

Genetics, Conversation and Conversion: A Discourse at the Interface of Molecular  
Biology and Christian Ethics

**Brian Brock, Walter Doerfler, Hans Ulrich**

### **Investigating Genetics through Collaborative Conversation**

This chapter reports on an experimental conversation between a practicing molecular biologist and a Christian ethicist. It arose in the form of joint lectures in which the presentation of the technical state of the art in genetic science proceeded hand in hand with a theological analysis of the moral implications of its scientific models, discourses, and hermeneutic claims. The impulse to open such dialogue was a sense from both sides that there is a serious deficit of detailed interaction between the two disciplines, creating a critical lack of relevant ethical discussion of issues related to human genetics. As a result, popular and academic discussions of ethical issues in human genetics have drifted apart to the point of absurdity. Yet rather than responding to this estrangement by embarking on the popular ‘scientific education’ approach, we felt that a concerted attempt was needed not simply to express the science to the public, but to try to understand the moral implications of the science by struggling to articulate theologically expressed questions and criticisms in the course of discussion about the science.

The central focus of this discussion is human genetics. More specifically, we explored the relation between the genetic knowledge of researchers, whose breakthroughs are so often publicly discussed, and the actual, contemporary practice of medicine. Our

aim is to elucidate the boundary between research on human biology and medical practice in order to clarify the interrelationships between the rapidly changing knowledge of researchers about narrow aspects of human genetic functioning and the sweeping claims about treatment so often touted in the media with every discovery of a gene for this or that malady. Thus this paper traces a dialogue between two voices in the broader discussion of medical ethics, the genetic researcher whose work stands behind the promise of new future treatments, and the theological ethicist, whose aim is the clarification of the factors which sustain flourishing human health in its widest sense.

The main theme which emerged was that though theology and molecular biology are two quite different languages they are nevertheless critically concerned with the same subject matter. This paper traces the points of agreement where we discovered the two discourses to converge on specific questions, though often the respective accounts of this convergence and the object of their shared investigation were formulated in strikingly different terms. The task was to find whether, and at which points, terms and descriptions in each discourse were flexible or rigid, and thus to identify previously hidden regions in which negotiation of perceptions were available. Both sides did, in fact, discover which aspects of their own positions were flexible and inflexible, and so clarified their own knowledge in the terms of their own discourses. Most importantly for the building of more nuanced discourse of genetic ethics in the future, however, this discussion allowed the language strategies of each side to emerge and so to become available for assessment and critique in ways not possible before the conversation. A new transparency began to develop regarding how language was being used to reveal or suppress aspects of the phenomenon on view through the use of specific metaphors or images. The result was a

problematization of formerly assumed metaphorical constructs, and with this problematization a reformulation of familiar ethical questions became possible.

Because the whole experiment rests on the attempt to draw together two languages whose ethical implications at times point in different directions, it is important to state at the outset that this paper is written from the vantage of theological language and conceptualities. To admit this is not to imply that biological and theological languages are incompatible; rather, we should not too easily or quickly assume that they do not conflict, or that when they do the conflict is not without marked ethical implications. Such an unflinching search for conflict is sustained from a theological perspective by the Christian confession of the unity of all truth in Christ.<sup>1</sup> From such a perspective, exploring the conflicts between claims about creation is viewed in faith as promising for all participants in the discussion. This paper attempts to pinpoint the basic points where ethically relevant conflicts between the two languages appeared in the hopes of founding an account of genetic ethics which is closer to the points at which scientific decision-making is taking place and so serving as a working resource for those at the forefront of scientific development.

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<sup>1</sup> For a succinct recent treatment of this theme, see Gavin D'Costa, Theology in the Public Square: Church, Academy, and Nation (Oxford: Blackwell Publishing, 2005), chapter six. D'Costa draws on the long Catholic tradition of interdisciplinary dialogue which is succinctly summarized by John Paul II: 'Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes.' Quoted in D'Costa, Theology in the Public Square, 198.

Although in the day-to-day practical activity in both fields—molecular genetics and Christian ethics—conflicts about ethical aims and procedures might appear unavoidable, what has emerged in discussion is that both disciplines in fact have the same goal: to understand or at least try to understand the universe in which humans have the privilege to live and the capacity to analyze. The rediscovery of this convergence of interest is a reminder of the Judeo-Christian tradition that science is the study of the ‘other book’ of God’s works, and as such is another expression of wonder at creation expressed through an inquiry which seeks to know and understand it as divine gift. This definition also implies a basic limit to both scientific and theological inquiry. We cannot know the mind of God, which suggests that there will be types of cosmological questions which cannot be examined via the methods of science. Human study can, however, understand some of God’s works. Here theological and biological inquiries share essential presuppositions. Both understand the primary place of attentiveness to phenomenon; in one case sacred texts, in the other physical processes. As a result, both have an acute sensitivity to the ways in which discourses become stale by straying from this close attentiveness into ideology by focusing, for instance, on abstract conceptualities like systematization or becoming too narrow exclusively deploying, for example, statistical analysis shorn of other experimental modalities. These insights framed our discussion and focused it on several points on the ‘text’ of human biological operation which is the sole subject of both biological science and ethical decision-making.

The first practical aim of discussion was to clarify precisely which aspects of the human genome were of shared ethical interest. Here, of course, molecular biology took a lead role in explaining what features of genetic processes were the focus of its

investigations. Discussion of these critical biological junctures revealed that the deepest question for those interested in ethical questions is the extent to which interested parties are working with the same paradigm. Traditionally the meeting point for theology and medicine has been at the point of joint interest in the question of human suffering, and it is from this point that our discussion also found common ground. It is worth pointing out, however, that this essentially theological presupposition might not have been shared if one of the participants held alternative fundamental paradigms framed by primary ethical images derived from ideas like evolutionary advance, genome enhancement or other foci. We were able to agree that what is given, created, in this case the human genome, contains and bounds human activities of study. At the same time we could also agree that this givenness, in exhibiting the richness of God's working, both serves as a limit to human activity and admits the reality of sickness and suffering. From such a starting point theology and biology can share a complex view of human life in which sickness, as an aspect of human suffering, can be understood as a messenger telling us about biological life.<sup>2</sup>

Sickness is a part of life, and only by attempting to hear what it tells us about life are we able to understand the rich system of compensation and variability which is human life. Thus to ask about sickness brings the complexity of the given entity called 'human biological life' into view in a way which allows us to see how disease and healing are related in complex and intertwined ways which our interventions can only modify in relatively insignificant ways. This nuanced and interconnected relation of life

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<sup>2</sup> Cf. Michel Foucault, The Birth of the Clinic: An Archaeology of Medical Perception, A. M. Sheridan Smith, trans. (New York: Vintage Books, 1994), chapters 8-9.

and sickness is often the first casualty in popular discussion of genetics. By ignoring the complex relation of sickness and health, attention understandably falls to the exciting potential of gene modification, so placing a premium on that which is added or what is supposed to be newly created.

Our discussion avoided these oversimplifications by setting as its task the discovery of what the shared presupposition of the givenness of human life means when not assuming that ‘human life’ exists independently of our description of it. This awareness of the role of the subject in scientific investigation is the hallmark of modern science and theology, and grounds our agreement that our descriptions and investigations of life are already an answer to the givenness of creation and so already tied together with our hopes about what this givenness means. The discussion which follows is therefore not best understood as a report on an example of ‘discourse ethics’ (which imply the reaching of agreement from fixed points of reference<sup>3</sup>), but of a joint exploration of biological phenomenon, and is ‘pre-discursive’ in essence.

### **Reframing the basic presuppositions of genetic ethics:**

As already noted, contemporary discussions in medical ethics most often work with the background presupposition that the task of medicine is to minimize human suffering. In western medicine the primary response to suffering is focused on the repair of biological defects. In the specialist medical ethics literature found in western liberal polities this

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<sup>3</sup> In the form popularized by Jürgen Habermas. See [The Theory of Communicative Action](#).

starting point is then combined with economic or triage considerations to yield the sorts of ethical limit discussions exemplified by discussion of the limits of plastic surgery and other elective surgeries, or the permissibility of sex-change operations. The more emotive of such questions often find their way into public discourse, as in the debates about therapeutic cloning, stem cell research or gene manipulated food. It is our contention that both popular and academic medical ethics discourses know too much: they already begin their thinking with a set of (false) assumptions about genetics. As a result they leave untouched the scientific progression in which the labelling of something as a defect carries an assessment that it requires a therapy. Taking into account the subjective framework of experimental science allows us to see the circularity of the claim that a biological defect is something which medicine ought to be able to remedy, a moving target which develops as concepts of health and sickness evolves.

This problem becomes particularly acute in the field of genetics. Consider for a moment what we have to assume to begin a research program. For instance, we can be certain that scientists are not currently searching for a ‘democracy gene’ because the belief in democracy and capitalism are assumed by practitioners of modern science and are not considered a disease. Conversely, we have seen much sensationalized searches for the ‘gay’ or ‘God’ or ‘promiscuity’ or ‘crime’ genes. That it seems sensible to research the genetic basis of homosexuality but not of democracy indicates how the genetic sources of various conditions are not only tied to human suffering, but also to questions we can no longer talk about in public. Public funding is available to ‘unravel’ those questions that we as a society can no longer agree about naming pathological or normal. At these points the promise of genetics is to resolve debates which can no longer be

resolved in public, research stepping in to offer clarity where democracy has broken down.

The intractable nature of ethical debates when framed in these terms reveals that, from a scientific standpoint, it is not at all obvious that we have been able to recognize what a biological defect really is. In relation to genetics, only in a limited number of instances is it even possible to identify what is properly thought of as a classical mutation. This complexity of the concept of mutation is rarely, if ever, questioned in discussions of ethics, with the result that the whole of the ethical debate in public and in the specialist literature has worked within the parameters defined by the question ‘Which defects can and will we repair?’ In the course of our discussions it became apparent that a great deal of additional analytical work will be required to provide a more adequate framework in which the medically oriented goals of providing therapies could hope to be realized. A knowledge gap exists between genetic research, on the basis of which promises of cures are often presented, and the full development of genetic therapies. It appears that it may not have been well communicated to medical professionals and the political machinery which funds medical research that the state of knowledge in molecular biology is not sufficiently developed to be readily applied to the solution of important medical problems.

When the size of the gap between discovery and therapy is adequately appreciated, it becomes apparent that the common framing of discussions of specific questions in genetic ethics with the question ‘should we or should we not’ is premature. More importantly, this basic question is focused at the wrong point in the relation between research and medical treatment, namely, on the effects of therapies or of

experiments which may never materialize. It is our contention that these questions of therapy and the ethics of its application are secondary or even tertiary considerations within a properly grounded ethical consideration of the issues, as they bypass the main question which an ethical consideration of genetic practices needs to answer.

Where the western medical research and care projects meet Christian thought is in the desire to help the sick and to alleviate human suffering as much as possible. This desire explains the reasons why medicine might sometimes prematurely attempt to apply new concepts in molecular genetics. Nevertheless, it is counterproductive to make promises or raise hopes which cannot be realistically fulfilled.

In order to more concretely locate the progress of the state of the art in molecular biology, the following represents some of the limitations of scientific knowledge of human genetic processes.

- 1) We lack full understanding of the regulatory mechanisms governing gene function.
- 2) We do not know the meaning of the great majority of the nucleotide sequence (repetitive DNA).
- 3) Epigenetic mechanisms (higher order information patterns) are only beginning to be unravelled.
- 4) Most medical problems have yet to be related to specific biological functions or to disturbances of function as affected by a range of genes.
- 5) Lack of function in one gene can sometimes be compensated, mitigated, or exacerbated by the state of other genes.

- 6) Correlations between certain mutations and disease are statistically likely, but not always rigorously understood or proven.

From a functional point of view the state of activity of a gene, or more likely sets of genes, is paramount to the understanding of the biological function and/or the causation of disease. We understand only partly how and why entire sets of genes are activated or silenced, the major alterations in activity profiles in cells or organisms which play a decisive role in embryonic and foetal development, in the causation of complex diseases, and particularly in tumour biology. A number of factors, frequently cumulatively termed 'epigenetic mechanisms', cooperate to effect the complicated regulation of activity profiles in sets of genes: the methylation of cytidine in DNA, modifications (acetylations and methylations) of DNA-binding proteins, the histones, and other less well understood modifications of chromatin. Evidence has recently been accumulating that the so called repetitive DNA sequences, which comprise the majority of the human genome can participate in the overall activity regulation of the human genome. Not understanding their proper function means we are some way from understanding how disturbances in these unknown mechanisms might contribute to pathogenesis.<sup>4</sup>

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<sup>4</sup> For more detailed discussion of these points, especially as relating to DNA Methylation, see, DNA Methylation: Basic Mechanisms ([Current Topics in Microbiology and Immunology](#), Vol. 301, 2006), Walter Doerfler and Petra Boehm, eds., and DNA Methylation: Development, Genetic Disease and Cancer ([Current Topics in Microbiology and Immunology](#), Vol. 310, 2006), Walter Doerfler and Petra Boehm, eds.

Given the sweeping significance of the distance which scientific knowledge has yet to traverse before reaching knowledge which will reliably yield safe and effective therapies, Christian ethics raises the following question which must accompany not only the search for therapies but the explorative process itself. What, precisely, is a genetic defect? This question highlights two gaps in the presuppositions of the current scientific and ethical discussion.

First, neither the scientific nor ethical discussions proceed with a sharp definition of the relationship between human sickness and genetic anomalies. In terms of the functioning of medicine, the concept of sickness plays a central role in deciding what a treatable illness might be. Thus, in order to talk meaningfully about the relationship of medicine and genetic science we must conceptually and empirically clarify how we ought to understand genetic changes to be related to human sickness.

Second, there is a much looser connection between genes and their expression than is typically assumed in public discussion. We are not yet in a position to explain what is going on between the genetic material of an individual and their phenotype, and are only observing hitherto invisible (because unsought) biological processes. We can observe relationships between symptoms and base pair combinations, and attempt to describe them, but this observation, despite great progress, remains in its infancy. The term gene expression is at this point misleading as it implies a more direct and causal relationship than has yet been explained or substantiated.

**Ethically relevant divergences of the languages of theology and molecular biology:**

The following three questions are trained on a single point: the establishment of the moral import of the biological phenomenon commonly known as the mutation. The basic insight expressed in these three intertwined observations is that genetic change is currently central to medical research and therefore must be the point at which Christian ethics makes its relevance apparent. We suggest three angles of approach to this problem. The first is to ask questions about the moral relevance of the heuristic nature of biological models. The second queries the moral implications of collectivist tendencies in biological models. Finally, we inquire into the moral relevance of language which describes changes in human genetic material—the so-called mutation.

1) A first problem complex centres in the central use made in biological discourse of terms grounded on assumptions having non-scientific scope, e.g., relying on or implying theories about how human life began. This is a story, an image contained in metaphor, which has strong heuristic value. Terms like selection, speciation, and survival are tied to an evolutionary metaphysic which has not been, and cannot be scientifically substantiated by experiment. The usefulness of the terms is in marking out areas of exploration of phenomenon, and in shaping how these areas will be perceived. They thus function heuristically rather than descriptively. The heuristic role of evolution is easily visible in animal biology for example. Observing the difference in the depth of the fork in the tails of Swifts, the evolutionary heuristic generates a testable first explanation. Different flight characteristics related to the different shapes might be keyed to different ecological niches and so provide different sorts of survival advantages. This theory of evolution

does not determine whether this hypothesis is true or not, but is the condition for a very specific sort of practical theorizing and investigation.

This heuristic power of the concept of mutation accounts for the focusing of current biological science on understanding the mutation. The evolutionary heuristic uses the term 'mutation' to designate the points at which biologically relevant or revealing events are taking place. Huntington's chorea can be understood to be functioning as a flagship example validating current explanations of genetic disease. A genetic change has been identified and linked with the occurrence of the disease. Here again, however, we must keep in mind that the mechanism of expression in even such a clearly correlated case is to date not understood. As so often the genetic defect and the symptoms of the disease cannot be definitively linked. This illustrates how the scientific heuristic directs scientific scrutiny of phenomenon, but does not itself produce results.

Having located the point of investigation, 'Selection' 'survival' and 'speciation' name further theories about what is going on in a mutation, revealing and giving shape to investigations of specific occurrences in biological organisms. Yet these concepts have implication far beyond their heuristic value; they also carry strong evaluative overtones. It is the evaluative aspect of these terms which is so ethically important. While we can and must say that in certain cases something has changed in an organism, that the organism is functioning differently than expected, it is easy for the conceptual tools we used to reveal this facet of creaturely life to decidedly shape from the outset our moral assessment of the change. We may only look for something, for instance, we consider detrimental to the species. What allows us to see changes at all are evolutionary

conceptual models, constantly under revision, but within which terms such as ‘selection’, ‘speciation’ and ‘survival’ play basic roles in anchoring the conceptual imagery.

Thus it is morally relevant to be clear that ‘selection’ includes the metaphor of improvement, of weeding out the less good, as does ‘survival’. ‘Speciation’ asks about the borders and boundaries of genetic pools and thus locates specific cases within an inquiry of inclusion and exclusion. From a theological perspective the task of separating the biological and political resonances of the theory are formidable indeed, and when not disentangled, are immediately detrimental to the disabled.<sup>5</sup> If observed genetic change is labelled with one of these terms, a moral judgment is implied which frames future discussion about how such cases ought to be treated. We might rather say that in a

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<sup>5</sup> Consider the following comment from Charles Darwin, The Descent of Man and Selection in Relation to Sex (London: John Murray, 1906): ‘With savages, the weak in body or mind are soon eliminated; and those that survive commonly exhibit a vigorous state of health. We civilised men, on the other hand, do our utmost to check the process of elimination; we build asylums for the imbecile, the maimed, and the sick; we institute poor-laws; and our medical men exert their utmost skill to save the life of every one to the last moment. There is reason to believe that vaccination has preserved thousands, who from a weak constitution would formerly have succumbed to small-pox. Thus the weak members of civilised societies propagate their kind. No one who has attended to the breeding of domestic animals will doubt that this must be highly injurious to the race of man. It is surprising how soon a want of care, or care wrongly directed, leads to the degeneration of a domestic race; but excepting in the case of man himself, hardly any one is so ignorant as to allow his worst animals to breed’ (205-206).

modern age in which discovery and treatment are so closely intertwined, the aim of treatment, and the political measures it entails, are already assumed precisely in the search for and discovery of mutation.

This discussion of the moral implications of the theory of evolution revealed an important difference in how the theologians and the molecular biologist understood the status of the theory. The biologist among the authors (W.D.) felt that when it was published, Charles Darwin's The Origin of Species (1859) may legitimately have been considered hypothetical, or speculative. But a century and a half of evidence gathering, especially that provided by molecular biology's notation of the congruences between the nucleotide sequences of many different genomes, left no shred of doubt that all species have developed from precursors anteceding them in evolutionary time. His conclusion was that, although we still do not understand in detail the mechanisms that drive evolution, Darwin's main conclusions are correct. It therefore seemed to him unreasonable to question their overall validity, with the caveat that science has always remained open to unexpected and revolutionizing new developments and to the necessity to reconsider previously accepted concepts accordingly.

For the theologians the matter was less clear cut. They felt that their critical powers depended precisely on their ability to take evolution not as a truth claim having equal validity to the Christian creeds and their claims about Christ, but rather as a provisional and developing human account of created reality.<sup>6</sup> Evolution is undeniably a

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<sup>6</sup> For discussion of this point, cf. Karl Barth, Church Dogmatics III.3 (Edinburgh: T&T Clark, 1960), 124-131: 'No law is known to us with the certain with which God is known to us by His Word, or with such clarity that even in relation to its own sphere we can

theory of modern secular man, to which a Christian faith properly listens with eschatological patience, confessing in faith that this too is a partial truth, destined to be revealed and purified in the final judgment of human knowledge and activity. Theology thus cannot but see evolution as part of the modern tradition of scientific enquiry, a tradition which was nurtured and is still supported by many Christians. Because evolution is a central belief of the modern scientific tradition, comments Oliver O'Donovan, it is not easily held as provisional by its participants. '[O]ne cannot honestly relate to one's tradition like the conservator of a museum. It has to be lived in confidently.'<sup>7</sup> Tradition makes common action possible, meaning that the community of scientific enquiry exists only as it agrees on a truth, in this case the truth of the theory of evolution. Because the church has not yet seen fit to add the theory of evolution to the list of things it confesses to be finally and undeniably true about reality, there remains at this point an eschatological tension between the tradition of faith, and the tradition of scientific enquiry. This does not mean that Christians need deny the theory of evolution, but that their membership in a community anchored in claims about Christ gives them a freedom to remind the community of scientists that its truth claims are of a different order than its

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responsibly pass it off as at least the formal foreordination of all actual occurrence within that sphere. No high measure of noetic certainty or clarity can give to laws known to us, i.e., discovered and guaranteed by us, the character of ontic laws, the character in virtue of which we necessarily perceive in them the laws of God, and therefore in effect the real foreordination of creaturely occurrence at any rate from the formal standpoint' (127).

<sup>7</sup> Oliver O'Donovan, Common Objects of Love: Moral Reflection and the Shaping of Community (Grand Rapids: Eerdmans, 2002), 38.

own fundamental truth claims. That reminder is that modern science has based its authority on the claim that all truly scientific claims take the form of statements which might be, but have not yet been falsified.

2) This raises question of the location of genetic sickness. An obvious initial question to be asked is whether sickness is to be understood as something attributable only to the individual or to the individual and to the whole? In scientific terms this is a question about whether to refer to the sick according to phenotypic or genotypic attributes. Is someone sick when they carry a gene or when they exhibit a pathology?

In Christian theology only an individual, an ‘I,’ can be sick.<sup>8</sup> To say this is to reveal that the claim that the ‘whole’, the genome, is sick can only be a metaphysical or theological claim. Such a concept of a ‘sick genome’ is a pessimistic stance about the human race and amounts to a questioning of the viability of the whole biological system. The scientist, therefore, must leave this question to one side. In order to make any claims of a scientific nature about the viability of the gene pool, its ‘sickness’ would require a control group. This would require another human gene pool to measure deviations in our gene pool against, an obvious impossibility. Science, on its own terms, is left with only this biological system called the human race to study in as much detail as possible.

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<sup>8</sup> Such a statement is the fruit of a long and rich western discussion of the meaning of sickness, recoverable due to the revitalization of the philosophical principium individuationis in the wake of Friedrich Nietzsche’s work. Hans Günter Ulrich, Anthropologie und Ethik bei Friedrich Nietzsche: Interpretationen zu Grundproblemen theologischer Ethik (Munich: Christian Kaiser Verlag, 1975), 61-66.

The Christian response to this problematic is to affirm that whether the human genome is slowly changing or not, it is the biological material which we have been given, and so is good. In a theological sense to exist at all is good, an artefact of God's provision precisely in a fallen state. The 'And it was good' of the first two chapters of Genesis ought not be understood as having been revoked because of the Fall. The implication of this Christian affirmation is the claim that sickness can only be a statement about the suffering of the individual. The gene pool cannot be sick.

The ethical result of putting this so strongly is an insistence that sickness must be so defined that the sick individual remains part of the human community in all circumstances. They are not excluded from the community, excommunicated, by possessing a divergent genetic heritage. No matter their genotype they remain one of us, claiming our medical care for the alleviation of their particular sufferings rather than using them as an example of a divergent or threatening stream within the gene pool, to be cut off, excluded, or studied for the good of the whole.

To make such a firm distinction exposes the fact that the scientific heuristic often works against it. Biological definitions of sickness arise from heuristic apparatuses which have no way to sharply distinguish between the sickness of the individual and the sickness of the whole. If disease is considered part of the functioning of the whole biological system then the sickness of the individual is per definitionem a marker of lack of, or part of, the process of the adaptation of the whole, reducing the priority of treating the individual *qua* individual. This tendency of the heuristic of biological science has clear ethical implications for how we approach sick individuals both as individuals and as members of society. Medicine cannot and must not treat society or gene pools. The

political task is to guard against the force of the metaphor toward thinking in terms of collectives. Special vigilance in oversight is therefore appropriate when methods which explicitly work with collectives play a dominant role in policymaking, such as genetic epidemiology<sup>9</sup> and public health.

3) These observations take us to the deep ambiguity behind these problems: what is a mutation?<sup>10</sup> Unlike sickness, which we discover from the cries of the subject who suffers it, the language of mutation assumes an observer's perspective. To pronounce something a mutation is requires a view of the whole gene pool and a theory of its development. We have already seen that, empirically, this is information that scientific method cannot supply. All that might be said about the constitution of the whole gene pool is therefore hypothetical, extrapolated from the major part of the human nucleotide sequence which is

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<sup>9</sup> Discussed in Blair Smith's contribution to this volume.

<sup>10</sup> The oscillation of perception marked by the terms 'variation' and 'mutation' lies at the heart of the problematic of Darwinian theory, present from its inception: 'The term "variety" is almost equally difficult to define; but here community of descent is almost universally implied, though it can rarely be proved. We have also what are called monstrosities; but they graduate into varieties. By monstrosity I presume is meant some considerable deviation of structure in one part, either injurious to or not useful to the species and not generally propagate.' Charles Darwin, The Origin of Species (Oxford: Oxford University Press, 1996), chapter two, 38. Darwin's main theoretical insight was that the difference between a variation and a mutation is less straightforward, and more interpretative, than often assumed.

now available. On the basis of the information about the genome sequence possessed to date researchers can compare sequences from any individual. Yet to so define normal function relies not on comprehensive, or even broad knowledge of the content of the whole actual genome, but only a statistical 'normal' extracted from a minute portion of it. Here the popular force of Darwin's account often misleads. In The Origin of Species, Darwin's most memorable examples of special variations in gene pools draw on observations about the breeding of plants, pigeons and dogs.<sup>11</sup> But breeders select for an outcome, an experimental procedure not available to scientists. The problem faced by scientists is that of the human life span: what can be empirically established without the verifiability test of breeding?

Biologically, we can speak more specifically about the meaning of the term mutation. Genetic information in any genome can be altered, mutated, in several ways. There can be single nucleotide exchanges, deletions, insertions of single or multiple nucleotides, sequences can be amplified, mutations can be located inside genes, can occur in the regulatory region, can affect the reading frame, or the splicing mode of a gene. Gene expression can moreover be subject to epigenetic mechanisms; among them the sequence-specific introduction of methylated nucleotides and the modifications of histones have a decisive effect. In a number of instances, we can directly explain in definite biochemical terms how a mutation alters the function(s) of a gene, e.g. in sickle cell anaemia or in cystic fibrosis, and we have a good idea how diseases arise as a consequence of these mutations. In a much larger number of cases, there exist only correlations between mutations in a given gene and a disease, while we do not possess the

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<sup>11</sup> Darwin, The Origin of Species, chapter one.

absolute proof for the validity of our correlative conclusions. Moreover, in complex genetic alterations, as in chromosomal aberrations, even when the genetic change is well understood, its mechanisms are not. For instance, with Down's Syndrome, we completely lack an explanation of how the presence of a third chromosome 21 can lead to the phenotype of Down Syndrome, even though the complete nucleotide sequence of some  $33 \times 10^6$  and most of the genes it carries are well known.

The relevant point in the context of our discussion is the ways that mutation language is, at least in one of its most important resonances, anti-theological. At one level we can allow that 'mutation' names the various alterations just discussed. In some cases the changes are necessary and regularly occurring in every organism, in other cases familiar biological processes are hampered. It is this harmful version of change which we commonly think of as a mutation. Analysis of the cultural freight of the term 'mutation' thus reveals that it also entails an assessment of the change, that it is a harmful change. 'Mutation' thus often assumes a judgment about the 'survivability' or 'adaptability' of an organism defined by reference to a specific point in its genome. The moral assessment built into the term mutation thus calls forth a judgment about whether the change represents a benefit or deficit and so goes far beyond simply noting a change in the expected sequence of nucleotides.

It is this judgment of change which draws biological science beyond a description of biological processes and into a cosmological theory with ethical import. As such it is not 'another perspective' alongside the theological, but a counter-theology which takes the position of the last judge in making quasi-eschatological judgments about the whole genome and its trajectory. It is here that the tight modern linkage of therapy and

discovery reveals its problematic aspect. The language of mutation oscillates between a scientific description and a medical diagnosis which implicitly calls for treatment. Mutation carries a negative medical status which drives the impulse to repair. But not all changes in the human genome are so easily labelled ‘mutations’ in the sense of ‘defects to be repaired to alleviate suffering.’ One example of this might be Down’s Syndrome. Yet keeping separate the descriptive and prescriptive, the explorative and applicative, is especially problematic in the context of the modern interlinkage of science and technology in which politicians supplying the vast sums spent on medical research demand at least the promise of therapeutic or economic benefit.<sup>12</sup>

The richness and variety of the gene pool must not be equated with the richness and variety of human flourishing because this, in theological terms, is a richness of relationship. Mutation language is built on a picture of the watchmaker God, who created and leaves creation alone. God is thus alienated from his creative work, and we are severed from understanding ourselves as part of God’s ongoing work. In Christian theology biological change is part of a larger story, one of the many sub-narratives within a larger narrative of God’s working, the end of which we do not yet see. We have no perspective from which to draw a definitive conclusion as to whether a biological change is part of the new creation or not. We therefore cannot say ‘this is superfluous genetic material’ or ‘this is a defect, a mutation’ unless we take up a totalitarian perspective in

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<sup>12</sup> For a related account of the intertwining of modern experimental science with technology, and the political forces that funding brings to bear on the direction of research, see Mary Joe Nye, Before Big Science: The Pursuit of Modern Chemistry and Physics 1800-1940 (Cambridge: Harvard University Press, 1996).

which we do not just claim to know parts of the logic of the whole, but that we exhaustively know the logic of the universe.<sup>13</sup>

**Main conclusions:**

1) Biological and theological discourses stand before the same basic material processes, but are equipped to emphasize and question different aspects of it. It is in examining the phenomenon itself that practitioners of both disciplines meet. This meeting place supplies a criterion for defining what it is for both disciplines to be practiced well. This criterion is attention to phenomenon. If both disciplines are understood this way we are enabled to see that they utilize similar and intertwined modes of inquiry. As they face the ‘given to be described’, the two wrestle to define what is being described in the light of the ethical question ‘What are we to hope for?’ the combinations of these questions yields the heuristic question which can properly guide scientific and theological research: What, precisely, is the relationship of the given to that which we hope for?

Here, to say that we ‘understand’ is not simply to make a claim correct in analytical or linguistic terms, but is measured against the multiform standard of phenomenon. We must seek to understand what is going on here, with this specific biological process in all its interlinked complexities. This has led us to stress in this chapter not so much the two languages which we bring to the inquiry into biological processes, but the search to find how the two logics of inquiry embedded in the

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<sup>13</sup> Bernhard Waldenfels, ‘Ordnung im Potentialis: Zur Krisis der europäischen Moderne,’ Der Stachel des Fremden (Frankfurt am Main: Suhrkamp, 1998), chapter one, 15-27.

disciplines of biology and theology might be understood to meet in the quest to understand the suffering of humans. Insofar as they do, then they can be understood in a newly recovered fashion to be a joint inquiry.

Our joint inquiry into the role of genes in human life has led to the discovery that it is not the case that all scientific research into the human genome is essentially oriented by the hope of relief of human suffering. At the same time a strong overlap between some biologists and theologians emerged in their shared presupposition that what is under study is not properly understood through a technological desire to create something new or ‘improved’ but can only be properly grasped if what currently exists is taken on its own terms, without any desire to change or improve it. This shared presupposition about the givenness of biological systems can also meet a shared hope for the future of humanity in which suffering is ameliorated. Insofar as theologians and biologists share these presuppositions and aims, the descriptive and therapeutic remain intertwined in a manner allowing fruitful inquiry into the moral relevance of our descriptions of phenomenon. Because modern research into genomics takes place within a modern context in which research projects are closely tied to application, it has been our claim that genetic ethics must do its most important work at this fundamental level. Only by understanding the moral implications of the way our naming of phenomenon is already loaded with ethical implications do we actually deal with the ethical questions of our age.<sup>14</sup>

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<sup>14</sup> To our knowledge, the only medical ethicist making similar arguments is Johannes Fischer, Professor of Theological Ethics and Head of the Institute of Social Ethics at the University of Zurich. See ‘Ueber die schwierige Beziehung zwischen Forschung und

2) To facilitate this wrestling by theologians, a productive grasp of biological phenomenon is necessary in order that a greater awareness may develop of the points at which biology is asking its questions, and the decisions currently facing biological scientists. For instance, discussions of therapeutic cloning depend on the diagnosis-sickness-repair model whose ethical implications we have sharply queried. In order for such questions to be properly and accurately understood, our inquiry forces the opening question of precisely how ‘therapy’ is being, and ought to be, defined. Much of the work of theological ethicists on the topic of genetics simply grants that ‘science’ has defined the meaning of phenomenon, and so simply gives away its ability to speak with moral relevance through lack of proper engagement with scientist and the phenomenon they observe.

At the same time biologists must become more reflexive about what they do. They must come to see the far reaching implications of the claim that their work not only discovers what exists in the world, but ‘imposes and structures’ rather than simply ‘discovers’ and ‘repairs’. In being asked to speak publicly with theologians about how they come to understand biological phenomenon, biologists become aware of the ways that their images and metaphors impose and structure perception in the course of research. As they do so they may become aware of the way that their work is driven by powerful hermeneutic filters in the form of insightful languages and metaphors which

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Ethik’ at [http://www.ethik.unizh.ch/ise/downloads/publikationen/fischer/Fischer-Forschung\\_u\\_Ethik.pdf](http://www.ethik.unizh.ch/ise/downloads/publikationen/fischer/Fischer-Forschung_u_Ethik.pdf).

both make their work possible and also carry strong moral implications. We have outlined the points at which the metaphors which allow biology to see also push in the direction of moral claims which they may not wish to endorse. It is the task of theological inquiry to play the role of midwife role in revealing the importance of these morally critical points. When the biologist undertakes a public description of his or her experimental approach, they are given opportunity to see with more clarity the richness of the hermeneutic that makes perception possible while at the same time offering access to the moral implications which their own hermeneutics press on them.

We have seen the blunt polarities almost always assumed in moral debate about genetics, such as ‘genetic vs. environmental causes,’ ‘normal vs. mutated gene’ and ‘coding vs. extra repetitive genetic material,’ obscure rather than clarify the moral questions at stake. Genetic scientists too can show us that much remains unclear, and all interpretative. The promise of genetics to provide moral clarity and mastery of phenomenon has, on further inspection, been shown not only to be less clear cut than we once believed, but the quest for this clarity has been exposed as an evasion of the complexities of politics and moral deliberation about who humans are and what they are to hope for.