Dr. Ray Bohlin Presents "Natural Limits to Biological Change"

Discovery Institute's *Dallas Conference on Science and Faith* (January 22, 2022) featured Probe VP and Discovery Institute Fellow Dr. Ray Bohlin's breakout session on his book *The Natural Limits to Biological Change*.

Read Dr. Bohlin's article: The Natural Limits to Biological Change

His PowerPoint slides can be accessed here.

PowerPoint slides in a PDF document are here.

A Meaningful World

The Poison of Meaninglessness

We have been drinking a poison that first infects our heads, then slowly moves to our hearts. It is the poison of meaninglessness. Many people assume that science says the universe is without purpose and everything is a result of random, meaningless events. A recently released book, *A*

Meaningful World by Benjamin Wiker and Jonathan Witt,{1} seeks to be the antidote to this poison by looking at science and how certain features of the universe do not fit within the materialistic worldview. This book will be our guide as we consider the question, How does science reveal meaning in the universe? But first, we need to understand the poison before we can discuss its antidote.

Within the scientific community, the assumption of meaninglessness is a result of its members' worldview. Most scientists hold to a materialistic worldview where everything is explained by physical or material causes, which are purposeless, random, natural events. Furthermore, a materialist reduces everything to its basic parts and claims that ultimate meaning lies in these parts. For example, when people say that we are a product of our genes, they are reducing humans to their chemical parts. By this definition, people do not have a soul, and the illusion of human genius or creativity is explained as neurons firing in the brain or animal instinct.

So if that is the poison, what is the antidote? The antidote comes from Christians who break the materialist spell by showing that the world is full of meaning and purpose because it has a Creator. This can be done by looking at scientific evidence for a meaningful world.

A good place to begin is with the idea of genius. Why study genius? Because the most poisonous effect of materialism is the way it skews our self-understanding or our worldview. In a materialistic world without a purpose, there would be no signs of creativity and genius in nature. Before Darwin's time, the evidences of creativity and beautiful design in nature were some of the best arguments against materialism. However, the theory of evolution through random, natural causes denied the masterful work of design.

First, we will learn how to recognize some common elements

found in a work of genius by looking at one of the most well-known geniuses of all time, William Shakespeare. Then, we will see if those same elements show up in nature.

How Do We Know It's Genius? The Example of Shakespeare

A Meaningful World describes four elements that will show up in a work of genius: depth, clarity, harmony, and elegance. If the world is designed by an ingenious designer, then we should see these four elements of genius in nature.

How do we detect genius in nature? Let's take a look at the work of a well-known playwright, William Shakespeare, as our model for describing the elements of genius.

Consider the situation in *Hamlet* where we get the famous and often misused line, "Methinks it is like a weasel."{2} The surface reading is that Hamlet and Polonius are looking at clouds and Hamlet observes that one looks like a weasel. As we delve deeper and consider the context, we find that Hamlet is actually exposing Polonius as a weasel himself.

The deeper meaning in Shakespeare's work has intrigued academics for years. And it points us to our first character of genius, *depth* or depth of meaning.

However, depth is nothing if it cannot be detected. So here we come to our next element of genius, *clarity*. Shakespeare did not write the scene with Hamlet and Polonius for his own whimsy, but so that the reader would detect the double meaning in Hamlet's weasel comment. Ingenious works have depth and meaning that beg to be discovered. Hence, they have clarity.

The last two elements of genius go hand in hand: *harmony* and *elegance*. Harmony would describe how various parts—or in Shakespeare's case, how various scenes—are interrelated. In all of Shakespeare's plays, the characters and scenes are

related to each other; no scene is random or contradictory to the rest of the play. They are in harmony with each other.

The last element, elegance, is not about parts but about the unifying whole. When all of the parts have come together and operate harmoniously, then we have a new element, in this case a play. No one scene stands alone, but is within a context of the whole. One cannot understand the line “Methinks it is like a weasel” without setting up the context of the play itself.

So from Shakespeare we have identified four important elements to genius: depth, clarity, harmony, and elegance. Let’s see if we can find these same elements in nature.

Genius in the Periodic Table of Elements

When we turn to chemistry to see if we find a conspiracy of ingenious design, we will find that, just like a cleverly crafted puzzle that was meant to be solved, when you arrange the elements according to weight, the periodic table makes a stunning natural jigsaw puzzle.

Now that scientists have solved the jigsaw puzzle, they find that it gives us amazing information about atomic properties. This insight has allowed us to make everything from pharmaceuticals to cosmetics to weapons to particle accelerators. So is it just coincidence, or does the periodic table display the properties of ingenious design?

Let’s consider how the periodic table works. When you line the main elements up in groups of eight, the periodic table functions much like a Sudoku puzzle. Elements going across a row, or period, are related in their structure, while elements going down a column are related in their properties. Sudoku puzzles are designed by the puzzle maker with just the right amount of clues for the puzzle to be solved. If you look at the history of chemistry, you will find that the periodic table was first put together because there just happened to be

the right amount of clues to give us a reason to be suspicious of design.

Remember those four elements of Shakespeare's work: depth, clarity, harmony, and elegance? It turns out that when we consider the periodic table, these properties across rows and columns display a *depth* of meaning beyond the obvious weight of elements. Secondly, its properties are clear enough for us to discover them, so it has *clarity*. The jigsaw puzzle of the elements arranged in this way display a *harmony* that sings sweetly to chemists' ears; for example it turns out that elements on the right of the table generally combine with elements on the left of the table. Third, the periodic table of elements is *elegant* in how it operates as a functioning whole. We could not know the characteristics of many of the elements without having other elements to compare them to. In this sense, the table reads like a play in which each element is a character whose personality is only really seen in light of the entire cast of characters.

Although a materialist would say that we are nothing but chance chemical reactions, it seems that our chemistry is not so random after all, but that it was designed with us in mind. Next we will find mathematics and physics also have the properties of ingenious design.

Genius in Mathematics and Physics

The worldview of many scientists would have us believe that the universe is meaningless because it is the result of chance random processes. In mathematics, a language of the universe, do we find the handiwork of genius designer?

In the book *A Meaningful World*, the authors emphasized the *clarity* of mathematics because the ability of the human mind to discern mathematical principles is quite remarkable. The universe seems to follow certain mathematical laws: the

pattern of the multiplication table, musical scales, and the beauty of symmetry. These mathematical laws, however, are not elusive. Since ancient times man has been able describe truths about nature in terms of numbers, counting, and patterns.

We can easily find the *harmony* and *elegance* in the language of nature by looking at mathematics and physics. Math has harmony because, starting with basic arithmetic, you can build all the way up to complex principles like calculus and trigonometry. The elegance of mathematics is really seen when applied to physical phenomena. After many years of experiments, we have discovered that the complicated idea of gravity can be described by one simple equation. This is natural elegance.

The *depth* of mathematics is more difficult to grasp because we are so accustomed to using math. After Newton's time, mathematics seemed to be the end all, be all, of the universe. This was stretched to the point that some worshipped mathematics over God. But soon mathematicians and scientists found that we did not actually have the whole picture. With Einstein's theory of general relativity and quantum mechanics, mathematics grew as a field and continues to grow and refine.

Although mathematics is an abstract idea, it is the language of the physical world. As we have seen, mathematics and the way it describes physical phenomena displays clarity, depth, harmony, and elegance. Math is the language that God invented. And it is one of the ways that He speaks to us of His existence.

Genius in Biology

Since Darwin's day, biology has been infused with the idea that everything from bacteria to human beings has sprung from the result of random, purposeless, natural causes. But nature seems to show the fingerprints of the creative genius of our creator, God.

Can we see those signs in biology? *A Meaningful World* describes harmony within biology at length. Let's take a look at the cell.

The cell contains many parts: the mitochondria, the nucleus, and DNA. Each of these parts has its particular job to do. And, in addition, each part has a job that is related to all of the other parts of the cell. Think of the cell like a car engine and mitochondria as the carburetor. A carburetor has a specific job in the engine. You cannot talk about what a carburetor is without explaining how it works within the engine. Its job is related to all of the other parts. This is *harmony*, one of our elements of genius.

But what about elegance, depth, and clarity? It seems that these are also apparent in biology. The *elegance* of the cell is how it functions as one intricate machine, like our car engine. The cell is a biological engine; actually it is a very efficient, self-sustaining, self-replicating engine.

What about depth in biology? Let's go back to the cell. Cells get their energy through metabolism. We used to think that this was a simple path with many useless byproducts. Upon closer inspection, one sees that those byproducts have functions within the cell that are necessary for its survival. As we continue to study the cell, we find more and more *depth* to its function.

Finally, how does biology demonstrate *clarity*? Were we meant to find the handiwork of a designer? Most biologists would agree that biology is the study of things that have the appearance of design. If it appears designed perhaps it was, and perhaps we were meant to discover that. The genius behind biology is clear enough that God says that we are without excuse.{3}

Hopefully, you can see that creation is a masterful work of a divine genius. As the book *A Meaningful World* has shown us,

nature bears the hallmark of design that has us, its students, in mind.

Notes

1. Benjamin Wiker and Jonathan Witt, *A Meaningful World: How the Arts and Sciences Reveal the Genies of Nature (Downers Grove, Ill.: InterVarsity Press, 2006).*
2. Hamlet Act 3, Scene 2
3. Romans 1:19,20 (ESV)

© 2007 Probe Ministries

The Controversy over Evolution in Biology Textbooks

Texas, Textbooks and Evolution

Public school textbooks are big business in Texas. Texas is the second largest purchaser of textbooks behind California. Texas also employs an extensive review process which involves input from the public. Independent school districts in the state of Texas can purchase whatever textbooks they prefer. But if they want state assistance in the purchase of textbooks, they'd better pick those texts that are recommended by the State Board of Education.

Publishers know that whatever books Texas approves, other states will adopt as well. Therefore the decisions by the Texas State Board of Education regarding textbooks influence what many students across the country will be reading over the

next few years. Publishers pay very close attention to what goes on in Texas.

Evolution has been a contentious issue before the State Board for decades. A few years ago, they passed a resolution that said textbooks were to be free from factual errors and that the information in the texts should allow students to "analyze, review, and critique scientific explanations, including scientific hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information."

This certainly sounds scientific and fair. I mean, who doesn't want both sides of scientific controversies presented? Any "scientist to be" needs to be able to analyze, review, and critique scientific explanations. Scientists rarely want to just take someone's word for something. Scientists tend to be skeptical in nature. That's a good thing. Students ought to be encouraged and trained to think this way.

That is, they ought to be trained to think this way about everything in science, except evolution. Evolution has become the unassailable myth of modern science. No dissension allowed. No controversies accepted. No challenges tolerated. Evolution is a fact and anybody who doesn't think so is ignorant, dishonest, or religiously motivated.

But for some reason, skepticism about evolution and Darwinian evolution in particular just won't go away. The dissenters are also growing in number and levels of education. So when the Texas State Board of Education announced its two public hearings in the summer of 2003, the battle lines were clearly drawn. Skeptics of Darwinism came loaded with careful examinations of the textbooks up for adoption, pointing out inaccuracies, falsehoods, and skimmed-over controversies. No one came to include creation or intelligent design into the textbooks.

Defenders of evolution came loaded with little else besides crude attempts to discredit their critics and scary words of warning about attempts to get religion into the science textbooks.

What’s Wrong with the Textbooks As They Are?

If you have occasion to pick up a high school biology textbook, you quickly realize that the process of writing it must be a daunting task. The amount of detailed information they contain today over a wide range of biological phenomena is truly staggering.

The reality that they contain errors or out of date material can be easily understood. You would think that authors and publishers would welcome those who spot these problem areas and take the time and effort to point them out. For the most part this is indeed the case. Except when the errors concern the presentation of evolutionary theory. Pointing out factual errors, exaggerated claims or poor logic in the presentation of evolution suddenly becomes suspect. One’s motives should be questioned. Evolution is a fact, after all, and surely no one thinks that evolution as presented in textbooks should be altered in any way.

I’m being facetious, of course. Evolution should be open to scrutiny as much as any other area of biology, but it isn’t. Some mistakes in biology textbooks have persisted for decades, despite efforts to point them out and seek their removal or correction.

A classic example involves the Miller-Urey experiment. In 1953, Harold Urey and Stanley Miller published the results of an experiment that was meant to simulate the production of biochemicals necessary for life from gasses that were thought to be in earth’s early atmosphere. Among a host of meaningless organic compounds, Miller and Urey found a few amino acids,

the building blocks of proteins.

The experiment caused quite a sensation and launched the origin of life field with a bang. Over the years, however, numerous problems showed up that invalidated the experiment. Chief among these problems was the determination that the atmosphere they used—ammonia, methane, water vapor, and hydrogen gasses—did not represent the early atmosphere. These hydrogen rich gasses were replaced with carbon dioxide, carbon monoxide, nitrogen, and water vapor. When these gasses are used, the experiment is a dismal failure. Trace amounts of the simplest amino acid, glycine, sometimes appears, but not enough to get excited about.

All this has been known since the late 70s. But over thirty years later, textbooks represent the Miller/Urey experiment as if it still represents a realistic simulation. Why? Because it's the only experiment that works. And there needs to be a naturalistic story of where life could have come from.

Other problems remain in the infamous and fraudulent embryo drawings of Ernst Haeckel, the newly discovered problems with the peppered moth story, the startling evolutionary problem of the Cambrian explosion, and many others. Some of evolutionists' most cherished examples of evolutionary principles have fallen on hard times.

A Public Hearing in Texas in July 2003

The Texas State Board of Education is a powerful group of people. Every six years they evaluate textbooks for use in the Texas public schools, and many private schools and public schools from other states follow their lead. Part of the reason for this is the extensive review process the board employs.

Not only do the fifteen elected Board members review the texts, but a committee of educators from the Texas Education

Agency also reviews them, and the public is invited to state its opinions as well. The Board reviews textbooks every year but they cycle through several categories every six years. The year 2003 was the year for biology textbooks.

I attended the first public hearing on July 9th in Austin, Texas. Citizens of Texas who wish to testify need to sign up about two weeks prior to the hearing. Each testifier is allotted three minutes, which is closely timed, and then a few board members may ask a few questions.

Three minutes isn't very long. It's about the length of one of our daily radio programs. So whatever you need to say, you'd better say it concisely and quickly. I briefly presented my scientific credentials and addressed problems with the Miller-Urey experiment, the Cambrian explosion, and the mutation/natural selection mechanism of evolution.

I kept my remarks strictly along factual lines and discussed the evidence, with no mention of a Creator or Intelligent Design. But before the meeting even started I knew I was in for a long afternoon. At noon, one hour before the meeting, a group from The National Center for Science Education (NCSE) gave a press conference warning the media to expect another attempt from pseudo-scientists to try to include creationism into the textbooks.

Actually of the forty or so people signed-up to testify, only three of us were there to criticize evolution and no one was there to argue for creation. In the minutes before the meeting there was suddenly a horde of media looking for me and asking for interviews. Thanks to the NCSE I was provided with opportunities for nearly a dozen interviews, mostly TV. I was able to explain our side of the story and correct the NCSE's distorted paranoia.

The defenders of evolution came to say that evolution ought to be left alone: don't cave in to the pressure! But who was

exerting the pressure? There were only three of us and over thirty of them. We came with scientific criticisms. They offered little else besides blatant misrepresentations and character assassinations.{1} These testimonies primarily set the stage for the September hearing.

A Second Public Hearing in September 2003

A major player in the entire hearing process was the Discovery Institute (www.discovery.org), a public policy institute out of Seattle, Washington. Discovery sponsors a Center for Science and Culture that provides limited funding for skeptics of Darwinism and proponents of Intelligent Design. I have received two limited fellowships from Discovery to help write a new edition of my book with Lane Lester, *The Natural Limits to Biological Change.* It was Discovery that contacted me about possibly testifying at the July 9th hearing.

Because of the intense media coverage of that hearing, the folks at Discovery spent a great deal of time addressing the media, correcting their errors and explaining the real story. As the September 10th hearing approached, Discovery sent out press releases and sent a team to Texas to hold press conferences and potentially testify before the State Board of Education.

Because of all the media attention, that ranks of testifiers swelled to unmanageable portions. Over 150 people signed up to testify and they all expected their three minutes. You do the math! This was going to be a long meeting. Most of those associated with the Discovery Institute and a Texas-based organization, Texans for Better Science Education (www.strengthsandweaknesses.org), gained the early testimony slots when the board members were most alert. The meeting dragged on until 1 a.m., a full twelve hours.

Once again, those of us criticizing the textbooks came prepared with specific criticisms of the textbooks and the

other side simply wanted to say that we had no place at the table of discussion and should be ignored because we are pseudo-scientists and religious fundamentalists.

Most distressing of all was a pastor from a large Southern Baptist Church in Austin who came to tell the Board that evolution was of science and creation was of Genesis and faith and that the two had nothing to do with each other. He went on to add that he and everyone else knew that the dissenters from evolution were only there to protect their religious beliefs. He received a thunderous round of applause from the theistic evolutionists, agnostics and a theists in the crowd.

How sad that this brother in Christ was so deceived and even pretended to know why I was really there, having never spoken to me, nor had we even ever met. This broke my heart, as did other pastors who came to help but only showed their lack of knowledge about evolution and ended up hurting more than they helped.

While many evolutionists embarrassed themselves by exhibiting a childish paranoia, so did many Christians who just really didn't understand the issues. I'd love to do a Probe Ministries Mind Games Conference in all these churches—they need it.

Was Anything Accomplished?

There was heavy media interest from July through early November when the Texas State Board of Education made their final decision. Special interests from both evolutionists and those dissenting from evolution were involved.

Those who wanted to strictly follow Texas guidelines to teach evolution, but remove factual errors and include both strengths and weaknesses of evolution hoped to vote on each textbook individually. But the more liberal majority decided to vote on adopting the Texas Education Agency's

recommendation to approve all eleven textbooks. This motion passed by a vote of 11-4. Only two textbooks had made sufficient changes to be judged "conforming."{2} The other nine would have been judged "non-conforming," which would have still made them eligible to be purchased with state funds. Only a book judged "rejected" would not be purchased by the state.

This was a small setback. But some significant changes were made. The fraudulent Haeckel drawings of vertebrate embryos, suggesting far more evidence for evolution than actually exists, have been virtually removed entirely. The fraud has been known for over 100 years. Two textbooks (Holt and Glencoe) have now inserted acknowledgments that the Miller-Urey origin of life experiment was based on ideas about the earth's early atmosphere no longer accepted by scientists. Another textbook has qualified an earlier claim made about evolutionary intermediates. The original textbook claimed that "since Darwin's time, many of these intermediates have been found." The revised text now reads: "Since Darwin's time, some of these intermediates have been found, while others have not." {3}

The journal *Science* matter-of-factly reported, "In response, some textbook publishers made minor changes, including replacing embryo drawings with photos and dropping the term 'gill slits.' One also eliminated the assertion that Darwin's theory is the 'essence of biology.'"{4}

While many of these changes are small, the public perception of the debate seems to be changing as evidenced by this statement from a *Dallas Morning News* editorial from November 5th:

> *"This ought to be easy; science is supposed to deal solely in facts. But the teaching of evolution is so entangled with politics that warring factions can't even agree on the facts. (What did the flawed Miller-Urey "origin of life" experiment*

prove, if anything, for example?) This is an injustice to the people of the state, who have a right to expect their children's biology textbooks to be a straightforward presentation of the most up-to-date scientific information, facts not privileged from a religious or anti-religious perspective."

Other errors and problems still remain.{5} But this has been a good start.

Notes

1. Sample testifier statements:

   - *Steven Schafersman, President of Texas Citizens for Science: "I am aware that the Discovery Institute, a creationist organization out of Seattle, Washington, has become involved in the Texas education process just as they did recently in Kansas and Ohio. They have prepared written testimony about the books submitted here and apparently deputized a member of a Texas creationist organization, Probe Ministries, to speak on their behalf." (Hey, that's me!)*
   - *Ms. Amanda Walker: "So what we are really doing here is talking about using the political process to override the science process to suit creationists whose theories can't stand up in the global scientific community"*
   - *Dr. David Hillis, Professor of Biology, UT Austin: "The objections to evolution in textbooks that you have heard are not about science or facts. They are about pushing a religious and political agenda."*
   - *Ms. Kelly Wagner: "If you consider at all adding intelligent design to any of these textbooks, I would like you, again, this is a very, very personal*

> *question. I would like you to think, am I furthering medical research? Or am I contributing to Kelly Wagner's early death?" Ms. Wagner felt that "weakening" evolution in the high school biology textbooks would compromise medical research and therefore that research on her heart condition could be compromised.*

2. Most likely these would have been the Holt Biology book and the Glencoe Biology book, both of which made numerous constructive changes.

3. Holt Biology, p. 283

4. Constance Holden, "Texas resolves war over biology texts," *Science* Vol. 302(Nov.14, 2003):1130.

5. Use this website from Discovery for full report on the Texas debate. http://www.discovery.org/csc/texas/.

©2003 Probe Ministries

Genetic Engineering – A Christian Scientist's Perspective

Dr. Ray Bohlin examines the rapidly moving world of genetic engineering from a Christian worldview perspective. He explains that most genetic engineering attempts to make more efficient changes similar to those previously done through selective breeding and other conventional techniques. However, those working in the field need to be aware of the ethical and religious issues that arise in this area of

science.

What Is Genetic Engineering?

Our culture teeters on the edge of a steep and dangerous precipice. New technologies will soon allow us to change, radically and permanently, the world in which we live. Indeed, we will hold in our hands the capability of directly and purposefully changing who we are as human beings. The technology I am speaking of is genetic engineering.{1} Ethical and technical questions swirl around discussions of genetic engineering like the wall clouds of the eye of a hurricane. Many in society seem to be bracing themselves for the disappearance of the calm of the eye and the coming of the full force of a powerful and destructive combination of new plants and animals unleashed on an unsuspecting environment, with new and improved humans designed to succeed.

Before your alarm buttons go on overload, let me say that I hope to lend a reassuring voice with a dose of sober realism. Genetic technology will undoubtedly unleash great power to change our world forever, but should it, and will it? In this article I want to explore just a few of the technical and ethical questions we face as a society. The time to discuss these issues is now, while we still have time to think without simply reacting.

The phrase *genetic engineering*, unfortunately, often conjures up images of macabre experiments resulting in Frankenstein-like monsters and the cold-hearted use of genetic information to create new social classes depending on our genes, as in the 1997 film *Gattaca*.{2} However, genetic engineering can simply be defined as the manipulation or alteration of the genetic structure of a single cell or organism.

Sometimes the manipulation of an organism's genome, the totality of all its genes, can simply refer to the project of identifying its complete DNA sequence in order to gain

information for future study and potential alteration. The Human Genome Project is therefore, in a sense, a form of genetic engineering because the human genome must be broken up and manipulated in order to gain the desired information.

Ordinarily, genetic engineering refers to the direct addition, deletion, or intentional mutation of an organism's DNA sequence to produce a desired effect. Knockout experiments in mice seek to determine the effects of eliminating a particular gene from the mouse genome. Recombinant DNA experiments usually take a gene found in one organism and place the gene into another organism. These animals can be of the same or different species.

Sometimes researchers will simply change the DNA sequence in a gene to study what effect the specific change has on the gene or its protein product. All of these alterations fall under the umbrella of genetic engineering. In this broad definition, genetic engineering is neither good nor evil. The nature of the experiments themselves will determine if they are moral or immoral.

Why Are There Genetic Illnesses?

The initial thrust of genetic research is the treatment and potential cure of genetic illnesses. Therefore, we must explore why genetic illnesses occur at all. "Why questions" within science usually occur on two levels and are notoriously difficult. The first level and usually the easier of the two are the scientific. The "why" is best changed to "how." For our purposes this means, How do genetic illnesses arise? The second, more difficult question asks on a moral basis, Why do genetic illnesses occur?

The answer to the first question, How do genetic illnesses arise?, is simply, mutations. Mutations are mistakes in the DNA sequence. Sometimes a mutation is simply the substitution of one nucleotide for another.

Mutations can also result from a piece of DNA being deleted. This may cause one or more codons to disappear. In cystic fibrosis (CF), codon 508 out of 1,480 is missing, causing one amino acid to be removed from the resulting protein. This causes the severe respiratory and digestive problems of CF patients that are usually lethal before their 30th birthday.

So far, genes for more than 1,200 human disorders have been identified, which are found over all twenty-three pairs of human chromosomes. Some estimate that there may be as many as 3,000 to 4,000 human genetic disorders that are due to defects in a single gene. Most disorders, however, will be due to mutations in a host of genes.

The moral question is perhaps not so difficult in its answer, but in our acceptance of the answer. Mutations exist as a result of the Fall. We know the serpent was cursed, Eve was cursed, and Adam was cursed (Gen. 3:14-19). But Romans 8:18-22 also tells us that all creation was subjected to futility, groans and suffers, and eagerly awaits the revealing of the sons of God so it may be set free from its slavery to corruption. This world is not as God intended.

Asking why someone suffers from a genetic disease is no different than asking why someone was killed in a traffic accident when others walked away. We know our suffering is temporary. We know that God will somehow work it all out for good (Rom. 8:28). But in 2 Corinthians Paul tells us we suffer so we can comfort those who suffer after us (1:4), so other sufferers will know they are not alone (1:6), and, principally, we suffer so we will trust in God and not ourselves (1:9).

Part of the Christian mission has always been to alleviate suffering where possible. While Jesus' miracles clearly were part of fulfilled prophecy, they were also about relief from suffering. Genetic engineering, while possessing a power that can be used for evil, which we will discuss, also at least has

the potential to relieve the suffering from, if not even cure, genetic disease.

Could Changing Genetic Material Produce a Dangerous Superbug?

One concern that many people have about genetic engineering is the possibility of unintentionally creating a superbug or a damaging plant or animal whose destructive nature is only discovered after the fact. After all, our knowledge of the workings of genes and proteins is still growing. We hear constantly how complex everything is. What makes us think we can tinker with this incredible biological reservoir of information without making some incredible blunder from which there is no turning back?

When genetic engineering in bacteria was first discovered and introduced (Recombinant DNA technology), many scientists had this very fear. This was partially the reason for the self-imposed moratorium and four levels of containment in the early 1970s. But geneticists and molecular biologists found that dangerous, unintentional consequences were virtually nonexistent. Enforcement of the guidelines eventually relaxed and soon became outdated and ignored. What this means is that researchers were quite convinced that transferring DNA of known sequence and function into bacterial chromosomes and plasmids did not result in unforeseen consequences. The procedure became routine and straightforward.

This does not mean that someone, somewhere, won’t use biotechnology to produce a superbug intentionally. Certainly this technology can be used to produce even more powerful and resistant agents of biological warfare. Some even speculated that HIV (human immunodeficiency virus), the virus that causes AIDS, was intentionally produced. Though this hypothesis has been successfully refuted, the prospect remains that DNA recombinant technology has opened up a new field that can be

used for evil.

However, we must be clear that this is not the fault of the technology itself. It is entirely human to shrink with fear away from things that we don't understand. The first predictable reaction of tribal societies when faced with modern technology was to cower in fear. Something dreadful was about to descend upon them. Usually this didn't happen and, with some education and familiarity, fear dissipated. But only human agents alone can make evil choices. Fire will heat our homes and cook our food, but it can also kill indiscriminately in the hands of an arsonist. But fire itself is not evil.

What should concern us more than the advent of biotechnology is the growing popularity of a totally secular and naturalistic worldview. Naturalism contends that humans are just complicated animals. The end result of this assumption is that ethics becomes an exercise in simply determining what works, not what is right.

Biotechnology is powerful, indeed, but we cannot put the genie back in the bottle. Therefore we must engage the discussion as to how this technology can be used to cure disease and not become another snare to degrade and dehumanize people's lives.

Are We Playing God by Creating Organisms That Never Existed Before?

Unfortunately, the concept of playing God means different things to different people.{3} For some it may have nothing to do with God at all. They are simply expressing awe and wonder at the power that humans can wield over nature.

For some Christians, however, the notion of playing God carries a pietistic view of God's realm of activity versus that of the human race. In this context, playing God means performing tasks that are reserved for God and God alone. If this is what genetic technology does, then the concerns about

playing God are justified. But what is often being reflected in this perspective is that God acts where we are ignorant and it should stay that way.

What is really at stake is fear, fear of what we may learn, fear of what new responsibility this new knowledge will put on our shoulders, and fear that this new knowledge will be used to harm us and not for the common good. The point was made that technology itself is not evil. Any technology can be used to further God's purposes or hinder them. People make those decisions, not technology.

By the very fact that we are called to be stewards of God's creation (Gen. 1:26-28), we need to expand our knowledge of what God has made in order to better rule over His creation. Part of being made in God's image is our creativity. In this sense we "play God" by imitating Him. Our works of art, buildings, management of natural parks, and care for the poor, sick, and disadvantaged all imitate God for the good of His creation.

But we are still creating new creatures that did not exist before. Isn't God the only Creator in that sense? We seldom realize that we are hard-pressed to find in nature today the ancestors of nearly all the plants and animals we use for food or service. Our current varieties of corn, wheat, flowers, cattle, dogs, horses, etc., bear little resemblance to the original stock in nature. That is because we have selected and manipulated them over the millennia for our own purposes. We have already created animals and plants that never existed before. Genetic technology has greatly increased the specificity and power of our abilities, but the nature of what we can do is the same as before.

If we are to play God in the sense of imitating Him as we apply the truth of being created in His image and in exercising our appointment as stewards over all He has made, then we need to do so with humility and compassion. Our

creative abilities should be used to enhance the condition of men and women as we struggle in a fallen world. Genetic technologies can and should be used to help alleviate or even cure the effects of genetic disease.

Is It Wrong to Combine Genes from Different Species?

Have you ever wondered if we should be transferring genes from one species to another at all? Does this in itself violate some ethical principle? One gene does not define a species. Bacteria are composed of thousands of genes and it is estimated that humans possess as many as 100,000 genes. Therefore, transferring one gene from one organism to another does not create a hybrid in the traditional sense. Genes, remember, are composed of DNA. DNA is a molecule; it is not living in and of itself.

If the idea of adding something foreign to an organism is troublesome, just realize that we do this all the time when we take antibiotics, over the counter pain medications, and other synthetic medications. Our bodies would never come across most of these substances in nature.

What is different is that with genetic engineering, we have added something to a cell or organism that will change the composition of that cell or organism, possibly for as long as it lives, and is potentially passed on to future generations. It is reasonable to ask if we have the wisdom even to try to make these kinds of changes. No doubt, genetic technology provides a power never before possessed by human beings: to design intentionally or create a new variety of organism by altering its genetic structure.

Once again, the issues are, Which genes are actually being transferred? and, For what purpose? These questions, asked case by case, should rule our choices, not the inherent legitimacy of genetic engineering itself. Creating crops

internally resistant to disease, particularly to help developing countries better feed their people, is a goal worthy of God's image-bearers.

However, intentionally manipulating the gene of a known pathogenic and deadly bacterium with the expressed intent of creating a biological weapon that is untreatable and incurable is a hideous evil. Kerby Anderson also warns that we need to consider the extent that genetic manipulation may cross over barriers God instituted in the created kinds.{4} If God felt it important to create boundaries of reproduction that his creatures were to stay within, we ought not cross over them ourselves (Gen. 1:11, 12, 21, 24, 25).

It is certainly possible for genetically modified organisms created for agricultural and medical purposes to develop in ways not planned or foreseen. Therefore, it is necessary that proper and extensive tests be performed to assure, as much as possible, that no unnecessary harm will come to the environment or to humans. As vague as this prescription is, it only serves to reinforce the necessity of further education on the part of everyone to ensure that this powerful technology is used responsibly. We simply cannot afford to be ignorant of genetic issues and technologies and expect to contribute to the necessary discussion that lies ahead.

Notes

1. An excellent resource for Christians on this topic is *Genetic Engineering: A Christian Response*, Timothy J. Demy and Gary P. Stewart, eds. (Grand Rapids, MI: Kregel Publications, 1999)
2. *Gattaca*, a film by Andrew Niccol, A Jersey Films production, distributed by Columbia Pictures, 1997.
3. Allen D. Verhey, "Playing God," in *Genetic Ethics: Do the Ends Justify the Genes?* (Grand Rapids, MI: Eerdmans Publ. Co., 1997), 60-74.
4. J. Kerby Anderson, "The Ethics of Genetic Engineering and

Artificial Reproduction," in *Genetic Engineering: A Christian Response*, Timothy J. Demy and Gary P. Stewart.

©2000 Probe Ministries