

POSSIBLE INFLUENCE OF GENETIC FACTORS
ON SIN, SANCTIFICATION, AND THEOLOGY

Burton Webb and Keith Drury¹
Indiana Wesleyan University

Abstract:

Emerging evidence in both the scientific and medical literature seems to indicate that several addictive behaviors some Wesleyans traditionally have recognized as sinful may be linked to mutations in specific genetic sequences. Although this does not necessarily indicate a cause-effect relationship, it does raise interesting questions regarding the nature and inheritance patterns of these behaviors. Genetic predispositions toward alcoholism, smoking, drug abuse, and gambling have all been suggested. Schizophrenics are more likely to commit petty crimes and assault than the general population. Some research supporting a genetic link for homosexuality has been in the literature in the last several years. This paper will explore the theological implications of this genetic research by raising important questions for Wesleyan theologians to consider: To what extent is an individual culpable for sin influenced by genetic factors? Should genetic predispositions change the church's view of sin? If we learn to manipulate genes, will "genetic sanctification" be possible?

Presuppositions (Burt)

When writing on a topic as potentially controversial as the possible genetic origins of sin, as a scientist, I should probably start out by stating a few of my presuppositions about both science and faith. By doing this I hope to set a certain framework around the biology that I will present while setting the stage for the material that Keith will address shortly.

1. While I believe that reductionism is not the best way to pursue science, it does provide certain insights, that when placed in proper context, give us valuable information about the world around us. For example, studying the specific genetic defects present in a cancer cell may allow us to understand the origin of that specific cancer, but it will not allow us to understand the complexities of the disease's impact on the person from whom the cell was isolated. Indeed, we may be able, by a reductionist approach, to treat the cancer and save the patient – but at what cost to the patient? What quality of life? What side effects? What relational effects? Humans are complex biological, emotional, and spiritual beings and a reductionist approach to genetics provides limited information about only one of these three aspects of humanity. What I will argue here is that genetic predispositions (genes) and the protein structures they code for can have an impact (subtle or overt) on the emotional and spiritual domains of our humanity.
2. While I am not a genetic determinist when it comes to behavioral traits – I may, occasionally, wander close to that view long enough to point out that our genetic

¹ Burton Webb is Professor of Biology and Keith Drury is Associate Professor of Religion at Indiana Wesleyan University.

and epigenetic make-up influence our choices and behaviors in ways that we are only beginning to comprehend.

3. I am a firm believer in the idea of free will. I do not believe that we are pre-programmed automatons, walking through the motions of a robotic predestined universe. I do not see God as puppet master, but as someone who wanted a reciprocal relationship with humans so passionately that he was willing to risk the possibility that they might reject him.
4. I am also a firm believer in the power of the Holy Spirit to transform a life – no matter what the genetic predisposition.

I suppose there are many other things I could mention in my list of presuppositions, but for this paper, these four should be adequate.

Now, on to the first topic of this presentation: *Do our genes cause us to sin?* Is there any evidence that humans carry genetic material that might influence them to violate the laws of God as presented in the Bible and interpreted by the church? I will begin our discussion with a brief review of basic genetic theory before moving to a discussion of some specific behaviors that many Christians would call sinful – addictive behaviors like alcoholism, and drug abuse – and then turn to more overtly sinful behaviors like crime and homosexuality.

Background: DNA and the House – An Analogy

To understand any of this we must understand something of the central dogma of biology: DNA – RNA – Protein. Deoxyribonucleic Acid (DNA) is a particular kind of chemical capable of storing vast amounts of information in a very small location. By way of analogy, think of DNA as a hard-drive copy of a blueprint for the construction and maintenance of a very large, very complicated house (the cell). Right away, things get complicated because the central room in the house has two non-identical copies of this hard-drive blueprint that are competing with each other to be read by the builders of your house.

DNA is far too large to be read in its entirety by the builders of the house. So, small sections (genes) of the blueprint are copied and sent out to the builders. These small copies of genes are called RNA and each RNA contains only enough of the blueprint to make a small part of the house (cell). The actual structure of the house is made of another material called protein.

Think about a house for a minute. Is everything in the house made of the same stuff? No, of course not. Houses are made of metal, plastic, drywall, wood, stone – all sorts of things. Your cells are no different; they are made of a variety of building materials (proteins, lipids, carbohydrates, ions, etc) and each component has an enormous number of possible designs. In the cell, the blueprint (DNA) contains the designs for about 30,000 different proteins. Some are structural, like the wood studs that most houses have in their walls, and some are more functional like a doorknob.

Having two different blueprints can be both a blessing and a curse. For example, you get two different kinds of doorknob designs to choose from. You can either make them in roughly equal

amounts in each room, or you can choose to use one over the other. Sounds like a nice design feature doesn't it... but wait, there's more! Let's say one of your doorknobs doesn't work properly. It is possible to completely turn off that section of the blueprint! In the cell, this epigenetic² change is called methylation. Once methylated, a gene is completely inactive – that style of doorknob can no longer be made.

Finally, when your cells divide the entire blueprint must be copied. This is no small feat; there are over 3 billion letters in the blueprint that are copied one letter at a time. Needless to say, mistakes are occasionally made and the results can be inconsequential, beneficial, or disastrous – depending on the mistake³. The ability of DNA to be changed is the basis for all of the biological diversity that we see around us⁴ – and it gives humans many strange looking doorknobs.

Do our Genes Pre-dispose Us to Sinful Behaviors?

It is not my goal to argue whether this behavior or that behavior is sinful. I will leave that to the biblical scholars and the theologians (perhaps Keith would like to shed some light on that). In this section I will talk about the published evidence that *seems to indicate*⁵ a genetic link to addictive behaviors, violent crime, and homosexuality.

Addictive Behaviors:

Early studies of addiction to alcohol focused on the pleasure centers of the brain and the genes that regulate the pleasure response. 15 years ago a variation in OPRM1, a gene coding for an opiate receptor (pleasure response), was implicated in about 15% of people with alcohol addiction. We all carry all carry this gene, but in some people the shape of the protein it codes for is slightly different (a different style doorknob). When a person drinks alcohol it stimulates the release of a group of chemicals called endorphins. These endorphins, in turn, attach to the opiate receptors in the brain and stimulate a pleasurable feeling. In the brain of a person carrying the altered form of OPRM1, the endorphins stimulate a response that is both stronger and longer

² Epigenetic literally means above the genes. Indeed, this is what the change appears to look like at the molecular level. Bases that make the DNA molecule have carbon-hydrogen (methyl) groups added to them thereby changing their appearance from the “top”. These methylated genes are no longer used for making RNA and proteins.

³ Mutation in the DNA is a tricky thing. Mutations are fairly common and most do not result in any substantial change in the way a cell operates. We have enough extra DNA that acts as insulation against mutation, and the code itself has a certain redundancy/degeneracy.

⁴ In addition to carrying the information necessary to make proteins, plants and animals need two things out of their DNA – stability and instability; stability from the point of view of the individual and instability from the point of view of the species. The ability to adapt and change to environmental pressures is central to our understanding of biology.

⁵ Scientists are very good at using words like “seems to indicate”. Everything we do in science is a prediction about the world around us that is based on certain theories and statistical probabilities. Scientists must be cautious and err when they make pronouncements about biology with too much certitude.

than what the rest of the population experiences⁶. In other words, the shape of the doorknob allows the door of pleasure to remain open for too long. These people are addicted to feeling *really* good. Their use of alcohol feeds the good feeling and they are prone to use it to excess. Dozens of studies have been conducted comparing families with significant numbers of alcoholics in them to families without alcoholics. Among the most robust is a study published in the journal *Addiction Biology*⁷ that compared the genomic DNA of 2310 individuals from families of alcoholics to 1238 individuals from control families. In this paper, Edenberg and his colleagues at the Indiana University School of Medicine were able to demonstrate strongly significant correlations between alcoholism and at least three clusters of genes: GABA receptors, ADH genes, and the gene for the muscarinic acetylcholine receptor, M2. Perhaps the most significant was one of the GABA receptor genes called GABRA2. At present over 31 mutations (called SNPs in the literature⁸) are strongly associated with alcohol dependence, one of them has a P value = .000000022 (.01 is normally considered significant). Carrying a mutation in the GABRA2 gene causes the individual to be at significant risk of developing alcohol dependence in their lifetime.

Crime and genetic indicators:

Crimes are committed for a variety of reasons – poverty, lust, power, greed, to name but a few. Can we add bad genes to the list? In a paper published by Per Jensen in the *Journal of Neurology, Neurosurgery, and Psychiatry*⁹ the answer maybe, yes. In this work, Jensen compared crime rates in individuals suffering from Huntington’s disease (a single gene disorder) to unaffected relatives and the general population. He found that men who carried the Huntington gene were several times more likely to commit violent crime, seven times as likely to be arrested for drunken driving, and twice as likely to commit any of the types of crimes studied. But this observation is by no means the end of the story. Several genetically associated mental diseases like schizophrenia and major affective disorder have been correlated with an increased risk for the commission of crime. Indeed, one need look no further than the Marion county jail to determine that crime must be linked to one prominent genetic marker – the Y chromosome.

⁶ Markus Heilig *Triggering Addiction – Molecular biology teases out two distinct forms of alcoholism*. (2008) *The Scientist*.

⁷ Howard J. Edenberg, et al *Variations in GABRA2, Encoding the $\alpha 2$ Subunit of the GABAA Receptor, Are Associated with Alcohol Dependence and with Brain Oscillations*. (2004) *American Journal of Human Genetics*.

⁸ A SNP or single nucleotide polymorphism is a point mutation in a particular gene. Our DNA is loaded with SNPs and they are responsible for most of the diversity that we see between member of the same species.

⁹ Per Jensen, Kirsten Fenger, Tom G Bolwig, Sven Asger Sørensen, *Crime in Huntington’s disease: a study of registered offences among patients, relatives, and controls*. (1998) *Journal of Neurology, Neurosurgery, and Psychology*.

A gay gene?

Since the 1980's several papers have been published suggesting a link between homosexuality (particularly in men) and genetic factors. The majority of the data point to 1.) Familial inheritance patterns, 2.) Genetically correlated twin studies, 3.) Birth order/number of older male siblings, 4.) Hormonal influences *in utero*, and finally certain 5.) Genes¹⁰. In a highly controversial paper, Dean Hammer¹¹ reported that there might be an altered form of a gene on the X chromosome that was associated with homosexual behavior. Hammer's hypothesis has been both confirmed, and confounded in the literature. Leading to a certain amount of confusion regarding his work. More recently, genome-wide analysis of homosexual and heterosexual men has revealed three additional loci of interest. However, we have no solid evidence in humans... yet.

But, what of other species? Recently, a gene has been identified in *Drosophila* that codes for a glial amino acid transporter. Mutations in this gene result in an increase in homosexual behavior in the affected individuals indicating that the strength of glutamatergic synapse interactions may play a role in same sex attraction¹². Fruit flies are not humans – but they often do provide valuable information about human genetics. A quick scan of the human genome reveals that there *is* a human orthologue to the drosophila gene – thus far, no one has published a human study of the glial amino acid transporter known as *gb*.

While none of these evidences are completely compelling on their own, when viewed together we begin to see a pattern emerge. For *some* sins there *might* be an underlying genetic relationship. Correlation does not always indicate causation, but the signs are there – time will tell.

Can our genes be modified to alter behavior?

So you carry a gene or two that predisposes you toward sinful behavior. Does carrying that gene doom you to a life of addiction or other sinful behavior? Do your genes predetermine your behavior? Are you predestined to sin?

While carrying a mutation in a gene like GABRA2 places an individual at increased risk for becoming addicted to alcohol, the expression of these genes is rather plastic throughout life. It is *not only* the presence of a gene that determines the trait; it is the *expression* of that gene which really matters. At times we make more or less of the genes we carry in the DNA. We will,

¹⁰ Qazi Rahman. *The neurodevelopment of human sexual orientation*. (2005) Neuroscience and Behavioral reviews.

¹¹ Brian S. Mustanski Æ Michael G. DuPree, Caroline M. Nievergelt Æ Sven Bocklandt, Nicholas J. Schork Æ Dean H. Hamer. *A genomewide scan of male sexual orientation*. (2005) Human Genetics.

¹² Yael Grosjean, et al. A glial amino-acid transporter controls synapse strength and homosexual courtship in *Drosophila*. (2007) Nature Neuroscience.

occasionally, turn certain genes off completely or turn them down¹³ to a level that they no longer affect us. Altering the structure of a gene and thereby altering its expression by natural or pharmacologic mechanisms is known as epigenetic change.

Several studies now indicate that epigenetic changes throughout life impact the expression of genetic material. Usually, the expression of a gene is guided by pre-programmed cellular factors like developmental stage. For example, there are several hundred genes present in the DNA of every cell that are only expressed during fetal development. These genes appear to govern things like how long your fingers grow, where your lungs are located, and what sex you are. Expression of these *fetal* genes in *adult* somatic cells often results in diseases like cancer.

But, there is a growing body of evidence that things in our environment can result in epigenetic changes to the DNA. Make no mistake; these are physical changes to the DNA molecule resulting from interactions with the world around us. Recently at a meeting of the American Psychological Association, Stephen Suomi and his colleagues reported that macaques carrying a polymorphism (mutation) in a specific serotonin transporter were much more likely to experience anxiety and antisocial behavior when raised with peers carrying similar mutations. However, when individuals carrying the mutation were placed in family groups – communities that reinforced good social skills and behaviors. Not only did their behavior change – so did their DNA¹⁴. The mutated genes were heavily methylated and no longer expressed. In other words, *nurture changed nature*. Not surprisingly, there is a human orthologue to this macaques gene.

One wonders whether epigenetic changes in gene expression or genetic regulation might account for a specific interaction between body and spirit. Could God save a person from their genetic predispositions by altering their epigenetic makeup? Several intriguing possibilities exist, but I shall leave those to my colleague, Keith Drury.

The potential influence on theology (Keith)

Dr. Webb has outlined potential developments in genetic research that could influence on how we think about theology. It is now my job to conclude this joint paper but outlining some potential influence these discoveries—if they persist—may have on future theological discussions, particularly if we discover a material/biological propensity to certain sins and the possibility of genetically altering a physical propensity to sin if we find it.

¹³ This concept is not widely known outside biologist circles, but the expression of genes we carry is highly regulated. It is as though there were a series of rheostat dimmers on our genes so that expression can be adjusted ever so finely.

¹⁴ It should be noted that this was an oral presentation and has not been published in the peer-reviewed literature yet. Similar papers have appeared, but not with this specific kind of correlation. The greatest change in behavior was in individuals that were heterozygous for the affected gene.

Biological Propensity to Certain Sins

First, if we discover a material/biological propensity to certain sins a number of new considerations surface concerning a wide variety of subjects from original sin and anthropology to our hope grounded in the resurrection and anticipation of view of the future.

Original Sin

Such a discovery may have the greatest influence on our doctrine of original sin. The doctrine of original sin (at its most basic understanding) proposes that humans have an inherited propensity toward sin inherited from the original fall of humankind.¹⁵ Most Christian thinkers have seen this propensity to sinfulness as “spiritual” rather than a physical inheritance. A firm discovery of a *material* inclination toward a certain sin (or all sin) would shift the Christian theologian’s thinking from the spiritual to the physical.¹⁶ If Original Sin were shown to have genetic influences theologians would be pushed more into the material world to explain why humans seem inclined toward sin. Theologians would probably revisit the monistic leanings of Jewish thought seen in the Old Testament—a kind of “non-reductive physicalism”¹⁷ when explaining original sin. A possible positive effect could be a more holistic understanding of humanity and sin rather than our present bifurcated spirit-and-body approach. However, such a discovery would not be earth-shaking to Christian theology. In some ways discovering a genetic inclination to a particular sin (or even *all* sin) would merely tell us one way we inherit original sin—though it would amplify the physicality of it.

¹⁵ Original sin is different from actual sins in that it describes the state of humans as inclined toward evil. Actual sins are thoughts, words and deed a person commits as the effect of the “proneness” toward sin, or original sin. The Old Testament provides hints beyond the story of “the fall” in Scriptures including Psalm 51:5 and Psalm 58:3. The New Testament (especially the Apostle Paul) is clearer in describing this inclination toward sin in Romans 5:12-21 and 1 Corinthians 15:22. Islam and modern Judaism do not offer this teaching along with some Christians who follow the thinking of Pelagius (fourth Century BCE) who believed that humans were not inclined toward sin but could choose themselves and could choose good without God’s intervention. The Third Ecumenical Council—the Council of Ephesus in 431, rejected Pelagianism establishing original sin as firm orthodoxy even since though periodically there emerge theologians who follow more closely along the Pelagianism line of seeing humanity and born neutral.

¹⁶ Interestingly many preachers in the “American holiness movement” did appear to treat original sin as a “thing” in their style of preaching—depravity as *something* that God could remove or “eradicate” from humans by a miraculous act of entire sanctification, though most holiness preachers and theologians today have abandoned that approach as juvenile and are more likely to teach the proneness to sin as a wholly “spiritual” malady with “spiritual” solutions.

¹⁷ “Non-reductive physicalism” treats the physical seriously, giving it a major role but stops short of reducing humanity to flesh alone or seeing the body as the *exclusive* factor. This line of thought recognizes there may be other factors (e.g. human will) that also may contribute to whole makeup of humanity. Should an actual material propensity to sin be confirmed in research theologians will be talking more with people like Indiana Wesleyan University’s Keith Puffer who has been thinking and studying this subject for years.

Monism

Such a discovery might affect our anthropology perhaps promoting Monism. Many Christian thinkers, philosophers and anthropologists have seen humans as made up of three “parts:” spirit, soul and body, a *tripartite* being. Others have seen humans as *bipartite*—we are made up of body and spirit/soul. *Monism* sees humanity as a single indivisible part—a human cannot be fully human without a body. Monism has seen a recent resurgence among evangelicals including Joel Green, a New Testament scholar, recently at Asbury Theological Seminary. Recent discoveries in brain research have seemed to fortify the physicality of things we formerly thought were only “spiritual.” If we discover a physical link in the inclination toward sin, monism may become a more popular approach to anthropology or our doctrine of humanity.

Resurrection of the Body

Such a discovery might also increase our interest in the doctrine of the resurrection of the body. Christian orthodoxy teaches that all human beings will be resurrected at some future time. The Apostle’s Creed concludes with the final two statements, “I believe... in the resurrection of the body and life everlasting.” The pagan belief during the time of the early church was that the immortal soul went directly to the afterlife when a person died. Most considered the material body as evil so escaping it was the only way to purity. The first Christians argued against this “spiritual heaven of spirits-without-bodies” and taught that the human *body* would one day be resurrected like the body of Jesus was resurrected. Modern “Sunday school Christians” have tended toward the spirit-goes-to-heaven-immediately approach of the first century pagans more than the orthodox doctrine of the resurrection of the body. They have opted for the “absent from the body-present with the Lord” which seems like a more comforting thing to say at funerals. If we discover a greater role in the physicality of humanity there will likely be a renewed interest in the “least believed doctrine in the Apostle’s Creed”—an actual future resurrection of the body. The more we discover humanness is tied to the body and not just a spirit that inhabits a body, the more likely we will be to investigate how the *body* might be resurrected so that a full human could enter “life everlasting.”

Eschatology

A discovery like this could also affect our eschatology, or doctrine of the future. If we find that what we formerly thought was “all about the spirit” is actually also about the body theologians may rethink our view of the intermediate state between death and resurrection. What happens to a person when they die if they cannot be a “real person” apart from the body?¹⁸ We might

¹⁸ The notion of the “immortality of the soul” or a “detachable soul” is not automatically a required orthodox doctrine of Christianity though among current popular belief it is almost universal. N. T. Wright and others have doubted the idea of a body-less soul and some theologians have suggested that a person is not a person without a body thus a resurrection of the body is necessary for humans to be fully a person in eternity. If we discover that “more things are physical than we thought” it may nudge popular Christianity to highlight the classic historic orthodox teaching that our *bodies* will some day be resurrected. The doctrine of the resurrection

become more inclined to suggest some sort of “soul sleep¹⁹” to describe the intermediate stage between death and resurrection. Or we might propose continued existence until the resurrection in some sort of a temporary body God gives us until the resurrection.²⁰ These are some of the more prominent areas theology might ponder if these discoveries become firm.

Genetically Altering Sin

Discovering the possibility of genetically altering a physical propensity to sin if we find it also raises several fundamental questions on the nature of salvation and the Christian life.

Sanctification

Such a discovery would have a significant impact on our view of sanctification. If we were to discover that there is a genetic proneness to some sins (or even to all sin) and that these genes could be altered so that a person could be “cleansed” of the inclination to a sin we would likely expand our view of sanctification. Sanctification is the Christian doctrine of how God helps us put off sin and put on righteousness, becoming more like Christ. It is not a doctrine of a few “holiness” denominations but an orthodox doctrine of Christianity from the Church Fathers like Augustine through to virtually every Protestant, Roman Catholic and Eastern Orthodox

of the body however, raises all kind of “modernist” questions. We ask, “If I am destroyed in a fire and my cells go up in smoke, how are the cells of my body going to be recovered and all put back together again?” Or, we ask, “What if someone was eaten by a shark and their cells become absorbed into the cells of the shark—how will these cells be raised?” Since the body is constantly being renewed, we ask, “Which cells and atoms will get raised again, the ones in my body at death or a sampling of cells from my entire lifetime?” We wonder how many cells God would need to recreate our “body” from scratch. These modernist questions have persuaded many to simply dismiss the whole notion of resurrection. Many have dropped down to the sub-Christian view of the resurrection of a *soul*, excluding the bodily resurrection. Then again, we have recently witnessed how cloning can grow a duplicate body from a single cell of a donor body so the notion is not seem so far-fetched today than it was 50 years ago—even for human scientists to accomplish, let alone God.

¹⁹ “Soul sleep” is the idea that the soul is unconscious between the death and resurrection and time passes unconsciously like it passes when we are sleeping. Roman Catholics teach the soul is judged immediately after death (though a temporary stay in purgatory finishes up the purification for heaven). Popular Protestant belief is similar to the Roman Catholics (excepting the Purgatory part) though theologians have tried (mostly unsuccessfully) to persuade Christians of importance the resurrection of the body. Eastern Orthodoxy teaches that the soul inhabits a kind of “abode of the dead” until the final resurrection of the dead, where the dead “rest in peace.” John Calvin rejected “soul sleep” and tended toward the Eastern Orthodox view. The resistance of moderns to accept the resurrection of the body may also be an indicator of our faulty view of the body as being evil which may be a larger question of an anthropological error.

²⁰ The theory that God may grant us a temporary physical house at death and before the resurrection may actually be a good theory though this is one of those ideas that get dismissed when its detractors label the idea with a derisive term like “rent-a-body.”

theologian today. We have tended to see sanctification as a wholly “spiritual” action performed by God in us to enable us to change. When a person is trapped by a “besetting sin” like pornography, drunkenness or homosexual behavior we usually urge them to seek God’s changing grace so they can be “delivered” through a wholly spiritual transaction. What if they could simply get their genes altered? Instead of going to the altar they could go to the doctor? Overcoming sin and adding virtue to our character has largely been a domain of religion more than medicine in the recent past. Could science in the future provide a route to sanctification that once was largely the domain of religion? Might even future medicine provide the “entire sanctification” we once thought was purely a miraculous act of God?

To me this offers the most interesting possibilities for future inter-disciplinary exploration. How would theologians respond if we could alter a person’s genetic makeup so they were no longer inclined toward sin or so that they would be naturally inclined toward love, joy, peace, longsuffering, gentleness, goodness, faithfulness, meekness and temperance? Would such genetic sanctification “count?” Or would you say these people were character-robots? This is the area for the most fruitful inquiry in the coming decades. If we actually discover there is a genetic inclination to sin (or to virtue) and if we discover ways to alter this make-up what would theologians say?

The evidence is not yet firm, but if they become convincing we at least already have a model for dealing with them: *physical healing*. Most of us believe God can heal a person physically. He does not always heal but God *can* heal and sometimes does. Yet we also believe God heals through medicine as well. In fact we “count” this as healing too. To most of us it is not an either/or proposition—God can heal instantaneously and miraculously but God also heals through the God-ordained use of medicine. In the doctrine of providence we believe God has already provided cures and we are to go find them in nature and apply them to sick people. There are certain molecules which combined can relieve suffering, pain and bring health back to sick people. We say we “discovered” these cures and we are right—they are already here by God’s great love through providence—our job was to find them.²¹ Thus healing is not a proposition of God *or* science but God *and* science... and even God *through* science.

So, if we discover a way to alter a person’s inclination to a particular sin by altering their genetic makeup theologians might consider such a discovery similarly to how they view penicillin or the truths of psychology and counseling—God given gifts that help persons find wholeness. If a Christian goes through a year’s counseling sessions and comes out a godlier person we Christians do not say, “God was not needed—counseling did it all.” As Christians we believe God uses medicine and counseling to heal us and bring us to wholeness just like he might use a trip to the altar. If we discover ways to alter genes to make godlier people I suspect we will say something similar.

²¹ The doctrine of providence is perhaps one of the most critical theological ideas underlying a Christian approach to science and research. If God has provided in the universe everything we need to bring healing and end suffering for humanity our task is to practice the best science we can in order to discover what God has already given us.

Concluding cautions

Finally we offer a few cautions as a conclusion to this paper before we open up to a larger discussion and your questions and comments. Here are four concluding cautions for us all:

1. *The evidence is not yet complete.* Our paper is ahead of the curve on this subject. We know this because we pitched the same paper to a theological society who was not ready for it yet. (so we are delivering it here.) There are some indications that some inclination to sin could be genetic but the findings are not yet final—thus our paper is still in the realm of conjecture. First studies are sometimes/often wrong and so we should not jump too quickly to conclusions, though we can certainly discuss them as possible issues of the future.

2. *We must stay humble.* Even if these early indicators prove to be true we should be wary of assuming that we might banish all sin through genetic manipulation and usher in the millennium ourselves. Science has been here before. Penicillin was a wonderful discovery but new strains of bacteria and viruses have mutated and new diseases like AIDS have emerged. We have great medicine yet we still have disease and death. If an inclination to sin is genetic it may be possible that new inclinations to sin might mutate as fast as we conquer the last ones.

3. *An inclination is not a license.* Even if we discover that some people are genetically inclined toward drunkenness or adultery or homosexuality this proneness is not a license to sin. Most of us would admit to a proneness to one sin or another—but we expect ourselves to restrain our sinful desires and do not grant ourselves the “right” to sin just “because God made me this way” any more than we accept cancer as God-given.

4. *Resist reductionism.* If we do discover a genetic proneness to sin it would not mean automatically that genetics is the *only* factor in sinning, after all Adam fell in the garden and Lucifer fell from Heaven. There are a variety of factors influencing sinfulness besides the flesh. If these discoveries continue and become convincing we will find that physical factors are stronger than we thought. This would not eliminate all other factors. Most of us believe there is a human will and there are spiritual beings that are factors—there is a real Satan and real spiritual forces in an unseen world and these also play into the equation. A person with absolutely no inclination toward sin can still be tempted by the “world and the devil” even if there were no temptation from the flesh.

Finally, we conclude with a personal word. The greatest discovery for the two authors of this paper is not about genetics and theology at all, but is the value we have found from interdisciplinary discussions. The two of us from different discipline have been exploring these matters for more than 9 years in three different semester-long reading groups and over several *hundred* hours of discussions together. Our greatest findings have not been in biology or theology but in the good that can result when people from different isolated disciplines bring their own discipline to the table and seek connections together. It has been one of the highlights of the last few years of our teaching here at Indiana Wesleyan University. Amen.