



Session IV

What is the Perspective from Bioscience?



*“Jesus’ call
to us
is ultimately
to be
good members
of the kingdom
no matter
what our
profession is.”*

Let’s see if there are some uniquely biological spins that we can put on the questions we need to ask. First, let me remind you of the basics and how they apply for biologists. I think we would agree that our main motivation ultimately is what I’ll call the “kingdom mandate.” Matthew 6:33 (NIV) says:

*Seek first his kingdom and his righteousness
and all these things will be given to you as
well.*

Hallelujah! That’s what we like to sing. That’s the kingdom mandate. Jesus’ call to us is ultimately to be good members of the kingdom no matter what our profession is. And though that may seem obvious, the “real rub” is to discover what the kingdom mandate means to me as a Christian biologist. What should it look like? How do I flesh it out? It’s a great starting principle. We would all agree that the ultimate goal is to be good subjects of the King. I’d like to suggest a few ways in which being a good member of the kingdom of God interfaces with how I run my life as a biologist. While these things are not in rank order, I would like to describe some very basic biblical principles.

Jeff Hardin, M.Div., International School of Theology, Ph.D. Biophysics, University of California-Berkeley, did his postdoctoral work at Duke University. In 1991, he joined the faculty of the department of zoology, University of Wisconsin-Madison, where he is currently an associate professor. His research into the morphogenesis of early embryos has resulted in recognition as a Lucille P. Markey Scholar in the biomedical sciences and a National Science Foundation Young Investigator. Dr. Hardin also has been recognized for teaching as a Lilly Teaching Fellow, and has received awards for his use of technology in teaching. He is a co-founder of the University of Wisconsin Teaching Academy. With Wayne Becker and Lewis Kleinsmith, he is co-author of *The World of the Cell* (Benjamin-Cummings).

Doxological Fascination

For me, seeking the kingdom as a biologist means that I do what I do with “doxological” fascination. By that I mean *bringing glory to the King*. So we need to ask ourselves, “Does our research encourage us to praise the Creator and revel in his creation?” I don’t believe that God wants us to see biology as drudgery. Now admittedly there are some unpleasant things that we do as biologists, but at ground level we need to be excited about biology as an act of worship. So in that sense, bringing glory, doxology, and fascination means being really fired up about what we are studying and being motivated to try to unlock the secrets of our research.

Let’s look at Psalm 19. We talked about Frances Bacon using a two-book metaphor. Where does that two-book metaphor come from? One place is in this passage:

The heavens declare the glory of God. The skies proclaim the work of his hands. Day after day they pour forth speech; night after night they display knowledge. There is no speech or language where their voice is not heard. Their voice goes out into all the earth, their words to the ends of the world. In the heavens he has pitched a tent for the sun, which is like a bridegroom coming forth from his pavilion, like a champion rejoicing to run his course. It rises at one end of the heavens and makes its circuit to the other; nothing is hidden from its heat (Psalm 19:1–6, NIV).

In this first strophe of Psalm 19, the Psalmist is saying, “You know what? The universe is cool!” You really get the feeling that he is reveling in it. He is luxuriating in how awesome the creation is. And in that sense, God’s creation is a book. It reveals something about its Creator that we can

only get through it. In verse two, it says: "Day after day they pour forth speech." "Pour" is from a Hebrew word that means to bubble up from the ground. Remember how the crude oil bubbled up from the ground in "The Beverly Hillbillies"? Well, that's what this idea is. The creation is bubbling forth praise of the Creator. That needs to be the bedrock upon which we do our biology. Francis Bacon said: "Let no man think or maintain that a man can search too far, be too well studied in the book of God's word or in the book of God's works."¹ Interestingly, Darwin quotes these words in his preface to the *Origin of Species*.

Francis Collins, who is a believer, heads the NIH's portion of the human genome project. He said this about the same idea:

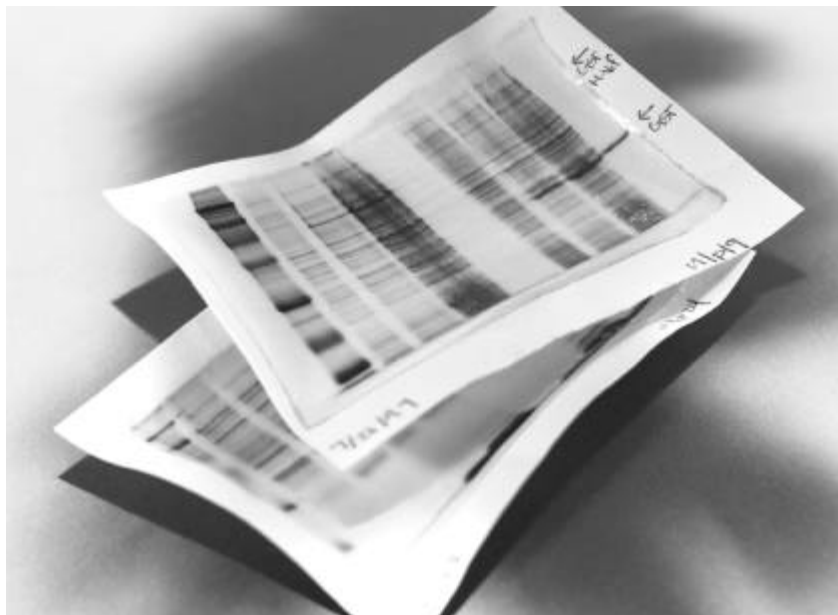
The work of a scientist involved in this project [the human genome project], particularly a scientist, who has the joy of also being a Christian, is a work of discovery which can also be a form of worship. As a scientist, one of the most exhilarating experiences is to learn something ... that no human has understood before. To have a chance to see the glory of creation, the intricacy of it, the beauty of it, is really an experience not to be matched. Scientists who do not have a personal faith in God also undoubtedly experience the exhilaration of discovery. But to have that joy of discovery, mixed together with the joy of worship, is truly a powerful moment for a Christian who is also a scientist.²

To Francis Collins, unlocking the secrets of the human genome is an act of worship. So that's one of the things that seeking the kingdom as a biologist means.

Stewardship of Creation

Seeking the kingdom also means that we need to be part of the overall biological enterprise of Christians being stewards of creation. By that I mean *caring for the world of the King*. One of the justifications for this comes from Genesis 1:27-28 (NIV):

So God created man in his own image, in the image of God he created him; male and female he created them. And God blessed them and said to them, "Be fruitful and increase in number; fill the earth and subdue it. Rule



over the fish of the sea and the birds of the air and over every living creature that moves on the ground."

Clearly human beings have dominion. If, as Christian biologists, we are going to be concerned about practical application of knowledge from basic biological research, then we need to be concerned about this dominion issue. We have a responsibility to fill the earth, and I think we have done a good job of that as a human species, to a degree. But, in addition, we have a role to care for the earth. One of the things that we want to ask is, "In what ways can Christians who are biologists uniquely speak to this issue of stewardship?" In particular, in Genesis 1 and 2, we have the good news of God creating a very good world, but in Genesis 3 we have the bad news. And the bad news is that the effects of the Fall have tarnished, in many ways, God's original intent for the creation. This means that part of the stewardship mandate now is to exercise a restorative function with regard to creation. Stewarding creation means caring for the world of the King and trying to undo, in some sense, the physical results of the Fall of the whole creation.

Healing Restoration

Now we can move to another idea, which I think is part and parcel of a uniquely Christian biology. We need to think about ways in which Christian biology can address healing restoration. By that I mean *caring for the people of the King*. If we take a look at Genesis 3:16-19 (NIV), we learn something interesting. The Fall has happened. The

Stewarding creation means caring for the world of the King and trying to undo, in some sense, the physical results of the Fall of the whole creation.



Session IV

*Does my
research topic
encourage
or
discourage
God's values
and
work out
his principles?*

What Discipline Perspectives Guide Us In Choosing a Research Topic?

Bioscience

eyes have been opened. The serpent has just been cursed. He now has to crawl around on the ground, and he is going to get into some kick boxing with the human species. Then in verse 16 we read:

To the woman he said, "I will greatly increase your pains in childbearing; with pain you will give birth to children. Your desire will be for your husband, and he will rule over you." To Adam he said, "Because you listened to your wife and ate from the tree about which I commanded you, 'You must not eat of it.' Cursed is the ground because of you; through painful toil you will eat of it all the days of your life. It will produce thorns and thistles for you, and you will eat the plants of the field. By the sweat of your brow you will eat your food until you return to the ground, from it you were taken; for dust you are and to dust you will return."

The effects of the Fall encompass both the creation and human beings as part of the creation. One of the results seems to be some reproductive difficulties for the human species. A distinctively Christian view makes biology part of the healing process.

Ethical Reflection

Christian biology also involves ethical reflection. People of the kingdom need to *live by the rules of the King*. If we go back to Psalm 19, we get a nice taste of ethics. The first six verses have to do with the book of God's creation. But then the Psalmist goes on and switches gears in verses 7–11 (NIV). He says:

The law of the Lord is perfect reviving the soul. The statutes of the Lord are trustworthy, making wise the simple. The precepts of the Lord are right, giving joy to the heart. The commands of the Lord are radiant, giving light to the eyes. The fear of the Lord is pure, enduring forever. The ordinances of the Lord are sure and altogether righteous. They are more precious than gold, than much pure gold. They are sweeter than honey, than honey from the comb. By them is your servant warned; in keeping them there is great reward.

The Psalmist ties the book of God's creation to the book of God's Word. For him

these are inextricably linked. And so the Christian biologist needs to maintain that inextricable linkage. God's Word shows what right living ought to look like. So I think Christian biologists need to ask, "Does my research topic encourage or discourage God's values and work out his principles?" That's a very general question. And yet I think it is one we don't often ask. This is where I believe the Bible provides some unique insights. For example, in the account of the Fall in Genesis 2, recall that the command was given: "... *you must not eat from the tree of the knowledge of good and evil* ...". From the creation narrative, we get the sense that human sinfulness requires restraints on knowledge. So the Genesis narrative prefigures the Pandora's Box problem. We should ask, "Is human ethical behavior sufficient to restrain the implications of human knowledge?" That's where biblically based ethical reflection can be pretty powerful. This includes looking at inappropriate uses of technology.

I am a developmental biologist. Reproductive technology is a booming industry. We manipulate human embryos very frequently. How should we feel about that? Livestock cloning has become a routine process. I live in Madison, Wisconsin. There is a company there that routinely clones cows. The first reported cloning was in 1997. That is how fast this technology is moving. In the UK and continental Europe, genetically modified foods are a big thing. How do we feel about that? Are there inappropriate technologies that we should totally avoid? If so, then clearly there are going to be some things that are ethically out of balance for us as believers and as biologists.

I mentioned Francis Collins, director of the Human Genome Project. Are there any things that we should be ethically troubled by as biologists that are going to come out of the Human Genome Project? Well, I think there might be. Collins mentioned his daughter having some reservations about pre-natal genetic diagnosis. Well, we're going to get better and better at doing that. We will have genetic tests for many conditions that are completely debilitating from birth. We also have tests for genetically predisposed conditions that may only manifest

themselves later in a person's life. How should biologists handle that? Unless we think biblically, we are not going to come up with correctly framed answers to these kinds of questions. But as Christian biologists, I think these answers need to be part of how we choose what kind of research we decide to do.

We should ask, "Is human ethical behavior sufficient to restrain the implications of human knowledge?"

Let me give you an example. I am in the Zoology Research Building on the Madison campus and next door to me for a long time was a good friend of mine. He works on the biology of what happens after fertilization. Once you fertilize an egg, the two nuclei move together and fuse in a movement known as pronuclear migration. He studied this and is, without doubt, the world's expert on pronuclear migration. He studied things like sea urchin embryos and mice, which do not create ethical problems. He studied rhesus monkeys—we're getting a little warmer now. Eventually he started studying leftover material from human in vitro fertilization clinics. In the United States, it is legal to perform research on this material. If the embryos were fertilized for the express purpose of experimentation, that research, if federally funded, is prohibited by federal law. But you can use private funds to do research on leftovers in this way. So he did some experiments on leftover human embryos, investigating various properties about them.

He had obtained these human embryos from a fellow at the University of California at Irvine, who ran an in vitro fertilization clinic. Typically in obtaining oocytes from women, you superovulate the woman by giving her fertility drugs. The woman releases multiple oocytes, which are collected and fertilized. Typically all of those are not re-implanted into the woman. The man from UC Irvine took the leftovers and shipped them out without informing the women from whom the oocytes were obtained. He saw no ethical problem with that. Of course, other people did.

I am troubled by the fact that we as Christian biologists don't talk about these kinds of things in a coherent manner. I don't remember a single discussion that I have been in about these kinds of issues. Typically, we are very reactive about these sorts of things. So when we pick research topics we need to ask before we get into those situations, "Do I want to put myself in a position where I might find myself in an ethical quandary of this sort?"

Cultural Reformation

The fifth thing that needs to be part of our kingdom mandate as biologists is what I'll call "cultural reformation." By that I mean *spreading the message of the King*. Here we have a very Calvinist idea. Although I don't come from that tradition, I resonate with it very strongly. This basically boils down to fleshing out the great commission. Matt. 28:19–20 (NIV) says:

Therefore go and make disciples of all nations ... teaching them to obey everything that I have commanded you ...

Cultural reformation is an extension—a redemptive extension—of the great commission into the culture at large. In this sense then, in choosing a research topic, I think that a legitimate question to ask is, "Does my research encourage or discourage God's values in the world generally?" These values may not be explicitly framed in a biblical sense in the culture at large. Another way to ask it is, "Can I bring, based on the research I do, God's values to the societal table?"

Arthur Holmes said:

[I]f all truth is ultimately God's truth, then we have no reason to denigrate some areas of learning by regarding them as either worldly or as beyond help or as having little or no importance. On the contrary, such learning needs to be restored to the wholeness of God's truth from which it is torn.³

What I think he means is that basic research, including basic biological research, is an area where we can have a redemptive influence. In particular, by restoring the context where it is done, we can be, in some sense, God's agents of redemption within the biological community. Charles Harper calls people doing that "subtle interlocutors," that is, when opportunities arise in our respective fields, we take the opportunity to be agents of redemption. Thus, we can ask, "Are there particular areas that I might decide to research specifically because there may be more opportunity for this kind of redemptive influence?" I'm not saying I know the answer, but I think that's one way to think about it.

Charles Malik said: "The problem is not only to win souls, but save minds. If you win the whole world and lose the mind of the world, you will soon discover that you have not won the world."⁴ And elsewhere he said: "I know of no more important question to ask than, 'What does Jesus Christ think of the university?'"⁵ He means that we need to apply a Christian critique to our culture. Our "culture" is biological research, the community of scientists who engage in it, officials at the federal level who fund it, and leaders in the private sector who encourage proprietary research. That's the culture to which we need to speak.



Session IV

*How does
picking a
research topic
affect
my spiritual
formation—
my ability
to become
a person
of the King?*

What Discipline Perspectives Guide Us In Choosing a Research Topic?

Bioscience

One thing that we can say, as believers, is that our Christian faith allows us to provide a meaning for biology by providing a larger context for our work. Terry Morrison talked about the first chapter of Colossians where the cosmic Christ is a “glue” that holds everything together—both the material and the immaterial world. This is the ultimate cosmic context within which to do biology.

Secondly, you might be motivated to explicate the work of the Creator. If we believe Colossians 1 to be true, then in some sense we engage, as the Psalmist did in Psalm 19:1–6, in art appreciation every time we do science. Some people would like to say more, that we can actually explicate evidence for the Creator. That’s a stronger kind of statement. So one possible motivation is to choose a research area with the express purpose of trying to show evidence for the Designer of the world. Now I know there are vehement differences of opinion about this, but I think it is fair game for us to discuss it here.

Finally, I think Christian faith helps us avoid (to borrow a term from our humanities colleagues) a deconstruction of people by naturalistic reductionism. We know functionally that most of us are reductionists in our day-to-day research. I certainly am. However, I am not a philosophical reductionist by any stretch of the imagination. I think there may be situations where we, analyzing the parts, can show that there is a failure to appreciate the whole. That is true in issues like the mind/body problem or the brain/mind issue and the Creation with a capital “C” that Cal DeWitt likes to describe. You can’t view that atomized. You must view it holistically to fully appreciate it, and I think Christians have a unique spin on it that we can bring to the table.

Spiritual Formation

So far we have been talking about Christian biology and ways we can do biology in select research topics, or research emphases within those topics, that make us good citizens of the kingdom of God. We know that God calls us to be more than good external citizens of the kingdom. He expects our *hearts* to conform to the kingdom. Thus,

choosing a research topic needs to have our own spiritual development in mind. That may seem nuts, but in thinking about our careers, about the kind of research we want to get into, there are questions we need to ask. One such question is, “How does picking a research topic affect my spiritual formation—my ability *to become a person of the King?*”

I firmly believe that there are certain areas of biology that some of us, given our giftedness and our situations in life, probably shouldn’t go into because of the demands that they would place on us. They are inappropriate for us. For example, my wife and I are a team to care for our younger son who has autism. We are trying to balance him with our older, 13-year-old son. It is inappropriate for me to do extensive fieldwork, where I am gone for eight months out of the year. In situations like that, we have to ask questions about the appropriateness of a particular research path. If I am in a competitive area that’s really going to require that I spend fourteen hours a day in the lab, I need to ask, “Is that appropriate?” In my opinion, that’s a great question which we should not brush under the carpet and say, “Well, you may have to make sacrifices and work hard.” Although that may be true, some sacrifices may be inappropriate for us to make.

Let me suggest a few ways in which we can get into trouble. This is not restricted to biology, but certainly includes biology. Most of our career paths are prone to busyness. Pascal in the *Penseés* said: “If our condition were truly happy we should not need to divert ourselves from thinking about it.”⁶ In other words, we complain about being busy all the time, but you know we actually like it! It keeps us from thinking about those niggling questions in the back of our mind that are troubling us about ultimate issues. Busyness is a salve that temporarily covers that wound, at least until we rip it open again.

As biologists, we are also prone to pride and ambition like that in every other field of science. One thing the Bible frequently condemns is being a fool, that is, being a spiritually proud person. In academia, we are prone to that and get into areas of biology because they are hot and because we

get “strokes” for doing them. To me that’s an incorrect motivation.

Some paths are clearly prone to self-sufficiency. I think you have to look into your own heart about this one, but there are certain areas of biology where you know this to be true. I think of people like Jane Goodall, who is out by herself. Maybe she can manage that, but you may need to ask yourself, “Will I get into trouble with that type of research?”

John Calvin said:

For God has not granted his servants such a great benefit that each of them has been endued with full, perfect, and absolute knowledge. No doubt he does this partly to humble us, partly to keep us in zeal for brotherly communication.⁷

What Calvin was saying is that none of us has all the answers, so we need other scholars. To the extent that your biology pulls you away from interdependence—that’s something to think about. That’s a potential warning sign. It may not be a definitive one, but I think it’s something to think about.

Ultimate Integration

Ultimately, I think the goal for all of us is integration. By that I mean *becoming whole servants of the King*. If we are devoted followers of the King, then the ultimate goal is that we will become whole, devoted followers of the King. In that sense, we should ask, “Does my research topic fit me as a total person with unique gifts and giftedness?” In the first chapter of James, it says that if we ask God for wisdom, he will grant it to us. I think this is an area where we need deep wisdom. Ultimately, what an integrated life looks like is going to be different for each one of us. I think there is no way to legislate the integrated life. For each of us, our answer is going to be different. Part of the answer to that question is going to be, “What kind of research is appropriate for me to do?” Part of it is going to be a career decision, “What kind of job do I want so I can do a particular kind of research? Do I want a large research university? Do I want a high quality Christian liberal arts college? Do I want a secular, but smaller school? What kind of environment do I want?” No one, except us, can provide answers to these questions. However, we can kick these ideas around in community, and ultimately that’s the goal. Nicholas Wolterstorff calls that “the search for shalom.” I really like that idea. He said:

The goal of human existence is that man should dwell in peace in all his relationships: with God, his fellows, with nature, a peace which is not merely the absence of hostility ... but a peace which at its highest is enjoyment. To dwell in shalom is to enjoy living before God, to enjoy living in nature, to enjoy living with one’s fellows, to enjoy life with oneself. Never can there be

shalom without justice. Yet shalom is more than justice ... In shalom there is delight.⁸

Whatever we ultimately choose to do as biological researchers, I think God wants us to delight in shalom. He wants us to love doing our research. He wants it to seem like it’s not fair that we should be paid to do it. I believe that’s what he wants. The task for all of us is to ask the questions to help us get to that end point. That, I think, is the struggle for us. Clearly the answers to these questions are going to be different for each one of us. Are there some things that should be distinctive about Christian biologists? What should we look like, if we consider ourselves Christian biologists? Things I’ve said are not really earth shaking, but they are good starting points for us to flesh out the particulars. ☆

Notes

¹Francis Bacon, *The Advancement of Learning*, I.3. (1605) quoted in the frontispiece to Charles Darwin *On the Origin of Species*, 6th ed. (1859). Bacon’s work is available online at: <http://www.uoregon.edu/~rbear/adv1.htm> Darwin’s is available online at: <http://www.literature.org/authors/darwin-charles/the-origin-of-species-6th-edition/index.html>

²Francis Collins, “The Human Genome Project,” in J. Kilner, R. D. Pentz, and F. E. Young, eds. *Genetics Ethics: Do the Ends Justify the Genes?* (Grand Rapids, MI: William B. Eerdmans, 1997), 96.

³Arthur Holmes, *All Truth is God’s Truth* (Grand Rapids, MI: Eerdmans, 1977), 27.

⁴Charles Malik, *The Two Tasks* (Westchester, IL: Cornerstone Books, 1980), 32.

⁵Charles Malik, *A Christian Critique of the University* (Downers Grove, IL: InterVarsity Press, 1982), 24.

⁶Blaise Pascal, *Pensées*, in *Pascal (Great Books of the Western World 33)*, R. M. Hutchins, ed. (Chicago: Encyclopedia Britannica), 203 (reprint 1952, Pensée 165b).

⁷John Calvin, preface to *Commentary on Romans* quoted in E. Harris Harbison, *The Christian Scholar in the Age of the Reformation* (New York: Charles Scribner’s Sons, 1956), 152.

⁸Nicholas Wolterstorff, *Reason within the Bounds of Religion*, 2d ed. (Grand Rapids, MI: Eerdmans, 1984), 114.



Session IV

Discussion Session

What Discipline Perspectives Guide Us In Choosing a Research Topic?

Bioscience



Lee DeHaan is a graduate student studying plant genetics at the University of Minnesota.



Martyna Elas is a post-doctoral researcher investigating radiation oncology at the University of Chicago.

Audience: You said that God wants us to delight in our topic of research. How compatible is “delighting in research” and “the long, hard painful road to research” that Charles Harper referred to earlier?

Hardin: I don’t mean to imply that every waking moment of every day is a delightful experience for me. After filling out the sixth recommendation for a premedical student who wants to go to medical school in one day, I am not exactly delighting in my work, although writing recommendations is part of my job. I agree with Charles when he described “a process.” The process may be a little bit labyrinthine and varies for different people. I know people for whom everything seems easy. I look at them and really fight envy. For some of us “to delight” is more difficult than for other people. No job is perfect, and so you are going to have to make compromises.

Joy, a postdoctoral fellow, and I were talking yesterday about the decisions she is facing. In her words, “I really like research, I really like teaching, and I don’t see many jobs where you can combine those in a nice way. It’s going to make me sad to give something up.” I think part of the nature of the beast is having to make some compromises. You must weigh the bedrock things that are personally important to you.

Audience: I have a controversial issue and question. I want to focus on the issues involved with animal research, but I have been in an isolated science community. At the same time, I have been in a pretty conservative church. These two communities are basically opposite. How can people who struggle with ethical questions of animal work bring their concerns to the members of their church? What biblical information becomes part of the decision making?

Hardin: In my personal situation, I don’t work with anything that my university considers to be an animal. I work on a little nematode worm, which was the first higher animal whose genome was sequenced. It was the template for what they did with the human genome. We know a

little about these tiny worms, but they are not furry, they don’t have backbones, and so the university considers them biological material. I used to work with sea urchins, which the university considered as seafood rather than as animals! Are there people here that have extensive work with animals? A lot of us, right? So a good question is, “To what extent is that appropriate stewardship?”

Audience: We don’t want to be cruel to animals but we just need to use them to provide solutions for human life. Should we use animal life to help other animal life?

Hardin: Some would say to hold humans as higher animals is “speciesism” as Peter Singer from Princeton has said. It is not a total given in our society that humans are considered to be higher animals, therefore justifying the use of other animals in research. Are there other thoughts on research use of animals?

Audience: I basically agree with what you are saying. The thing that gives me great pause is pain research that uses animal models. That seems very difficult to do. While I think it needs to be done, I could not have joy in doing that research.

Hardin: There are no easy answers in that situation. Without arguing from the creation mandate for the ethical use of animals in research, it becomes difficult to justify that research.

Audience: Can you justify sacrificing animals for educational purposes rather than for research?

Hardin: When gaining knowledge requires the sacrifice of the animal, the issues become much more intense for biologists. This is an area where we are really different from physical science people.

Audience: I do research with animals as experiments but they are sacrificed at the end. To be honest, the idea that it’s going to help someone else is nice and certainly it leads to grants etc. but that’s not particularly why I am doing it. I

am a mathematician and a modeler so I am very removed from the idea of helping someone else. I am having a hard time justifying what I do for that reason. In this area of research is it warranted to kill animals?

Hardin: Good question. What do you think?

Audience: I can speak to that because we sacrifice a lot of mice and rats. And we sacrifice them before the experiment even begins. At one point, I did have a problem killing these poor little mice. A lot of them are very cute, especially the brown ones. In this work, I came to realize and understand more what it meant to have dominion over the animals. I see a “care versus cosmetics” dichotomy. I don’t think I can ever do research on an animal so that someone can wear mascara. I don’t necessarily think it’s bad that we have cosmetic products but they are not necessary in the same way as understanding about medical, physiological, or immunological processes. But it is sufficient justification that something we do in our lab can result in better scientific understanding so that someone else can develop something that can help people breathe better.

Audience: I don’t work on animals but when I have a mouse in my kitchen I don’t think twice about killing it. Most people consider a pest like a mouse not nearly as significant. However, there is a minority being more and more vocal about the sanctity of all life.

Audience: For Christians, is there a difference between a mouse and a monkey? But what is our stand on it? I’m not expecting it to be the same for everybody. I think that with a science background we’ve seen more differences between animals than the animal rights groups.

Hardin: Some people would say the level of sentience is important.

Audience: But, for us, is the issue dominion?

Hardin: Yes, but you could still argue that dominion is exercised differently over beings that have different levels of sentience. I think one could make that argument. You are not going to find anything about primatology in the Bible, so I think that you have to argue from principle.

Audience: I used to do experiments that required sacrificing a lot of rats. We used to isolate enzymes from their livers. I am not sure I could have done the same work if it was on chimpanzees. I would need a stronger reason for using chimpanzees as opposed to rats, or be more careful about minimizing the suffering.

Hardin: I think those are all extensions of this issue of dominion.

Audience: If animal use in research is an issue and a problem, then who is developing new alternatives?

Audience: For some things, you are not going to have an alternative. In other cases, there are alternatives. For example, many people have developed recombinant DNA technology—splicing the gene into bacteria and then just growing bacteria and harvesting the enzymes so that you are sacrificing bacteria rather than mammals.

Hardin: Charles Harper said that we don’t want to put out a bunch of people who are trying to slay philosophical dragons. And yet he called for us to raise up a cadre of “subtle interlocutors.” I am not sure exactly what he meant by that, but let’s think about this question without trying in a Quixotic fashion to slay windmills that don’t need to be killed. Are there explicit ways in which Christian biologists should think about their research topics that would help to fulfill this idea of what I call cultural reformation? Are there areas we should go into that will contribute in some more explicit sense to the praise and glory of God and in some sense be saltier and brighter to our society? I can think of several areas that we could kick around. One is the Intelligent Design movement. If you subscribe to the view of Michael Behe that irreducible complexity is out there, one possibility is to show that some things are irreducibly complex. You could investigate something with the express purpose of doing that.

We could discuss the area of neuronal function. We had a lively discussion around lunch today about brains and minds. What is the nature of a mind? Is there a soul out there? Should we get into mind/brain research with the express purpose of trying to explicate that interaction in a way that is consistent with Christian thinking?

Environmentalism is another important area. Should we forget about Gaia but talk about God’s world instead? Should we specifically encourage Christians to work in those areas? If you are an advanced graduate student, you have the opportunity in choosing a postdoc to get into an area that could potentially impinge on these kinds of ideas. What do you think about that? To what extent should we think about “apologetic” biology? Is that appropriate?

Audience: I certainly think it could be, but I think it is also useful to have a perspective of what’s gone on in physical sciences in the last forty years. Probably forty or fifty years ago, there was a lot more hostility to Christianity in the physical sciences than there is now. What changed that? Did we find, when we examined the big bang theory of cosmology, that there’s real evidence for God? It wasn’t that. One of the changes in the physical sciences was a growing sense that this universe is really neat and it is okay for us as scientists to admit that fact! So non-Christians in the physical sciences can see how you can be a Christian. They can see how it might yet make sense to be a Christian. This decrease in hostility to Christianity has been due partly to an awareness that the physical universe is really neat and our knowledge as physicists and cosmologists has a limit. I think that same sort of thing could happen in the biological sciences.

Hardin: It sounds like a “wait and let it shake out” approach.

Audience: You can accelerate that process by constantly pointing out in private conversations and writing just how wonderful all this stuff is! It’s okay as scientists to talk about wonder!

Audience: I think the physical scientist may have embraced a little bit more humility than biological scientists. Physical sciences have had their entire world view reshaped by things like the big bang and varied views on cosmology. I think biologists



Session IV

What Discipline Perspectives Guide Us In Choosing a Research Topic?

Bioscience

have yet to go through that kind of humbling process where the way they explain the world has been completely turned around.

Audience: Colin Russell was describing that in terms of going into a research topic with preconceived notions. I think that it is okay to study what the world is studying if we are yearning and praying for God to reveal himself through that. If we're studying species or whether God uses evolution as a process, God is going to reveal that to us in his work. I am not so sure that we have to set out to disprove things as much as to continue proving what is true about God's creation.

Audience: What about that term, "subtle interlocutors"?

Audience: I took it to mean not just as showing scientists where they are wrong but also showing other Christians where scientists are right. When I went to a creationist meeting, I felt uncomfortable because there wasn't a humble appreciation that said maybe we don't understand all of this or an acknowledgment that there is truthful work in science. Certainly evolution, even if you don't agree that it is totally right, has shown us truth that you wouldn't probably have ever come to otherwise about the changing of life.

Audience: Only truth can glorify God. If our goal is something other than finding truth about God's creation then we're going to find something other than truth. Whatever that is simply cannot glorify God because it is not true. Only that which is true about God's creation can reflect him.

Audience: Sometimes we ask, "Should we slay dragons or be those subtle interlocutors?" This is asking the wrong question. The question is not either/or, it is probably both. Jesus said we should be as "wise as serpents, harmless as doves," which implies this second idea. The apostle Paul talks about the warfare that deals with principalities and powers that exalt themselves against God. The Christian is responsible to tear those down, which involves "slaying the dragon." I think God gifts us in different ways. There are some very good dragon slayers around, and I am grateful for them. And there are some others who are more subtle, and I am grateful for them.

Hardin: Is it possible to be a dragon slayer within the system? Let's use Phillip Johnson, a law professor at Berkeley, as an example. One thing that gives him an advantage in many

ways is that he stands outside the system. He's like a prophetic voice crying in the wilderness. And that makes some biologists really mad, I guess. But suppose you are in the system. You've got to apply for grant money to maintain your lab's funding. You have to go up against the machine. Do you rage against the machine? Is that a good tactical move or not?

Audience: About a year ago someone asked me, "I want to research this mind/brain question because I believe for theological reasons in mind/brain dualism. What should I do? Should I hide that fact or should I try and find a professor that will support me in that?"

I thought about that question for a while and tried to answer that person by saying, "It depends on your aim. Is your goal to learn more about God's creation and hope that along the way you'll find some good evidence for dualism?" Then you would be perfectly fine going to a professor of neuroscience who doesn't believe in dualism and find a research topic that interests you both and let the evidence come where it may. If, on the other hand, you focus your effort to prove dualism, you don't want to go work for the average professor neuroscientist. You probably want to locate a niche for yourself.

Audience: Will you define the term "interlocutor" for me?

Hardin: I think "interlocution" is essentially dialogue. If you become the top gun in your field, you have a platform from which you can gently raise issues because of your credibility.

Audience: That fits in with the idea, that if you are involved in this kind of work, it is important to the glory of God to be good in it and earn those credentials. The "subtle" part of the term suggests not to be nagging, but just to be aware of appropriate ways to do dialogue. The appropriate way is to follow the method of science, have a thesis in mind, and then proceed in ways our society and others allow us to function. But you always have to know in the back of your mind that this is the direction you are going. That's being subtle.

A number of years ago an undergraduate Christian student who I happened to know applied to our medical school for admission. When he did not get admitted he came to see me about it. I happened to be on the admissions committee, so it was a bit complicated but I couldn't reveal everything to him. In the interview process when he was asked, "Why do you want to be a physician?" his response had been, "Because God told me to do it." The committee



Randy Kerstetter is a postdoctoral fellow researching biology at the University of Pennsylvania.



Chinedu Njoku investigates veterinary preventive medicine as a postdoctoral researcher at Ohio State University.

interpreted that this was a person who could not think for himself, which was not an unrealistic interpretation for the admissions committee. The student hadn't really thought about it so he did this three times. Later I had the opportunity to sit down and share with him and said, "There might be some other ways for you to answer that question that wouldn't violate your faith." Is looking at other ways of answering that question being a "subtle interlocutor?"

Hardin: Yes, that's getting closer. Sociologically speaking, I don't see a lot of evangelical Christians explicitly moving into origins type research. One of the reasons that you might not want to do that is because these issues come up again and again if you are in that area. Is that a cop out? That's what I am asking. Should someone explicitly go into that area only to show that the "primordial ooze to Albert Einstein" scenarios have real insurmountable holes in them?

DeWitt: Restoration ecology is an area, at least in my own experience, that opens up communications. In our work at Au Sable on Puget Sound, we're engaged in a very major prairie restoration project that includes providing college level courses and doing research in restoration. The project opened up channels for communication as reflected in various questions: "Why would you want to restore a prairie?" or "What's bad about agricultural land that we want to have this come back?" One student who took one of our courses last summer said, "I'll have to get out of here pretty soon because I am soon going to become a Christian otherwise." While the project was not explicitly done as something out of a Christian calling, everyone was working from a sense of calling. It was contagious. A lot of people had never thought about what it means to restore creation.

Hardin: Trying to find cultural resonance is a good thing no matter what field we are in. Are there fields where there's more resonance? That's a tough question to answer because the culture keeps changing. I teach a course in embryonic development at the University of Wisconsin. I begin my opening lecture with the history of embryology and I quote from a Hebrew poet named David. In Psalm 139, David muses about God's omnipresence that includes the womb. With this example, I am trying to draw out resonance with people because anybody who has had a child has a sense of wonder about the process.

Here is a related question. Are there any areas that are ethically off limits for Christian biologists? I would personally argue that there are certain areas of biology that could be considered as "Pandora's box" areas of biology. Once the lid is off, bad things are going to happen. I think that cloning is one of those Pandora's box issues.

Audience: I think there's a responsibility on both sides. I feel like saying we don't go into cloning humans because it's a sanctity of life issue, but I feel that we have been here before with in vitro fertilization. Perhaps, we conceived something that God didn't intend to conceive. What do we do with the result? Shouldn't we be careful to see embryo creations as things that God has allowed to come into being?

Hardin: I think most people say that if you clone a human being, the result is also a human being.

Audience: What if you created a human being without a brain? It has been proposed here.

Hardin: Researchers have put human nuclei into enucleated pig oocytes. Someone at the University of Wisconsin is doing experiments involving nuclear transplantation across species lines, however human material is not being used in that situation.

Since the human genome project is moving forward, there is no reason to think that one could not do germ line transformation of human beings or genetically engineer humans. Usually genetic engineering is justified as a therapeutic intervention to correct a genetic deficit that is transmissible. Are you going to repair that genetic defect so the repair is transmitted in the germ line? What about that? Are there areas like these where we should say "no"?

Audience: Will it make a difference if we say "no"? And how do we as a community discuss this? Some Christians may believe that it is not a problem? Do we make a decision as a group that some things are off limits for Christians? Maybe we could spend some time just proving something else is right.

Hardin: An area where Christians disagree is using human embryos that are left over from in vitro fertilization to produce human embryonic stem cells. The University of Wisconsin is a main center for distributing human embryonic stem cells. What do I do with that as a faculty member? Do I go to those doing it and say, "I think it's a bad idea." How do I engage them?

Audience: We have difficulty in weighing intangibles and tangibles together. We have real benefits and we have potential benefits. We have real harm and potential harm. We don't have a good way of weighing real benefit against potential harm.

Hardin: With stem cells the discussion is almost always potential benefit. However, that seems to be a weak argument, since there has been no demonstrated actual benefit.

Audience: You don't realize the benefits unless you research it.

Audience: The Christian Medical and Dental Society has a well established mechanism ready for dealing with ethical questions. If you go to their web site it will show something already worked out. Perhaps we as Christian biologists should participate fully in a group that has already dealt with some of these issues so we can work on others in the future.

Hardin: Should this kind of forum be replicated? Our gathering is unique in my experience. We have people at different levels in their careers that include the full spectrum from professors to postdoctoral researchers to graduate students.

Audience: It's encouraging that other people are searching and asking how to live your faith and what direction to take. I have things to share when I go back to my research laboratory. ☆