cause for vigilance and a watchful eye. I have said many times that we can no longer afford to be ignorant of genetic technologies. And while I agree that the pace of progress could afford to slow down a little, let's be careful not to throw the baby out with the bathwater.

After a series of lectures on genetic engineering and human cloning at a Christian high school, one student wrote me to say:

> *I am a senior, in an AP Biology class, and I find genetics absolutely fascinating. It's both fascinating and scary at the same time. . . . [You have inspired me] to not be afraid of the world and science in particular, but to take on its challenge and trust God.*

Amen to that!

Notes

1. "Genetics: The Future of Medicine," *NIH*, Publication No. 00-4873, 2.
2. *Nature*, 409 (15 February, 2001), www.nature.com.
3. *Science*, 291 (16 February, 2001), www.sciencemag.org.
4. Genetics: The Future of Medicine, 9-11.
5. Kevin Davies, "After the genome: DNA and human disease," *Cell*, 104 (Feb. 23, 2001), 465-467.
6. www.probe.org/did-the-human-genome-project-prove-that-darwin-was-right/.
7. Wen-Siung Li, Zhenglong Gu, Haidong Waing, and Anton Nekrutenko, "Evolutionary analyses of the human genome," *Nature*, 409 (15 Feb 2001):847-849.
8. Tom Abate, "Human Genome Map Has Scientists Talking About the Divine – Surprisingly low number of genes raises big questions," Monday, February 19, 2001, *San Francisco Chronicle*.
9. James M. Jeffords and Tom Daschle, "Political issues in the genomic era," *Science*, 291 (16 February, 2001), 1249-1251.

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“What are the Best Scientific Evidences for a Young Earth/Old Earth?”

I read with great interest your article on the Origins Web site “Christian Views of Science and Earth History .” I am doing research on this age issue, focusing on the scientific data especially. The earth is either young or is old. You said it well, “all truth is God’s truth.” I am looking for the best scientific evidences for a young earth/old earth and want to investigate what the other side would say to those opposing arguments. Can you help me out with this?

There are several books I can recommend.

From a biblical perspective, there is a recent volume titled *Three Views on Creation and Evolution* edited by J. P. Moreland and John Mark Reynolds in the Counterpoints series from Zondervan (1999). Hugh Ross has his *The Genesis Question* for an old earth perspective, and there is Henry Morris’s *The Genesis Record* and John Whitcomb’s *The Early Earth* from a young earth perspective.

From a scientific perspective, Hugh Ross wrote his definitive biblical and scientific treatise on the old earth called *Creation and Time* in 1994 from NavPress. Young earth creationists Van Bebber and Taylor published a response titled *Creation and Time: A Report on the Progressive Creationist Book by Hugh Ross* also in 1994 from Eden Productions. ICR (The Institute for Creation Research) has published numerous technical monographs on a young earth which can be viewed and ordered at www.icr.org. Other young earth books, including Russ Humphrey’s *Starlight and Time* can be found there, as well

as at the Answers in Genesis website, www.AnswersinGenesis.org. Hugh Ross' organization Reasons to Believe also has online ordering at www.reasons.org.

This should give you more than enough to get started on.

Respectfully,

Ray Bohlin
Probe Ministries

"How Can I Prepare for College?"

Dear Mr. Bohlin,

I will be attending Cornell University in the fall of 2000. My declared major is pre-med, biochemical engineering. I will also attending the Mind Games conference in July. Can you suggest any Christian reading materials for me so that I can be prepared for the conference in July, but most importantly, so I can be prepared for Cornell in August as a Christian.

Good to hear we will see you in July! I am looking forward to meeting you and spending the week together.

I would recommend Jim Sire's book, *The Universe Next Door*, as a good place to start. Worldview is an essential concept to the conference and Sire maps out the different worldviews in a concise manner. Considering your future major, I would recommend *Darwin's Black Box* by Michael Behe and *Defeating Darwinism by Opening Minds* by Phillip Johnson for starters. If Sire proves interesting reading to you and you are wondering where some of these strange ideas came from, you might look

for a copy of Francis Schaeffer's *How Should We Then Live?* which briefly (258 pages) traces the historical development of philosophy, theology, art and science in the west. Though the book is over twenty years old, Schaeffer turned out to be an accurate prophet of where things were headed. So, read Sire first and take on the others as time, money and interest dictate.

See you in July.

Respectfully,

Ray Bohlin, Ph.D.
Probe Ministries

The Coming Revolution in Science

The Design Inference



True scientific revolutions that impact more than a single discipline rarely occur more than once a century. Newton's *Principia,* published in the 17th century, truly qualifies. Darwin's *Origin of Species,* published in 1859, also belongs on the list. Standing in the wings, ready to join these esteemed works and perhaps even overturn the latter, stands William Dembski's *The Design Inference*.{1} This

impressive work published by the distinguished Cambridge University Press outlines the mathematical principles necessary to distinguish intelligently caused events from natural events.

ust listen to some of the comments from the dust jacket of the book from secular philosophers and mathematicians. One wrote, “Dembski has written a sparklingly original book. Not since David Hume’s *Dialogues Concerning Natural Religion* has someone taken such a close look at the design argument.” Being put in the same sentence as David Hume is no small potatoes. Mathematician David Berlinski warns, “Those who agree with its point of view will read it with pleasure, and those who do not will ignore it at their peril.”

Dembski has rigorously detailed the key trademark of intelligent causes, what he calls *specified complexity.* The term *specified* refers to the notion that an event conforms to an independently given pattern. Complexity refers to an event of small probability. For instance, people win improbable lotteries all the time. The odds are usually in the millions to one. But when the number of tickets purchased is considered, nobody questions the legitimacy of *someone* holding the winning ticket. This would be an event of small probability without any specification. Somebody will win, but nobody can predict whom. But let’s propose that the same person wins the same lottery three times in a row! Suddenly there is an independent pattern and we immediately become suspicious that more than just chance is involved. We now have an event of extremely small probability that also conforms to a pattern or is specified. The most likely cause for such an event is that someone has intelligently tampered with the lottery.

Dembski boldly suggests that these same principles can be applied to the question of the origin of life and other evolutionary questions and still maintain the integrity of science. While Dembski has been sharply criticized by the

evolutionary establishment, to their discredit, their critiques have been largely emotional and dismissive. No one has successfully challenged the heart of his thesis.

Now before you decide to run out a get a copy, please be advised that this book is not for the casual reader. Loaded with technical jargon and symbolic logic, you had better haven eaten your mental Wheaties before tackling this one. But Dembski has written a scaled down version, which I will now discuss.

Hasn't Science and Philosophy Ruled Out Design?

William Dembski's groundbreaking book, *The Design Inference* from Cambridge University Press, is highly technical. Dembski has therefore written a follow-up book titled, *Intelligent Design: The Bridge between Science and Theology,*{2} which is more accessible to the general reader. *Christianity Today* has named it their 1999 Book of the Year in the "Christianity and Culture" category.

Listen to a few sound bites from comments of those recommending Dembski's *Intelligent Design*. A quantum chemistry professor from the University of Georgia says, "William Dembski is perhaps the very brightest of a new generation of scholars." A professor of philosophy from the University of Texas says, "William Dembski is the Isaac Newton of information theory." Another university professor proclaims "If Dembski is right, and I believe he is, then it is unscientific to deny the existence of God." Wow! Unscientific to deny God! Do you think that comment is rankling a good number of evolutionary biologists? Finally, another University of Texas professor of government goes further by claiming that "Dembski strengthens the case for saying that our deepest moral inclinations not only look designed, they are."

Let me now begin to satiate your curiosity by telling you a little more about this groundbreaking work. The book is divided into three parts. In the first part Dembski gives a historical backdrop to the current controversy over design. In academia, the design argument has been considered dead for over 150 years. Dembski identifies two major reasons for this demise of design. The first was the continual attack on miracles, which culminated in the 18th and 19th century. Dembski cogently explains that their arguments don't work.

The second blow to design came from Darwin's *Origin of Species*. Darwin dismissed the prevalent British natural theology of his day by not so much refuting it, but by announcing that it simply wasn't scientific. Dembski quotes evolutionary philosopher David Hull, "He dismissed it not because it was an incorrect scientific explanation, but because it was not a proper scientific explanation at all." Darwin's faulty conception of science is still with us and Dembski sets out to refute it.

The criteria used by the British natural theologians were naive in the sense that they believed that design was self-evident. This led to far too many false positives, that is, assignments of design that were later proved to be naturalistic. The design argument was forced to retreat. In the second part of *Intelligent Design*, Dembski articulates the principles laid out in his *The Design Inference* for the general reader.

What Does a Theory of Design Look Like?

Having told you about Dembski's work and the impact it is beginning to have, I will summarize Dembski's prescription or cure for the rule of naturalism in science.{3}

No one in the design movement as far as I know seeks to invoke God at every turn as an explanation for natural phenomena. So why bring God into the picture at all? For most scientists,

God is only a hypothesis, and an unnecessary one at that. But beyond the ordinary operation of nature is its order. Dembski references Einstein's remark that the most incomprehensible thing about the universe is that it is comprehensible. This order must come from outside the universe or from within. But science tells us today that the only allowable answer is that it comes from within. This naturalistic philosophy has become a form of idolatry. Nature becomes the do all and end all. As Dembski says, "Rather it is a matter of investing the world with a significance it does not deserve."{4}

Naturalism is pervasive in the culture. Even most Christians think and live naturalistically without realizing it. So how can naturalism be defeated? What is needed, says Dembski, is a means of detecting God's actions in the natural world. In other words there must be a reliable way to distinguish natural causes from intelligent causes. Some sciences already employ such methods such as forensic medicine, cryptography, archeology, and even the SETI program, the search for extraterrestrial intelligence. SETI depends on the ability to distinguish an intelligent message from space from the surrounding radio noise. This can be done without necessarily understanding the message or knowing the message sender.

This brings up another crucial point of intelligent design. Dembski says that intelligent design is theologically minimalist.{5} By this he means that intelligent design empirically detects design without speculating about the nature of the intelligence. This is crucial to answer the critics who accuse design theorists of simply wanting to bring the Bible into science. If one detects design or concludes that a particular natural phenomena contains the necessary earmarks of design, that's all that needs to be said. One can personally reflect on the nature of this intelligence, but it is not a part of the scientific test.

Dembski calls for a new generation of scholars open to pursuing intelligent causes in the universe. Here at Probe

we're committed to helping find, select, and train such potential scholars to take part in a true scientific revolution.

Does Intelligent Design Offer a Bridge between Science and Theology?

In this review and summarization of Dembski's insights let's now explore the future Dembski foresees for the dialogue between science and theology.{6}

Of course most within the scientific community see no future at all for such a discourse. Most within modern academia hold to either of three models that Dembski labels as conflicting, complementing, or compartmentalizing. Most of us are very familiar with the conflict model. Most who call themselves rationalists or secular humanists would subscribe to this view. Basically they see science as having explained all of reality and that there is no room for theology at all. I once attended a conference where a theology professor was so intimidated by this view that he said that theology was a dead discipline and would cease to exist in twenty years.

Stephen J. Gould, a Harvard paleontologist, and the National Academy of Sciences have advocated the compartmentalization view. Basically they maintain that science and theology inform different parts of reality—science the realm of facts and theology the realm of morals and faith. There is no conflict and also no dialogue between the two. It is also not hard to see that this view basically rules theology out of any important discussions about real facts. Theology inhabits only the fuzzy world of morals, which must be relative if naturalism rules in science.

Similar is the complementarity view, which essentially states that science and theology can actually inform the same reality, but their language is so foreign to the other that no meaningful discourse can take place. Both are necessary to

give a complete account of reality, but you can forget about the two ever talking to each other.

In one way or another, each of these three views will eventually rule theology as irrelevant to the important questions and a fully naturalistic science will eventually be the wellspring for all useful information and discourse. But as you might expect, Dembski offers a fourth view and argues that it is the only proper view of the two disciplines.

Dembski compares science and theology to two different windows that view the same reality. Since the windows are different, they gain a different perspective. But since they are viewing the same reality, what is seen from each window can in many cases be meaningfully related. Both science and theology may on occasion, be capable of further explaining observations from each window. He offers the current discussion concerning the cosmology's Big Bang and theology's act of Creation as an example. If the Big Bang is true, then Christianity's theology of creation *ex nihilo* is a better explanation than naturalism's attempt to explain something from nothing.

There is much more work to be done here as Dembski readily admits, but the tone and direction is very refreshing.

What Are the Standard Objections to Design in Science?

There is the potential of the intelligent design movement bringing about a revolution in science. I have summarized the work of William Dembski, a double Ph.D. in philosophy and mathematics with a Master's of Divinity thrown in for good measure. In the appendix of his much acclaimed book, *Intelligent Design: The Bridge between Science and Theology*, Dembski investigates several of the more common objections to intelligent design. To conclude this review I will examine one of these objections.

Dembski states the first objection this way, “Design substitutes extraordinary explanations where ordinary explanations will do and thereby commits a god-of-the-gaps fallacy.” Those believing that God used evolution as His means of creation usually voice this objection. This view is motivated by the tremendous history of naturalistic science in explaining very difficult natural phenomena by natural means. This often occurs after someone has claimed that God was necessary to explain a particular observation. Isaac Newton thought divine intervention was necessary to explain the irregularities of planetary orbits. It was eventually shown that these irregularities were periodic and not random and thus explainable by natural law.{7}

Newton was widely criticized for this view, and many Christians fear that appealing to design now will end up in ridicule later when natural processes may also explain contrivances of intelligent design later. While this fear is understandable in the light of history, there are considerable differences. Design does not claim to simply explain what we do not understand. Rather, intelligent design is attempting to demonstrate a real solution to problems based on what we know about design, not what we don’t know about natural explanations.

Besides, if we believe that the laws of nature are incapable of producing certain natural phenomena, such as the genetic code of DNA, just how long are we supposed to keep looking for a naturalistic solution instead of looking elsewhere? This puts shackles on scientific inquiry and stifles new ideas. Certainly we should attempt to exhaust all known naturalistic possibilities before pursuing a design answer. But fear of failure should not be our deterrent. There is always risk in proposing new scientific ideas and hypotheses. The risk is that you just might be wrong. But this has never permanently hindered the proposal of a new idea. Failure should be a constant risk in science. Otherwise nothing new will ever be

discovered.

“Not all gaps are created equal. To assume that they are is to presuppose the very thing that is in question, namely, naturalism.”{8} William Dembski has issued a strong challenge through his books and more are to follow from others dealing with the philosophy and science of intelligent design. The next several years should be very exciting indeed.

Notes

1. William A. Dembski, *The Design Inference: Eliminating Chance by through Small Probabilities* (Cambridge, England: Cambridge University Press, 1998).

2. William A. Dembski, *Intelligent Design: The Bridge between Science and Theology* (Downers Grove, IL: InterVarsity Press, 1999).

3. Ibid., 97- 121.

4. Ibid., 101.

5. Ibid., 107.

6. Ibid., 187- 210.

7. Nancy Pearcey and Charles Thaxton, *The Soul of Science: Christian Faith and Natural Philosophy*, Wheaton, IL: Crossway Books, 1994), 91-92.

8. Dembski, *Intelligent Design*, 245.

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Darwinism Takes a Step Back in Kansas

Has Oz Returned to Kansas?

Suddenly, the mere mention of the Kansas State Board of Education in most educational and academic circles brings derisive giggles and sneers. In August the Kansas State Board of Education voted to remove references to macroevolution from state science testing standards. A wave of revulsion gripped the nation's media. In *Time* magazine, Harvard University paleontologist Stephen J. Gould trumpeted, "The board transported its jurisdiction to a never-never land where a Dorothy of the new millennium might exclaim, 'they still call it Kansas, but I don't think we're in the real world anymore.'"{1} Gould further belittles honest concerns about the teaching of evolution by proclaiming: (1) no other nation has endured any similar movement (this makes us look bad overseas); (2) evolution is as well documented as any phenomenon in science (it is perverse to call evolution anything but a fact); and (3) no discovery of science can lead us to ethical conclusions (believe what religion you want, science doesn't threaten you).

That's a pretty scathing reaction. Let's see what else we can find.

Here's one from nationally syndicated columnist Ellen Goodman of the *Boston Globe*.{2} Ms. Goodman declared that "removing evolution from the science curriculum is a bit like removing verbs from the English curriculum. Evolution can still be taught, but it's no longer required, it won't be tested, and it will be discouraged." (However, natural selection, variation, and microevolution will still be recommended and tested.) Later she decries the fact that "In 1925,

creationists dragged a young biology teacher, John Scopes, to the courtroom for the infamous 'Monkey Trial.'" Actually it was the ACLU that dragged Scopes into the courtroom. He couldn't even remember if he had actually taught evolution. They needed a "volunteer" to defend to test the new Tennessee law. (See Phillip Johnson's *Defeating Darwinism By Opening Minds,* 1997, IVP, Chapter 2 for the real story of the Scopes trial and its shameful portrayal in the play and film, *Inherit the Wind*.) Goodman also pontificates that "there is no serious scientific dispute about the fact of evolution." Notice that Ms. Goodman indicates that evolution is a fact, therefore beyond question. She also cleverly indicates that if you dispute evolution, you must not be a serious scientist.

In the Seattle *Post-Intelligencer*, Sean Gonsalves laments, "Educated people everywhere are still in shock over the appalling ignorance displayed by the Kansas state board of education that voted two weeks ago to effectively remove evolution and the 'Big Bang' theory from the state's science curriculum. Is there still a science curriculum in Kansas?"{3}

Well, those unruly, ignorant anti-evolutionists really seem to have overstepped their bounds this time! You would think that we would be cowering in the corner somewhere after all the abuse from such heavy hitters, but no, actually, we're quite ecstatic. I have given you only a small example of the media and science firestorm, but it is just more of the same. While nobody enjoys being the butt of jokes and verbal abuse, what is significant are two things. First, the Kansas board has dealt Darwinists a severe blow by not mandating creation, thereby eliminating Darwinist's usual rallying cry of science versus religion. They have simply searched for a more objective means of presenting evolution. That's tough to argue against. Second, Darwinists have been flushed out into the open. Flimsy, *ad hominem* attacks, appeals to authority, and question begging have been brought out in the open for all to see. The Kansas State Board of Education has unintentionally

raised the stakes in the decades old creation/evolution discussion.

What Really Happened in Kansas?

Given the reaction to the decision by the Kansas State Board of Education you would have thought the six board members who voted for the new standards in a close 6-4 vote were part of some dastardly plan to underhandedly bring God into the classroom. Also seemingly at stake was the reputation of the whole state of Kansas if its citizenry did not rise up in revolt against such an irrational decision. Apparently, Kansas had been set back decades in science literacy.

Well, what actually happened in Kansas? What did the board actually do and why? It is important to realize that the Kansas board authorized a 27-member panel of scientists and science educators from the state to revise the current state science testing standards. These standards do not mandate what can and cannot be taught, only what likely will be included on state science tests. What the board received was a highly prejudicial document making evolution the single unifying concept to the state's biology standards. When board chairwoman Linda Holloway asked the committee representatives for evidence of macroevolution they essentially replied, "We're the experts, and that will have to do."{4} What that means is that she received no evidence, just an admonition that, with their position as scientists, she should just trust them.

Rather than turn the Kansas high school classrooms into a propaganda machine for materialist philosophy, the board decided to amend the standards to maintain microevolution—natural selection acting on genetic variation—but not macroevolution¾the claim that microevolution leads to new complex adaptations and new genetic information. They also left it up to the individual school districts to determine how much or how little evolution to teach. Evolution

was *not* removed from the curriculum, as so many news stories reported. Creation was not mandated, Darwin was not banned, and evolution was not censored.

What this *does* do is leave open to school districts the opportunity to teach the surging controversy surrounding evolution. Actually, what many in the intelligent design movement would have preferred, if possible, is to teach more evolution, not less. Meaning, let's teach not only the evidence for evolution, but also the mounting evidence calling the naturalistic creation story into question. Students should be familiar with evolution. It is the major story of origins within the scientific community. But in the interest of a true liberal education, the serious questions regarding evolution should also be included. Students should be allowed the privilege of weighing the evidence for themselves, not just accepting it because their teacher tells them to.

This is really where the threat to the scientific community lies. The more doubt about evolution that's allowed, the trickier the educational landscape becomes for a fully naturalistic, materialistic approach to education.

In the past, the media barrage over such an anti-evolutionary decision has been decidedly one-sided. What is significant this time is that the Kansas board has received some rather hefty and significant support from invited articles, guest columnists, and op-ed pieces in prestigious news outlets such as the *Wall Street Journal*, the *Washington Post*, the *Chicago Tribune*, and the *Washington Times*. The debate is indeed changing.

Some Surprising Support for Kansas Board of Education

Amidst the unusual rancor and indignation from the media and scientific community following the decision of the Kansas State Board of Education, many have missed the small, yet

significant, support the board has received for the spirit of their decision: namely, to try to find a way to disrupt the universal agenda to present scientific naturalism as the only possible explanation of where we all came from.

On August 16, 1999, the *Wall Street Journal* published an article by UC Berkeley law professor and Darwinian critic, Phillip Johnson.{5} Johnson quotes a Chinese paleontologist who openly criticizes Darwinism as wryly commenting that "In China we can criticize Darwin but not the government. In America you can criticize the government but not Darwin." After summarizing the frantic response of scientists and educators, Johnson commented, "Obviously, the cognitive elites are worried about something a lot more important to themselves than the career prospects of Kansas high school graduates."

Johnson pointed out that evolution is the main scientific prop for scientific naturalism, a philosophical system that leaves God totally out of its picture of reality. Quoting well-known scientists such as Carl Sagan, Richard Dawkins, Stephen J. Gould, and Richard Lewontin, Johnson makes clear that this is the real battle. Allowing evolution's flaws to be detailed in classrooms would allow a broader discussion of fundamental assumptions. Johnson concluded optimistically, "Take evolution away from the worldview promoters and return it to real scientific investigators, and a chronic social conflict will become a chronic intellectual adventure."

A few days later, the *Washington Times*{6} chided the rest of its media cohorts for a vast overreaction and actually cited evidence that calls Darwinism into question. The friendly editorial concluded with "No one, and certainly not the Kansas Board of Education, is saying that evolution should not be taught; it remains the prevailing scientific theory of creation. Rather, some healthy agnosticism and scientific open-mindedness on the matter would seem to be in the best interest of everyone curious about the greatest mystery of all." Hear, hear!

The *Chicago Tribune*, while openly critical of the action of the Kansas Board of Education, also criticized previous actions of the National Association of Biology Teachers concerning evolution.{7} The association initially used the words *unsupervised* and *impersonal* to describe the evolutionary process. These clearly non-scientific terms were eventually and reluctantly removed by the association, who explained they didn't think the terms would be construed negatively, which the *Tribune* called either a lie or clear demonstration of scientific fundamentalism.

Finally, the *Washington Post*{8} printed an article by Jay Richards, senior fellow and program director of the Discovery Institute's Center for the Renewal of Science and Culture. The CRSC is currently the only think tank I know of that openly supports and endorses intelligent design. Richard's final point, "Fairness and objectivity in the science classroom require that teachers teach the controversy, not deny its existence," is fair, lucid, rational, and appealing. "Teach the controversy" has become a rallying cry. You are bound to hear it more and more. The debate in Kansas has resulted in similar debates around the country, to which we now turn our attention.

Darwinism Assailed in Other States

Following the recent decision by the Kansas State Board of Education the teaching of evolution was big news around the country. In Kansas there were roundtable discussions, lectures, and debates. Some were in academic settings, such as the University of Kansas and Washburn University, some were in churches, and some were sponsored by a humanist skeptic organization. The American Association for the Advancement of Science (AAAS) was prompted to publish their own statement deploring the action taken by the Kansas Board of Education.{9}

You might think that all the negative publicity would cause

other states to back off any changes in their own science curriculum. But apparently, all this publicity has encouraged other school boards to chart their own course or adopt the methods of other states before them.

The Oklahoma State Textbook Committee voted to adopt a disclaimer to be placed on the inside cover of all biology textbooks. Unhappy with the propaganda-like treatment of evolution in the majority of textbooks they looked at, the committee needed the disclaimer to be able to recommend a sufficient diversity of biology texts for the state. While arguably not the best statement on the subject, the disclaimer labels evolution as controversial, a separation of microevolution and macroevolution, and encourages students to study hard, keep an open mind, and perhaps they can contribute to the origins discussion in the future. Nothing is said about creationism, intelligent design, or any other theories. Basically the statement wants students to think critically about evolution.

What has been missed in the newly swirling controversy about the disclaimer in Oklahoma is that it is nearly a direct copy of the disclaimer adopted by Alabama over two years ago which has not been challenged in court. However, instead of mentioning the obvious connection, journalists attempted to draw parallels to a Louisiana school district directive that was recently struck down because it specifically mentioned creationism. The two disclaimers are not related, but in the attempt to make it look as bad as possible, the chosen tactic is to mislead.{10} Once again, a very reasonable, but not perfect resolution was dismissed as simply another attempt to smuggle creationism into the public schools.

Meanwhile in West Virginia a similar controversy hit the news. The Kanawha County Board of Education is considering a resolution that would allow for the teaching of theories for and against the theory of evolution. It soon came to light that Illinois and Kentucky had previously passed resolutions

similar to the one in Kansas. Commentary and editorials were appearing in major and local newspapers across the country taking sides in a suddenly public and heated discussion. Clearly, something has changed. The usual evolutionist hand-wringing is sounding more like whining and the previously unheard-of support for a revision of the instruction in evolution is suddenly receiving a cautious but receptive ear in important academic, educational, and media circles. While it must be kept in mind that all of these "victories" are relatively small and can be easily overturned, nonetheless their simplicity, objectivity, and legal savvy are raising eyebrows that paid little attention before.

What Does All This Mean?

The flurry of nationwide activity concerning the teaching of evolution in our public school systems, while noteworthy, is not terribly new. This battle has been going on for over three decades, but with seemingly little change. However, this time, as I have documented, there has been surprising support and very public discussion over the last few months. Phillip Johnson and others have been invited or allowed to offer their impressions and rebuttals in newspapers, journals, and magazines across the country. Public lectures, debates, and roundtable discussions have been offered before large crowds.

Something has definitely changed. I think we can isolate the change in two places. First some of the cherished, misleading evolutionary explanations are being rebutted openly and decisively in these public discussions. Second, the public is becoming better educated on the issues involved and they are less intimidated by the evolutionary rhetoric.

One of the favorite lines used to dismiss critics of evolution is to label them as religious zealots and fundamentalists. Religion and science, says this argument, have nothing to say to one another so you can't bring religion into the science classroom. Stephen Gould states the case in his usual

journalistic style, “Science and religion should be equal, mutually respecting partners, each the master of its own domain, and with each domain vital to human life in a different way.”{11} Elsewhere it becomes plain that Gould means that science deals in facts and religion in the intangibles of morality and such. This is seen more and more as condescending nonsense. Other evolutionists like Douglas Futuyma readily admit that, “By coupling undirected, purposeless variation to the blind, uncaring process of natural selection, Darwin made theological or spiritual explanations of life processes superfluous.”{12} The negation of a theological principle is itself, a theological principle. Besides, any theory which purports to explain where we came from will contain the seeds of ethics and morality.

Robert E. Hemenway, chancellor of the University of Kansas, tried to say that the Kansas decision is a rejection of science altogether.{13} But when you actually read what the Board of Education did, they actually expanded the coverage of evolution from the previous standards and required students to know a very decent description of Darwinian evolution.{14} Skepticism is healthy in science. The new standards actually promoted questioning and critical thinking. This kind of obfuscation was not so easily foisted on the public.

The educational effort of many organizations over the past several decades has begun to yield citizens surer of themselves and not so easily intimidated. Seeing articles appearing in major news outlets like the *Wall Street Journal*, the *Washington Times*, and the *Chicago Tribune*, as well as appearances on CNN, have galvanized popular opinion and provided means to critically counterattack the bluster of the opposition.

Although the coverage has not always been accurate and completely positive, and the actual decisions by education boards have not always hit the mark, the net effect has been a major opening up of the debate. Change has been accomplished

in these few months that would have ordinarily taken years. As mentioned previously, the phrase “teach the controversy” will be found more and more in the public discussion. That’s exactly what needs to happen.

Notes

1. Stephen Jay Gould, “Dorothy, It’s Really Oz, 1999,” *Time* vol. 154, no.8 (August 23, 1999), 59.

2. Ellen Goodman, “Those Ever-Evolving Creationists,” *Boston Globe*, Aug. 19, 1999, A19.

3. Sean Gonsalves, “Kansas School Board Fighting the Wrong Theory,” *Seattle Post-Intelligencer*, August 24, 1999, A11.

4. Jeremy Johnson, “Media Pigeonholes Board into Stereotype,” *Kansan*, August 19, 1999.

5. Phillip E. Johnson, “The Church of Darwin,” *Wall Street Journal*, August 16, 1999, A14.

6. “Editorial, Kansas Conundrum,” *Washington Times*, August 19, 1999, A16.

7. Steve Kloehn, “In a Word, Kansas Tries to Make Evolution Go Away,” *Chicago Tribune*, August 20, 1999, 10.

8. Jay Richards, “Darwinism and Design,” *Washington Post*, August 21, 1999, A19.

9. “AAAS Statement on the Kansas State Board of Education Decision on the Education of Students in the Science of Evolution and Cosmology,” *Science*, vol. 286 (November 12, 1999), 1297.

10. Diane Plumberg, “Panel Plunges State into Debate about Evolution,” *Daily Oklahoman*, November 12, 1999.

11. Gould, 59.

12. Douglas J. Futuyma, *Evolutionary Biology*, 3rd ed. (Sunderland MA: Sinauer Assoc., 1998), 5.

13. Robert E. Hemenway, "The Evolution of a Controversy in Kansas Shows Why Scientists Must Defend the Search for Truth," *Chronicle of Higher Education*, October 29, 1999, B7.

14. Jonathan Wells, "Ridiculing Kansas School Board Easy, But It's Not Good Journalism," *Mitchell (South Dakota) Daily Republic*, October 14, 1999.

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Mere Creation: Science, Faith and Intelligent Design

An unprecedented intellectual event occurred in Los Angeles on November 14-17, 1996. Under sponsorship of Christian Leadership Ministries, Biola University hosted a major research conference bringing together scientists and scholars who reject naturalism as an adequate framework for doing science and who seek a common vision of creation united under the rubric of intelligent design. The two hundred participants, primarily academics, formed a nonhomogeneous group. Most had never met each other. Yet virtually all the participants questioned the reigning paradigm of biologynamely, that natural selection and mutation can account for the origin and diversity of all living things.{1}

So said Dr. Henry F. Schaefer III, professor of chemistry at the University of Georgia, author of over 750 scientific publications, director of over fifty successful doctoral students, and five-time Nobel nominee, in his foreword to the

1998 book, *Mere Creation: Science, Faith and Intelligent Design.*{2} I was privileged to be one of the two hundred participants at this historic conference which, along with the subsequent book, form the backbone of future direction of the fledgling intelligent design movement.

I would like to highlight significant chapters from this book and provide additional resources to learn more about this important challenge to Darwinism. Along the way I hope you will gain a glimpse of how important this movement is to the future not just of biology, but of science education as a whole in this country and around the world.

Jonathan Wells is a post-doctoral research biologist in the department of molecular and cell biology at the University of California at Berkeley. His Ph.D. is from the same institution in developmental biology. In his chapter, "Unseating Naturalism,"{3} Wells lists several important insights from developmental biology that seriously challenge a purely naturalistic biologic science.

Since 1983, homeotic genes have been the rage in evolutionary developmental biology. First discovered in fruit flies, these genes appear to act as switches to turn on a series of genes important for sequential levels of development. Of interest to evolutionists, is the fact that many of the same genes found in fruit flies are also found in almost every other animal group, all acting as developmental switches. They are even frequently found on the same chromosome and in the same order from species to species. Such evidence seems quite a compelling argument for all life forms evolving from a common ancestor.

But Wells quickly points out that these genes do not control the same body structures from species to species, so an evolutionary explanation does not fit so well. "If the same gene can 'determine' structures as radically different as a fruit fly's leg and a mouse's brain or an insect's eyes and

the eyes of humans and squids, then that gene is not determining much of anything."{4} There is no current mechanism to understand how a homeotic-switching gene can change from coding for one function to another in different organisms. Suddenly, this new great evidence of evolution is yet another problem for evolutionary biology. Wells goes on to point out that intelligent design has no trouble incorporating similar switches in different organisms just as an engineer understands the use of similar ignition switches in different kinds of vehicles.

Wells concludes that, "A design paradigm can nurture the sort of formal and teleological thinking that will enable biologists to discover the laws of development that have so far eluded them."{5} The reason for the elusion is the shackles of Darwinism.

Redesigning Science

In taking a close look at the book, *Mere Creation*, edited by Bill Dembski, I would like to explore Dembski's own contribution to the volume, "Redesigning Science."{6} If the name Bill Dembski is unfamiliar to you, it won't be for long. Dembski is an extremely bright and articulate young man with earned doctorates in mathematics from the University of Chicago and philosophy from the University of Illinois at Chicago along with an M. Div. from Princeton Theological Seminary. Dembski is also the author of perhaps the most significant book to date in the intelligent design movement, *The Design Inference: Eliminating Chance through Small Probabilities*{7}, from the prestigious Cambridge University Press.

Bill is also confident. He is confident that intelligent design can thoroughly reshape the horizons of science in the next twenty years. He begins his chapter with a whimsical scenario recounting a "nightmare" potentially experienced by Harvard paleontologist and vocal anti-creationist, Stephen Jay

Gould. The nightmare includes Gould no longer teaching at Harvard, relegated to leading field trips to the Galapagos Islands and the Burgess Shale in the Rocky Mountains of Canada, with Phil Johnson and cronies firmly in control of the National Science Foundation.{8} While Dembski admits that the nightmare is hopefully not realized in all its details, the notion of design claiming primacy within science is clearly the objective.

In order for this objective to be realized, design must be specifically and rigorously defined. I'll allow Dembski to explain in his own words.

> *The key step is to delineate a method for detecting design. Such a method exists. We use it implicitly all the time. . . . The method takes the form of a three-stage explanatory filter. Given something we think might be designed, we submit it to the filter. If it successfully passes all three stages of the filter, then we are warranted asserting it is designed. Roughly speaking, the filter asks three questions, and in the following order: Does a law explain it? Does Chance explain it? Does design explain it?{9}*

In trying to classify an event as either due to natural law, chance, or design, we first try to assess if it is an event of high probability and therefore due to some recognizable natural law. A bullet firing when a gun's trigger is pulled or getting at least one head when a fair coin is tossed a hundred times are both high probability events due to natural law.

Rolling snake eyes with a pair of fair dice, or even winning a million dollar lottery when considering how many tickets are sold, constitute events of intermediate probability that are justly relegated to chance.

But let's say the same person wins that lottery three times in a row or even twice in a row. Suddenly we suspect that something more than chance is involved. Dembski's own example

is Nicholas Caputo, the county clerk of Essex County, New Jersey. Caputo was responsible for determining the order in which candidates appeared on the ballots for elections. Caputo was a Democrat and 40 out of 41 times the Democrats were listed first, which everyone agrees, gave them a slight advantage. We intuitively use the explanatory filter to classify these events as designed because they are of small probability and they conform to a pattern. Thus intelligent design combines small probability with what Dembski terms, "specified complexity."

Dembski and the other authors of *Mere Creation* believe we can apply the same test scientifically to physical, chemical, and biological events.

The Explanatory Power of Design

One of the critical questions for intelligent design is its ability to explain at least some natural phenomena more completely than naturalistic science. Stephen Meyer addresses this problem in his chapter, "The Explanatory Power of Design."{10} Steve Meyer is professor of philosophy at Whitworth College in Spokane, Washington, with a Ph.D. in the history of and philosophy of science from Cambridge University, England. As an example of design's explanatory power, Meyer chooses to explore the origin of information within living systems, specifically the origin of the genetic code. Meyer brings a scholarly appraisal to the subject since his Ph.D. dissertation concerned the history and status of origin of life research.

Meyer summarizes the extreme problems origin of life research has encountered in the last thirty years, highlighting along the way the important work by Charles Thaxton and Walter Bradley.{11} Following the euphoria of the famous experiment by Miller and Urey in 1953, the origin of life community has suffered setback after setback. Miller and Urey demonstrated that a mixture of methane, ammonia, water and hydrogen could

be induced to produce, among many other organic compounds, a few amino acids, the building blocks of proteins. Subsequent work showed that this hypothetical atmosphere was pure mythology. So was the notion of a prebiotic soup of biochemical building blocks.{12}

Beyond the purely biochemical difficulties of origin of life research looms the immense problem of accounting for the origin of complex specified information contained in biomolecules, and specifically in DNA and the genetic code. In the computer age we are often amazed at the speed and storage capacity of modern personal computers, particularly the laptop variety with their 12 gig hard drives and 500 MHz speeds. We seldom realize, however, that "the information storage density of DNA, thanks largely to nucleosome spooling, is several trillion times that of the most advanced computer chips."{13} So not only is there real information stored in DNA, but it is stored at a density on a molecular level, we can't even approach with our best computers. So just where did this information come from?

Attempts to account for the origin of biological information by natural biochemical means have utterly failed. The odds of achieving even a small 100 amino acid protein are less than 1 in 10^{125}. Events of that small a probability just don't happen. Not only that, but researchers now realize that natural forces are incapable of achieving the formation of bio-information by any process. At first, some thought that maybe the amino acids and nucleotides had some natural affinity for each other to help account for the specific sequences of proteins and DNA. When that turned into a dead end, some hoped that some sort of natural selection of molecules might help. But natural selection requires reproducing cells. So-called "self-organization" processes only provide low level order, like ripples in the sand, not informational messages like "JOHN LOVES MARY" written in the sand.

Scientific laws will only describe ordered natural phenomena, like the structure of a crystal, which bear no relationship to the specified complexity within biomolecules. Instead, our experience with informational codes and languages indicates that they always come from an intelligent source. Therefore mind or intelligence stands as the only possible source for the information in DNA, proteins and cells as a whole.{14}

Applying Design within Biology

Have you ever wondered how a baby is formed from a single cell in just nine months? You could ask the same question of just about any animal from wasps to caterpillars to frogs to clams. A fully functioning organism is a symphony of integrated parts performing in coordinated fashion to make beautiful music. But where did all the orchestra members (or proteins) come from? And who told them where to sit? And how do they know when and what to play? And what about tempo and volume and on and on? Well, you get the picture. Biological organisms are immensely complex, but they all start out as single cells. Somehow they turn into assemblages of different cells and tissues that all know their places and roles. Embryological development has long been a mystery and its secrets are only slowly being revealed. It has also turned into a potentially fruitful battleground between evolution and intelligent design.

Paul Nelson recently received his Ph.D. in philosophy from the University of Chicago and is currently doing post-doctoral work at the same university in evolutionary and developmental biology. The connection between embryological development and evolution is significant because, in order for organisms as diverse as hawks and starfish to evolve from a common ancestor, they must change not only their outward appearance but also the developmental process that starts as single cells for both. Nelson's "Applying Design within Biology" explores the connection and its inherent contradictions.{15}

A major observation of embryology has been that developmental

mutations are usually harmful and often fatal. And the earlier in the developmental process the mutation occurs, the more likely the effect will be harmful. This led most embryologists to believe that evolutionary changes utilize mutations that appear relatively late in embryological development. Subsequently Darwinists predicted that the further back you go in comparing two organisms' patterns of development, the more similar they will be. Unfortunately for evolution, this is not true. There is wide diversity of early cleavage patterns of cells in embryos from species that can actually be closely related. One author went so far as to refer to this as "intellectually disturbing."{16}

Such a dramatic reversal would, you would think, cause many or at least some developmental biologists to question the validity of Darwinism. But as I have indicated so many other times in other essays, Darwinism is assumed, not questioned. Biologists mainly concluded that change in early development is doable after all and quite common. But as Nelson aptly summarizes, "There is little if any experimental evidence that 'changes in early development are possible.'"{17}

While the diversity of pathways to similar ends in development is a problem for evolutionary developmental biology, it is an expectation of intelligent design. The sheer magnitude of instructions for embryological progress screams for a design perspective. Design is also found in the newly discovered redundancy of developmental pathways. Knocking out a seemingly essential gene can sometimes have no effect whatsoever. Built-in redundancy is a hallmark of *design*, not chance mutations and natural selection. Nelson basically believes that any element of an organism necessary for survival and reproduction in any environment is a strong candidate for design. This should help open up new research avenues for developmental biology which is exactly what new theories should do.

Basic Types of Life

Next time you are walking through a zoo, stop and think about what makes some animals different and others similar. For instance, if you are looking out over a large pond, you may see different species of ducks, geese, and swans. While they do appear different in some respects, there are also very tantalizing similarities. However, if there are also some flamingos or sea gulls in the crowd of aquatic birds, you would not put them in the same category as ducks and geese. They seem different. Evolutionists, of course, would see sufficient similarities: they are birds, after all, with wings, feathers, and beaks. So evolutionists would say they all evolved from a common ancestor. Ducks and geese are more similar to each other than they are to flamingos so the ancestor of ducks and geese is more recent than the ancestor of ducks, geese, and flamingos.

But since intelligent design is calling into question many evidences and predictions of naturalistic evolution, it is reasonable to assume that all animals are not related back in time through a common ancestor. Perhaps all birds did not evolve from a single source. Maybe there are many different ancestors for the many groups of birds and other animals. Well, how would you know? How could you recognize groups of animals that do derive from a common ancestor and those that have arisen independently? Siegfried Scherer makes an attempt in his chapter titled, “Basic Types of Life.” {18}

Dr. Scherer is a professor of microbial ecology and director of the Institute of Microbiology at the Technical University of Munich and has published numerous papers in international peer-reviewed journals. Scherer proposes that there is another unit of taxonomic classification that can be overlaid on current taxonomy, the idea of basic types.{19} A basic type is a group of organisms or species that are capable of hybridizing. These hybrids don’t necessarily have to be

fertile themselves. Simply producing a coherent functioning organism from sperm and eggs of different species is sufficient.{20} Numerous successful attempts to hybridize different species of ducks, swans, and geese have convinced Scherer that they belong to a single basic type. This would mean that all 148 species are descended from a single common ancestor.{21}

The distinct differences mentioned earlier, between ducks and flamingos, would result from them being of different basic types. This observation leads Scherer to suggest that microevolution can now be defined as evolution within one basic type and macroevolution as evolution between basic types. The current evidence suggests that macroevolution is an undocumented process both from the fossil record and the biology of basic types.

The plethora of species within a basic type like the ducks and geese also suggests that there was a great deal of variation built into each basic type to allow many distinct species to form through speciation. This prediction would be consistent with intelligent design but not evolution. There would be no reason for evolution to suggest that some species would have more variation than others would. This is corroborated by the observation that hybrids between two species frequently resemble a third species. This indicates that the genetic combination of the third species was hidden between the two species used to form the hybrid.{22}

Scherer summarizes that evidence of individual ancestors for each basic type, fossil and biological gaps between basic types, similar or convergent characters in different basic types, and odd features, such as slightly differing genetic codes now found in a few organisms would also be evidence of design over evolution. The possibilities for further research are everywhere. Intelligent design becomes an extremely fruitful paradigm for research.

Notes

1. Henry F. Schaefer III, “Foreword,” in *Mere Creation: Science, Faith and Intelligent Design*, William A. Dembski, Ed. (Downers Grove, Ill.: InterVarsity Press, 1998), 9.

2. Ibid., 475.

3. Ibid.,, 51-70.

4. Ibid., 56.

5. Ibid., 68.

6. Ibid., 93-112.

7. William A. Dembski, *The Design Inference: Eliminating Chance through Small Probabilities* (Cambridge: Cambridge University Press, 1998), 243.

8. Dembski, *Mere Creation*, 93.

9. Ibid., 94.

10. Ibid., p. 113-147.

11. Charles Thaxton, Walter Bradley and Roger Olsen, *The Mystery of Life’s Origin: Reassessing Current Theories* (Dallas: Lewis and Stanley, 1984), 228.

12. *Mere Creation*, 118-119.

13. Ibid., 120.

14. Ibid., 136-137.

15. *Mere Creation*, 148-174.

16. Eric Davidson, quoted in *Mere Creation*, 155.

17. Ibid.

18. Ibid., 195-211.

19. Scherer does at least mention a competing idea, baramin, initially proposed by creationist Frank Marsh (*Fundamental Biology*, 1940, Lincoln Neb., n.p., *Variation and Fixity in Nature*, Mountain View, Calif.: Pacific Press) and further explicated by Kurt Wise (K. Wise, Baraminology: "A Young Earth Creation Biosystematic Method, in *Proceedings of the Second International Conference on Creationism*, R.E. Walsh and C.L. Brooks, eds. (Creation Science Fellowship, Pittsburgh, PA, 1990, Vol. 2, 345-360 and K. Wise, "Practical Baraminology," *Creation Ex Nihilo Technical Journal*, 1991, 6(2): 122-137). Scherer chooses not to mention another attempt in fleshing out this concept, the prototype, proposed by Lane P. Lester and Raymond G. Bohlin in *The Natural Limits to Biological Change* (Dallas: Probe Books, 1984), 161-172.

20. *Mere Creation*, 197-199.

21. Ibid., 200.

22. Ibid., 203-204.

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"Can You Recommend the Best Christian Colleges for My Son?"

Dear Dr. Bohlin,

I read your article on line at Leadership U. and would respect your opinion on a matter of concern to me. I am especially impressed that you managed to keep the faith while studying genetics and molecular biology.

My son will be starting college next year. He is homeschooling, but I guess he does well academically because he got 1600 (perfect score) on his SAT. He wants to go to California Institute of Technology and study physics eventually, but wants to first go to a Christian College of good reputation for one or two years to meet other Christian young people and to become really well grounded in the faith before going to Cal Tech. (I personally hope for him to meet a godly, Christian girl for a wife.)

Hopefully, it would be a college committed to an orthodox, fundamental, conservative Christian doctrine, and have at least more than, say, 1000 students.

What are the best Christian colleges, in terms of the quality of the students and the quality of the teaching?

Can you make any suggestions, any recommendations of Christian colleges?

Your request is a reasonable one and I commend you for seeking advice. I would also suggest you ask others who have sent their kids to Christian colleges for their opinion. Our older son attends John Brown University, a Christian college of about 1,100 students in Siloam Springs, Arkansas. It is a sound Christian university dedicated to teaching a Christian worldview. Their engineering department is top-notch (our son is in digital media), I understand, and very rigorous. I would presume their physics department is up to those standards. I also recommend Taylor University in Indiana, Westmont College in Santa Barbara, California and to a lesser extent, Wheaton College in Illinois. Any of these colleges would offer significant scholarship money for your son. But you already

seem a bit leery and that is good. A college is only as good as its faculty and they are never universally excellent either in scholarship and teaching or in their adherence to a thoroughly Christian worldview. For instance, a number of the biology faculty at these institutions are theistic evolutionists and would not be receptive to many of my articles. However, I know some of the biology faculty at Westmont and they are not theistic evolutionists. I know of only one at Wheaton for sure. A student must be equipped to know what they believe and why even in a Christian university.

Clearly your son has been given a gift with his intelligence and I respect his desire for Cal Tech. We need more Christian young people with the talent and dedication to pursue the best education they can get to qualify them to impact the academic community for Christ. There is a strong growing movement away from a strict materialism, particularly in astronomy and physics. The intricate workings of God's universe are more and more being seen as something that is beyond being explained by chance. So much so that being a Christian in these fields is not as difficult as biology and geology.

I would strongly recommend your son attend our weeklong Mind Games Conference outside of Little Rock, Arkansas this summer regardless of where he goes. This conference is billed as our national conference and repeatedly draws national merit scholars and valedictorians from local and distant Christian and public schools. He will be among peers. There are also several college students who attend who can help with advising from their own experiences. Our web site can give you some details for this conference (probe.org/student-mind-games). Also look at my article on Campus Christianity to get an idea of my practical advice for students (it is usually the final session of a conference for students).

Concerning a wife, a good Christian wife can also be found among Christians from a secular university who understand the challenge to their faith at these institutions. This can be a

very maturing experience. Our younger son is at the University of North Texas and growing in his faith in a much more vital way than our son at John Brown. Each student is different, and their needs are different. If our sons were to switch colleges they would both be profoundly unhappy. By the way, I met my wife at the University of Illinois in Campus Crusade for Christ.

I hope you find this helpful.

Respectfully,

Ray Bohlin
Probe Ministries

Why Does the University Fear Phillip Johnson?

Who Is Phillip Johnson?

Best-selling author Phillip Johnson has become the leader of the Intelligent Design movement. His books *Darwin on Trial, Reason in the Balance, Defeating Darwinism by Opening Minds* and the recently released *Objections Sustained* have become rallying points for Christian scholars across the academic spectrum. Johnson has addressed university audiences around the country, sometimes on his own, often in debate with a leading proponent of evolution. He has even addressed in private session entire science, law, and philosophy departments at top universities. Well, just who is Phillip Johnson and how does he rate such attention?

Johnson was raised in a nominally Christian family, but he

grew to become a convinced skeptic of the faith. This process was greatly aided by his education, first as an undergraduate at Harvard and then at the University of Chicago Law School where he graduated first in his class. Johnson became convinced that people were basically good, education would solve whatever problems you had, the stuff of Sunday school was okay but mythology, and he could achieve success by thinking for himself and absorbing the culture around him.

This is the enticing picture the academic community paints for students and Johnson bought it. But things began to unravel in his mid-thirties. He had achieved his goals. He served as law clerk for Supreme Court Chief Justice Earl Warren and held a distinguished professorship of law at UC Berkeley, but he lacked fulfillment. He was publishing papers nobody read, or ought to read. His marriage to a beauty queen fell apart and he was single parenting for awhile. The writings of C. S. Lewis had impacted him greatly, but he thought, “Too bad we can’t believe in that anymore.” Eventually he heard the gospel preached in a way that seemed plausible and attractive. Johnson envied the speaker’s combination of commitment and fulfillment. “Do I have something so wonderful?” he questioned. Johnson said, “They believed it, I could too.”

Johnson put his faith in Christ, but faced a dilemma. If the gospel is true, why are all the “intelligent” people agnostic? He prayed for insight. Beginning with a sabbatical at University College in London in 1987-88, Johnson embarked on an intellectual journey. This journey has developed into a project that has seen him publish four books, deliver hundreds of lectures on college campuses, and become the leader of the fledgling Intelligent Design movement over the last ten years. Primarily through his study of evolution, Johnson learned that the academic community’s primary intellectual commitment is to the philosophy of naturalism. If the “facts” contradict materialistic conclusions, then the “facts” are either explained away, ignored, or just plain wrong.

Therefore, evolutionists like Richard Dawkins can say things like “Biology is the study of complicated things that give the appearance of having been designed for a purpose,” and actually say it with a straight face. The appearance of design is an illusion, you see, because we “know” that organisms evolved and the primary reason we “know” this is because naturalistic philosophy demands it.

Johnson’s primary task seems to be continually provoking the scientific community into facing the reality of its naturalistic presuppositions. In earlier years, the scientific establishment was able to dismiss creationists and not officially respond. But when a tenured law professor from Berkeley starts messing with your head, people start answering back. The National Academy of Sciences has issued two publications in the last two years trying to stem the tide.{1} The cracks in Darwinian evolution are beginning to show.

What Could a Law Professor Say About Evolution?

What could a legal scholar possibly have to say about evolution? Many in the academic community have raised the same question as Phillip Johnson has visited their university. In his own words Johnson states: “I approach the creation-evolution dispute not as a scientist but as a professor of law, which means among other things that I know something about the ways that words are used in arguments.”{2}

Specifically what Johnson noticed was that both the rules of debate about the issue as well as the word *evolution* itself were defined in such a way as to rule out objections from the start. Science is only about discovering naturalistic causes of phenomena, therefore arguing against the sufficiency of natural causes is not science! Also the “fact of evolution” is determined not by the usual definition of fact such as collected data or something like space travel which has been

done, but as something arrived by majority vote! Steven J. Gould said, “In science, fact can only mean ‘confirmed to such a degree that it would be perverse to withhold provisional assent.'”{3}

In the early chapters of *Darwin on Trial*, Johnson does an excellent job of summarizing the evidence that has been around for decades calling Darwinian evolution into question. These include problems with the mechanism of mutation and natural selection, problems with finding transitional fossils between major groups when they should be numerous, problems with the molecular evidence for common descent, and severe problems with any scenario for the origin of life.

In a chapter titled “The Rules of Science” Johnson excels in illuminating the clever web evolutionists have drawn to insulate evolution from criticism.{4} In order to limit discussion to naturalistic causes, science is defined in purely naturalistic terms. In the Arkansas creation law decision, Judge Overton said science was defined as being guided and explained by natural law, testable, tentative, and falsifiable. Overton got this from the so- called expert testimony of scientists collected for the trial by the ACLU. These criteria were used against creation on the one hand to say that a creator is not falsifiable, and also that the tenets of creation science were demonstrably false. How can something be non-falsifiable and false at the same time?

The conflict enters in when one realizes that creation by Darwinist evolution is as un- observable as creation by a supernatural creator. No one has ever observed any lineage changing into another and the few fossil transitions that exist are fragmentary and disputable. “As an explanation for modifications in populations, Darwinism is an empirical doctrine. As an explanation for how complex organisms came into existence in the first place, it is pure philosophy.”{5}

In a chapter titled “Darwinist Religion” Johnson points out

that despite the claims of scientists that evolution is secular, it is loaded with religious and philosophical implications. Most definitions of evolution emphasize its lack of purpose or goal. This makes evolution decidedly non-purposive in contrast to a theistic, purposive interpretation of nature. If it is the philosophic opposite of theism, evolution must be religious itself. Darwin himself constantly argued the superiority of descent with modification over creation. If scientific arguments can be made against theism, why can't scientific arguments be made for theism?

Darwin on Trial continues to sell, to be read, and to influence those open to consider the evidence. Since Johnson is not a scientist his book is highly readable to the educated layman. If you have never picked it up, you owe it to yourself to read what has become a classic in the creation/evolution controversy.

Johnson Extends His Case against Evolution into Law and Education.

Over the years of speaking on the creation/evolution issue I have been asked many times why people get so upset over this issue. If it is just a question of scientific accuracy, why does it produce such emotional extremes? The answer, of course, is that the creation/evolution debate involves much more than science. At question is which worldview should hold sway in making public decisions.

In Phil Johnson's second book, *Reason in the Balance*, he makes this very point when he says, "What has really happened is that a new established religious philosophy has replaced the old one. Like the old philosophy, the new one is tolerant only up to a point, specifically, the point where its own right to rule the public square is threatened."{6}

The old philosophy Johnson speaks of is the theistic or Judeo-Christian worldview and the new philosophy is the materialist

or naturalistic worldview. Johnson has referred to *Reason in the Balance* as his most significant and important work. That is because it is here that he lays the all important philosophical groundwork for the scientific, legal, and educational battleground of which the creation/evolution controversy is only a part.

That we no longer live in a country dominated by Judeo-Christian principles should be inherently obvious to most. But what many have missed is the concerted effort by the intellectual, naturalistic community to eliminate any possibility of debate of the worthiness of their position. On page 45 Johnson says,

> *"Modernist discourse accordingly incorporates semantic devices—such as the labeling of theism as religion and naturalism as science—that work to prevent a dangerous debate over fundamental assumptions from breaking out in the open. As the preceding chapter showed, however, these devices become transparent under the close inspection that an open debate tends to encourage. The best defense for modernist naturalism is to make sure the debate does not occur."*[7]

Johnson is quick to point out that there is not some giant conspiracy, but simply a way of thinking that dominates the culture, even the thinking of many Christians.

Therefore, in the realm of science when considering the important question of the existence of a human mind, only the biochemical workings of the brain can be considered. Not because an immaterial reality has been disproved, but because it is outside the realm of materialistic science and therefore not worth discussing. Allowing the discussion in the first place lays bare a discussion of fundamental assumptions, the very thing that is to be avoided.

In education, "The goal is to produce self-defining adults who choose their own values and lifestyles from among a host of

alternatives, rather than obedient children who follow a particular course laid down for them by their elders."{8} The reason, of course, is if God is outside the scientific discussion of origins, then how we should live must also exclude any absolute code of ethics. This also precludes the underlying assumptions from being discussed.

In law, naturalism has become the established constitutional philosophy. Rather than freedom *of* religion, the courts are moving to a freedom *from* religion. The major justification is that "religion" is irrational when it enters the domain of science or a violation of the first amendment in public education. "Under current conditions, excluding theistic opinions means giving a monopoly to naturalistic opinions on subjects like whether humans are created by God and whether sexual intercourse should be reserved for marriage."{9} What then are the strategies for breaking the monopoly?

Can Darwinism Be Defeated?

The main thing Christian parents and teachers can do is to teach young thinkers to understand the techniques of good thinking and help them tune up their baloney detectors so they aren't fooled by the stock answers the authorities give to the tough questions.{10}

So says Phillip Johnson in his recent book, *Defeating Darwinism.* (For a fuller review see Rick Wade's article, Defeating Darwinism: Phil Johnson Steals the Microphone.) Johnson is at his best here, relaying the many semantic and argumentative tricks used to cover up the inadequacies of Darwinism. In the chapter "Tuning Up Your Baloney Detector," Johnson introduces the reader to examples of the use of selective evidence, appeals to authority, ad hominem arguments, straw man arguments, begging the question, and lack of testability. This chapter will give you a good grasp of logical reasoning and investigative procedure.

Johnson also explains the big picture of his strategy to weaken the stranglehold of Darwinism on the intellectual community. He calls it *the wedge*. Darwinism is compared to a log that seems impenetrable. Upon close investigation, a small crack is discovered. "The widening crack is the important but seldom recognized difference between the facts revealed by scientific investigation and the materialist philosophy that dominates the scientific culture."{11} In order to split the log, the crack needs to be widened. Inserting a triangular shaped wedge and driving the pointed end further into the log can do this. As the wedge is driven further into the log, the wider portions of the wedge begin widening the crack.

Johnson sees his own books as the pointed end of the wedge, finding the crack and exposing its weaknesses. Other books in these initial efforts would certainly include the pioneering works of Henry Morris,{12} Duane Gish,{13} Charles Thaxton,{14} and even the agnostic Michael Denton.{15} Following close behind and fulfilling the role of further widening the crack are the works of J. P. Moreland,{16} Michael Behe,{17} and William Dembski.{18} What is needed now to widen the crack further and eventually split the log are larger numbers of theistic scientists, philosophers, and social scientists to fill in the ever widening portions of the wedge exposing the weaknesses of naturalistic assumptions across the spectrum of academic disciplines.

Here Johnson's strategy meshes nicely with Probe Ministries. Much of our energy is spent educating young people in a Christian worldview through Mind Games Conferences, the ProbeCenter in Austin, Texas, and our website (www.probe.org). We share with Johnson the joy of encouraging and opening doors for young people in the academic community. Johnson says,

> *"If you know a gifted young person, help him or her to see the vision. Those who are called to it won't need any further encouragement. Once they have seen their calling, you had better step out of the way because you won't be able to stop*

them even if you try."{19}

There is also an inherent risk in all this. Teaching young Christians to think critically and have the courage to join this exciting and meaningful cultural battle means they will also begin to examine their own faith critically. Some may even go through a period of doubt and deep questioning. While this may sound threatening, we shouldn't shy away. If Jesus truly is the way, the truth, and the light then any "truth" exposed to the light will endure. Our children will be stronger having put their faith to the test. The reward of possibly making a directional change in our downward spiraling culture is worth the risk.

Johnson Responds to the Intellectual Elite

One of the reasons that Phillip Johnson has become a leader in the Intelligent Design movement is the combined effect of his tenured position on the law faculty of the prestigious University of California at Berkeley and his deftness and sheer enjoyment in taking on the power brokers within the established halls of academia. Johnson has traveled extensively in the U.S. and abroad. He has also lectured and debated before university audiences and faculties. His knowledge of debate, concise prose, and his likeable demeanor allows him to bring the issues to the table skillfully. Many are able to think clearly about these issues for perhaps the first time.

Another avenue Johnson has pursued with great success has been to write articles and review books for some of the leading magazines and newspapers in the country. Johnson's fourth book, *Objections Sustained: Subversive Essays on Evolution, Law & Culture,*{20} is a collection of his essays since the publication of *Darwin on Trial* in 1991. While most of the essays in the book were originally published in either the

journal *First Things* or the paper *Books and Culture*, Johnson's pen has also been found in the pages of *The Atlantic, The Wall Street Journal, The Washington Times, The New Criterion,* and many other national and local magazines and newspapers. He has openly challenged some of the leading spokesmen for naturalistic evolution such as Stephen J. Gould and Richard Lewontin of Harvard, Richard Dawkins of Oxford University, and Daniel Dennet from Tufts University.

The point of all this is to draw the Darwinists out into the open where the debate can be seen and heard by all who are interested. Previously, creation was routinely dismissed as religion, but Johnson is not so easily swept aside since he has been able to expose the house of cards behind the bluster of Darwinism. The debate has crept more and more out in the open.

Two examples come to mind. First, the National Association of Biology Teachers (NABT) was caught with its hand in the cookie jar. In 1995, they released a statement about evolution describing it as, among other things, unsupervised and impersonal. Such theological/philosophical concepts should have no place in a "scientific" statement. A storm of controversy sparked both within and outside the teachers' ranks culminated in a reconsideration of the statement by the NABT board. At first the board voted unanimously to uphold the statement, and then a few days later, voted to remove the offending words. The *New York Times* remarked that "This surprising change in creed for the nation's biology teachers is only one of many signs that the proponents of creationism, long stereotyped as anti-intellectual Bible-thumpers, have new allies and the hope of new credibility."{21}

Second, the prestigious National Academy of Sciences has published two official publications attacking creationism{22} and supporting the teaching of evolution.{23} Rather than taking its critics head-on, these two books timidly revert to old and tattered evidences and appeals to authority. For

instance, the National Academy boldly asserts that "there is no debate within the scientific community over whether evolution occurred, and there is no evidence that evolution has not occurred."{24}

Science and Creationism says on the one hand, "Scientists can never be sure that a given explanation is complete and final."{25} But evolution cannot really be questioned because "Nothing in biology makes sense in biology except in the light of evolution."{26} Such obfuscation is now officially in the open arena—precisely where Johnson has been trying to force it to appear. The next ten to fifteen years promise to be exciting. I hope you continue to read Phillip Johnson and observe the ever broadening wedge drive deeper into the chinks of the Darwinian armor.

Notes

1. National Academy of Sciences, *Teaching About Evolution and the Nature of Science* (Washington, D. C.: National Academy Press, 1998), 140. Available online at http://www.nap.edu/readingroom/books/creationism/. National Academy of Sciences, *Science and Creationism: A View from the National Academy of Sciences* (Washington D. C.: National Academy Press, 1999), 35. Available online at http://www.nap.edu/readingroom/books/evolution98.

2. Phillip Johnson, *Darwin On Trial* (Downers Grove, IL: InterVarsity Press, 1991), 8.

3. Stephen J. Gould, "Evolution as Fact and Theory" in *Hen's Teeth and Horse's Toes* (New York: W. W. Norton, 1983), 255.

4. Johnson, *Darwin on Trial,* 111-122.

5. Ibid., 115.

6. Phillip E. Johnson, *Reason in the Balance: The Case Against Naturalism in Science, Law and Education* (Downers Grove, IL:

InterVarsity Press, 1995), 37.

7. Ibid., 45.

8. Ibid., 157.

9. Ibid., 29.

10. Phillip E. Johnson, *Defeating Darwinism by Opening Minds* (Downers Grove, IL: InterVarsity Press, 1997), 116.

11. Ibid., 92.

12. Henry Morris, *Scientific Creationism* (San Diego: Creation-Life Publishers, 1974).

13. Duane Gish, *Evolution: The Fossils Say No!* (San Diego: Creation-Life Publishers, 1972).

14. Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen, *The Mystery of Life's Origin* (New York: Philosophical Library, 1984).

15. Michael Denton, *Evolution: A Theory in Crisis* (Bethesda, MD: Adler and Adler, 1986).

16. J. P. Moreland, ed., *The Creation Hypothesis: Scientific Evidence for an Intelligent Designer* (Downers Grove, IL: InterVarsity Press, 1994).

17. Michael Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: The Free Press, 1996).

18. William A. Dembski, *The Design Inference: Eliminating Chance through Small Probabilities* (New York: Cambridge University Press, 1998.) And, William A. Dembski, ed., *Mere Creation: Science, Faith and Intelligent Design* (Downers Grove, IL: InterVarsity Press, 1998).

19. Johnson, *Defeating Darwinism,* 96.

20. Johnson, *Objections Sustained: Subversive Essays on Evolution, Law & Culture* (Downers Grove, IL: InterVarsity Press, 1998).

21. Quoted in Johnson, *Objections Sustained*, p. 88.

22. *Science and Creationism,* see note 1.

23. *Teaching about Evolution and the Nature of Science,* see note 1.

24. Ibid., 4.

25. *Science and Creationism,* 1.

26. Ibid., ix.

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Campus Christianity

Spiritual Wastelands 101

In the fall of my junior year in college, I had been a Christian for only a year. Since I had been involved in a Christian group on campus, however, I felt I had learned a great deal about my faith. As a science major I had completed most of my requirements for my degree, and I was looking forward to taking electives in my major of animal ecology. However, I still had a couple of hours in humanities to fulfill, not my most favorite subject. While I was looking for a humanities elective, I came across an English course entitled “Spiritual Wastelands.” I remember thinking to myself, “That looks interesting. I wonder what spiritual wastelands this course is about?” With my newfound interest in

spiritual things, I decided to enroll.

On the first day of class, I was horrified the minute the instructor walked into the room. He wore an old Army fatigue jacket, a blue work shirt open to the middle of his hairy chest, ratty blue jeans, sandals, long tangled hair, and a beard. He punctuated his appearance with a leather necklace containing what looked like sharks' teeth. To make it worse, he proceeded to go around the room and ask every student why he or she took this course. I don't really reember what the other students said but when he got around to me, I sheepishly replied that I was a Christian and that I was interested in knowing what kind of spiritual wastelands he was going to talk about. Immediately, with a look of malevolent glee, he exploded: "You're a *Christian*? I want to *hear* from *you*!"

Needless to say, if there had been a place to hide, I would have found it. As you may guess, the only spiritual wasteland he wanted to talk about was Christianity. I was like a babe who had been thrown to the wolves. Our class discussions, more often than not, were two-sided: the instructor versus me. Hardly anyone else ever spoke up. To say that I found myself floundering like a fish out of water would be an understatement. Occasionally my questions and comments would hit the mark. But I am convinced, as I look back, that even that degree of success was purely the grace of God.

Since that time, I have spent twelve more years in the university environment as both an undergraduate and graduate student. I have learned a great deal about how a Christian student should relate to the academic community, and I would like to share with you four principles for effective Christian witnessing in that setting. I think you will also find that these principles will prove to be an effective guide in any sphere of life.

> ***Approach your studies from a Christian worldview.*** *We need to think Christianly. The only way to accomplish this is to be*

continually involved in the process of knowing God.

***Realize that the job of the student is to learn**—not to preach. A teachable spirit is highly valued. This may seem obvious to you, but believe me, it isn't obvious to everyone.*

***Pursue excellence.** Every exam, every paper, every assignment must be pursued to the best of our ability, as unto the Lord.*

***Be faithful to the task**—leave the results (grades) to God. Do not get hung up on the world's definition of success.*

Think Christianly

All of our thoughts are to be Christ-centered, including those expressed in a university classroom. Paul tells us in 2 Corinthians 10:5 that "we are taking every thought captive to the obedience of Christ." All knowledge is to be encompassed by a Christian worldview. In other words, we should try to see all knowledge through the eyes of Jesus. This all sounds well and good, but how do we do that?

The only way to think and see as Jesus does is to know Him. This brings us to the basics of the Christian life. There are numerous demands on the time of a student. There are always experiments to do, books to read, papers to write, exams to study for, assignments to turn in, classes to attend. This is doubly true for graduate students, who spend their entire time seemingly three steps behind where they are supposed to be. Let's not forget the demands of a girlfriend or boyfriend, family, exercise, and just plain having fun. How is one supposed to find time for regular personal devotions, worship on Sunday mornings, fellowship with other believers, and the study of God's Word? These activities can all take a serious bite out of the time the university demands from a student. But this is the only way to draw closer to God and to understand His ways.

By being faithful in spiritual things, we trust God to honor the time spent and to bring about His desired results in our academic pursuits despite our having less free time than most non- Christians. Christian campus groups can be of tremendous help in these matters through training, Bible studies, and fellowship with believers who are going through the same struggles you are.

For those times when trouble does arise in the classroom, and you feel that your faith is being challenged and you are confused, an enormous amount of assistance is available to you. The manager of your local Christian bookstore can be a great help in finding books that deal with your problem. Organizations such as Probe Ministries can also help steer you in the right direction with short essays, position papers, and bibliographies. Dedicated and highly educated Christians have addressed just about every intellectual attack on Christianity. There is no reason to feel like you have to do it on your own. That was my mistake in the "Spiritual Wastelands" course. It never even occurred to me to seek help. I could have represented my Lord in a much more credible way if I had only asked.

There are no shortcuts to living the Christian life. We cannot expect to emerge from the university with a truly Christian view of the world if we put our walk with the Lord on hold while we fill our heads with the knowledge of the world. Remember! We are to take every thought captive to the obedience of Christ. In order to do that, we must know Him; in order to know Him, we must spend time with Him. There were many times in my college career when higher priorities prevented me from spending the amount of time I felt necessary to prepare for an exam, paper, or presentation, but I always found God to be faithful.

During my doctoral studies, we moved into a new house and the boys were ages 4 and 2. The room they were going to share desperately needed repainting and we were having new bunk beds

delivered on Monday, the same day of an important cell biology exam. The professor writing this exam was the one in whose lab I had hopes of working for my doctoral project. So I needed to do well.

The room was small and the beds were large, so they needed to be constructed inside the room. This meant the room had to be painted before the beds arrived. If I paint, I lose critical study time for an important exam. If I study, the room goes unpainted and I have an unhappy wife and a difficult task getting to it later. I chose to paint the room. I had a total of three hours of study time for the exam! I entered the exam free of tension knowing I did my best and it was in God's hands. I had no idea how I did on the exam, but when the grades came out, I received the second highest grade in the class and the best exam score in my tenure as a graduate student! The professor was impressed enough to allow me to begin working in her lab.

Cultivate a Teachable Spirit

I have run across numerous professors whose only encounters with Christians were students who simply told them that they were wrong and the Bible was right. Most professors do not have much patience with this kind of approach. It is a great way to gain enemies and demonstrate how much you think you know, but it does not win anybody to Christ.

Some Christian students have the impression that when they hear error being presented in university classroom, it is their duty to call out the heavy artillery and blast away. This is not necessarily so. As a student, your job is to learn, not to teach. In my education, I reasoned that in order to be a *critic* of evolution, I needed to first be a *student* of evolution and demonstrate that I knew what I was talking about. Once professors realized I was serious about wanting to understand evolution, when I began to ask questions, they listened. In the end my professors and I often had to agree to

disagree, but we all learned something in the process, and I built relationships that could grow and develop in the future.

The most effective tactic in the classroom is the art of asking questions. This approach accomplishes three things. First, you demonstrate that you are paying attention, which is somewhat of a rarity today. Second, you demonstrate that you are truly interested in what the instructor is talking about. All good teachers love students with teachable spirits, but not students who are so gullible as to believe unquestioningly everything they say. Third, as you become adept at asking just the right question that exposes the error of what is being taught, you allow the professor and other students to see for themselves the lack of wisdom or truth in the idea being discussed. Truth is truth, whether expressed by a believer or a pagan. However, non-Christians will believe other non-Christians much more readily than they will a fanatical Christian waving a Bible in his hand.

As a graduate student, I was in a class with faculty and other graduate students discussing a new discipline called sociobiology, the study of the biological basis for all social behaviors. One day we were discussing the purpose and meaning of life. In an evolutionary worldview, this can only mean survival and reproduction. Disturbed at how everyone was accepting this, I said, “We have just said that the only purpose in life is to survive and reproduce. If that is true, let me pose this hypothetical situation to you. Let’s suppose I am dead and in the ground and the decomposers are doing their thing. Since you say there is no afterlife, this is it. It’s over! What difference does it make to me now, whether I have reproduced or not?” After a long silence, a professor spoke up and said, “Well, I guess that ultimately, it doesn’t matter at all.” “But wait,” I responded. “If the only purpose in life is to survive and reproduce, and ultimately—now you tell me—that doesn’t matter either, then what’s the point? Why go on living? Why stop at red lights? Who cares?!” After

another long silence, the same professor spoke up and said, "*Well, I suppose that in the future, those that will be selected for will be those who know there is no purpose in life, but will live as if there is.*" What an amazing and depressing admission of the need to live a lie! That's exactly the point I wanted to make, but it sank in deeper when, through my **questions**, the ***professor*** said it and not me. When Jesus was found by His parents in the temple with the priests, He was listening and asking them questions—probably not for His benefit, but for theirs (Luke 2:46).

We are all familiar with 1 Peter 3:15, which says, "Sanctify Christ as Lord in your hearts, always being ready to make a defense to every one who asks you to give an account for the hope that is in you, yet with gentleness and reverence." This verse is a double-edged sword that most of us sharpen only on one side or the other. Many are prepared to make a defense, but they leave destruction in their wakes, never exhibiting gentleness or reverence. Others are the most gentle and reverent people you know, but are intimidated by tough questions and leave the impression that Christianity is for the weak and feeble-minded. The latter need to go back and read a few important passages:

> *2 Corinthians 10:3-5*
>
> *For though we live in the world, we do not wage war as the world does. The weapons we fight with are not the weapons of the world. On the contrary, they have divine power to demolish strongholds. We demolish arguments and every pretension that sets itself up against the knowledge of God, and we take captive every thought to make it obedient to Christ.*
>
> *Colossians 2:8*
>
> *See to it that no one takes you captive through hollow and deceptive philosophy, which depends on human tradition and*

the basic principles of this world rather than on Christ.

Acts 17

(The story of what happened when Paul boldly proclaimed the gospel in Thessalonica, Berea, and the Areopagus in Athens.)

Paul was a firm believer in the intellectual integrity of the gospel. The "staunch defender" needs to remember that Jesus told His disciples that the world would know that we are Christians by the love we have for one another (John 13:34-35) and that we are to love our enemies (Matt. 5:43-47). Paul exhorted the Romans not to repay evil with evil, but to repay evil with good and to leave vengeance to the Lord (Rom. 12:17-21). Finally, the writer of Proverbs tells us that a gentle answer turns away wrath, but a harsh word stirs up wrath (Prov. 15:1), and that the foolish man rages and laughs and always loses his temper, but a wise man holds it back (Prov. 29:9,11).

Pursue Excellence

Nothing attracts the attention of those in the academic community as much as a job well done. There is no argument against excellence. In Colossians 3:17 Paul tells us, "Whatever you do in word or deed, do all in the name of the Lord Jesus, giving thanks through Him to God the Father." If we are to do everything in Jesus' name, He deserves nothing less than the best that we can do. How many of our papers and exams would we be comfortable stamping with the words, "Performed by a disciple of Jesus Christ"? I think I would want to ask if I could have a little more time before I actually handed it in! Yet Paul admonishes us to hold to that standard in all that we do. This does not mean that every grade must be an A. Sometimes your best is a B or a C or even just getting the assignment done on time. The important thing is to try. It's important to be able to tell yourself that,

with the time, resources, and energy you had available to you, you did your best. The road to excellence is tough, exhausting, and even frightening. It is hard going. But our Lord deserves nothing less.

Ted Engstrom, in his book *The Pursuit of Excellence,* tells the story of a pastor who spent his spare time and weekends for months repairing and rebuilding a dilapidated small farm in a rural community. When he was nearly finished, a neighbor happened by who remarked, "Well, preacher, it looks like you and God really did some work here!" The pastor replied, "It's interesting you should say that, Mr. Brown. But I've got to tell you—you should have seen this place when God had it all to Himself!"

It is certainly true that God is the source of all our strength, and all glory and honor for what we may accomplish is His. But, it is no less true that God has always chosen people to be His instruments—frail, mistake-prone, imperfect people. His servants have not exactly enjoyed a life of ease while in His service. Striving for excellence is a basic form of Christian witness. We pay attention to people who always strive to do their best. In the classroom, people may not always agree with what you say, but if they know you as a person who works diligently and knows what you are talking about, they will give your words great respect. And, if there is enough of the Savior shining through you, your listeners will come back and want to know more.

I am reminded of the impact of four Hebrew youths in the Babylonian culture during the reign of Nebuchadnezzar: Daniel, Hananiah, Mishael and Azariah (whom you may recognize by their Babylonian names: Meshach, Shadrach and Abednego). They entered the prestigious secular institution, "Babylon University," and were immersed into an inherently hostile atmosphere. But Scripture says that

And as for these four youths, God gave them knowledge and

> *intelligence in every branch of literature and wisdom; Daniel even understood all kinds of visions and dreams . . . And as for every matter of wisdom and understanding about which the king consulted them, he found them ten times better than all the magicians and conjurers who were in all his realm (Daniel 1:17, 20).*

You can be sure they were instructed in Babylonian literature and wisdom, not Hebrew, yet they excelled. If our God is indeed the King of Kings and Lord of Lords, then He can not only protect us as we enter the university, but He can also prosper us. Imagine the testimony for Jesus Christ if the best philosophers, the best doctors, the best poets and novelists, the best musicians, the best astrophysicists, and on and on, were all Christians. That would be a powerful witness!

As you pursue excellence, do not be deterred by mistakes. They are going to come, guaranteed. The pursuit of excellence is an attitude in the face of failure. Thomas Edison, the creator of many inventions including the light bulb and the phonograph, was never discouraged by failed experiments. He simply reasoned that he now knew of one more way that his experiment was not going to work. Mistakes were his education. The wise man admits and learns from his mistakes, but the fool ignores them or covers them up. We all admire someone who freely admits a mistake and then works hard not to repeat it.

Strive for Faithfulness, Not Success

As students in the university learn to approach their studies from a Christian worldview, as they grow to appreciate their place as people who are there to learn and not necessarily to confront, and as they begin to pursue excellence in everything they do, it is tempting for them to believe that God will bless whatever they set out to accomplish. Their primary focus becomes whether or not all of their efforts are successful. It can become depressing if they do not see the kind of results

they expected God to bring about.

Soon after Mother Teresa received the Nobel Peace Prize for her work among the poor in Calcutta, she was asked by a reporter in New York City how she could dedicate herself so completely to her work when there was no real hope of success. It was obvious she was not going to eliminate hunger, poverty, disease, and all the other ills of that densely populated city in India. In other words, he asked, if you can't really make a dent in the conditions these people live in, why bother? Her reply was simple, yet profound; she said, "God has not called us to success, but to faithfulness." How many times have we heard in witnessing seminars that our job is to share the gospel and leave the results to God? What I hear Mother Teresa saying is that our responsibility is the same in everything we do.

Oswald Chambers, in his timeless devotional book *My Utmost for His Highest,* caused me to recall Mother Teresa and reflect on my own expectations. He said,

> *Notice God's unutterable waste of saints, according to the judgment of the world. God plants His saints in the most useless places. We say—God intends me to be here because I am so useful. Jesus never estimated His life along the line of the greatest use. God puts His saints where they will glorify Him, and we are no judges at all of where that is. (August 10)*

The main point here is that we should be faithful to the task God has given to us rather than worry about whether or not we are achieving the results we think God should be interested in. When we begin thinking that "God is wasting my time and His," we have probably stepped over the line. I spent five and a half years in the laboratory on doctoral experiments in molecular biology, experiments that never accomplished what I had planned. The most frustrating aspect was that these

experiments did not result in work that was publishable in the scientific literature, which is the ultimate goal of any scientist. I had a great deal of confidence when I started this difficult research problem that the Lord and I would work it out. Well, we didn't. I never dreamed how much Mother Teresa's words concerning the value of faithfulness over success would be lived out in my own life. It has been a hard, hard lesson. And I don't believe I have a complete answer as to why God chose to deal with me in this way. Scientific publications seemed not just desirable but necessary in my future career; yet God is sovereign and He apparently has other plans. During those years, I learned a great deal about living the Christian life in the midst of difficult circumstances. I can only pray that I will not forget what was so painful to learn.

Conclusion

In summary, orient your studies according to a Christian world view. Your main job as a student is to learn and to develop the skill of asking questions, and to keep the boxing gloves at home. Pursue excellence and remain faithful to the task to which God has called you, and leave the results to Him.

Suggested Reading

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Cloning and Genetics: The Brave New World Closes In

Is Dolly Really a Clone?

When the creation of Dolly, the first mammal cloned from adult cells, was first announced in February of 1997 there was a storm of publicity and controversy. While many wondered about the purpose of animal cloning and the possibilities such a success held for further animal applications, others were more concerned about the possible application to human beings. If we can clone sheep, can we clone humans? Should we clone humans? Why should we clone humans? Should humans be cloned to provide a baby for childless, infertile couples? Should we clone humans for embryo research? Should we clone humans to make extra copies of people with good genes? Would clones have a soul? While I answered these and other questions about human cloning in my article Can Humans Be Cloned Like Sheep? in retrospect, there was one question that was virtually ignored at the outset: Was Dolly a true clone?

Looking back, this appears to be a legitimate question that should have been more obvious. After all, Dolly was the only success amid 276 failures. There were 277 cell fusions made, with only 29 growing as embryos. All 29 were implanted into 13 ewes with only one pregnancy and one live birth. Dolly really beat the odds. There was also the fact that Dolly was not cloned from a currently living adult. Dolly's older twin had been dead for several years. Some of her tissues were harvested and kept frozen in the lab, so there was no live animal with which to compare Dolly.

Dolly's authenticity was formally challenged in a January 30,

1998 letter to the editor of the journal *Science*{1}. The authors offered seven reasons for skepticism concerning Dolly's identity as a clone of an adult cell. Among them was the fact that Dolly was alone and not yet joined by another adult clone from the Roslin Institute or any other laboratory. Also, though omitted by the original paper, it had been learned that the original sheep had been pregnant when the tissues were removed, raising the possibility that Dolly was cloned from a fetal cell rather than an adult cell. In addition, the questioning scientists called for additional genetic tests to establish Dolly's identity.

Although Ian Wilmut, the Scottish scientist who is Dolly's co-creator, admitted that Dolly might be a one in a million fluke, he and others were busy performing genetic tests to fully establish that Dolly was an authentic clone from an adult cell. Other labs had so far failed to duplicate Wilmut's success after hundreds of tries. This may not be so unusual since Dolly was the only success out of 300 nuclear transfers and the real odds may be as high as one in 1000. There was no way to know for sure. Wilmut may have gotten lucky indeed to achieve success after only 300 tries.{2}

A pair of papers in the British journal *Nature*{3} remedied much of the concern over Dolly's authenticity. DNA microsatellite and DNA fingerprinting analyses conclusively demonstrated that Dolly was an identical DNA copy of the cells of a 6-year-old ewe and not a clone of the fetus carried inside that ewe.

Cloning Mice Makes Cloning Humans More Feasible

Even with the clear success of cloning sheep, which Dolly's appearance and confirmation make plain, many doubted that the technology used to produce Dolly could be applied to humans. This skepticism was largely due to the universal failure to

clone mice from adult cells.

Mice have a number of advantages as experimental animals for cloning. The gestational time in mice is very short—a matter of weeks, their embryos are easier to manipulate than sheep and cows, and their genetics are already well understood.{4} But it was widely recognized that the early development of mice and sheep is significantly different. In sheep, the DNA in the newly formed nucleus remains dormant for several days. This was suspected to provide time for the DNA to be reprogrammed from its original function to embryonic functions. Mice, on the other hand, begin using the DNA in the newly formed nucleus after just 24 hours. It was thought that this might prove to be insufficient time for the DNA to be reprogrammed.

However, this too has been overcome, and in dramatic fashion. In July of 1998, *Nature* published results by T. Wakayama, working in Hawaii, documenting the cloning of mice.{5} And not just one mouse, but over 50 mice. Three successive generations were cloned, raising the conundrum that the "grandmother" was the twin sister of the "granddaughters."{6}

But what did Wakayama and his colleagues do that was different to bring about success? Strangely enough, no one is really sure. Apart from a few tricks of timing, the major difference seems to be that they used a cell type that no one had used before, and it worked! As an aside, Wakayama tried other adult mouse cells (neurons and testicular cells) that only brought about the usual negative results.

But they also tried cumulus cells. Cumulus cells are a non-growing group of cells that surround an egg cell after it is released from the ovaries. This served to confirm the suspicion that adult cells need to be quiescent, or non-growing, to be successful in cloning experiments. Still, the nuclear transfer technique employed by Wakayama was successful between 2 and 3% of the time using cumulus cells. This rate of

success is ten times better than the technique that led to Dolly, but still very low, making the process tedious.

The success with cumulus cells is why the first cloned mouse was named Cumulina. It is also interesting that only cells from females have been successful in cloning attempts thus far. This could be problematic. For, you see, if all you need is a quiescent adult cell, an egg, and a womb, well, male involvement isn't really necessary. Perhaps it's best not to speculate what, if anything, this may mean in the future.

For many, the real significance of successful mouse cloning techniques is its application to humans. The early stages of embryonic development are very similar in mice and humans. Therefore, many believed that since cloning mice seemed next to impossible because of the early onset of DNA activity in mice and humans, cloning humans would also remain technologically impossible. Cumulina and her sisters have changed all that.

What Will Animal Cloning Be Used For?

So now we can clone sheep and mice. Apart from the possibilities for humans, what's the big deal? Why are scientists and pharmaceutical companies spending so much time and money trying to clone animals? Quite simply, the combination of the possible relief of human suffering from genetic disease with the potential to turn a handsome profit makes animal cloning nearly irresistible.

In the December 1998 issue of *Scientific American*, Ian Wilmut spells out some of the potential uses of animal cloning.{7} Principally, cloning will be used to create large numbers of what are called transgenic animals. Transgenic animals are genetically engineered to contain genes from another species. Wilmut and his colleagues created Dolly in an attempt to discover a more reliable method of reproducing transgenic sheep.

Creating transgenic animals is very tedious, difficult, and risky work. The Roslin Institute and PPL Therapeutics, for whom Wilmut works, transferred into sheep the gene for human factor IX, a blood- clotting protein used to treat hemophilia. With the proper genetic enhancement, sheep will produce this blood-clotting factor in their milk, which can then be harvested and sold on the market. The first transgenic sheep produced this way, Polly, was born in the summer of 1997. It is actually simpler to clone Polly than it would be to create another transgenic sheep through gene transfer.

Cloning offers many other possibilities for reproducing other kinds of transgenic animals. One is the production of animals containing transgenic organs suitable for organ transplants into humans. Pig organs are just about the right size for transplantation into humans. However, a pig heart, or liver, or kidney, would be severely and quickly rejected by our immune system. However, if the right human genes could be transferred into pigs, the organs they produce would be recognized as a human organ and not a pig organ. There would still be the problems associated with any organ transplant between humans, but these are much more manageable than cross-species immune rejection. At present, thousands die every year waiting for organs to become available. Cloning such transgenic animals could create a large and renewable source of organs for transplant.

Transgenic animals could also be created for research purposes to study human genetic diseases. Transferring defective human genes into appropriate animal hosts could produce more workable research vehicles for discovering new treatments and cures not possible using human subjects. Cloning of transgenic animals may also prove useful to create cells helpful in treating human diseases such as Parkinson’s disease, diabetes, and muscular dystrophy. In addition, cloning could be used to produce highly productive herds of sheep, cows, and pigs from animals that are already known to be excellent milk, meat, and

leather producers.

Obviously, the uses of animal cloning seem limited only by our imaginations. Of course, if you are already opposed to the use of animals in experiments, or even in their use for food, these ideas are fraught with ethical difficulties. As a Christian, however, I have answered this question. The Lord Himself produced the first skins for humans in Genesis 3:21 and later after the flood, the Lord allowed animals to be used for food (Gen. 9:2-4). While the utmost of care needs to be given to ensure that God's creatures, for whom we have been given responsibility (Gen. 1:26-28), do not suffer needlessly, the Lord clearly allows animals to be used to enhance our own lives, even if it costs them theirs.

New Uses for Human Embryo Research?

What if I told you that recent breakthroughs in human genetic research might make it possible to dramatically treat patients with Alzheimer's, Parkinson's, heart disease, diabetes, spinal cord injury, and a host of other degenerative diseases? In some cases, these treatments may actually cure many of these diseases and would not require the use of cells obtained from aborted fetuses. Hopefully, I've got your attention.

The November 6, 1998 issue of Science{9} announced the first successful attempts to cultivate human embryonic stem cells that have the potential to treat all the above diseases and more. However, they come with their own set of difficult and perhaps more serious ethical concerns.

First, just what are embryonic stem cells? Stems from plant seedlings give rise to all sorts of different structures such as trunks, branches, leaves, flowers, and eventually seeds and fruits. Animal embryonic stem cells do much the same thing. Stem cells have the potential to grow into just about any tissue that is present in the adult organism. Researchers call this potential totipotency, meaning they are potent to produce

all tissues. Embryonic stem cells have been isolated from mice since the early ’80s. Such research has been impossible in humans for ethical reasons. Stem cells only come from embryos in the earliest stages of development.

No one was willing to simply use embryos to obtain stem cells, thus killing the embryo, every time stem cells were needed. But, if stem cells could be isolated and cultivated in the laboratory so they could grow and divide and maintain their stem cell functions, then a continual supply could be maintained without risk to further embryos. What is called a stem cell line would effectively be created that could be used indefinitely. This research was greeted with such comments as “extremely important,” “very encouraging,” and “a major technical achievement with great importance for human biology.”{10}

What you may have noted in the above description is that a human embryo must still be used to create this stem cell line. In fact, the study reported in Science indicates that thirty-six embryos obtained from in vitro fertilization clinics in Madison, Wisconsin and Israel were used to create five stem cell lines. The embryos were obtained with the consent of the individuals whose eggs and sperm were used to create them and the approval of the local institutional review board.

The major concern expressed so far is for the legality for other labs to use these cells. Since there is a ban on the use of federal funds for research involving tissues derived from human embryos, this research was carried out using private funds from Geron Corporation, a Menlo Park, California biotechnology firm. The availability of these stem cell lines now raises the question of whether these cells can be used by other labs currently funded by government grants. Predictably, one researcher is applying for grant money to use these stem cells to deliberately test, and hopefully repeal this restriction.{11}

Proponents of stem cell research criticize the federal ban by suggesting that this leaves the government out of the regulatory picture since no guidelines have been issued for private research. I agree that the lack of guidelines for private industry is an oversight, but opening up government funding is not the answer. The ban should remain in force. Guidelines need to be issued that forbid this important work as long as human embryos are sacrificed to produce these cell lines. Research in animals should be encouraged to see if stem cells could be produced by other means. The end does not justify the means.

The Prospects for Human Cloning: The Enigma of Dr. Richard Seed

I am frequently asked how soon I think the first human clone will be produced. I usually respond that somewhere in the world within the next five to ten years, someone will announce the creation of the first human clone. But if we are to believe Dr. Richard Seed, the first human clone will appear before the year 2001. In December 1997, Dr. Richard Seed, physicist turned fertility specialist, announced that he intends to clone human beings. He said, “I know of at least fifteen people who want to clone humans, but haven’t got quite up the nerve to do it.”{12} When asked if he had the nerve, Seed replied, “I have the nerve.”

Richard Seed appeared in the news again in September of 1998 when he announced his plans to clone himself in two years and that his wife agreed to carry the baby!{13} Seed reported that he had received hundreds of calls from individuals that want either themselves or their dying children cloned. Seed thinks this is a first step to human immortality. On January 7, 1998 Seed affirmed on ABC News Nightline his remarks from a National Public Radio interview, that cloning technology will allow us to “become one with God. We are going to have almost as much knowledge and almost as much power as God.”{14}

Right now you're probably thinking this guy is a kook. Why worry about him? Well, that's precisely why we need to pay attention to him. He has the ability; he perfected embryo transfers in humans. He certainly has the motivation and nerve, and he is still seeking the cash to carry it out. But if he is accurate in the number of calls he has received, money may not be a problem for long. And even if the U.S. Congress passes a bill banning human cloning, Seed has said he will move his operation to Tijuana, Mexico.

People like Richard Seed fully explain why I believe someone, somewhere in the world will produce a human clone very soon. The question is, Are we going to just throw up our hands and surrender, or will we continue to stand up for the sanctity of human life and the sacredness of the human embryo?

If we don't think this through carefully and organize a cogent response to this threat to human dignity, the attitude of people like Prof. James Robl at the University of Massachusetts at Amherst will prevail. He said:

> *There is no clear-cut definition for what is life. And this is something, I think, that society is going to have to think about, is going to have to make some definitions, and those definitions may not be permanent, they may change as new technologies are developed. There is a fine line, and the line, at the early stages, is really based on your intentions of what they are to be used for as opposed to necessarily what they are. So the question of what is life seems to change, I think, in people's minds based on what their concerns are or their own interests are in how we might use whatever it is we are producing.{15}*

What Professor Robl calls for is an entirely utilitarian ethic. We define life, he says, based solely on what new technologies we develop. If a new technology, such as cloning or human stem cell production from human embryos becomes

available, yet this technology threatens human dignity, we simply redefine human life to encompass the new technology. This is the frightening specter of a brave new world. We must oppose it and we must articulate why.

Notes

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