PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In This Issue …

"The fear of the Lord is the beginning of Wisdom."

Psalm 111:10

VOLUME 77, NUMBER 1 **MARCH 2025**

(US ISSN 0892-2675) (CPM #40927506)

Perspectives on Science and Christian Faith

https://doi.org/10.56315/PSCF

Perspectives on Science and Christian Faith (USPS 28-3740, ISSN 0892-2675) is published quarterly by American Scientific Affiliation, 218 Boston St, Ste 208, Topsfield, MA 01983-2210. Periodicals postage paid at Topsfield, MA, and additional mailing office. POSTMASTER: Send address changes to: Perspectives on Science and Christian Faith, 218 Boston St, Ste 208, Topsfield, MA 01983-2210.

Manuscript Guidelines

JOURNAL VISION: The pages of *Perspectives on Science and Christian Faith (PSCF)* feature original contributions that advance human understanding of science and Christian faith. Consistent with the expectations for an academic journal, the articles it publishes should be clear, relevant, have an evident central thesis, engage the pertinent scholarly literature with fairness and rigor, exhibit charity, and conform to the highest standards of scientific and Christian theological integrity.

ARTICLES advance a position on a particular subject related to science and Christian faith. Such papers should be at least 2,000 words but not more than 8,000 words in length, excluding endnotes. An abstract of 50–150 words and a list of 5–15 keywords are required and should be in both the text of the email submission and at the beginning of the attached essay.

INSIGHTS inform readers of important emerging developments in science, theology, and other disciplines in a way that demonstrates both their intrinsic importance and their relevance for the science-faith conversation. Such papers should not primarily discuss their authors' own work and should normally be between 1,000 and 3,000 words in length, excluding endnotes. They are written by leading experts at the invitation of the Editor-in-Chief acting on the advice of the editorial board or in response to an author proposal. Prospective authors should consult the *PSCF* webpage for details as to what such a proposal entails.

REVIEWS contextualize, summarize, and evaluate important science and religion conversations while informing readers of the key concepts and issues involved and identifying promising avenues for further work. Reviews should be authoritative, comprehensive, and critical. They are written by leading experts at the invitation of the editor-in-chief acting on the advice of the editorial board or in response to an author proposal. Prospective authors should consult the *PSCF* webpage for details as to what such a proposal entails.

Although **THEME ISSUES** are normally co-edited by leading scholars at the invitation of the editor-in-chief acting on the advice of the editorial board, prospective authors of REVIEWS and INSIGHTS articles are also invited to consider whether such articles might serve as the basis for a future theme issue.

BOOK REVIEWS describe, contextualize, and evaluate books of significance to scholarly science-faith discourse. Book reviews are written under the guidance of subject area editors, who select books for review and offer them to scholars with appropriate expertise. Individuals who would like to be considered as potential reviewers are welcome to express interest to book review editor **Janet Warren** (ejanetwarren@gmail.com) for inclusion in the reviewer database. Publishers may also contact the book review editor if they are not sure which subject area reviewer would best consider a particular book.

- **Chris Barrigar** (chrisbarrigar@gmail.com): philosophy and theology
- **Brian Greuel** (btgreuel@gmail.com): biological and environmental sciences
- **Arie Leegwater** (arieleegwater1@gmail.com): history and philosophy of science, mathematics, and the physical sciences
- **Derek Schuurman** (dschuurman@calvin.edu): computers, engineering, and technology.

The viewpoints expressed in the books reviewed, and in the reviews themselves, are those of the authors and reviewers respectively, and do not reflect an opinion of their respective affiliations or the official position of the ASA.

LETTERS discuss material published in the preceding two issues of *PSCF* and should be no more than 300 words in length, excluding endnotes.

ALL CONTRIBUTIONS except ordinary book reviews and letters to the editor undergo both double-blind peer review and editorial review. Book reviews are subject to editorial review and may also undergo peer review at editorial discretion. Letters to the editor are subject to editorial review.

ADVERTISING is accepted in *PSCF*, subject to editorial approval. Please address inquiries for rates or further information to the Managing Editor. The ASA cannot take responsibility for any orders placed with advertisers in *PSCF* and does not imply endorsement by carrying the ad.

Stephen Contakes

DOI: https://doi.org/10.56315/PSCF3-25Contakes

Resources for Thinking and Loving Christianly Amidst the Changing Cultural Winds Surrounding Gender Incongruence

Although intelligence and academic learning are not in themselves marks of spiritual attainment, the New Testament consistently affirms the desirability of good thinking. Two of the Gospels explicitly mention that one effect of Jesus's healing of the Gadarene demoniac was the demoniac's restoration to a sound mind. The New Testament epistles even more plainly indicate that Christian believers are to think clearly so they can act rightly. Notably, the readers of 1 Peter were not to live according to the wisdom of a world in which whoever experiences the most sensual pleasure wins; instead, they were to be "vigilant," "alert," and "sober-minded" (*vide* 1 Peter 4, especially 4:7).

Within the wider context of the passage, the outcome of such thinking involves an ordering of life around God's will in prayer, outpouring in acts of sacrificial love. Such love "covers a multitude of sins," practices hospitality, thinks of gifts and status as an opportunity to serve, and speaks truthfully and with grace—for God and the benefit of others. This has direct relevance for the mission of *Perspectives on Science and Christian Faith*. Indeed, it is the frame in which we are called to operate, something that should direct and shape the perspectives we offer.

The above is important, for this issue of the journal is an unplanned *de facto* theme issue addressing Christian thinking about a contentious topic, gender incongruence. The first essay, by Tony Jelsma, updates and extends his 2022 review of the science surrounding gender incongruence and gender-affirming care.[1] The second, by Gregg Davidson, challenges arguments that employ variable or morphable sex in the animal kingdom and the existence of variable sexual developmental pathways in humans to argue against traditional binary understandings of biological sex. Such arguments have been influential in evangelical conversations about gender and sexuality over the past 15 years. Davidson contends that they rely on logical fallacies and, if applied consistently to a wider range of even more relevant animal behaviors, would normalize numerous human activities incompatible with universally accepted Christian ethical norms. Writing independently of Davidson, the philosopher Adam Smith addresses a question that naturally results: What, then, is the role of science in discussions about gender incongruence? Smith concludes that the question is not about the science but respect—just as some secular gender theorists contend. However, in contrast to some of those theorists, Smith does not assign empirical biological understandings of gender incongruence and gender-affirming care a lower value than personal feelings. Rather, Smith contends that respect involves honest conversation about the contestable ethical judgments involved when deciding whether gender incongruence is "a medical problem to be fixed" or "an identity to be celebrated."

The perspectives offered in this *de facto* theme issue highlight the urgent need for contributions addressing how Christians might understand gender incongruence theologically and respond to it pastorally, especially since the few rigorous accounts currently on offer have been problematized by the arguments in Fellipe do Vale's recent *Gender as Love*.[2]

This issue contains sixteen book reviews, representing the partial alleviation of a significant backlog generated by *PSCF*'s hardworking and longsuffering reviewers and review editors. Then there is an exchange of letters addressing Haarsma et al.'s argument that gender incongruence should not be understood to result from the Fall in a simple historical sense, plus a note of appreciation for Hal Poe's article addressing C.S. Lewis's approach to science and technology.

May all of the contributions in this issue help you think, live, and love Christianly.

Notes

[1]Tony Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria: A Christian Approach," *Perspectives on Science and Christian Faith* 74, no. 3 (2022): 130–48, https://www.asa3.org/ASA/PSCF/2022/PSCF9-22Jelsma.pdf.

[2]Fellipe do Vale, *Gender as Love: A Theological Account of Human Identity, Embodied Desire, and our Social Worlds* (Baker Academic, 2023).

Stephen Contakes
Editor-in-Chief

Tony Jelsma

Article

DOI: https://doi.org/10.56315/PSCF3-25Jelsma

On Gender, Gender Incongruence, and Gender-Affirming Care

Tony Jelsma

As the number of transgender individuals continues to rise, there is an urgent need to understand the nature of gender and the evidence supporting gender-affirming care. This article proposes the hypothesis that one's gender is a perception, influenced by biological and social factors. Early-onset gender incongruence seems to be influenced but not wholly determined by the prenatal hormonal environment, while late-onset gender incongruence is associated with comorbidities, suggesting that one's sense of gender can be impacted by a variety of psychological and social conditions that affect the mind-body connection. Puberty blockers have been used on children to buy time for them to decide whether to continue with their transition. However, most gender dysphoria desists at puberty, but this is prevented by puberty blockers. Moreover, puberty blockers have negative psychological and physiological consequences, and studies of puberty blockers and cross-sex hormones have not shown long-term improvements in mental health outcomes. Thus, while some gender incongruence does not resolve upon puberty and may be best treated by transitioning, the preponderance of evidence does not support a medicalized gender-affirming approach for children and adolescents.

Keywords: puberty blockers, luteinizing hormone, gonadotropin-releasing hormone, desistance, comorbidity, social construct, dysphoria, own-body perception, detransitioning, hypothalamus, pituitary, Dutch Protocol

The controversy surrounding gender identity and gender-affirming care shows no sign of diminishing. A US study using data from 2017–2020 found that 1.3 million individuals aged 13 and older identified as transgender, with youth aged 13–17 significantly more likely to identify as transgender than adults (1.4% vs. 0.3%).[1] As progress is being made in understanding gender and gender-affirming care, much remains to be determined.

This article builds on a previous review of the literature on gender incongruence,[2] with particular focus upon the nature of gender perception and the evidence surrounding aspects of gender-affirming care. Although much of the debate on this topic involves philosophical and theological arguments, this review focuses primarily on the biology, but it will also include a discussion of possible Christian responses.

This article is organized into two main sections. The first section deals with gender, its relationship to sex, and possible causes of gender incongruence. It also addresses identity development and suggests that gender incongruence may be due to abnormal self-perception. The second section covers aspects of gender-affirming care and the evidence supporting this care. This section includes a discussion of the quality of evidence in clinical studies and concludes that the evidence does not unequivocally support

Tony Jelsma *has been a biology professor at Dordt University since 2000, teaching human biology, developmental biology, and other courses. With a background in neuroscience, he has a long-standing interest in brain function. When not thinking about biology, he might be found on a bicycle, playing hockey, or playing the organ.*

gender-affirming care. Regret and detransitioning are also discussed, along with Christian perspectives on gender incongruence and some unresolved questions.

What Is Gender?

Perspectives on the Nature of Gender

Gender or gender identity is the internal sense of whether one is male or female (or neither for nonbinary individuals), as opposed to one's sex, which is genetically determined and involves the bodily manifestations of one's sex. Although gender is popularly used as a synonym for biological sex, the two are not equivalent. A diverse and often conflicting collection of views on the nature, origin, and stability of sex underlies discussions about gender dysphoria and transgender healthcare. As will be described in more detail later, gender incongruence can be apparent at different stages in development: in childhood or in adolescence. It is not clear to what degree these two forms have a shared etiology, but this article will propose differences in their context, which can affect their sense of gender.

One view of gender is the biology-based essentialist view, which argues that gender is identical to sex and wholly derived from it.[3] However, this view cannot account for the fact that sex and gender are incongruent for some people.

A second view is that gender is influenced, but not completely determined, by testosterone (some of which is converted to estrogen) present in the male but not in the female fetal brain.[4] This hormonal milieu is thought to cause the brain to develop sex-specific characteristics. For example, fetal testosterone corresponds with male-typical play in children[5] and rodents.[6] While a definitive biological mechanism cannot be identified,[7] there may be genetic and epigenetic (environmental) contributions to gender incongruence. Higher frequencies of gender incongruence are seen in congenital adrenal hyperplasia,[8] partial androgen insensitivity,[9] polycystic ovary syndrome,[10] exposure to diethylstilbestrol,[11] and genetic variants of androgen receptors[12] and estrogen signaling pathways.[13]

A study of 32 transgender individuals found differences in epigenetic profiles (DNA methylation patterns) between transgender and cisgender populations, although these findings are preliminary as they did not account for other conditions that affect DNA methylation.[14] Nevertheless, some of the affected genes are known to be involved in neural development, although their role in gender development is unknown. Curiously, most of these differences were seen in male-to-female transgender individuals (87 differences) but only two were seen in female-to-male individuals. These differences were seen before gender-affirming hormone therapy (GAHT); consequently, GAHT caused changes in methylation patterns.[15] It should be noted that each of these conditions, whether genetic or epigenetic, only partially contributes to an increase in the frequency of gender incongruence. Thus, other factors must play a role in one's gender perception.

A striking example of the role of hormones in gender perception is the case of Greg Eilers.[16] Eilers suffered from gender dysphoria, which intensified in adulthood, to the point where he was forced to retire from the ministry in order to transition to Gina. The transitioning process included bottom surgery and estrogen treatments. The absence of testosterone and the higher levels of estrogen resolved his dysphoria. Counterintuitively, as long as he remains on estrogen, he senses his gender as male.

While the Eilers case also provides an example of gender not being fixed, Jack Turban, a child and adolescent psychiatrist and prominent advocate for gender-affirming care and author of *Free to Be: Understanding Kids & Gender Identity*, suggests that gender is invariant, one's "authentic self."[17] For Turban, it is not that one's gender changes, it is one's understanding of their gender that might evolve.[18]

Another factor to consider is the stability of gender perception over time. If one's gender is one's "true self" and cannot change, that would strengthen the argument for treating gender incongruence via body modification. However, 60–90% of early-onset gender incongruence has been reported to desist at puberty.[19] Further evidence for a biological component to gender perception involves individuals with a deficiency of the enzyme 5-alpha reductase-2, which converts testosterone to dihydrotestosterone. Testosterone is thought to be involved in masculinization of the fetal brain, but dihydrotestosterone is needed for development of male genitalia. Individuals lacking 5-alpha reductase-2 have abnormal genitals at birth and are often raised as girls. However, when testosterone levels increase at puberty, there are changes in the genitals and other secondary sex characteristics. In one study, roughly half of these individuals changed

from female to male.[20] That not everyone changed their gender indicates that other factors are involved, and one cannot exclude the possibility that the gender incongruence existed in childhood but was not manifest until puberty. The author of the study noted that there was no correlation between the degree of external masculinization and gender changes, so it remains unclear why some people changed their gender and not others.

Nonbiological perspectives on gender are also influential. One involves the Vrije (Free) University Medical Center (VUMC) in Amsterdam, in the forefront of treatments for gender dysphoria since the 1960s. The VUMC is a (Reformed) Christian institution and the stated motivation for the surgeons performing the sex change operations was explicitly Christian[21] and, in the case of the surgeon Freerk Bouman, grounded in a dualist conception in which treatment of the body functioned as service to the soul. Bouman states,

> To me [performing these surgeries] is proof of Christian compassion. These people are in need; they are kind of the wretched of this earth. From a Christian point of view the soul, the psyche, should be considered more important than the body. So, if the soul is so disturbed that it makes people feel totally unhappy and get into trouble, it is allowed to help them in this way. I can justify that. Jesus is the Good Samaritan. He looks after the outcasts. I think that is beautiful.[22]

While Bouman's ethic of compassion and service is commendable, it should not automatically be taken as the normative Christian perspective. Fellipe do Vale in his book *Gender as Love: A Theological Account of Human Identity, Embodied Desire, and Our Social Worlds* argues that prioritizing soul over body (or in Bouman's case, gender over biological sex) runs the risk of falling into Gnosticism, treating the body as evil and temporal.[23] Moreover, such a position is incompatible with the monistic perspective, held by some Christians, that body and soul are unified.

Another view is that gender is a social construct. As the child develops, they respond to cues from their own bodies and how they are conditioned by others to develop a sense of gender.[24] Proponents of this view are motivated by a concern to avoid defined (and potentially discriminatory) gender roles. For instance, the transgender journalist Andrea Long Chu, following Judith Butler, claims that we must rid ourselves of the idea that any necessary relationship exists between sex and gender.[25] She argues for the right to change one's biological sex without appealing to gender and the right to assume a gender that is not determined by one's sexual biology. The transgender law professor Florence Ashley also uses the social constructivist perspective to bolster moral claims when she argues for gender self-determination and medical transitioning as a medical right.[26]

Partly because of the difficulty in determining a definitive cause for gender incongruence, this article proposes the hypothesis that gender is not so much an *entity* as a *process*, one of perception or interpretation, which develops over time. Specifically, it proposes that one's sense of gender is emergent, influenced by but not reducible to biological sex. A fertilized egg has a biological sex but no gender. As the embryo, the fetus, and then the child develops, that person is influenced by biological and social factors—for example, the hormonal environment of their brain, their awareness of their body, how they are treated by others, and role models and perceived gender roles that they encounter. They then incorporate all of this as their sense of gender develops. Generally, one's gender aligns with one's biological sex, but various factors could affect this process, resulting in gender incongruence. Once established, one's sense of gender can be remarkably resistant to change. Some sufferers of gender incongruence simply cannot escape their dysphoria. However, as will be shown later, in other contexts, one's sense of gender is not as stable as one might think, especially during adolescence.

Gender incongruence is thought to come in two general categories. The early-onset form arises before puberty, usually between ages 3 and 7,[27] while the late-onset form arises in adolescence. Most early-onset cases desist upon puberty. A recent general population study of 2,772 individuals in the Netherlands found a decrease in gender non-contentedness over the course of adolescence from 11% at age 10 to 4% by age 26. In contrast, just 2% experienced increasing gender non-contentedness over time and, associated with that, a poorer self-concept and mental health.[28] Those experiencing increased gender nonconformity were ten times more likely to be same-sex attracted or bisexual; this is similar to findings in other studies.[29] This correlation raises the possibility that these individuals mistook same-sex attraction for gender incongruence and/or that there is a shared etiology between the two conditions. However, for those in whom the incongruence persists, the dysphoria intensifies and causes extreme distress, in part due

to the development of unwanted secondary sex characteristics.

While the relationship between early- and late-onset gender incongruence is unknown, the proportion of the late-onset form is increasing in the overall population and, unlike the early-onset form which primarily affects natal males, primarily involves natal females.[30] The late-onset population also presents with considerable psychiatric comorbidity.[31] Little is understood about the nature and causes of this form of gender incongruence. This article proposes the hypothesis that late-onset gender incongruity is not biologically determined, as in early-onset gender dysphoria, although there still could be a biological contribution; rather, it is a disorder of perception, facilitated by the associated psychiatric comorbidities.

In hypothesizing that late-onset gender dysphoria is a disorder, it must be acknowledged that the American Psychological Association,[32] the Endocrine Society,[33] and the World Professional Association for Transgender Health (WPATH)[34] strongly disagree with the characterization of gender incongruence as a disorder and thus object to any efforts to "treat" the incongruence in any way except by gender-affirming care. However, despite the commendable desire to avoid stigmatization embodied in the gender-affirming approaches offered by these organizations, a major purpose of this article is to consider the possibility that gender incongruence is a disorder of perception. Thus, the term disorder will be retained, although in so doing there is no intent to denigrate those with gender incongruence or prejudge the cause of their condition.

Perception of Self

The scientific question of how one experiences one's gender, let alone how that experience can change, is difficult to address, as one's sense of gender cannot be objectively measured. The nature of perception was introduced in the previous review,[35] but needs to be elaborated here. In addition to the work of Anil Seth, the neuroscientists Gregory Berns[36] and Andy Clark[37] have also elaborated on the process of perception. Berns summarizes the neuroscience thus:

> … the question of self-identity boils down to one of self-perception, namely how a person thinks about themself. Take gender, for instance, which not so long ago was thought to be a fixed, objective feature of someone's identity. The argument went, you can look in the mirror and see for yourself the shape of your body, the genitals you were born with (or not). But we now understand that *what you do with that information*, your own sense of gender identity, whether congruent or not with the physical expression of your sex, is a matter of perception—and that is a process that occurs in the brain.[38] (italics added)

All three authors describe the process of perception as making inferences, using incomplete sensory information, and those inferences are updated as more data come in. The brain receives a variety of inputs, including chemical and electrical signals, and, by trial and error, uses those signals to try and make sense of its surroundings. This process can readily be seen in babies, who gradually become aware of their surroundings and learn how to interact with them in a process that Joshua Rule and colleagues describe as hacking.[39] This approach leads to more rapid perception, improvements in perception with learning, and selective attention in the presence of distractors.[40]

In addition, there is also interoceptive inference, in which the brain receives inputs from the body—for example, pH, blood pressure, electrical signals, hormones, inflammatory molecules—and uses those signals, in a process known as allostasis, to construct a guess about one's physiological state and to respond accordingly.[41] Usually, this guess is correct or can be modified with further information, but disorders of allostasis—misinterpretations—can occur. Conditions like anxiety and depression may involve such.[42] Seth and Manos Tsakiris apply the concept of interoceptive inference to self-perception.[43] If one's sense of self is based on inference, that inference may not necessarily be correct. As Seth and Tsakiris explain,

> On the view we propose, the function of perception is not to recover a "veridical," action-independent representation of the external environment or body. Instead, predictive perception, in any modality, is ultimately geared towards driving actions that preserve physiological integrity of the organism. In other words, we do not perceive the world (and self) as it is, but as it is useful to do so. This may involve systematically "misperceiving" the environment, by criteria of veridicality.[44]

Seth and Tsakiris go on to explain that perception remains relatively stable because we do not expect our "selves" to change significantly over time, although they acknowledge the possibility of breakdowns in cases such as schizophrenia, dementia, delirium, and multiple personality disorder.

Although Seth and Tsakiris do not discuss it, the subjectivity of perception may also apply to gender. This

possibility was proposed by the clinical psychologist Jaco van Zyl, who describes gender dysphoria as an affective-perceptual disturbance involving the body.[45] Under certain circumstances (e.g., the comorbidities that are common in gender incongruence), one's gender perception might be affected.

The nature of own-body perception in gender incongruence was investigated by Jamie Feusner et al., who carried out an fMRI study and found weaker functional connections within the self-body identification network in (adult) transgender persons than in controls.[46] They suggest that the connection between body perception and self-identification might be more reflective than reflexive, that is, gender identity might be a conclusion rather than a genetic or developmentally determined feature; such a conclusion supports the hypothesis of perception described above.

A striking example of the role of (mis)perception in gender identity was described by V.S. Ramachandran and Paul McGeoch, who examined the existence of phantom penises (the sense of having a penis when there isn't one) in transgender individuals.[47] Transgender males experienced phantom penises *before* they acquired a penis through surgery while transgender females experienced a lower incidence of phantom penises after surgery than would be experienced by people whose penis was removed for other reasons, for example, cancer. This further supports the idea that gender incongruence might involve misperception.[48]

Though attributing gender incongruence to misperception, it needs to be clear that this is not meant to diminish or discount how real it is to those suffering from gender dysphoria, just as other body dysmorphias, such as phantom appendages and anorexia, are very real. Furthermore, once formed, it may be difficult to change one's perception, since one's perception shapes how subsequent information is received and indeed may result in a "rewired" brain. The (mis)perception hypothesis may help explain why various biological contributions only cause a relatively low frequency of gender incongruence.

Development of a Sense of Self in Adolescence

How would adolescence be a time of susceptibility to gender incongruence? Erik Erikson's eight stages of identity development throughout an individual's lifespan provides a possible explanation.[49] These stages are marked by a psychosocial crisis, which the individual must navigate to continue their development. The fifth stage, which occurs during adolescence, is a crisis of identity. Rapid body changes accompanied by sexual awakening force the individual to seek a sense of belonging. If this stage is not successfully navigated, the individual is susceptible to identity confusion. The overreaction to this lack of identity includes over-identifying with a particular group and becoming intolerant of others. Erikson wrote,

> It is difficult to be tolerant if deep down *you are not quite sure that you are a man (or a woman)*, that you will ever grow again and be attractive, that you will be able to master your drives, that you really know who you are …[50] (italics added)

James Marcia further develops Erikson's identity stage, describing two categories of individuals with identity confusion. Those who have not experienced the crisis of identity are foreclosed, retaining their parents' identity and possibly being threatened if their childhood beliefs are challenged. By contrast, those still in the crisis period are preoccupied and struggle to make commitments.[51] While Marcia does not address gender, the latter group may be particularly susceptible to gender incongruence.

Anatomical changes in brain development during adolescence may affect one's sense of gender. A study by Nienke Nota et al. found functional brain connectivity differences between transgender adults and controls but not between prepubescent children with gender dysphoria and controls.[52] This suggests that anatomical changes associated with incongruent perception are not early-onset but develop over time. In childhood, subcortical areas such as the amygdala and striatum are associated with cue-driven impulsivity. As the child enters adolescence, the brain matures rapidly as the neocortical (conscious) area continues to develop (it is not complete until well into one's twenties[53]), providing better cognitive processing of emotional cues—that is, the adult thinks things through before responding.[54] This may allow adults to be more resistant to stimuli that may trigger late-onset gender incongruence.

Accompanying the cognitive aspects of brain maturation in adolescents is the development of the mind-body connection and one's sense of self. Ivanka Savic and coworkers demonstrated a correlation between self-body perception and gender dysphoria. Using fMRI, they found that transgender men and

women showed weaker structural and functional connections in the anterior cingulate-precuneus and right occipito-parietal cortex, regions known to process self-body perception.[55] In contrast, homosexuals exhibited intermediate connectivity between heterosexual cisgender and transgender. In another study, they found that maturation of the cerebral cortex of transgender individuals is reduced in the occipito-parietal cortex and sensory motor cortex, which are regions thought to encode one's own body image and body ownership.[56] One possible implication of these findings is that a less-developed mind-body connection weakens the sex-gender connection and makes the individual more susceptible to factors that lead to gender incongruence.

Jennifer Pfeifer and coworkers used functional magnetic resonance imaging (fMRI) to compare regions of the brain that were active when children and adults were asked questions related to their self-knowledge (e.g., does a particular feature describe themselves or someone else).[57] In children, this activity preferentially activated the (immature) prefrontal cortex, while in adults the temporal lobes were preferentially activated. The authors interpreted this to mean that the children in this study relied more on active self-reflection and less on stored self-knowledge than adults when responding to these cues, again making adults more resistant to gender incongruence.

As individuals reach puberty, it appears that they can be susceptible to gender incongruence if the development of their mind-body connection is impaired. This can occur in several ways, including mental stress such as anxiety, depression, or social isolation. It can also occur in the context of autism. These factors will be discussed next.

Social Isolation, Touch, and the Mind-Body Connection

Social context and social interactions play important roles in the development of an individual's mental development and beliefs.[58] An abnormal social context could affect one's sense of self and gender. The mind-body connection is harmed by social isolation and the lack of physical contact. Consider touch perception, in which different types of receptors present in the skin provide information about temperature, pain, light touch, stretching, et cetera, to the sensory homunculus, which "maps out" the body to allow the individual to know what part of the body has been stimulated, and how. However, there is another type of touch sensation, which was discovered in two patients who, due to neuropathy, lacked the primary touch sensations but retained a different kind of touch receptor, called C-tactile fibers.[59] These receptors respond to gentle touch, particularly slow stroking on hairy skin, and provide a pleasant but nonlocalized sensation. Rather than activating the sensory cortex, these fibers activate the insular cortex, which is thought to be important for body ownership.[60]

This type of touch is thought to be important for social development and in the construction of a sense of self and body ownership.[61] It can be illustrated by the rubber hand illusion. In this illusion, the experimenter gently strokes both the participant's hand, which is hidden from view, and an adjacent rubber hand, which is in view. Over time, the participant transfers the sense of ownership from their real hand to the rubber hand.[62] Notably, Pawel Tacikowski et al. used the same stroking approach on participants wearing virtual reality goggles while lying on a table. If the goggles portrayed a person of the opposite sex while their bodies were being stroked (in a nonsexual way), their sense of gender also shifted to the opposite sex,[63] suggesting that, under certain conditions, one's sense of gender could be somewhat fluid.

Physical contact between friends is frequent in both boys and girls, although expressed differently, and is important for the development of body ownership and development of mind-body ownership. That contact can be lacking in adolescents who are socially isolated, particularly if the cause of their social isolation is anxiety or depression or not fitting in with their peer group. It is difficult to distinguish cause and effect, but a recent study found that transgender and gender-questioning adolescents spent an astounding 4.5 and 3.4 more hours respectively of total recreational screen time per day than their peers![64]

Autism and Gender Incongruence

Differences in brain development can also have an effect on the development of one's sense of gender. Emily Thrower et al. reviewed studies that looked at the correlation between autism and gender dysphoria[65] and found that the proportions of people with gender incongruence on the autism spectrum ranges from 6–26%, higher than the 2.47% frequency found in the general population.[66] Similarly, the frequency of gender incongruence among those with autism is over four times higher than in the general population.[67]

The basis for this increased co-occurrence is unclear, though it has been extensively studied. A review of the literature by Juliette Bouzy et al. considered elevated fetal testosterone, less internalization of gender roles and identification with a gender group, and cognitive differences that might affect one's awareness of social pressures for gender conformity.[68] Assia Riccioni et al. described shared features between autism and gender incongruence, including impaired social behavior and theory of mind, repetitive thoughts/obsessions, cognitive inflexibility, and altered sensory processing.[69] People on the autism spectrum tend to display a reduced gender self-concept.[70] There is a diminished mind-body connection[71] and processing of social touch by C-tactile fibers in people with autism.[72] The effect of the latter on development is compounded by the fact that autistic people tend to avoid social touch, likely due to a hyper- or hypo-sensitivity.[73]

Comorbidities, Mind-Body Connection, and Gender Perception

There is a higher incidence of comorbidities associated with gender incongruence, which this article will argue affects gender stability. The result of gender minority stress on the mental health and suicidal ideation of transgender people has been established.[74] One study of college students found a 4.3-fold higher incidence of mental health problems in those with gender incongruence.[75] Other studies had similar findings.[76] A survey of children at a clinic in Australia found the comorbidities listed in Table 1.[77]

Table 1. Clinical Characteristics of Gender-Dysphoric Children Presenting at a Gender Clinic

Family conflict	66%
Parental mental illness	63%
Separation from important figures	60%
Bullying	54%
Depression	62%
Anxiety	63%
Behavior disorders	35%

It is difficult to disentangle cause and effect in this phenomenon. The presence of gender dysphoria may contribute to or result from these mental health comorbidities. The latter may be the case in this study, in which children first sensed their incongruence before age 10. Even in these cases, however, the comorbidities may hinder the resolution of gender dysphoria in adolescence by impeding the development of the mind-body connection. Because of the uncertain relationship between the dysphoria and comorbidities, Mark Yarhouse and Julia Sadusky encourage counselors to first address comorbidities and see if the dysphoria resolves.[78]

Gender-Affirming Care

Medical care for those with gender incongruence should ideally be evidence based, accessible, and offered by knowledgeable and culturally sensitive medical providers.[79] The present standard of care is transitioning. It involves three phases: social transition, which allows the individual to present as the opposite sex without surgical or pharmacological treatment, puberty blockers (for children) and cross-sex hormones, and surgery. The latter might involve some combination of mastectomy, metoidioplasty, or phalloplasty (construction of a penis by two different means), or vaginoplasty (construction of a vagina) in addition to cosmetic surgeries to help the individual "pass" as the opposite sex. This review focuses primarily on the first two phases.

Transitioning in Children and Adolescents

There is a debate about the ethics of treatment of children and adolescents with gender dysphoria, primarily because their brains have not fully developed and the evidence suggests that they cannot fully grasp the consequences of transitioning: lifelong dependence on hormones, loss of fertility, numerous surgeries with frequent complications, and loss of sexual function. A small qualitative study of 14 individuals considering puberty suppression and their parents found that most of the parents, clinicians, and adolescents did not fully understand puberty suppression and its consequences.[80] A second small study found that only 24% of transgender youth expressed a wish to have their own biological child.[81] A third small study found that transgender adolescents had lower rates of romantic relationships and sexual experiences than the general population, which may affect their valuation of sexual relationships.[82]

Social Transition

Social transition involves efforts to disguise one's sex or resemble the other sex. Initial practices include changing one's name and pronouns, dressing androgynously, altering one's hair style, and changing one's voice to sound more like the desired sex. As puberty develops, further measures may be taken, though not without deleterious physical consequences. One study of chest binding to flatten the

breasts found over 97% incidence of pain, shortness of breath, bad posture, and/or skin problems.[83] The practice of tucking to disguise male genitalia involves bringing the testes up into the inguinal canal and pushing the penis back toward the rectum, and can lead to infection, testicular pain, issues with urinary flow, and lowered sperm count.[84]

Although the long-term effects of social transition are uncertain,[85] Mark Yarhouse and Julia Sadusky propose social transition as a way of allowing the patient to manage their dysphoria.[86] Yet James Morandini et al. examined the effect of social transition in over 200 children and adolescents but found no significant effects on their mental health status.[87] Social transitioning also does not appear to affect long-term outcomes. James Rae et al. compared children who socially transitioned earlier (due to more intense dysphoria) with those who transitioned later and found no difference in gender identification and preferences between earlier- and later-transitioning individuals.[88]

Puberty Blockers and the Dutch Protocol

Gender-dysphoric children face a dilemma when reaching puberty. Development of secondary sex characteristics could intensify the dysphoria but as described earlier, in most cases, the incongruence desists. The puberty blocker treatment was proposed to buy time to see if the incongruence would desist, without the added stress of the development of secondary sex characteristics.[89] If the incongruence persists, then the child would take cross-sex hormones. The evidence is now clear that this approach, while well-intended, is problematic.

The regulation of sex hormones involves the hypothalamus, anterior pituitary, and the gonads (fig. 1). Neurons in the hypothalamus release gonadotropin-releasing hormone (GnRH) to the anterior lobe of the pituitary, where it activates cells called gonadotropes, which release luteinizing hormone (LH) and follicle-stimulating hormone (FSH) into the bloodstream. This occurs in both males and females. These two hormones regulate reproductive functions in the testes or ovaries, including the production of sex steroids such as testosterone, estrogen, and progesterone. In males, constant levels of testosterone are maintained through a negative feedback system, in which the sex steroids and the protein inhibin suppress the production of GnRH, LH, and FSH. In females of reproductive age, increased estrogen production by developing ovarian follicles overrides this negative feedback, resulting in ovulation. Thus, in females, the levels of estrogen and progesterone rise and fall over the course of the menstrual cycle.

The extent of hormone production can vary over time. For instance, there is also a prenatal wave of GnRH production, which causes a surge in testosterone production in baby boys. This testosterone enters the brain where it is involved in masculinization of the brain.[90] When someone reaches puberty, GnRH levels increase, stimulating the release of LH and FSH, and the sex steroids. The age at which this occurs is affected by external and internal factors, occasionally resulting in delayed or precocious puberty.

Puberty can be suppressed pharmaceutically by the GnRH *agonists* (GnRHa) leuprorelin/leuprolide or triptorelin, colloquially known as puberty blockers.[91] GnRH is normally released in pulses and acts on gonadotropes in the anterior pituitary to cause them to release LH and FSH. However, overstimulation by constant (rather than pulsatile) levels of GnRHa downregulates GnRH receptors on these cells, which in turn decreases LH and FSH, and then sex steroid hormone production by the gonads. GnRHa is not needed for female-to-male transitioning, as testosterone overrides any effect of estrogen. The combination of GnRHa and estrogen can be used off-label in adolescent or adult biological males to suppress testosterone production as part of their transition to a female identity. It is also used in children to suppress the development of puberty in the Dutch protocol.

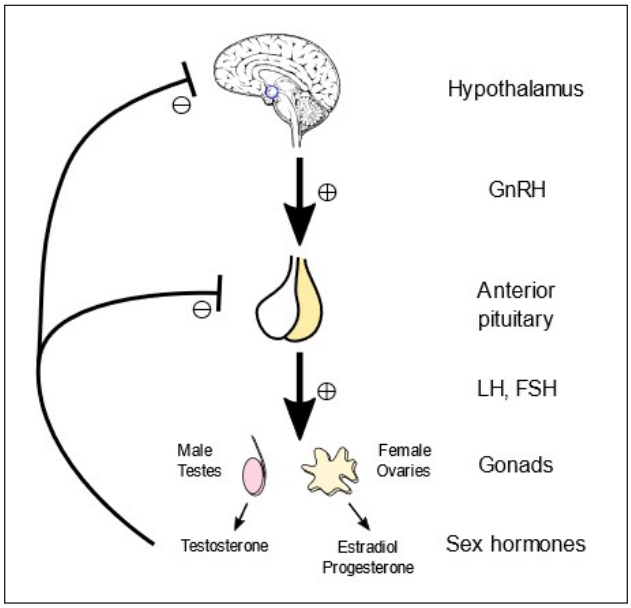

Figure 1. Simplified diagram of regulation of the hypothalamus-pituitary-gonad (HPG) axis. See text for details. By Artoria2e5 – Own work, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=81460023.

Because individuals with gender dysphoria may experience intensified distress as secondary sex characteristics develop during puberty, GnRHa may be used to suppress puberty in order to buy time to see if the incongruence persists. The use of puberty suppression for this purpose was first reported in the Netherlands.[92] A female with gender dysphoria was treated with puberty suppression starting at age 13 and testosterone treatments at 18, followed by several sex-reassignment surgeries over the course of several years, including mastectomy, hysterectomy, and metoidioplasty (construction of a small penis). Overall, the patient was satisfied with the transition, although they suffered some depression due to an inability to function sexually. The patient also was of above average intelligence (and later became a physician), had no other serious psychopathology, and concomitantly received extensive counseling.

This single case was followed by a larger trial, now known as the Dutch Protocol,[93] which reported some success. This protocol was soon adopted in many other countries as a treatment for gender dysphoria, though the trial was critiqued as producing data of limited reliability.[94]

Critique of Puberty Blocker Studies

Given that so much of gender-affirming care is based on the Dutch Protocol, which is a single study, it is important to review this study, in order to evaluate the quality of the evidence that was presented, particularly in the use of this protocol in other clinical settings. The Dutch Protocol study suffers from many weaknesses, which are summarized in table 2. First, this was just a single study, comprising 70 individuals. Although one needs to start somewhere, this single study was undertaken to establish the Dutch protocol—yet other studies did not show the same success. A study of 324 sex-reassigned persons in Sweden found that, although patients' dysphoria was alleviated, there was still a high risk of mortality, suicidal behavior, and psychiatric morbidity.[95]

Table 2. Weaknesses of Dutch Protocol Study
Small sample size
Lack of a control group
Counseling support adds confounding variables
Loss of patients to follow-up
Short study duration
Defective assessment tool

A similar study conducted in Finland involving 3,665 individuals seeking gender reassignment found that gender reassignment did not change the risk of needing subsequent psychiatric assessment,[96] and a follow-up study of 2,083 gender-referred patients did not find a correlation between gender dysphoria and suicide mortalities, but they did find a correlation with psychiatric morbidity (note the use of objective measurements and the larger patient numbers than those reported in the Dutch Protocol study).[97] Finally, a smaller study in the UK on 47 individuals with gender dysphoria found rates of deterioration and improvement over a period of 36 months similar to the rates found in larger studies.[98]

A second critique of the Dutch study was that all the patients remained gender dysphoric and went on to cross-sex hormone treatments.[99] This contrasts with gender dysphoric children not on puberty blockers, who experience a frequency of desistance ranging from 61 to 90%,[100] the majority of whom are same-sex attracted. Indeed, almost ninety percent of this study group reported attraction to their natal sex; that is, they were same-sex attracted and not transgender.[101]

While the authors of this study noted but did not attempt to explain the connection, Kelley Drummond et al., in a separate study of biological females, noted a high (88%) desistance rate; in addition, they found a positive correlation between the severity of the childhood dysphoria and the probability of same-sex attraction.[102] Subsequent studies with puberty blockers have found a similarly high, but not complete, persistence of gender incongruence.[103] A long-term follow-up study of 307 transgender youth by Kristina Olson et al., found just 2.5% desistance after five years.[104] These participants had undergone a complete social transition and received puberty blockers during the course of the study.

The authors of the Dutch study argued that the persistence they observed was due to the careful selection of patients who had genuine gender dysphoria.[105] While it may be possible that these researchers were exceptionally adept at identifying those whose gender incongruence would persist, it could be argued that the reorganization of the brain that occurs at puberty due to sex hormones is a more likely explanation for the desistance, which had been prevented by the puberty blockers used in the Dutch study. Indeed, the administration of puberty blockers did not ameliorate the dysphoria, a result that was expected by the authors of this study.[106] If the likely

cause of the incongruence was related to the hormonal milieu *in utero*, it is possible that the reactivation of the hypothalamus-pituitary-gonadal axis at puberty could reset the brain to resolve the incongruence. The influence of pubertal testosterone in gender perception was described earlier in this paper in a study of genetic males who had female or ambiguous genitalia due to a deficiency in the conversion of testosterone to dihydrotestosterone (the latter is required for male genital development). These individuals were raised as females but roughly half of them changed to a male gender as their testosterone levels increased in adolescence or early adulthood.[107]

A third critique of this study was that there was no control group. This was an observational study, following the patients after treatment. Other studies acknowledge the lack of a control group but state that this is for "obvious ethical reasons": withholding treatment would be unethical.[108] However, this reasoning begs the question by assuming the very hypothesis they are testing. An additional concern is that since all participants in this study received puberty blockers, one cannot discount the placebo effect.[109] Not only did these patients receive treatment, which would improve their hope for relief, but changes in hormone levels have profound effects on psychological function and brain anatomy, possibly giving the impression that their dysphoria is resolving.[110] The effects of treatments on the person's mood is a phenomenon described by Jack Turban as gender euphoria.[111]

Another concern about this study is that participants in this trial received extensive counseling support to address any psychological or social problems. Such support is obviously a good thing, but it prevents one from distinguishing the benefit of puberty blockers from the benefit of counseling support. This is an important point because it may account for the fact that when the Dutch protocol was adopted in the UK, the patients did not receive a similar level of counseling support[112] and the Dutch results were not replicated.[113]

Yet another weakness of the Dutch study and many other studies is the loss of participants to follow-up. Provided that the reason for the attrition is unrelated to the treatment received, this would not be a concern. However, in this case, those not satisfied with the treatment would be less likely to persist in the trial and thus attrition could skew the data. In a follow-up to the original Dutch study, 55 of the original 70 patients one year after cross-sex hormone treatment found good overall psychological function.[114] Six of the remaining fifteen original patients were not yet eligible for surgery and thus were not included,[115] but no reasons were listed for the remaining nine. While an attrition rate of 13% is reasonable, other studies that claim success of puberty blockers have higher attrition rates. For example, one study lost 65% of its participants over the 18 months of their trial.[116]

One of the greatest concerns with this original study is the assessment tool that was used. Participants filled out a survey that, in part, assessed the participants' degree of gender dysphoria and perception of their body image at three times during the trial: before puberty suppression (T0), upon initiation of cross-sex hormones (T1), and one year after gender-reassignment surgery (T2). There were two versions of the survey, one for males and one for females, but patients at time T2 used the opposite survey that they used at T0 and T1. Consequently, the sex-specific nature of the survey made it impossible to compare conditions before and after treatment.

Another part of this survey assessed psychological functioning, including depressive symptoms, anger, anxiety, and behavior and emotional problems. Many measures on this portion of the assessment showed statistically significant improvement from T0 to T2. The authors did not show a statistical comparison between T0 and T1 vs. T1 to T2; however, an examination of the relevant table in their paper (table 3) shows approximately half of this improvement occurring between T0 and T1, even though the gender dysphoria had not abated nor was there any physical change, since cross-sex hormones had only just been administered and there wasn't time to have effects.[117] Although it is impossible to know for certain in the absence of a control group, this improvement in subjective measures suggests that much of the improvement could be attributed to the placebo effect. Moreover, measures of depression, anger, and anxiety did not change over the course of the study.

All this criticism is not to fault the authors of the Dutch Protocol study, as the scientific community was interested in preliminary findings, and this research group intends to publish a longer-term study when the data become available. As senior author Peggy Cohen-Kettenis noted, "A truly proper follow-up needs to span a minimum period of 20 years."[118] Whether such a study will be feasible, given the challenges in keeping track of participants for so long, is

an open question. Nevertheless, at this time, the evidence does not support the use of puberty blockers to improve the plight of those suffering from gender incongruence.

The GRADE Criteria for Evaluating Evidence

The quality of current evidence for transgender healthcare may be assessed using the GRADE approach developed by Gordon Guyatt et al., which employs evaluation criteria to arrive at a reliable objective assessment of the quality of evidence for medical procedures.[119] One component of this assessment is the kind of data that is being collected, whether it is objective or subjective. Reporting on patients' perceptions is less reliable than objective measurements of things such as mortality, fertility, and other physiological measurements. The seriousness of the outcomes also contributes to the quality of evidence; for example, changes in the number of suicides constitute stronger evidence than measurements of suicidality, which may be temporary and not lead to actual suicide. Similarly, the seriousness of the side effects of treatment needs to be considered. Mortality and the loss of fertility are more serious than weight gain or social anxiety. One also needs to consider all the possible side effects of a treatment.

The GRADE criteria also consider study design. Randomized trials (with negative controls and blinding of researchers) provide stronger evidence than observational studies. In randomized trials, the data to be collected are decided upon beforehand, whereas in observational studies, researchers record findings after the fact; this method can result in biased data analysis. Observational studies, in turn, are stronger than individual case studies, which have no control and are more susceptible to confounding variables. Moreover, a greater number of participants generates more confidence in the findings. Finally, a longer study duration will detect effects that may be missed in shorter studies.

In transition studies, longitudinal studies of at least five years' duration are important to assess the long-term impacts of transitioning. Loss of participants during follow-up can skew the data, especially in studies of gender transition (those with negative outcomes are less likely to be willing to respond to further requests to participate). Wide confidence intervals, due to small sample sizes or wide variability in results, and small effect sizes also weaken confidence in one's conclusions. Finally, possible conflict of interest and publication bias can call into question the objectivity of the study (negative results are often not published or accepted by journals).

While there are many studies that claim to support the use of gender-affirming care, whether puberty blockers or for medical transition,[120] the above weaknesses consistently arise.[121] Using the GRADE criteria, Guyatt concluded that the evidence supporting puberty blockers was very weak.[122]

More recently, the Cass Review commissioned by the UK National Health Service (NHS) under the direction of Dr. Hilary Cass, a pediatric endocrinologist, reported that the evidence for gender-affirming treatments was weak.[123] It cited the low quality of evidence and equivocal findings in the available studies. In response, the NHS has indefinitely banned the use of puberty blockers for gender incongruence in children under the age of 18.[124] This decision parallels similar legislation in the Canadian province of Alberta, roughly half of the US states, and several European countries. In response, WPATH (World Professional Association for Transgender Health), an organization that publishes standards of care for professionals working in gender health,[125] issued a critical response to the Cass Review, arguing that Cass lacks personal experience in transgender healthcare, the report contains no new research, several countries disagree with the findings of the review,[126] and the double-blinded clinical trials called for by the review would be unethical because the control group is withheld from receiving beneficial treatments.[127]

Cass responded to these criticisms, pointing out that the team carrying out the review met with over 1,000 individuals, some in one-to-one meetings, others in groups, interviewing both people with lived experience of gender dysphoria and organizations working with LGBTQ+ children.[128] Moreover, this review was not intended to contain new research but a survey of existing studies. Finally, claiming that double-blinded clinical trials withhold beneficial treatments is a circular argument because trials are needed to determine whether the treatments are beneficial in the first place.

Cognitive Effects of Puberty Blockers

The effect of puberty blockers on the brain has been reviewed by Vincent Prévot et al.[129] and Nimmi Wickramasuriya et al.[130] In rams, suppression of testosterone reduces emotional reactivity, hampers adjustment to environmental change, and delays maturation of cognitive processes (e.g., information

processing, which affects the motivation to approach and avoid objects).[131] In male mice, puberty blockers "increase hyperlocomotion, change social preference, and increase neuroendocrine stress responses. In female mice, they increase hyponeophagia (a measure of anxiety) and despair-like behavior."[132] In female macaques, puberty blockers make the monkeys more submissive and less affiliative but also less anxious.[133]

Although weakened by small studies and overreliance on case studies, the available evidence suggests that puberty blockers also have cognitive and emotional effects in humans. There are GnRH receptors in the amygdala (emotion processing), hippocampus (memory function), and olfactory system (smell processing).[134] When puberty blockers were used to treat 15 girls with precocious puberty, their IQ decreased by approximately 7 points,[135] consistent with a decrease of 9 IQ points reported in a transgender patient.[136] Other studies indicate adverse effects on visual working memory,[137] executive function,[138] and mood.[139] GnRHa administration has been shown to increase depression and alter reward processing, although it is not clear from this particular study whether this results from the decrease in GnRH effectiveness or from altered sex steroid hormone levels.[140] Adult Down syndrome patients experience improved cognition and brain connectivity when their reduced levels of GnRH were treated with pulsatile GnRH therapy.[141] This agrees with the correlation between decreased cognition (and olfaction) and reduced levels of GnRH in a mouse model of Down syndrome. The decreased cognition is abolished by restoring normal GnRH levels. That treatment rescues cognitive deficits suggests that the cognitive effects of puberty blockers might be reversible.

Luteinizing hormone (LH) receptors are also expressed in several regions of the brain involved in cognition, including the hippocampus and cortex.[142] One review suggests that elevated levels of LH in the blood of older men and women (due to the lack of negative feedback because of reduced levels of estrogen or testosterone; see fig. 1) may contribute to cognitive decline in Alzheimer's disease.[143]

It may seem contradictory that *decreased* GnRH and *increased* LH have similar cognitive effects, since the former induces the latter. However, Jeffrey Blair et al. reconciled this apparent discrepancy by showing that circulating LH levels in the *bloodstream* inversely correlate with LH levels in the *brain*.[144] This is consistent with a study indicating that removal of the ovaries with or without a hysterectomy increases the risk of dementia.[145] This correlation is consistent with the removal of negative feedback on GnRH and LH levels upon loss of estrogen, increasing LH levels in the blood. There are also receptors for FSH in the brain[146] and, although there is no direct evidence in humans, the perturbation of FSH signaling in mice results in depression-like behaviors[147] and affective disorders.[148]

Other Physiological Effects of Puberty Blockers

Puberty is an important physiological developmental stage, which can be missed by suppressing puberty.[149] However, the limited studies (reviewed by Jo Taylor et al. as part of the Cass Review[150]) of the physiological effects of puberty blockers used for gender dysphoria documented relatively minor effects, although a few may be cause for concern.

The first involves bone mineral density. The growth spurt that occurs during puberty is largely driven by rising levels of sex steroids, primarily estrogen (testosterone in males is converted to estrogen by the enzyme aromatase). Puberty blockers prevent this upregulation and therefore result in reduced bone density.[151] When sex steroid levels increase again upon transition, with cross-sex hormones or by stopping puberty blockers, the bone density does not fully recover to normal levels.[152] Reduced height is one consequence.[153] This effect on bone density is compounded by the fact that bone density in transgender youth is low even before treatment.[154] It is not clear why this is the case, but possible reasons include decreased physical activity and a poor diet, which are common in these individuals.[155]

The second adverse effect involves future reproductive function, although this has not been well studied in humans, as only a minority of gender-incongruent children feel that future fertility is important.[156] Therefore, few preserve their sperm or eggs before treatment.[157]

Female mice treated with puberty blockers and testosterone can still produce fertilizable eggs that develop into normal looking pups, suggesting that female fertility is not jeopardized by puberty blockers.[158] However, a recent study (available as a preprint) found a dramatic change in human testicular cell populations in response to puberty blockers over a two-year timeframe.[159] This includes the expected

drastic reduction of germ cells, which develop into mature sperm, and a dramatic reduction in the number of Sertoli cells, which are important for sperm development as they regulate the sperm production process in response to signals from the pituitary. As the samples were obtained from biopsies, it is unclear if sperm production would recover when puberty blocker treatment ceases. However, the authors state that "gland atrophy and abnormalities from the histology data raise a potential concern regarding the complete 'reversibility' and reproductive fitness of spermatogonial stem cells."[160]

Cross-Sex Hormone Treatments

The transitioning process itself also involves alteration of the hormonal environment. The intended effect is to cause development of the desired secondary sex characteristics, but the hormonal treatment also affects brain structure and function.[161]

There are several cross-sex hormone options for biological males, which differ in cost (government subsidies differ among countries), accessibility, and prescriber preference.[162] The options include puberty blockers to block testosterone production for adolescents and children beginning puberty (Tanner stage 2) and in adolescence. As puberty blockers are considerably more expensive than the other options, they are unlikely to be used unless covered by health insurance. Much cheaper and safe to use, provided fluid intake is maintained, is spironolactone. It is normally used as a diuretic since it acts in the kidney to reduce sodium reuptake and thus water retention, but spironolactone, at higher doses, also blocks the binding of testosterone to its receptor. Spironolactone may be taken in combination with estrogen since negative feedback from estrogen suppresses LH production, thus further reducing the levels/action of testosterone (fig. 1). An even more effective cross-sex hormone, not licensed in the US but used in much of the rest of the world, is cyproterone acetate. It can be used in combination with estrogen as it inhibits testosterone and stimulates progesterone. It also elevates levels of the hormone prolactin (with negative consequences on sexual function and bone mass[163]) and is associated with a worse cardiovascular risk profile.[164]

Cross-sex hormone treatment for biological females is simpler. Testosterone administration overrides the effects of estrogen and suppresses the production of LH and thus estrogen by negative feedback (fig. 1).

Both male-to-female and female-to-male treatments are associated with a variety of adverse drug reactions,[165] including elevated intracranial pressure,[166] erythrocytosis (excess red blood cells),[167] pelvic pain,[168] and pelvic floor and sexual dysfunction.[169]

Given that hormonal treatments for transitioning have irreversible anatomical and physiological effects, there should be clear, evidence-based guidelines to direct care. However, a systematic review of guidelines used for these treatments (undertaken as part of the Cass Review) found this not to be the case.[170] Most guidelines did not systematically review empirical evidence or offer evidence-based recommendations, and they did not make it clear how the treatment should be implemented. A companion review assessed the associated guidelines for psychological and medical interventions and found that guidance for psychological care should be provided and management of the overall healthcare of prepubertal children should be limited, among other concerns.[171]

Surgical Treatments

Genital surgeries such as vaginoplasty and phalloplasty, colloquially known as bottom surgeries, were discussed in the previous article in this journal,[172] so will only be briefly reviewed here. Vaginoplasties are the formation of a vagina, primarily by inversion of skin from the penis or using intestinal tissue.[173] Complications include a lack of depth of the neovagina and reduced sensitivity and desire. Carmen Kloer et al. reviewed studies on the success of vaginoplasties using the female sexual function index (FSFI), a multidimensional self-report instrument to measure sexual satisfaction in which scores range from 2 to 36, and a score of 26.5 or less indicates sexual dysfunction.[174] Out of 17 studies measuring FSFI in vaginoplasty recipients, only two had scores above 26.5.

Phalloplasty is the formation of a penis, either from existing genital tissue (metoidioplasty), or from elsewhere (flap-based phalloplasty).[175] Metoidioplasty is more straightforward and results in an undersized penis with good sensitivity. Flap-based phalloplasty uses skin from different locations, is more complicated, and results in an anatomically sized penis, but which lacks sensitivity. Depending on the technique used, roughly a third of the surgeries experience complications, primarily to urethral reconstruction.[176]

Most transgender individuals do not undergo bottom surgery. Bita Tristani-Firouzi et al. in 2022 surveyed preferences for and barriers to gender affirming surgeries in the US.[177] Only 20% of trans women underwent bottom surgery, while an additional 67% were interested in it. Only 4% of trans men underwent bottom surgery, although a further 50% expressed interest in it. By contrast, almost half of trans men had a mastectomy, with almost everyone else in this survey expressing an interest in having one. The primary barriers to surgery were potential complications, cost, and not feeling ready.

Mental Health Outcomes After Gender-Affirming Care

Many studies indicate improved mental health after gender affirmation treatments, although a recent meta-analysis of longitudinal studies found no consistent improvements in depression or suicidality.[178] Unfortunately, the available studies also suffer from small sample sizes, subjective measures of benefits, lack of controls, comorbidities, high dropout rate, and short study durations.[179]

For example, Rikke Simonsen et al. evaluated 104 adult individuals from the Danish national registry (ages >30 years, 56 MtF, 48 FtM) who underwent sex reassignment surgery from 1978–2010.[180] Of these, 7 had psychiatric morbidity before and after surgery, 23 had morbidity before but not after, and 17 had morbidity after but not before surgery, although the reasons for psychiatric morbidity may differ before vs. after surgery. There were also two suicides, but their clinical significance was unclear due to the small sample size. The strengths of this study include its longer time frame (>10 years after surgery) and the fact that the participants were adults who likely experienced persistent gender dysphoria for many years.

Anthony Almazan and Alex Keuroghlian analyzed data from a large 2015 US Transgender Survey of over 27,000 adults.[181] Of this group, 3,559 had undergone at least one type of gender-affirming surgery at least two years prior, while a further 16,401 endorsed a desire for surgery but had not yet received it. As the latter also received other gender-affirming care, such as counseling, puberty blockers, and hormone therapy, they served as controls to reduce the impacts of these confounding variables. They found significant decreases in psychological distress and suicidal ideation within the month prior to the survey. In contrast, *lifetime* mental health (suicidal ideation, suicide attempts, smoking, and alcohol use) was not affected by gender-affirming surgery. Despite the large sample size and exemplary control group, the study is limited by its use of data from survey responders, who might not be representative of the overall population. A similar phenomenon may be at play in a recent US study by Wilson Lee et al., which found an increase in suicide attempts after the implementation of laws restricting gender-affirming care to minors.[182] Because of the study design (a survey recruiting participants through social media), this study could not measure actual suicides.

In contrast, Diana Tordoff et al. conducted a short time-frame (< 3 months) survey of 104 13-to-20-year-olds (63 FtM, 27 MtF, 14 nonbinary or unknown).[183] Though there was high variance in the results, they found 60% (95% CI: 0.17–0.95) lower odds of depression and 73% (95% CI: 0.41–2.51) lower odds of suicidality but no change in anxiety (95% CI: 0.41–2.51) twelve months after surgery. Nevertheless, this study was limited by its short time frame, low participation (only two-thirds of those invited chose to participate), and high attrition (37.5%) in the study.

Finally, Amy Green et al. collected data from a large 2020 US online survey of LGBTQ youth aged 13–24, including 11,914 who identified as transgender or nonbinary.[184] Within this sample, they compared youth who would like to receive gender-affirming hormone treatment (4,537 individuals) with those who were receiving this therapy (1,216 individuals). Those receiving hormone therapy showed reduced depression over the previous two weeks (61% vs. 75%), exhibited reduced suicidality in the past year (44% vs. 57%), and made fewer suicide attempts in the past year (15% vs. 23%). The large sample size points to the validity of these differences, although the authors acknowledged that they were unable to determine whether hormonal treatment caused the improvements in mental health, in that those with more suicidal ideation may have been less able to obtain hormone treatment in the first place.

Regret and Detransitioning

The incidence and experiences of those who decide not to continue with their transition is a difficult topic to assess, and detransitioners are not well studied.[185] One may feel regret but choose not to detransition, as they have invested so much in the process that they do not want to go through the biological and social ordeals of detransitioning.

Reasons for regret and/or detransitioning include discrimination, discomfort with one's new sex, medical complications, or realizing that there was a different cause for their distress than gender dysphoria—for example, that an individual is gay and not trans.[186] In any case, the transition procedures are not easily reversible. Estrogen stimulates breast development and testosterone, a deeper voice, facial hair, bone remodeling, and vaginal atrophy, which makes intercourse painful. These changes do not regress upon detransitioning. Both sexes may have difficulty passing (that is, it is obvious that a person is transgender), due to the secondary sex characteristics that developed before transitioning. Mastectomy produces scars.

It is difficult to determine the incidence of regret or of detransitioning.[187] Many clinics do not carry out follow-up studies on their patients after treatment.[188] Because of dissatisfaction with the results of their transition, detransitioners are unlikely to return to the clinic where they received their initial treatments and thus would be lost to follow-up. However, some work has been done in this area. Riittakerttu Kaltiala et al. followed the national medical records in Finland from 1996–2019, using individuals who discontinued cross-sex hormones as a proxy for detransitioning.[189] They found a 7.9% discontinuation rate overall, with a higher rate among more recent transitioners. Christina Roberts et al. examined hormone treatments in the US Military Health System from 2009 to 2018 and found a hormone continuation rate of 70.2%, that is, a discontinuation rate of 29.8% at four years.[190] These discontinuation rates contrast with a meta-analysis done by Valeria Bustos et al., who found just 77 out of 7,928 patients (~1%) expressed regret after surgery. The reasons for the large differences between the different studies are unclear but may involve the different criteria used to determine regret. The studies reviewed by Bustos et al. address regret directly using patients' responses, while the studies by Kaltiala et al. and Roberts et al. assumed that cessation of hormone treatments was equivalent to desistance.

Christian Perspectives on Gender Incongruence

It should not be surprising that the debate over gender has not left the church unaffected. Christians suffering from gender incongruence may feel isolated and unable to discuss their condition with others. They may be exposed to hurtful comments from well-meaning but uninformed pastors and other church leaders, which may lead them to reject the Christian faith. Thus, it is important for Christian leaders to be knowledgeable about this topic in order to effectively serve these members of the body of Christ.

As in the secular culture, there is a variety of views on gender incongruence in the church. Mark Yarhouse, a clinical psychologist specializing in gender, describes three frameworks for conceptualizing gender incongruence: the integrity, disability, and diversity frameworks.[191] This was described in more detail in the earlier review[192] and is summarized here.

The *integrity position*, most familiar to theologically conservative Christians, is essentialist. Using various scripture passages, it roots gender in sex and sexual complementarity between males and females. As with homosexuality, any expression of gender incongruence is viewed as sinful and a rejection of how we were created male and female.

The *disability position* likewise roots gender in creational norms (biological sex) but recognizes that in this fallen world there is disorder, which can include gender incongruence. This view differs from the integrity view in that the incongruence is not viewed as immoral but as a disorder, deserving of compassion rather than judgment. Like other psychological conditions, the possibility of a biological contribution to gender incongruence affects the degree of (but does not eliminate) responsibility that the individual bears for navigating their condition. They may try to minimize its influence on their lives. However, if an individual cannot function in their biological sex, this view would allow transition to alleviate the suffering.

The *diversity position* holds to the view that the biblical accounts of the creation of humans as male and female are descriptive but not prescriptive. They do not indicate that gender is binary but rather a spectrum. Consequently, differential gender expression, whether due to biological causes or a choice rooted in one's personal autonomy, may be celebrated.

Final Comments

Numerous questions about the biological and cognitive bases of gender dysphoria and transgender healthcare persist; these are not likely to be answered soon. Similarly, among the diverse range of views on the nature and causes of gender, none of them clearly articulates its exact nature. This article proposes the

hypothesis that one's sense of gender is a perception that develops over time in a top-down process that is dependent on the development of one's mind-body connection. If that development is hampered—either by prenatal hormonal influences or by conditions such as autism, social isolation, depression, or anxiety—that person may be susceptible to gender incongruence. Alternatively, these comorbidities that result from pre-existing gender incongruence could hinder the development of the mind-body connection. In either case, the mind-body connection strengthens in adolescence, sometimes leading to desistance.

The application of animal studies to the human experience of gender is limited but the prenatal hormonal milieu may play a role as well. This is illustrated by the case of Greg Eilers's adult gender incongruence, which was resolved using cross-sex hormones.[193] Nevertheless, such cases are rare. Genetic[194] and epigenetic[195] studies have identified genes associated with gender incongruence, but we do not know how they affect gender.

While most agree that early-onset and adolescent-onset gender incongruence are different, some argue that the two are the same, and that those who experience the so-called late-onset variant simply come to an understanding of their condition at a later stage in their life. However, the differences between early- and adolescent-onset gender incongruence (which include different sex ratios) suggest that different mechanisms are involved. Considering that the early-onset variant resolves in most cases, to resolve a child's dysphoria without undergoing the various steps of transition would be a desirable goal, not to mention preventing the need for possible detransitioning afterward. However, it is possible for some transgender people to live fulfilled lives after transitioning, as may be seen from the examples of the Christian theologian Austen Hartke[196] and the musician Kristina Rizzotto.[197]

Defining gender incongruence as a misperception doesn't tell us what to do when it occurs. While it is beyond the scope of this article, counseling is obviously a vital component of treatment for gender dysphoria, including reducing suicidal ideation,[198] and there are new approaches that could help resolve one's dysphoria without resorting to the invalidated methods and harmful effects of conversion therapy.[199] One approach is to address the comorbidities that may hamper the development of one's mind-brain connection. Another approach, psychodynamic psychotherapy, encourages the patient to explore their gender before proceeding with gender-affirming care.[200] Florence Ashley contends this approach is tantamount to conversion therapy because, like conversion therapy, it sees gender incongruence as a disorder and seeks to resolve it without altering the body.[201] In contrast, Robert D'Angelo maintains that psychotherapy empowers young people to develop creative solutions to their difficulties and promotes agency and autonomy, although this is complicated when working with minors.[202] Until further clarity is reached on the benefits of psychotherapy, well-meaning but ill-informed people should demonstrate extreme caution and refrain from asserting that counseling is all that is needed to "fix the problem."

Currently, the evidence surrounding gender-affirming care is weak. The variability between studies, including the use of different criteria, makes comparisons and meta-analyses difficult, and some data, like the longer-term cognitive effects of puberty blockers, still need to be collected. People are individuals and differ one from another, so the causes and possible treatments will vary. Newer studies, and especially long-term studies, are needed to strengthen the evidence and provide best practice protocols.

In the interim, there is a danger of oversimplifying when trying to gain an understanding of this complex issue. Disagreements will persist, but we need to be united in the goal of acting in the best interests of those who suffer from this condition.

Notes

[1]Jody L. Herman, Andrew R. Flores, and Kathryn K. O'Neill, "How Many Adults and Youth Identify as Transgender in the United States?," June 2022, https://williamsinstitute.law.ucla.edu/publications/trans-adults-united-states/.

[2]Tony Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria: A Christian Approach," *Perspectives on Science and Christian Faith* 74, no. 3 (2022): 130–48, https://doi.org/10.56315/PSCF9-22Jelsma.

[3]Ilan Dar-Nimrod and Steven J. Heine, "Genetic Essentialism: On the Deceptive Determinism of DNA," *Psychological Bulletin* 137, no. 5 (2011): 800–818, https://doi.org/10.1037/a0021860.

[4]Darrell W. Brann et al., "Brain-Derived Estrogen and Neural Function," *Neuroscience & Biobehavioral Reviews* 132 (2022): 793–817, https://doi.org/10.1016/j.neubiorev.2021.11.014.

[5]Bonnie Auyeung et al., "Fetal Testosterone Predicts Sexually Differentiated Childhood Behavior in Girls and in Boys," *Psychological Science* 20, no. 2 (2009): 144–48, https://doi.org/10.1111/j.1467-9280.2009.02279.x.

[6]Damian G. Zuloaga et al., "The Role of Androgen Receptors in the Masculinization of Brain and Behavior: What We've Learned from the Testicular Feminization Mutation," *Hormones and Behavior* 53, no. 5 (May 1, 2008): 613–26, https://doi.org/10.1016/j.yhbeh.2008.01.013.

[7]Aditi Bhargava et al., "Considering Sex as a Biological Variable in Basic and Clinical Studies: An Endocrine Society Scientific Statement," *Endocrine Reviews* 42, no. 3 (June 1, 2021): 219–58, https://doi.org/10.1210/endrev/bnaa034; and Rachel N. Levin et al., "Biological Studies of Transgender Identity: A Critical Review," *Journal of Gay & Lesbian Mental Health* 27, no. 3 (2023): 254–83, https://doi.org/10.108019359705.2022.2127042.

[8]Sumudu Nimali Seneviratne et al., "Gender-Role Behaviour and Gender Identity in Girls with Classical Congenital Adrenal Hyperplasia," *BMC Pediatrics* 21, no. 1 (2021): 262, https://doi.org/10.1186/s12887-021-02742-9.

[9]Settimio D'Andrea et al., "Polymorphic Cytosine-Adenine-Guanine Repeat Length of Androgen Receptor Gene and Gender Incongruence in Trans Women: A Systematic Review and Meta-Analysis of Case-Control Studies," *The Journal of Sexual Medicine* 17, no. 3 (2020): 543–50, https://doi.org/10.1016/j.jsxm.2019.12.010.

[10]Cintya L. Schweisberger et al., "Gender Diversity in Adolescents with Polycystic Ovary Syndome," *Journal of Pediatric Endocrinology & Metabolism: JPEM* 35, no. 11 (2022): 1422–28, https://doi.org/10.1515/jpem-2022-0249.

[11]Laura Gaspari et al., "Early Female Transgender Identity After Prenatal Exposure to Diethylstilbestrol: Report from a French National Diethylstilbestrol (DES) Cohort," *Journal of Xenobiotics* 14, no. 1 (2024): 166–75, https://doi.org/10.3390/jox14010010.

[12]Rosa Fernández et al., "Molecular Basis of Gender Dysphoria: Androgen and Estrogen Receptor Interaction," *Psychoneuroendocrinology* 98 (2018): 161–67, https://doi.org/10.1016/j.psyneuen.2018.07.032.

[13]J. Graham Theisen et al., "The Use of Whole Exome Sequencing in a Cohort of Transgender Individuals to Identify Rare Genetic Variants," *Scientific Reports* 9, no. 1 (2019): 20099, https://doi.org/10.1038/s41598-019-53500-y.

[14]Karla Ramirez et al., "Epigenetics Is Implicated in the Basis of Gender Incongruence: An Epigenome-Wide Association Analysis," *Frontiers in Neuroscience* 15 (2021): https://www.frontiersin.org/articles/10.3389/fnins.2021.701017.

[15]Rebecca Shepherd et al., "Gender-Affirming Hormone Therapy Induces Specific DNA Methylation Changes in Blood," *Clinical Epigenetics* 14, no. 1 (2022): 24, https://doi.org/10.1186/s13148-022-01236-4.

[16]Greg Eilers, *A Roller Coaster Through a Hurricane: One Wild Ride: My Journey with Gender Identity* (pub. by author, 2019).

[17]Jack Turban, *Free to Be: Understanding Kids & Gender Identity* (Atria Books, 2024), 74.

[18]Turban, *Free to Be*, 126.

[19]Madeleine S. C. Wallien and Peggy T. Cohen-Kettenis, "Psychosexual Outcome of Gender-Dysphoric Children," *Journal of the American Academy of Child & Adolescent Psychiatry* 47, no. 12 (2008): 1413–23, https://doi.org/10.1097/CHI.0b013e31818956b9; Devita Singh, Susan J. Bradley, and Kenneth J. Zucker, "A Follow-Up Study of Boys with Gender Identity Disorder," *Frontiers in Psychiatry* 12 (2021): 287, https://doi.org/10.3389/fpsyt.2021.632784; Pien Rawee et al., "Development of Gender Non-Contentedness During Adolescence and Early Adulthood," *Archives of Sexual Behavior* (February 27, 2024): 1813–25, https://doi.org/10.1007/s10508-024-02817-5; and C. J. Bachmann et al., "Gender Identity Disorders among Young People in Germany: Prevalence and Trends, 2013–2022. An Analysis of Nationwide Routine Insurance Data," *Deutsches Ärzteblatt International* 121, no. 11 (2024): 370–71, accessed June 11, 2024, https://www.aerzteblatt.de/int/archive/article/239563/Gender-identity-disorders-among-young-people-in-Germany-prevalence-and-trends-2013-2022-An-analysis-of-nationwide-routine-insurance-data. In the Wallien study, 43% of the original participants were desisters, while 30% could not be reached. In the Singh study, 88% were desisters. In the Bachmann study, roughly two thirds of patients desisted after five years.

[20]Peggy T. Cohen-Kettenis, "Gender Change in 46,XY Persons with 5α-Reductase-2 Deficiency and 17β-Hydroxysteroid Dehydrogenase-3 Deficiency," *Archives of Sexual Behavior* 34 (August 2005): 399–410, https://doi.org/10.1007/s10508-005-4339-4.

[21]Mart J. van Lieburg, *Barmhartigheid en wetenschap: De onvoltooid verleden tijd van de Faculteit Geneeskunde VU* (Vrije Universiteit, 1990), cited in Alex Bakker, *The Dutch Approach: Fifty years of Transgender Health Care at the VU Amsterdam Gender Clinic*, trans. Hilde Bakker, Carl Buijs, and Maureen Steiniger, 1st edition (Boom, 2021).

[22]Freerk Bouman cited in Bakker, *The Dutch Approach*, 33.

[23]Fellipe do Vale, *Gender as Love: A Theological Account of Human Identity, Embodied Desire, and Our Social Worlds* (Baker Academic, 2023).

[24]Anne Fausto-Sterling, "A Dynamic Systems Framework for Gender/Sex Development: From Sensory Input in Infancy to Subjective Certainty in Toddlerhood," *Frontiers in Human Neuroscience* 15 (2021): 150, https://doi.org/10.3389/fnhum.2021.613789.

[25]Andrea Long Chu, "Freedom of Sex: The Moral Case for Letting Trans Kids Change Their Bodies," *Intelligencer* (March 11, 2024), https://nymag.com/intelligencer/article/trans-rights-biological-sex-gender-judith-butler.html.

[26]Florence Ashley, "Gender Self-Determination as a Medical Right," *CMAJ (Canadian Medical Association Journal)* 196, no. 24 (2024): E833–35, https://doi.org/10.1503/cmaj.230935.

[27]Michael Zaliznyak et al., "How Early in Life Do Transgender Adults Begin to Experience Gender Dysphoria? Why This Matters for Patients, Providers, and for Our Healthcare System," *Sexual Medicine* 9, no. 6 (2021): 100448, https://doi.org/10.1016/j.esxm.2021.100448.

[28]Rawee et al., "Development of Gender Non-Contentedness During Adolescence and Early Adulthood."

[29]Kelley D. Drummond et al., "A Follow-Up Study of Girls with Gender Identity Disorder," *Developmental Psychology* 44, no. 1 (2008): 34–45, https://doi.org/10.1037/0012-1649.44.1.34; and Wallien and Cohen-Kettenis, "Psychosexual Outcome of Gender-Dysphoric Children."

[30]Madison Aitken et al., "Evidence for an Altered Sex Ratio in Clinic-Referred Adolescents with Gender Dysphoria," *The Journal of Sexual Medicine* 12, no. 3 (2015): 756–63, https://doi.org/10.1111/jsm.12817.

[31]Riittakerttu Kaltiala-Heino et al., "Gender Dysphoria in Adolescence: Current Perspectives," *Adolescent Health, Medicine and Therapeutics* 9 (March 2, 2018): 31–41, https://doi.org/10.2147/AHMT.S135432.

[32]American Psychological Association, "APA Policy Statement on Affirming Evidence-Based Inclusive Care for Transgender, Gender Diverse, and Nonbinary Individuals, Addressing Misinformation, and the Role of Psychological

Practice and Science," adopted by the APA Council of Representatives, February 2024, https://www.apa.org/about/policy/transgender-nonbinary-inclusive-care.

[33]Wylie C. Hembree et al., "Gender Dysphoria/Gender Incongruence Guideline Resources," October 25, 2024, accessed December 21, 2024, https://www.endocrine.org/clinical-practice-guidelines/gender-dysphoria-gender-incongruence.

[34]E. Coleman et al., "Standards of Care for the Health of Transgender and Gender Diverse People, Version 8," *International Journal of Transgender Health* 23, no. S1 (September 6, 2022): S1–259, https://doi.org/10.1080/26895269.2022.2100644.

[35]Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria: A Christian Approach."

[36]Gregory Berns, *The Self Delusion: The New Neuroscience of How We Invent—and Reinvent—Our Identities* (Basic Books, 2022).

[37]Andy Clark, *The Experience Machine: How Our Minds Predict and Shape Reality* (Pantheon, 2023).

[38]Berns, *The Self Delusion*, 3, italics added. Berns does not mention gender in the rest of the book.

[39]Joshua S. Rule, Joshua B. Tenenbaum, and Steven T. Piantadosi, "The Child as Hacker," *Trends in Cognitive Sciences* 24, no. 11 (2020): 900–915, https://doi.org/10.1016/j.tics.2020.07.005.

[40]This understanding of perception is somewhat counterintuitive and antireductionist, with a top-down mechanism of perception rather than strictly bottom-up. Nevertheless, the top-down understanding of perceptional learning has been known for over twenty years. See Manfred Fahle and Tomaso A. Poggio, eds., *Perceptual Learning* (MIT Press, 2002), accessed December 23, 2024, https://direct.mit.edu/books/edited-volume/2507/Perceptual-Learning; and Wu Li, Valentin Piëch, and Charles D. Gilbert, "Perceptual Learning and Top-Down Influences in Primary Visual Cortex," *Nature Neuroscience* 7, no. 6 (2004): 651–57, https://doi.org/10.1038/nn1255.

[41]Peter Sterling, "Allostasis: A Model of Predictive Regulation," *Physiology & Behavior* 106, no. 1 (2012): 5–15, https://doi.org/10.1016/j.physbeh.2011.06.004.

[42]Lisa Feldman Barrett, Karen S. Quigley, and Paul Hamilton, "An Active Inference Theory of Allostasis and Interoception in Depression," *Philosophical Transactions of the Royal Society B: Biological Sciences* 371, no. 1708 (2016): 20160011, https://doi.org/10.1098/rstb.2016.0011; and Bruno Bonaz et al., "Diseases, Disorders, and Comorbidities of Interoception," *Trends in Neurosciences* 44, no. 1 (2021): 39–51, https://doi.org/10.1016/j.tins.2020.09.009.

[43]Anil K. Seth and Manos Tsakiris, "Being a Beast Machine: The Somatic Basis of Selfhood," *Trends in Cognitive Sciences* 22, no. 11 (2018): 969–81, https://doi.org/10.1016/j.tics.2018.08.008.

[44]Seth and Tsakiris, "Being a Beast Machine," 975.

[45]Jaco van Zyl, "Formulating Gender Dysphoria as an Affective-Perceptual Disturbance Involving the Body," *Psychodynamic Practice,* June 27, 2024, 1–17, https://doi.org/10.1080/14753634.2024.2371655.

[46]Jamie D. Feusner et al., "Intrinsic Network Connectivity and Own Body Perception in Gender Dysphoria," *Brain Imaging and Behavior* 11, no. 4 (August 2017): 964–76, https://doi.org/10.1007/s11682-016-9578-6.

[47]Vilayanur Ramachandran and Paul McGeoch, "Phantom Penises in Transsexuals: Evidence of an Innate Gender-Specific Body Image in the Brain," *Journal of Consciousness Studies* 15, no.1 (2008): 5–16, https://www.ingentaconnect.com/contentone/imp/jcs/2008/00000015/00000001/art00001?crawler=true.

[48]Calling gender incongruence a disorder of perception is not meant to be pejorative, however. The benefits of using guesses that are based on partial information for rapid processing of sensory information outweigh the deficit of the occasional incorrect perception.

[49]Erik H. Erikson, *Identity and the Life Cycle: Selected Papers*, (International Universities Press, 1959).

[50]Erikson, *Identity and the Life Cycle,* 98.

[51]James E. Marcia, "Development and Validation of Ego-Identity Status," *Journal of Personality and Social Psychology* 3, no. 5 (1966): 551–58, https://doi.org/10.1037/h0023281.

[52]Nienke M. Nota et al., "Brain Functional Connectivity Patterns in Children and Adolescents with Gender Dysphoria: Sex-Atypical or Not?," *Psychoneuroendocrinology* 86 (December 1, 2017): 187–95, https://doi.org/10.1016/j.psyneuen.2017.09.014.

[53]Zdravko Petanjek et al., "Extraordinary Neoteny of Synaptic Spines in the Human Prefrontal Cortex," *Proceedings of the National Academy of Sciences of the United States of America* 108, no. 32 (2011): 13281–86, https://doi.org/10.1073/pnas.1105108108; and Orma Ravindranath et al., "Pubertal Development Underlies Optimization of Inhibitory Control through Specialization of Ventrolateral Prefrontal Cortex," *Developmental Cognitive Neuroscience* 58 (December 2022): 101162, https://doi.org/10.1016/j.dcn.2022.101162.

[54]Ravindranath et al., "Pubertal Development Underlies Optimization of Inhibitory Control through Specialization of Ventrolateral Prefrontal Cortex."

[55]A. Manzouri and I. Savic, "Possible Neurobiological Underpinnings of Homosexuality and Gender Dysphoria," *Cerebral Cortex* 29, no. 5 (2019): 2084–2101, https://doi.org/10.1093/cercor/bhy090.

[56]Yanlu Wang et al., "Cortical Gyrification in Transgender Individuals," *Cerebral Cortex* 31, no. 7 (2021): 3184–93, https://doi.org/10.1093/cercor/bhaa412.

[57]Jennifer H. Pfeifer, Matthew D. Lieberman, and Mirella Dapretto, "'I Know You Are But What Am I?!' Neural Bases of Self- and Social Knowledge Retrieval in Children and Adults," *Journal of Cognitive Neuroscience* 19, no. 8 (2007): 1323–37, https://doi.org/10.1162/jocn.2007.19.8.1323.

[58]L.S. Vygotsky, *Mind in Society: The Development of Higher Psychological Processes* (Harvard University Press, 1978). Sociocultural and neurological aspects of development operate together in a dynamic, irreducible tension. In his cultural-historical activity theory of childhood development, Lev Vygotsky described how the natural line of organic changes and the cultural line of social influences fuse in the development of the child, an idea echoed in Erikson's concept of identity development as dependent on social feedback from others who provide the adolescent with their perception and their evaluation of him or her.

[59]H. Olausson et al., "Unmyelinated Tactile Afferents Signal Touch and Project to Insular Cortex," *Nature Neuroscience* 5 (September 2002): 900–904, https://doi.org/10.1038/nn896; and Håkan W. Olausson et al., "Unmyelinated Tactile Afferents Have Opposite Effects on Insular and Somatosensory Cortical Processing," *Neuroscience Letters* 436, no. 2 (2008): 128–32, https://doi.org/10.1016/j.neulet.2008.03.015.

[60]Manos Tsakiris et al., "Neural Signatures of Body Ownership: A Sensory Network for Bodily Self-Consciousness," *Cerebral Cortex* 17, no. 10 (2007): 2235–44, https://doi.org/10.1093/cercor/bhl131.

[61]Olausson et al., "Unmyelinated Tactile Afferents Signal Touch and Project to Insular Cortex"; and Ilona Croy et al., "Gentle Touch Perception: From Early Childhood to Adolescence," *Developmental Cognitive Neuroscience* 35 (February 1, 2019): 81–86, https://doi.org/10.1016/j.dcn.2017.07.009.

[62]Tsakiris et al., "Neural Signatures of Body Ownership."

[63]Pawel Tacikowski, Jens Fust, and H. Henrik Ehrsson, "Fluidity of Gender Identity Induced by Illusory Body-Sex Change," *Scientific Reports* 10 (September 1, 2020): 14385, https://doi.org/10.1038/s41598-020-71467-z.

[64]Jason M. Nagata et al., "Screen Use in Transgender and Gender-Questioning Adolescents: Findings from the Adolescent Brain Cognitive Development (ABCD) Study," *Annals of Epidemiology* 95 (July 2024): 6–11, https://doi.org/10.1016/j.annepidem.2024.04.013.

[65]Emily Thrower et al., "Prevalence of Autism Spectrum Disorder and Attention-Deficit Hyperactivity Disorder Amongst Individuals with Gender Dysphoria: A Systematic Review," *Journal of Autism and Developmental Disorders* 50 (2020): 695–706, https://doi.org/10.1007/s10803-019-04298-1.

[66]Guifeng Xu et al., "Prevalence of Autism Spectrum Disorder Among US Children and Adolescents, 2014–2016," *JAMA* 319, no. 1 (2018): 81–82, https://doi.org/10.1001/jama.2017.17812.

[67]Elizabeth Hisle-Gorman et al., "Gender Dysphoria in Children with Autism Spectrum Disorder," *LGBT Health* 6, no. 3 (April 2019): 95–100, https://www.doi.org/10.1089/lgbt.2018.0252.

[68]Juliette Bouzy et al., "Transidentities and Autism Spectrum Disorder: A Systematic Review," *Psychiatry Research* 323 (May 2023): 115176, https://doi.org/10.1016/j.psychres.2023.115176.

[69]Assia Riccioni et al., "Investigating Gender Dysphoria in Autism Spectrum Disorder: Clinical Challenges and Future Perspectives," *Journal of Psychopathology*, no. 1–2 (March–June 2023), https://doi.org/10.36148/2284-0249-N283.

[70]Aimilia Kallitsounaki and David Williams, "A Relation Between Autism Traits and Gender Self-Concept: Evidence from Explicit and Implicit Measures," *Journal of Autism and Developmental Disorders* 50 (2020): 429–39, https://doi.org/10.1007/s10803-019-04262-z; and Aimilia Kallitsounaki and David M. Williams, "Implicit and Explicit Gender-Related Cognition, Gender Dysphoria, Autistic-Like Traits, and Mentalizing: Differences Between Autistic and Non-Autistic Cisgender and Transgender Adults," *Archives of Sexual Behavior* 51 (August 2022): 3583–3600, https://doi.org/10.1007/s10508-022-02386-5.

[71]Behzad S. Khorashad et al., "Gender Incongruence and Autistic Traits: Cerebral and Behavioral Underpinnings," *Archives of Sexual Behavior* 53 (2024): 1873–84, https://doi.org/10.1007/s10508-024-02809-5.

[72]Martha D. Kaiser et al., "Brain Mechanisms for Processing Affective (and Nonaffective) Touch Are Atypical in Autism," *Cerebral Cortex* 26, no. 6 (June 2016): 2705–14, https://doi.org/10.1093/cercor/bhv125.

[73]Elle Felicity Henderson, "Autism, Autonomy, and Touch Avoidance," *Disability Studies Quarterly* 42, no. 1 (Winter 2022), https://doi.org/10.18061/dsq.v42i1.7714.

[74]Rylan J. Testa et al., "Suicidal Ideation in Transgender People: Gender Minority Stress and Interpersonal Theory Factors," *Journal of Abnormal Psychology* 126, no. 1 (2017): 125–36, https://doi.org/10.1037/abn0000234.

[75]Sarah Ketchen Lipson et al., "Gender Minority Mental Health in the U.S.: Results of a National Survey on College Campuses," *American Journal of Preventive Medicine* 57, no. 3 (September 1, 2019): 293–301, https://doi.org/10.1016/j.amepre.2019.04.025.

[76]Riittakerttu Kaltiala-Heino et al., "Two Years of Gender Identity Service for Minors: Overrepresentation of Natal Girls with Severe Problems in Adolescent Development," *Child and Adolescent Psychiatry and Mental Health* 9, no. 1 (April 9, 2015): article 9, https://doi.org/10.1186/s13034-015-0042-y; and Riittakerttu Kaltiala, Timo Holttinen, and Katinka Tuisku, "Have the Psychiatric Needs of People Seeking Gender Reassignment Changed as Their Numbers Increase? A Register Study in Finland," *European Psychiatry* 66, no. 1 (2023): e93, https://doi.org/10.1192/j.eurpsy.2023.2471.

[77]Kasia Kozlowska et al., "Australian Children and Adolescents with Gender Dysphoria: Clinical Presentations and Challenges Experienced by a Multidisciplinary Team and Gender Service," *Human Systems* 1, no. 1 (2021): 70–95, https://doi.org/10.1177/26344041211010777.

[78]Mark A. Yarhouse and Julia A. Sadusky, "Coping and Management Strategies," chap. 14 in *Gender Identity and Faith: Clinical Postures, Tools, and Case Studies for Client-Centered Care* (IVP Academic, 2022).

[79]Joshua D. Safer, "Research Gaps in Medical Treatment of Transgender/Nonbinary People," *The Journal of Clinical Investigation* 131, no. 4 (2021): e142029, https://doi.org/10.1172/JCI142029.

[80]Lieke Josephina Jeanne Johanna Vrouenraets et al., "Medical Decision-Making Competence Regarding Puberty Suppression: Perceptions of Transgender Adolescents, Their Parents and Clinicians," *European Child & Adolescent Psychiatry* 32, no. 11 (2023): 2343–61, https://doi.org/10.1007/s00787-022-02076-6.

[81]John F. Strang et al., "Transgender Youth Fertility Attitudes Questionnaire: Measure Development in Nonautistic and Autistic Transgender Youth and Their Parents," *Journal of Adolescent Health: Official Publication of the Society for Adolescent Health and Medicine* 62, no. 2 (February 2018): 128–35, https://doi.org/10.1016/j.jadohealth.2017.07.022.

[82]Sara L. Bungener et al., "Sexual and Romantic Experiences of Transgender Youth Before Gender-Affirmative Treatment," *Pediatrics* 139, no. 3 (March 1, 2017): e20162283, https://doi.org/10.1542/peds.2016-2283.

[83]Sarah Peitzmeier et al., "Health Impact of Chest Binding Among Transgender Adults: A Community-Engaged, Cross-Sectional Study," *Culture, Health & Sexuality* 19, no. 1 (2017): 64–75, https://www.doi.org/10.1080/13691058.2016.1191675.

[84]A. Vu et al., "(030) Troubles with a Tight Tuck—A Survey of Tucking Practices and Genitourinary Complaints," *The Journal of Sexual Medicine* 21, no. S1 (2024): qdae001.027, https://doi.org/10.1093/jsxmed/qdae001.027; and Ethan Manafi et al., "The Impact of Tucking on Fertility Among Transgender Women: A Systematic Review," *International Journal of Transgender Health* (August 8, 2024): 1–10, https://www.tandfonline.com/doi/full/10.1080/26895269.2024.2387643.

[85]R. Hall, L. Mitchell, and J. Sachdeva, "Access to Care and Frequency of Detransition Among a Cohort Discharged

by a UK National Adult Gender Identity Clinic: Retrospective Case-Note Review," *BJPsych Open* 7, no. 6 (2021), e184, https://doi.org/10.1192/bjo.2021.1022.

[86]Yarhouse and Sadusky, *Gender Identity and Faith*, 79ff.

[87]James S. Morandini et al., "Is Social Gender Transition Associated with Mental Health Status in Children and Adolescents with Gender Dysphoria?," *Archives of Sexual Behavior* 52, no. 3 (2023): 1045–60, https://doi.org/10.1007/s10508-023-02588-5.

[88]James R. Rae et al., "Predicting Early-Childhood Gender Transitions," *Psychological Science* 30, no. 5 (2019): 669–81, https://doi.org/10.1177/0956797619830649.

[89]Henriette A. Delemarre-van de Waal and Peggy T. Cohen-Kettenis, "Clinical Management of Gender Identity Disorder in Adolescents: A Protocol on Psychological and Paediatric Endocrinology Aspects," *European Journal of Endocrinology* 155, no. S1 (November 2006): s131–s137, https://doi.org/10.1530/eje.1.02231.

[90]Francis J.P. Ebling, "The Neuroendocrine Timing of Puberty," *Reproduction* 129, no. 6 (June 2005): 675–83, https://doi.org/10.1530/rep.1.00367.

[91]Carla Marisa Lopez et al., "Trends in the Use of Puberty Blockers Among Transgender Children in the United States," *Journal of Pediatric Endocrinology and Metabolism* 31, no. 6 (June 2018): 665–70, https://doi.org/10.1515/jpem-2018-0048.

[92]P.T. Cohen-Kettenis and S.H.M. van Goozen, "Pubertal Delay as an Aid in Diagnosis and Treatment of a Transsexual Adolescent," *European Child & Adolescent Psychiatry* 7, no. 4 (December 1998): 246–48, https://doi.org/10.1007/s007870050073; and Peggy T. Cohen-Kettenis et al., "Puberty Suppression in a Gender-Dysphoric Adolescent: A 22-Year Follow-Up," *Archives of Sexual Behavior* 40, no. 4 (2011): 843–47, https://doi.org/10.1007/s10508-011-9758-9.

[93]Annelou L.C. de Vries et al., "Puberty Suppression in Adolescents with Gender Identity Disorder: A Prospective Follow-Up Study," *The Journal of Sexual Medicine* 8, no. 8 (2011): 2276–83, https://doi.org/10.1111/j.1743-6109.2010.01943.x.

[94]E. Abbruzzese, Stephen B. Levine, and Julia W. Mason, "The Myth of 'Reliable Research' in Pediatric Gender Medicine: A Critical Evaluation of the Dutch Studies—and Research That Has Followed," *Journal of Sex & Marital Therapy* 49, no. 6 (2023): 673–99, https://doi.org/10.1080/0092623X.2022.2150346.

[95]Cecilia Dhejne et al., "Long-Term Follow-Up of Transsexual Persons Undergoing Sex Reassignment Surgery: Cohort Study in Sweden," *PLOS ONE* 6, no. 2 (2011): e16885, https://doi.org/10.1371/journal.pone.0016885.

[96]Kaltiala, Holttinen, and Tuisku, "Have the Psychiatric Needs of People Seeking Gender Reassignment Changed as Their Numbers Increase?"

[97]Sami-Matti Ruuska et al., "All-Cause and Suicide Mortalities Among Adolescents and Young Adults Who Contacted Specialised Gender Identity Services in Finland in 1996–2019: A Register Study," *BMJ Mental Health* 27, no. 1 (2024), https://doi.org/10.1136/bmjment-2023-300940. The methodology of this study has been challenged but not its primary conclusions (https://osf.io/preprints/psyarxiv/apjeb).

[98]Susan McPherson and David E. P. Freedman, "Psychological Outcomes of 12–15-Year-Olds with Gender Dysphoria Receiving Pubertal Suppression in the UK: Assessing Reliable and Clinically Significant Change," *Journal of Sex & Marital Therapy* 50, no. 3 (2023): 315–25, https://doi.org/10.1080/0092623X.2023.2281986.

[99]De Vries et al., "Puberty Suppression in Adolescents with Gender Identity Disorder: A Prospective Follow-Up Study."

[100]Jiska Ristori and Thomas D. Steensma, "Gender Dysphoria in Childhood," *International Review of Psychiatry* 28, no. 1 (2016): 13–20, https://doi.org/10.3109/09540261.2015.1115754.

[101]De Vries et al., "Puberty Suppression in Adolescents with Gender Identity Disorder: A Prospective Follow-Up Study."

[102]Drummond et al., "A Follow-up Study of Girls with Gender Identity Disorder."

[103]Chantal M. Wiepjes et al., "The Amsterdam Cohort of Gender Dysphoria Study (1972–2015): Trends in Prevalence, Treatment, and Regrets," *The Journal of Sexual Medicine* 15, no. 4 (2018): 582–90, https://doi.org/10.1016/j.jsxm.2018.01.016; Tessa Brik et al., "Trajectories of Adolescents Treated with Gonadotropin-Releasing Hormone Analogues for Gender Dysphoria," *Archives of Sexual Behavior* 49, no. 7 (2020): 2611–18, https://doi.org/10.1007/s10508-020-01660-8; and Polly Carmichael et al., "Short-Term Outcomes of Pubertal Suppression in a Selected Cohort of 12 to 15 Year Old Young People with Persistent Gender Dysphoria in the UK," *PLOS ONE* 16, no. 2 (2021): e0243894, https://doi.org/10.1371/journal.pone.0243894.

[104]Kristina R. Olson et al., "Gender Identity 5 Years After Social Transition," *Pediatrics* 150, no. 2 (2022): e2021056082, https://doi.org/10.1542/peds.2021-056082.

[105]De Vries et al., "Puberty Suppression in Adolescents with Gender Identity Disorder: A Prospective Follow-Up Study."

[106]De Vries et al., "Puberty Suppression in Adolescents with Gender Identity Disorder: A Prospective Follow-Up Study."

[107]Cohen-Kettenis, "Gender Change in 46,XY Persons with 5α-Reductase-2 Deficiency and 17β-Hydroxysteroid Dehydrogenase-3 Deficiency."

[108]Alessandra D. Fisher et al., "Cross-Sex Hormone Treatment and Psychobiological Changes in Transsexual Persons: Two-Year Follow-Up Data," *The Journal of Clinical Endocrinology & Metabolism* 101, no. 11 (2016): 4260–69, https://doi.org/10.1210/jc.2016-1276.

[109]Alison Clayton, "Gender-Affirming Treatment of Gender Dysphoria in Youth: A Perfect Storm Environment for the Placebo Effect—The Implications for Research and Clinical Practice," *Archives of Sexual Behavior* 52, no. 2 (2023): 483–94, https://doi.org/10.1007/s10508-022-02472-8.

[110]Hillary B. Nguyen et al., "What Has Sex Got to Do with It? The Role of Hormones in the Transgender Brain," *Neuropsychopharmacology* 44, no. 1 (2019): 22–37, https://doi.org/10.1038/s41386-018-0140-7.

[111]Turban, *Free to Be*, 15.

[112]Jasmine Andersson & Andre Rhoden-Paul, "NHS to Close Tavistock Child Gender Identity Clinic," *BBC*, July 28, 2022, https://www.bbc.com/news/uk-62335665.

[113]Carmichael et al., "Short-Term Outcomes of Pubertal Suppression in a Selected Cohort of 12 to 15 Year Old Young People with Persistent Gender Dysphoria in the UK."

[114]Annelou L.C. de Vries et al., "Young Adult Psychological Outcome After Puberty Suppression and Gender Reas-

signment," *Pediatrics* 134, no. 4 (2014): 696–704, https://doi.org/10.1542/peds.2013-2958.

[115]Stella O'Malley and Sasha Ayad, *EPISODE 66 – Pioneers Series – Where It All Started: The Dutch Researchers*, 2022, https://www.youtube.com/watch?v=fISYeDL38tQ.

[116]Rosalia Costa et al., "Psychological Support, Puberty Suppression, and Psychosocial Functioning in Adolescents with Gender Dysphoria," *The Journal of Sexual Medicine* 12, no. 11 (2015): 2206–14, https://doi.org/10.1111/jsm.13034.

[117]De Vries et al., "Young Adult Psychological Outcome After Puberty Suppression and Gender Reassignment."

[118]Bakker, *The Dutch Approach*.

[119]Gordon H. Guyatt et al., "What Is 'Quality of Evidence' and Why Is It Important to Clinicians?," *British Medical Journal* 336, no. 7651 (May 2008): 995–98, https://doi.org/10.1136/bmj.39490.551019.BE.

[120]What We Know Project, Cornell University, "What Does the Scholarly Research Say about the Effect of Gender Transition on Transgender Well-Being?" (online literature review), 2018, accessed June 3, 2024, https://whatweknow.inequality.cornell.edu/topics/lgbt-equality/what-does-the-scholarly-research-say-about-the-well-being-of-transgender-people/.

[121]Diane Chen et al., "Consensus Parameter: Research Methodologies to Evaluate Neurodevelopmental Effects of Pubertal Suppression in Transgender Youth," *Transgender Health* 5, no. 4 (2020): 246–57, https://doi.org/10.1089/trgh.2020.0006.

[122]Jennifer Block, "Gender Dysphoria in Young People Is Rising—and So Is Professional Disagreement," *BMJ* 380 (2023): 382, https://doi.org/10.1136/bmj.p382.

[123]Hilary Cass, "Final Report—The Cass Review," Independent Review of Gender Identity Services for Children and Young People, accessed May 8, 2024, https://cass.independent-review.uk/home/publications/final-report/.

[124]UK Department of Health and Social Care, "Ban on Puberty Blockers to Be Made Indefinite on Experts' Advice," GOV.UK, December 11, 2024, accessed December 13, 2024, https://www.gov.uk/government/news/ban-on-puberty-blockers-to-be-made-indefinite-on-experts-advice.

[125]Coleman et al., "Standards of Care for the Health of Transgender and Gender Diverse People, Version 8."

[126]Kasia Kozlowska et al. provide an extensive discussion of the perspectives taken in different countries and how those perspectives translate into treatment guidelines in these countries.

[127]"17.05.24 Response Cass Review FINAL with Ed Note.Pdf," May 17, 2024, https://otdchile.org/wp-content/uploads/2024/06/WPATH-and-USPATH-Response-Cass-Review-.pdf.

[128]Hilary Cass, "Gender Identity Services for Children and Young People: Navigating Uncertainty Through Communication, Collaboration and Care," *The British Journal of Psychiatry* 225, no.2 (2024): 302–04, https://doi.org/10.1192/bjp.2024.162.

[129]Vincent Prévot, Manuel Tena-Sempere, and Nelly Pitteloud, "New Horizons: Gonadotropin-Releasing Hormone and Cognition," *The Journal of Clinical Endocrinology & Metabolism* 108, no. 11 (2023): 2747–58, https://doi.org/10.1210/clinem/dgad319.

[130]Nimmi Wickramasuriya et al., "The Roles of GnRH in the Human Central Nervous System," *Hormones and Behavior* 145 (September 2022): 105230, https://doi.org/10.1016/j.yhbeh.2022.105230.

[131]D. Hough et al., "Peripubertal GnRH and Testosterone Co-Treatment Leads to Increased Familiarity Preferences in Male Sheep," *Psychoneuroendocrinology* 108 (October 2019): 70–77, https://doi.org/10.1016/j.psyneuen.2019.06.008.

[132]Christoph Anacker et al., "Behavioral and Neurobiological Effects of GnRH Agonist Treatment in Mice—Potential Implications for Puberty Suppression in Transgender Individuals," *Neuropsychopharmacology* 46, no. 5 (2021): 882–90, https://doi.org/10.1038/s41386-020-00826-1.

[133]Melanie Pincus et al., "Chronic Psychosocial Stress and Experimental Pubertal Delay Affect Socioemotional Behavior and Amygdala Functional Connectivity in Adolescent Female Rhesus Macaques," *Psychoneuroendocrinology* 127 (May 2021): 105154, https://doi.org/10.1016/j.psyneuen.2021.105154.

[134]Lothar Jennes and P. Michael Conn, "Gonadotropin-Releasing Hormone and Its Receptors in Rat Brain," *Frontiers in Neuroendocrinology* 15, no. 1 (1994): 51–77, https://doi.org/10.1006/frne.1994.1003.

[135]Slawomir Wojniusz et al., "Cognitive, Emotional, and Psychosocial Functioning of Girls Treated with Pharmacological Puberty Blockage for Idiopathic Central Precocious Puberty," *Frontiers in Psychology* 7 (2016), https://www.frontiersin.org/articles/10.3389/fpsyg.2016.01053; and Peter Hayes, "Commentary: Cognitive, Emotional, and Psychosocial Functioning of Girls Treated with Pharmacological Puberty Blockage for Idiopathic Central Precocious Puberty," *Frontiers in Psychology* 8 (2017), https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00044.

[136]Maiko A. Schneider et al., "Brain Maturation, Cognition and Voice Pattern in a Gender Dysphoria Case Under Pubertal Suppression," *Frontiers in Human Neuroscience* 11 (2017), https://www.frontiersin.org/articles/10.3389/fnhum.2017.00528.

[137]Miglena Grigorova, Barbara B. Sherwin, and Togas Tulandi, "Effects of Treatment with Leuprolide Acetate Depot on Working Memory and Executive Functions in Young Premenopausal Women," *Psychoneuroendocrinology* 31, no. 8 (2006): 935–47, https://doi.org/10.1016/j.psyneuen.2006.05.004; and Michael C. Craig et al., "A Study of Visuospatial Working Memory Pre- and Post-Gonadotropin Hormone Releasing Hormone Agonists (GnRHa) in Young Women," *Hormones and Behavior* 54 (June 2008): 47–59, https://doi.org/10.1016/j.yhbeh.2008.01.012.

[138]Annemieke S. Staphorsius et al., "Puberty Suppression and Executive Functioning: An fMRI-Study in Adolescents with Gender Dysphoria," *Psychoneuroendocrinology* 56 (June 2015): 190–99, https://doi.org/10.1016/j.psyneuen.2015.03.007.

[139]Grigorova, Sherwin, and Tulandi, "Effects of Treatment with Leuprolide Acetate Depot on Working Memory and Executive Functions in Young Premenopausal Women"; and D.S. Stenbæk et al., "Sex Hormone Manipulation Slows Reaction Time and Increases Labile Mood in Healthy Women," *Psychoneuroendocrinology* 68 (June 2016): 39–46, https://doi.org/10.1016/j.psyneuen.2016.02.023.

[140]Julian Macoveanu et al., "Sex-Steroid Hormone Manipulation Reduces Brain Response to Reward," *Neuropsychopharmacology* 41 (2016): 1057–65, https://doi.org/10.1038/npp.2015.236.

[141]Maria Manfredi-Lozano et al., "GnRH Replacement Rescues Cognition in Down Syndrome," *Science* 377, no. 6610 (2022): eabq4515, https://doi.org/10.1126/science.abq4515.

[142]Jeffrey A. Blair et al., "Luteinizing Hormone: Evidence for Direct Action in the CNS," *Hormones and Behavior* 76 (November 2015): 57–62, https://doi.org/10.1016/j.yhbeh.2015.06.020.

[143]Veronica L. Burnham and Janice E. Thornton, "Luteinizing Hormone as a Key Player in the Cognitive Decline of Alzheimer's Disease," *Hormones and Behavior* 76 (November 2015): 48–56, https://doi.org/10.1016/j.yhbeh.2015.05.010; and Blair et al., "Luteinizing Hormone."

[144]They even proposed a model to account for this effect. Blair et al., "Luteinizing Hormone."

[145]Walter A. Rocca et al., "Hysterectomy, Oophorectomy, Estrogen, and the Risk of Dementia," *Neurodegenerative Diseases* 10, no. 1–4 (2012): 175–78, https://doi.org/10.1159/000334764.

[146]Vitaly Ryu et al., "Brain Atlas for Glycoprotein Hormone Receptors at Single-Transcript Level," *eLife* 11 (2022): e79612, https://doi.org/10.7554/eLife.79612.

[147]Wen-kai Bi et al., "FSHR Ablation Induces Depression-like Behaviors," *Acta Pharmacologica Sinica* 41 (2020): 1033–40, https://doi.org/10.1038/s41401-020-0384-8.

[148]Wen-kai Bi et al., "FSH Signaling Is Involved in Affective Disorders," *Biochemical and Biophysical Research Communications* 525, no. 4 (2020): 915–20, https://doi.org/10.1016/j.bbrc.2020.03.039.

[149]Kalynn M. Schulz and Cheryl L. Sisk, "The Organizing Actions of Adolescent Gonadal Steroid Hormones on Brain and Behavioral Development," *Neuroscience and Biobehavioral Reviews* 70 (November 2016): 148–58, https://doi.org/10.1016/j.neubiorev.2016.07.036; Kristian Koerselman and Tuomas Pekkarinen, "Cognitive Consequences of the Timing of Puberty," *Labour Economics* 54 (October 2018): 1–13, https://doi.org/10.1016/j.labeco.2018.05.001; and Chen et al., "Consensus Parameter."

[150]Jo Taylor et al., "Interventions to Suppress Puberty in Adolescents Experiencing Gender Dysphoria or Incongruence: A Systematic Review," *Archives of Disease in Childhood* 109 (2024): s33–s47, https://doi.org/10.1136/archdischild-2023-326669.

[151]Daniel Klink et al., "Bone Mass in Young Adulthood Following Gonadotropin-Releasing Hormone Analog Treatment and Cross-Sex Hormone Treatment in Adolescents with Gender Dysphoria," *The Journal of Clinical Endocrinology & Metabolism* 100, no. 2 (2015): E270–E275, https://doi.org/10.1210/jc.2014-2439.

[152]Klink et al., "Bone Mass in Young Adulthood"; Chantal M. Wiepjes et al., "Bone Safety During the First Ten Years of Gender-Affirming Hormonal Treatment in Transwomen and Transmen," *Journal of Bone and Mineral Research* 34, no. 3 (2019): 447–54, https://doi.org/10.1002/jbmr.3612; Janet Y. Lee, "Bone Health in the Transgender and Gender Diverse Youth Population," *Current Osteoporosis Reports* 21 (August 2023): 459–71, https://doi.org/10.1007/s11914-023-00799-2; and Mary O. Stevenson and Vin Tangpricha, "Osteoporosis and Bone Health in Transgender Persons," *Endocrinology and Metabolism Clinics of North America* 48, no. 2 (June 2019): 421–27, https://doi.org/10.1016/j.ecl.2019.02.006.

[153]Simone Mahfouda et al., "Puberty Suppression in Transgender Children and Adolescents," *The Lancet Diabetes & Endocrinology* 5, no. 10 (2017): 816–26, https://doi.org/10.1016/S2213-8587(17)30099-2.

[154]Wiepjes et al., "Bone Safety During the First Ten Years of Gender-Affirming Hormonal Treatment in Transwomen and Transmen"; and Lee, "Bone Health in the Transgender and Gender Diverse Youth Population."

[155]Anna Bishop et al., "Diet and Physical Activity Behaviors Among Adolescent Transgender Students: School Survey Results," *The Journal of Adolescent Health* 66, no. 4 (2020): 484–90, https://doi.org/10.1016/j.jadohealth.2019.10.026.

[156]Strang et al., "Transgender Youth Fertility Attitudes Questionnaire"; and Justin Halloran et al., "Reproductive and Fertility Knowledge and Attitudes Among Transgender and Gender-Expansive Youth: A Replication and Extension," *Transgender Health* 8, no. 4 (2023): 328–36, https://doi.org/10.1089/trgh.2021.0080.

[157]Leena Nahata et al., "Low Fertility Preservation Utilization Among Transgender Youth," *Journal of Adolescent Health* 61, no. 1 (2017): 40–44, https://doi.org/10.1016/j.jadohealth.2016.12.012; Kenneth C. Pang et al., "Rates of Fertility Preservation Use Among Transgender Adolescents," *JAMA Pediatrics* 174, no. 9 (2020): 890–91, https://doi.org/10.1001/jamapediatrics.2020.0264; and Katrien Wierckx et al., "Sperm Freezing in Transsexual Women," *Archives of Sexual Behavior* 41 (2012): 1069–71, https://doi.org/10.1007/s10508-012-0012-x.

[158]Prachi Godiwala et al., "Puberty Suppression Followed by Testosterone Therapy Does Not Impair Reproductive Potential in Female Mice," *Endocrinology* 164, no. 11 (2023): bqad145, https://doi.org/10.1210/endocr/bqad145.

[159]Varshini Murugesh et al., "Puberty Blocker and Aging Impact on Testicular Cell States and Function," bioRxiv: The Preprint Server for Biology, March 27, 2024, https://doi.org/10.1101/2024.03.23.586441.

[160]Murugesh et al., "Puberty Blocker and Aging Impact on Testicular Cell States and Function," 2.

[161]Nguyen et al., "What Has Sex Got to Do with It?"

[162]Lachlan M. Angus et al., "A Systematic Review of Antiandrogens and Feminization in Transgender Women," *Clinical Endocrinology* 94, no. 5 (2021): 743–52, https://doi.org/10.1111/cen.14329.

[163]A. A. Luciano, "Clinical Presentation of Hyperprolactinemia," *The Journal of Reproductive Medicine* 44, no. 12 Suppl. (December 1999): 1085–90, https://europepmc.org/article/med/10649815.

[164]Yael Sofer et al., "Differential Endocrine and Metabolic Effects of Testosterone Suppressive Agents in Transgender Women," *Endocrine Practice* 26, no. 8 (2020): 883–90, https://doi.org/10.4158/EP-2020-0032.

[165]Ainhoa Gomez-Lumbreras and Lorenzo Villa-Zapata, "Exploring Safety in Gender-Affirming Hormonal Treatments: An Observational Study on Adverse Drug Events Using the Food and Drug Administration Adverse Event Reporting System Database," *Annals of Pharmacotherapy* 58, no. 11 (2024): 1089–98, https://doi.org/10.1177/10600280241231612.

[166]Huy V. Nguyen et al., "Elevated Intracranial Pressure Associated with Exogenous Hormonal Therapy Used for Gender Affirmation," *Journal of Neuro-Ophthalmology* 41, no. 2 (2021): 217–23, https://doi.org/10.1097/WNO.0000000000000926.

[167]Milou Cecilia Madsen et al., "Erythrocytosis in a Large Cohort of Trans Men Using Testosterone: A Long-Term Follow-Up Study on Prevalence, Determinants, and Exposure Years," *The Journal of Clinical Endocrinology & Metabolism* 106, no. 6 (2021): 1710–17, https://doi.org/10.1210/clinem/dgab089.

[168]Sav Zwickl et al., "Pelvic Pain in Transgender People Using Testosterone Therapy," *LGBT Health* 10, no. 3 (2023): 179–90, https://doi.org/10.1089/lgbt.2022.0187.

[169]Lyvia Maria Bezerra da Silva et al., "Pelvic Floor Dysfunction in Transgender Men on Gender-Affirming Hormone Therapy: A Descriptive Cross-Sectional Study," *International Urogynecology Journal* 35 (2024): 1077–84, https://doi.org/10.1007/s00192-024-05779-3.

[170]Jo Taylor et al., "Clinical Guidelines for Children and Adolescents Experiencing Gender Dysphoria or Incongruence: A Systematic Review of Guideline Quality (Part 1)," *Archives of Disease in Childhood* 109, Suppl 2 (April 9, 2024): s65–s72, https://doi.org/10.1136/archdischild-2023-326499.

[171]Jo Taylor et al., "Clinical Guidelines for Children and Adolescents Experiencing Gender Dysphoria or Incongruence: A Systematic Review of Recommendations (Part 2)," *Archives of Disease in Childhood* 109, Suppl 2 (April 9, 2024): s73–s82, https://doi.org/10.1136/archdischild-2023-326500.

[172]Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria."

[173]Carmen Kloer et al., "Sexual Health After Vaginoplasty: A Systematic Review," *Andrology* 9, no. 6 (2021): 1744–64, https://doi.org/10.1111/andr.13022.

[174]R. Rosen et al., "The Female Sexual Function Index (FSFI): A Multidimensional Self-Report Instrument for the Assessment of Female Sexual Function," *Journal of Sex & Marital Therapy* 26, no. 2 (2000): 191–208, https://doi.org/10.1080/009262300278597.

[175]Miriam Hadj-Moussa et al., "Masculinizing Genital Gender Confirmation Surgery," *Sexual Medicine Reviews* 7, no. 1 (January 2019): 141–55, https://doi.org/10.1016/j.sxmr.2018.06.004.

[176]Hadj-Moussa et al., "Masculinizing Genital Gender Confirmation Surgery."

[177]Bita Tristani-Firouzi et al., "Preferences for and Barriers to Gender Affirming Surgeries in Transgender and Non-Binary Individuals," *International Journal of Transgender Health* 23, no. 4 (2022): 458–71, https://doi.org/10.1080/26895269.2021.1926391.

[178]Kathleen McDeavitt, "Paediatric Gender Medicine: Longitudinal Studies Have Not Consistently Shown Improvement in Depression or Suicidality," *Acta Paediatrica* 113, no. 8 (2024): 1757–71, https://doi.org/10.1111/apa.17309.

[179]National Institute for Health and Care Excellence (NICE), "Evidence Review: Gonadotrophin Releasing Hormone Analogues for Children and Adolescents with Gender Dysphoria," March 11, 2021, https://cass.independent-review.uk/wp-content/uploads/2022/09/20220726_Evidence-review_GnRH-analogues_For-upload_Final.pdf; A. J. Eckert, "Conclusions Not So NICE: A Critical Analysis of the NICE Evidence Review of Puberty Blockers for Children and Adolescents with Gender Dysphoria," October 17, 2021, https://sciencebasedmedicine.org/a-critical-look-at-the-nice-review/; and Dhejne et al., "Long-Term Follow-Up of Transsexual Persons Undergoing Sex Reassignment Surgery."

[180]Rikke Kildevæld Simonsen et al., "Long-Term Follow-Up of Individuals Undergoing Sex Reassignment Surgery: Psychiatric Morbidity and Mortality," *Nordic Journal of Psychiatry* 70, no. 4 (2016): 241–47, https://doi.org/10.3109/08039488.2015.1081405 .

[181]Anthony N. Almazan and Alex S. Keuroghlian, "Association Between Gender-Affirming Surgeries and Mental Health Outcomes," *JAMA Surgery* 156, no. 7 (2021): 611–18, https://doi.org/10.1001/jamasurg.2021.0952.

[182]Wilson Y. Lee et al., "State-Level Anti-Transgender Laws Increase Past-Year Suicide Attempts Among Transgender and Non-Binary Young People in the USA," *Nature Human Behaviour* 8 (September 26, 2024): 2096–2106, https://doi.org/10.1038/s41562-024-01979-5.

[183]Diana M. Tordoff et al., "Mental Health Outcomes in Transgender and Nonbinary Youths Receiving Gender-Affirming Care," *JAMA Network Open* 5, no. 2 (2022): e220978, https://doi.org/10.1001/jamanetworkopen.2022.0978.

[184]Amy E. Green et al., "Association of Gender-Affirming Hormone Therapy with Depression, Thoughts of Suicide, and Attempted Suicide Among Transgender and Nonbinary Youth," *Journal of Adolescent Health* 70, no. 4 (2022): 643–49, https://doi.org/10.1016/j.jadohealth.2021.10.036.

[185]Kinnon Ross MacKinnon, Pablo Expósito-Campos, and W. Ariel Gould, "Detransition Needs Further Understanding, Not Controversy," *BMJ* 381 (June 14, 2023): e073584, https://doi.org/10.1136/bmj-2022-073584.

[186]Lisa Littman, "Individuals Treated for Gender Dysphoria with Medical and/or Surgical Transition Who Subsequently Detransitioned: A Survey of 100 Detransitioners," *Archives of Sexual Behavior* 50 (2021): 3353–69, https://doi.org/10.1007/s10508-021-02163-w; Lisa Littman et al., "Detransition and Desistance Among Previously Trans-Identified Young Adults," *Archives of Sexual Behavior* 50 (2024): 57–76, https://doi.org/10.1007/s10508-023-02716-1; and Kinnon R. MacKinnon et al., "Exploring the Gender Care Experiences and Perspectives of Individuals Who Discontinued Their Transition or Detransitioned in Canada," *PLOS ONE* 18, no. 11 (2023): e0293868, https://doi.org/10.1371/journal.pone.0293868.

[187]J. Cohn, "The Detransition Rate Is Unknown," *Archives of Sexual Behavior* 52 (July 2023): 1937–52, https://doi.org/10.1007/s10508-023-02623-5; and Sarah C. J. Jorgensen, "Transition Regret and Detransition: Meanings and Uncertainties," *Archives of Sexual Behavior* 52 (2023): 2173–84, https://doi.org/10.1007/s10508-023-02626-2.

[188]Clare Dyer, "Tavistock to Face Possible Clinical Negligence Claims over Gender Identity Service," *BMJ* 378 (August 12, 2022): o2016, https://doi.org/10.1136/bmj.o2016.

[189]Riittakerttu Kaltiala et al., "Discontinuing Hormonal Gender Reassignment: A Nationwide Register Study," *BMC Psychiatry* 24 (August 19, 2024): 566, https://doi.org/10.1186/s12888-024-06005-6.

[190]Christina M. Roberts et al., "Continuation of Gender-Affirming Hormones Among Transgender Adolescents and Adults," *The Journal of Clinical Endocrinology & Metabolism* 107, no. 9 (2022): e3937–43, https://doi.org/10.1210/clinem/dgac251.

[191]Mark A. Yarhouse, *Understanding Gender Dysphoria: Navigating Transgender Issues in a Changing Culture* (IVP Academic, 2015).

[192]Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria."

[193]Eilers, *A Roller Coaster Through a Hurricane: One Wild Ride: My Journey with Gender Identity*.

[194]Madeleine Foreman et al., "Genetic Link Between Gender Dysphoria and Sex Hormone Signaling," *The Journal of Clinical Endocrinology & Metabolism* 104, no. 2 (2019): 390–96, https://doi.org/10.1210/jc.2018-01105.

[195]Ramirez et al., "Epigenetics Is Implicated in the Basis of Gender Incongruence."

[196]Austen Hartke, *Transforming: The Bible and the Lives of Transgender Christians* (Westminster John Knox Press, 2018).

[197]"Dr. Kristina Rizzotto," Dr. Kristina Rizzotto, accessed December 21, 2024, https://krisrizzotto.com/.

[198]Mehmet Eskin and Şenol Turan, "Do Social Support, Perceived Stress, and Psychological Distress Mediate the Relationship Between Social Problem-Solving and Suicidality in People with Gender Dysphoria?," *Scandinavian Journal of Psychology* (December 5, 2024), accessed December 16, 2024, https://doi.org/10.1111/sjop.13084.

[199]Hyemin Lee et al., "Gender Identity Change Efforts Are Associated with Depression, Panic Disorder, and Suicide Attempts in South Korean Transgender Adults," *Transgender Health* 8, no. 3 (2023): 273–81, https://doi.org/10.1089/trgh.2021.0171; and Jack L. Turban et al., "Association Between Recalled Exposure to Gender Identity Conversion Efforts and Psychological Distress and Suicide Attempts Among Transgender Adults," *JAMA Psychiatry* 77, no. 1 (2020): 68–76, https://doi.org/10.1001/jamapsychiatry.2019.2285.

[200]Joanne Sinai and Peter Sim, "Psychodynamic Psychotherapy for Gender Dysphoria Is Not Conversion Therapy," *Journal of the Canadian Academy of Child and Adolescent Psychiatry* 33, no. 2 (2024): 145–53, https://pubmed.ncbi.nlm.nih.gov/38952790/; and Roberto D'Angelo, "Supporting Autonomy in Young People with Gender Dysphoria: Psychotherapy Is Not Conversion Therapy," *Journal of Medical Ethics* 51 (2025): 3–9, https://doi.org/10.1136/jme-2023-109282.

[201]Florence Ashley, "Interrogating Gender-Exploratory Therapy," *Perspectives on Psychological Science* 18, no. 2 (2023): 472–81, https://doi.org/10.1177/17456916221102325.

[202]D'Angelo, "Supporting Autonomy in Young People with Gender Dysphoria."

Gregg Davidson

Article

DOI: https://doi.org/10.56315/PSCF3-25Davidson

Human Sexuality: Logical Fallacies and the Shotgun Aim of Arguments from Nature

Gregg Davidson

Observations from nature employed to challenge a traditional model of binary human sex, fixed at conception, typically draw on the diversity of sex expression and plasticity in the animal kingdom, variable fetal developmental pathways in humans that result in intersex conditions, or purported minor sexual dimorphism in humans. This article draws attention to logical fallacies unconsciously employed when projecting observations of biological phenomena to what should be affirmed, or what is possible, for humans. A recent publication by three Christian researchers, encapsulating multiple aspects of arguments from nature, serves as an expedient example for critique.

Keywords: diversity in nature, sex transition, intersex, sexual dimorphism, logical fallacies, ethics, human design, science in society

Of the many subjects of contention in American society, sexuality and gender rank among the highest. The rancor created by the 2024 rewrite of Title IX, the landmark US ruling against discrimination based on sex, to mandate affirmation of gender identity, serves as a milestone in the polarization of Western culture.[1] On questions as fundamental as what a man or a woman is, one might expect Christians to be of uniform mind, yet traditional understandings of sex, sexuality, and gender are increasingly called into question from within the Christian community.[2]

Challenges to traditional understandings commonly take two approaches: interpretation of biblical texts as culturally malleable or misunderstood,[3] or drawing examples from nature to argue for acceptance of more diverse human sexual behavior or identification.[4] The focus of this article is on the latter, with particular attention to the biology of sex and medical transitions. Other important conversations related to sex, such as same-sex attraction or societal expectations of gender, are beyond the scope of this work.

Given the context, my use of the terms *sex* and *gender* refer only to biological phenomena and are not differentiated, though with acknowledgment that differences in definition have their place in broader contexts. *Sex expression* refers to the biological development of an embryo. Use of *gender-affirmation* refers principally to medical interventions to conform the body to match a perceived identity. Lastly, *behavior* refers not only to physical actions, but also to decisions to affirm or deny identities that may conflict with biological expression.

Observations drawn from nature to question traditional Christian views of binary or fixed sex draw attention to sexual and reproductive diversity in the animal kingdom, fetal-development pathways in humans that result in ambiguous or conflicting sex-expression, and/or purported

Gregg Davidson *is a professor of geology and geological engineering at the University of Mississippi, with broad interest in the intersection of science and Christian faith. He is author/co-author of* The Manifold Beauty of Genesis One; Friend of Science, Friend of Faith; *and* The Grand Canyon, Monument to an Ancient Earth.

minor sexual dimorphism in humans. The specific natural phenomenon varies, but the underlying reasoning is the same, arguing that the diversity of how sex is expressed in nature should serve as a model for embracing similar or related diversity in humans, including the ability to medically transition from one sex to another.

Advocates represent a broad swath of religious and non-religious belief, including those identifying as Christians with an interest in reconciling biblical texts with science. Examples include Justin Sabia-Tanis,[5] Joan Roughgarden,[6] Mark Achtemeier,[7] Austen Hartke,[8] Megan DeFranza,[9] Linda Tatro Herzer,[10] Jennifer Anne Cox,[11] Myron Penner, April Cordero, and Amanda Nichols.[12] These writers and their work do not just reside at the fringes of current Christian thought. Current or recent professional appointments at Christian institutions include United Theological Seminary, Point Loma Nazarene University, Trinity Western University, Oklahoma Christian University, and Tabor College (Perth, Australia). Contracts with Christian publishers include Baker Academic, Pilgrim Press, Eerdmans, and Westminster John Knox Press.

My chief concern, and focus of this article, is on the logic of linking observations in nature with affirmations of human sex transitions. In my assessment, such arguments unconsciously employ logical fallacies and pay too little attention to how the logic that is applied in support of a favored viewpoint may be equally applied to a broad spectrum of less-favored views or outcomes. A shotgun loaded with birdshot will place a few pellets in the bullseye of a target at close range, but an expanded view may reveal the entire sheet to be shredded. On the present topic, the possible collateral damage extends beyond questions of normal or ethical behavior, to how human bodies are best served medically.

To illustrate the problems, it is expedient to select a recent representative publication that broadly encapsulates the arguments-from-nature position. A paper published in *TheoLogica* in 2023, by Penner, Cordero, and Nichols,[13] serves this purpose, in that it includes multiple elements pertinent to the present concern.

- It challenges traditionally understood biologically based sex-essentialism in which all humans fall into immutable binary categories of male and female.
- Observations from nature are cited as relevant guides for human decisions related to sex identity and transitions.
- The authors profess Christian faith and an interest in applying their expertise to inform Christian practice.
- It is representative of current thought from a gender-affirming perspective, published within the last 24 months.
- It offers a clear and concise academic defense of its position.

As other papers or books could have served as well, my assessment should not be taken as a desire to single out these authors for scrutiny.[14] To minimize repetition of their names, their paper will henceforth be referred to by the authors' last name initials (PCN).

PCN argue for contingent-sex and fluidity of sex in humans based on examples of environmentally mutable sex from the animal kingdom, the existence of variable fetal sexual developmental pathways in humans, and claims of low human sexual dimorphism. Key elements of their paper are as follows:

1. For theological questions that concern the nature and functioning of biological organisms, science should be allowed to take the lead in providing the pertinent data for consideration.
2. Behavior and life cycles found in the animal kingdom are pertinent for addressing what should be considered acceptable for humans, as we share much of the same DNA. Examples of contingent sexual expression include (a) organisms capable of transitioning in adulthood from functional female to functional male, and (b) organisms in which sex at birth is contingent on environmental conditions.
3. Sexual expression in humans does not always follow the binary norm: (a) variations in human fetal development can result in reproductive organs that do not match genetic coding, complicating a simplistic male-female modality, and (b) variations of the typical XX or XY sex chromosomes sometimes occur at the time of conception, resulting in infants who do not neatly fit within the male-female dichotomy (collectively referred to as *intersex*).
4. One's own fetal development and sex could have followed innumerable different pathways, leading to expression of sex in nontypical ways. In "the language of possible worlds," any individual alive today could have been born intersex.
5. Humans retain a degree of "genetic infrastructure" for sex expression opposite of their birth

sex throughout their life, providing a foundation for potential transition.

6. Humans exhibit a low degree of sexual dimorphism beyond genitalia, arguing against binary "maleness" or "femaleness" and minimizing barriers to transitions.

They conclude,

> Instead of thinking that people who undergo medical or surgical interventions to facilitate sex transition are "going against their biological nature," a better way to understand their actions would be to see them as building or repairing the ramps from one path to the other—both of which are part of one's human nature.[15]

My critique does not address the itemized points individually. Rather, it addresses the terms employed to frame the question, the logic of biological comparisons (between species, between normal and aberrant developmental pathways, between sexes), the logic of basing human ethics on examples from nature, and, lastly, the tenuous role science is actually allowed to play.

Framing the Question

PCN frame the question of human sex in terms of being an *essential* or *contingent* property. An essential property is described as "a property or feature that a thing must have in every scenario possible." An essential view of human sex is cast as a belief that all humans fall into immutable binary biological categories of male or female. A contingent property is "a property or feature that a thing may have in some scenarios, but fails to have in other scenarios." A contingent view holds that sex is not a fixed characteristic in humans, and that sex is not limited to binary options. Humans may fall on a spectrum of sex or choose to change their sex.[16]

The choices offered present the first logical fallacy—a *false dichotomy*, where terms are unnecessarily defined to be mutually exclusive or as if they are the only choices available. If an essentialist view requires all humans to be clearly male or female, it takes only one person to be born with ambiguous reproductive organs to invalidate the argument.[17] An essentialist position defined in this way is a strawman. The debate is better framed with questions regarding whether the human biological *design* is constructed around a fixed binary model of sex, if occurrences of mixed or ambiguous reproductive organs fall on a normal spectrum of human development or represent medical disorders, and if the contingent nature of sex found in nonmammals has meaningful bearing on humans.

Of Fish and Turtles

PCN describe the life cycle of the blue-headed wrasse, a colorful marine reef species, as an example of sex transitions in nature. Under the right environmental conditions, an egg-producing female will morph to become a fully functional male. Such transitions have been documented under controlled conditions in aquariums and in natural environments.[18] In a similar vein, the red-eared slider, a partially aquatic turtle and common pet, is described as an example of birth-sex being contingent on environmental variables rather than tied to a specific genetic coding. For any given egg, the sex of the hatching depends on the incubation temperature.[19]

Many other examples from nature could be employed to demonstrate contingency, plasticity, or non-dimorphism of sex, either during embryonic development or as adults, particularly as one moves farther down the line of last-shared-common-ancestor with humans. Sea slugs are hermaphroditic, capable of reciprocally inseminating one another during mating.[20] Many plant species contain male and female organs and can self-pollinate.[21] The question, however, is not whether contingent sex exists in nature, but if that existence is relevant for understanding sex in humans or, more broadly, *mammals*.

Comparisons of sex determination between humans and nonmammals suffer the *false equivalence* problem, commonly referred to as "comparing apples and oranges." Mammals are genetically preprogrammed at conception for a particular sex. That programming can be sidetracked by genetic copying errors at the time of fertilization, or interrupted in various ways during embryonic development, to produce a result inconsistent with that programming, but such occasions represent anomalous development. Of significance, such alternate pathways typically result in a suite of ailments beyond reproduction.[22] After birth, no environmental stressors, internally or externally, will drive an individual mammal to shift from one functional sex to another.[23] At most, chemical influences after birth may shift anatomical development of isolated organs in a direction more typical of the opposite sex, such as breast development in young males with exposure to lavender.[24] In all such cases, the resulting changes fall short of altering the functional sex of the individual.

Human Sexual Dimorphism and (Non) Plasticity

There are no natural pathways to changing post-gestational sex in mammals, but perhaps one can medically intervene to create pathways that do not otherwise exist in nature. This could be possible, in principle, if the differences between human males and females is minor, limited to reproductive organs. Such is the reason for PCN and others[25] to refer to sexual dimorphism in humans as relatively minor.[26] Evidence commonly brought to bear includes the overlap in physical traits of males and females, such as height, body mass, speed, strength, aptitudes, or aggression. For any trait that is typical of males and typical of females, there is a spectrum of characteristics within populations that overlap. It is quite possible, for example, to find an individual female who is stronger, faster, or more aggressive than an individual male.

Such observations are pertinent to discussions of what it means to be a man or to be a woman in the context of a particular society, but when it is offered as evidence of biological sameness or of interchangeableness, the possibility of a *category mistake* is raised. As an illustration, drawing upon apples and oranges again, we can observe that the spectrum of physical traits of apples and of oranges overlaps significantly (e.g., size, shape, pericarp thickness, seed number/size/position, durability). But if such examples are cited as evidence of sameness or that there is a pathway for transitioning from one to the other, a category mistake has been made—in this case, by overlooking or ignoring vital differences that put them into distinct categories (e.g., species) despite their similarities and overlapping characteristics.

Few will suggest that human males and females are *entirely* the same, as reproductive systems are clearly dimorphic. But beyond reproductive organs, are they similar enough to declare that sexual dimorphism is minor, sufficient to make transition from one sex to another possible? The question can be addressed broadly with observations at the population level and, more specifically, with studies of individuals. Broadly speaking, if sexual dimorphism is indeed minor, limited to reproductive organs, one must explain why underrepresentation of women in non-reproductive clinical trials is problematic.[27] If male and female are otherwise interchangeable, any random selection of males for a clinical trial should be sufficient to assess the potential and the risks for all humans. Yet evidence is steadily growing that trials based on one sex are not sufficient.[28]

This observation is bolstered by studies of individuals in which researchers report significant differences between human males and females in nearly every organ and biological function. A random sampling of studies includes sexual dimorphism in bone microstructure,[29] kidney function,[30] lipid storage and glucose metabolism,[31] neuron development or activity in the infundibular nucleus (brain),[32] retinal nerve structure,[33] thyroid reactive oxygen species production,[34] architecture of lung gas exchange,[35] and even pain perception tied to the activation of nociceptors.[36] The differences go beyond macrostructures of the size and shape of organs, to the functioning and character of individual cells.[37]

Even without rigorous physiological and anatomical investigation, one has only to look at global athletics or the disparate impact of the same product on males and females. The absence of women in men's sports may, in some cases, be linked to discriminatory practice but, in general, is because of nontrivial sexual dimorphism. Without significant dimorphism, there would be no need for a separate category of sports limited to females.

The disparate impact of smart phones on girls vs. boys is now well established.[38] While one cannot say that every girl responds the same to the social pressures created in the digital universe, the fact that researchers see dramatic differences in populations of girls and of boys speaks directly to the reality of sexual dimorphism. Some will undoubtedly argue that those differences are a result of societal conditioning, not fundamental differences in biology, yet we are seeing the divergent results at a time when supposed differences have been minimized or trivialized more than at any other time in Western history. Genuine differences go far deeper than reproductive anatomy or societal programming.

In mammals, there is no "ramp" or "bridge" that may be "built or repaired"[39] that moves naturally, and without serious consequences, from one sex to the other. Transition surgeries remove healthy organs and build an edifice of tissues that resemble reproductive organs in appearance, yet with no (or vastly limited) functionality and often require lifelong medical treatments to maintain.[40]

One may counter that failure to produce functional changes in sex is because the medical science is

young. We may yet reach a time when a reproductive organ may be constructed or transplanted that is functional and requires no life-long treatments to maintain. Yet, even in this imagined future, change would be limited to an isolated set of organs and chemical treatments to address a narrow range of physiological responses. It ignores the fact that chromosomal sex influences far more than reproductive organs. As some researchers have noted, every cell of the human body is affected by the genetic coding of sex.[41] No surgery or hormone treatment can alter sex at the cellular level.

Alternate Developmental Pathways, Genetic Anomalies, and Intersex

The possibility of variant developmental pathways during mammalian gestation merits additional consideration. PCN devote a significant portion of their paper to the description of the chemical pathways responsible for sexual development in a human fetus, with an emphasis on the various ways that sexual expression can deviate from genetic instruction.[42] Of particular note, sexual differentiation is said to begin at week 6, at which point the normal pathway to male or female sexual configurations can take alternate pathways, leading to reproductive organs that do not align with chromosomal coding. To say this in another way, the genetic code for typical male or female development may be intact, but the normal pathways of development can be bumped along an atypical pathway. The result can range from indistinct or ambiguous reproductive organs to what appears to be normal organs belonging to the opposite sex.

The inference that there is no difference in embryos prior to week 6 is unjustified, as some fertility researchers have identified sex differences in morphokinetic development even at the very earliest stages of cell division.[43] There is no disagreement, however, that variant pathways can lead to sexual expression that do not match genetic coding. As an illustrative example (this time with a mammal), when the undifferentiated gonads of a male fetal rabbit were removed, the rabbit developed female (non-gonadal) organs.[44]

Such phenomena serve as a justification for PCN to declare a binary sex for humans to be an oversimplification. This reasoning also suffers from an equivalence fallacy, this time conflating the *existence of anomalies* in nature with *how nature is designed* to function.

Fetal sexual development that does not match the chromosomal coding represents a miscue in the chemical signaling that diverts the normal pathway. It is a pathway that was not supposed to happen, genetically speaking, and leads to abnormal development. In humans, if not fatal prior to birth, these alternate pathways result in a spectrum of medical conditions and symptoms that extend beyond the reproductive system.[45]

Genetic abnormalities in the X or Y chromosomes fall into a similar category of abnormal fetal development, the only difference being the root cause. If the genetic coding of X or Y chromosomes is abnormal, fetal development will be as well. Many different combinations of the usual XX or XY chromosomal pairs have been identified, each leading to unique biological expression and medical conditions. Variants include a single X (Turner syndrome), XXX (trisomy X), XXY (Klinefelter syndrome), XYY (Jacobs syndrome), a combination of both XX and XY, or missing or duplicated fragments of a chromosome. As a whole, children born with these developmental or genetic conditions are referred to as *intersex*, particularly when the reproductive organs are ambiguous or reflect the opposite chromosomal sex. As acknowledged earlier, intersex individuals do not fit neatly into a binary sense of male and female.

How we define the end result of an atypical developmental pathway plays a critical role for addressing questions of human sex. Consider another analogy using a different aspect of human design. Human anatomy is defined as having bilateral symmetry, with, among other things, two arms and two legs with mirror-image construction. In the 1970s, the Voyager missions launched two vessels on journeys into deep space with payloads of information about life on Earth for any inquisitive extraterrestrials.[46] Diagrams of human anatomy included examples of male and female, each with two arms and two legs. Yet we know from experience that there are occasions when a child is born with only a single arm, or no arms at all. Such a child is no less human, but there are few who would suggest that the existence of such individuals means the Voyager information got human anatomy wrong, or worse, overlooked a *category* of human. A missing appendage is understood to represent a biological malfunction, not an example on a spectrum of normal fetal development.

Textbooks on human anatomy are not in need of revision to include separate designations for *quad-*, *tri-*, *mono-*, and *a*-limbed humans.

If we are consistent, intersex conditions are likewise recognized as products of biological miscues that hinder the normal development of one sex or the other. Just as a child born with a missing limb does not represent a new category of human symmetry, a child with ambiguous genitalia does not represent a new category of sex.

I recognize that a common reaction to such descriptions is a complaint that it characterizes individuals as "mistakes."[47] There is merit in avoiding tagging anyone with such a label, though the next step of removing the language of error from biology is based on another false equivalency, for it conflates *condition* with *value*. As a parallel example, a person who experiences loss of sight, either at birth or later in life, has a condition of blindness. It is not as nature designed a human to be. But blindness is not a measure of worth. A mistake of biology does not equate to a devaluation of human value and dignity.

Efforts to destigmatize medical conditions or disabilities can be commendable, but also problematic when recasting errors of biology to be part of a spectrum of normal human development. If everything is identified as normal, there is nothing that requires unique medical attention, and nothing that needs to be fixed, even if we have the capacity to do so. Consider a few examples of conditions we would no longer consider problems if all developmental pathways are just part of the normal expression of human biology.

Normal Chromosomes, but Variable Developmental Pathways

Fetal alcohol syndrome: Frequent or high levels of alcohol exposure *in utero* inserts an atypical chemical into the normal developmental process, affecting facial features, nervous system, sensory organs, and having repercussions on juvenile growth, language, and social development.[48]

Conjoined twins: Multiples in the womb normally develop independently, the same as any individual child, though having to share maternal resources. Atypical development can, in rare cases, result in a comingling of tissues such that a portion of two bodies are fused. In some cases, the two can be surgically separated. In other cases, organs are so comingled that separation will cause the death of one or both.[49]

Extra appendage: There are occasions when the genetic coding is normal but the process of activating or deactivating genes takes an alternate pathway, leading to the creation of an extra digit or entire limb. The most common is an extra finger or toe, but a recent case includes an arm growing from the back of a newborn that was surgically removed.[50]

Genetic Disorders[51]

Cri du chat syndrome: Named for infants that sound like a mewing cat, the disorder results from a missing piece of chromosome 5. More serious symptoms include a suite of conditions such as heart and gastrointestinal defects.[52]

Hemophilia: Mutations in the FVIII or FIX genes result in interference with the normal blood clotting process following an injury, making it difficult to stop bleeding.[53]

Sickle Cell Anemia: Sickle cell is an inherited mutation in the HBB gene creating misshapen red blood cells. Though conferring one documented benefit of greater resistance to malaria, accompanying medical conditions often include fatigue, infections, severe pain from tissue damage, and swelling in hands and feet.[54]

The list could go on for many pages, but a short list is sufficient to make the point that there are many ways in which biological development can go wrong, not just those related to sex. Drawing on just one of the examples, breakthroughs in CRISPR technology have revolutionized our potential to reverse the effects of some genetic disorders such as sickle cell anemia.[55] But if alternate developmental pathways are not disorders, just simply variants of human expression, we have no need to treat or reverse. No one, thankfully, is suggesting such a course of inaction for sickle cell anemia, but a consistent application of the logic of normalizing atypical sexual development would argue for such an outcome. This is one example of the shotgun aim of an argument used for a favored application that does not sufficiently consider how it equally applies to less-favored outcomes.

It is important to clarify that not all biological anomalies require fixing. Some infants with intersex conditions have undoubtedly been rushed too quickly into corrective surgeries. Just as some people who are deaf decide to forgo corrective measures and embrace their condition and the unique community it fosters, some with intersex conditions may choose to

do the same. Neither requires erasing the language or designation of biological error.

Ethics and Examples from Nature

In this section, I move from discussion of biological processes to the philosophical and ethical implications of using observations in nature to justify human behavior or identity. Employing facts from nature to advocate for specific human practices runs the risk of the *is-ought fallacy*. Hume's Law, derived from David Hume's 1739 *Treatise of Human Nature*, is the thesis that a moral or ethical judgment, "what *ought* to be," cannot be logically derived simply from "what *is* observed."[56] As an example unrelated to nature, it may be true that 60% of students cheat on exams,[57] but what is observed does not logically lead to the conclusion that cheating ought to be condoned or justified.

In the present context, observations of contingent or pliable sex in nature (*what is*) do not logically lead to the conclusion that attempts to alter the sex of a human is morally or ethically defensible (*what ought to be*). Here again, insufficient attention is given to the shotgun aim: the same argument employed to justify a favored human behavior can be equally applied to a host of other less-favored behaviors.

A series of observations from the animal kingdom is provided below, each related to sex or sexuality, with subheadings that indicate what the behavior would be called *if done by humans*. In some cases, the relevance may be questioned if an observed behavior is considered an anomalous or "one off" incident, but examples brought to bear by PCN and others justifying a spectrum of sexual expression also include anomalous natural phenomena such as miscues in embryonic development.[58]

In principle, it is necessary to identify only two or three examples of animal behavior to make the point, but a longer list is worthwhile to illustrate how many nontraditional behaviors or societal taboos can be challenged with examples from nature.[59] Several of the examples include dolphins, which are particularly relevant given their highly intelligent, social, and playful character, and noting that we share far more DNA with them than we do with fish or turtles.[60]

Polyamory: Sex with many partners is not just occasionally found within the animal kingdom, it is nearly universal. Even among animals known for returning each season to the same mate, such as the iconic swan, DNA studies of offspring have confirmed that nearly all engage in "extra-marital" trysts.[61]

Non-consensual sex: Though rape is a word generally reserved for human interactions, the common elements of stalking, overpowering, and forcing copulation is common among animals. Among sharks, such as nurse and tiger sharks, males will bite the pectoral fin of a female, wrestling her into submission before forcibly mating, often leaving permanent scars.[62]

Gang rape: Groups of male dolphins have been observed to work as a team to chase down an uncooperative female, subdue, and take turns inseminating.[63]

Pedophilia: Sex (or attempted sex) with juveniles is not uncommon in the animal kingdom, including dolphins,[64] seals,[65] and penguins.[66]

Incest: Sex between parent and offspring is common among a long list of animals.[67]

Harems and violent exclusion of other males: Elephant seals are iconic examples of violent battles in the animal kingdom, with forceable removal of weaker or less aggressive males and herding of nonconsenting females into harems.[68]

Zoophilia/bestiality: Fur seals on Marion Island have been observed chasing, mounting, and attempting copulation with king penguins.[69] Dolphins are known to engage in sexual interactions with humans, with some reports of male dolphins pushing away human males and focusing sexual attention on female swimmers.[70]

Necrophilia: Sex (or attempted sex) with dead bodies has been observed in mammals, birds, reptiles, and amphibians.[71]

Humans are known to engage in some variation of all of the above, particularly polyamory (with or without mutual consent). Indeed, polyamory is on the rise in Western society, with dating sites now making routine use of the abbreviation ENM (ethical non-monogamy) for those looking to add another girlfriend or boyfriend to an existing long-term relationship.[72]

It is worth adding that the shotgun aim of employing examples from nature as the basis for justifying human decisions, identity, or affirmations extends well beyond questions of sexuality. Consider an additional short list of examples from nature and labels applied if practiced by humans.

Slavery: Many species of ants are known to engage in "social parasitism," routinely stealing the pupae of other ant colonies to raise as slaves.[73]

Conquest: Male loons (an aquatic bird) will invade the space of another loon, with territorial evictions frequently fatal for the displaced owner.[74]

Sadism: Cats are known for tormenting birds or mice they catch. Orcas in the wild are known to harass and kill other animals, such as dolphins, with no intention of eating them.[75]

Infanticide and cannibalism: A new alpha male in a tribe of chimps may kill the offspring sired by a competing male to give way for his own, sometimes eating the slain infants.[76] Male polar bears are not squeamish about making a meal out of an unprotected cub.[77]

Eugenics: Some spiders have been observed to not only prefer young suitors, but also to selectively kill older ones, weeding potentially degraded DNA from the gene pool.[78]

Does Science Even Matter?

The preceding discussion was all predicated on an assumption that science has a meaningful role to play in the discussion of human sex and sexuality. PCN explicitly argue that science should be allowed to

> take the lead in providing data to address theological questions that concern the nature and functioning of biological organisms and physical systems … the place to start for understanding how sex is expressed in humans is biology, not the Bible.[79]

The value or truth of that statement is not a foregone conclusion, but I will set that particular debate aside to consider the question of whether the *listen-to-science* proposal is actually being followed.

In current Western culture, the link between science and human sexuality has proven to be a moving target. Abagail Favale, a Catholic scholar on feminism and women's dignity, identifies second-wave feminism as the source of separating gender from sex: in this view sex was considered a biological reality and gender was a social construct. According to Favale, third-wave feminism turned this upside down: now sex is the construct and one's perception of gender is real.[80]

The confusion created by shifting definitions was brought to national attention when Justice Ketanji Brown Jackson was asked during her confirmation hearings if she could provide a definition of the word *woman*. Jackson famously answered, "I'm not a biologist." Supporters gave her credit for her attempt, but scrambled to emphasize that a biologist can't answer the question either.[81]

Arguments offered by PCN appear to follow a similar pattern, employing a *conceptual shift fallacy* in which an argument is built on a particular foundation, in this case on science, but basing conclusions on something else. Though most of the paper is devoted to the science of contingency of sex expression, the final recommendations for humans retain only a thematic tie to the science. The authors acknowledge that humans do not share the biological plasticity of fish or turtles,[82] and tacitly acknowledge that "ramps" to alternate development of reproductive anatomy in humans end while still in the womb.[83]

What is left is a thought exercise in which, in the "language of many possible worlds," any individual alive today *could have* experienced an alternate developmental pathway during gestation resulting in an intersex condition. That historical possibility is said to represent an "ongoing presence of parallel paths" throughout life, with the potential to create a ramp from the actually expressed pathway to an alternate pathway that could have been.[84] Yet, there is no scientific evidence that post-gestational offramps to an imagined alternate pathway are possible. In the analogy of a highway, the hypothesized offramp may be more accurately imagined as discharging into an open field with the potential for serious and permanent vehicular damage.

This presents an interesting quandary. Science is called upon to challenge simple binary concepts of sex, but when it comes to the question of whether a person is male or female, biology is deemed incapable of providing an answer.[85] When the metric for reality is what one feels themselves to be, we are no longer in the realm of science. We are left in rhetorical quicksand, where a woman is said to be someone who identifies as a woman, defining a word with the same word.[86] To define X as something that feels like X tells us exactly nothing. In such a world, science serves as an interesting backstory, but with little direct relevance.

If we are to retain a scientific foothold, there must be a baseline that is rooted in something more concrete than self-perception. Biologically speaking,

mammalian *design* maps to two sexes, fixed at conception. Intersex conditions are real, but properly understood as medical anomalies, deserving all the care, consideration, and support associated with any other disorder. In the absence of any developmental abnormalities, confusion regarding self-perceived sex may still be genuine, but that does not render self-assessment of an alternate sex *truthful*.

Many people have a sense that they know what a man or a woman is, yet genuinely struggle with a definition or description that encompasses the full range of humanity. There are parallels here with a statement in 1964 by another Supreme Court Justice, Potter Stewart, when he acknowledged difficulty in precisely identifying obscenity (porn), yet added, "I know it when I see it."[87] Abigail Favale offers assistance with at least the female half of the equation, saying a woman is "the kind of human being whose whole body is organized around the potential to gestate new life."[88] Note that her definition does not exclude those who are infertile or with developmental imperfections, as the focus is on a biological framework built around a conceptual functionality, not an individual's ability to fully realize that function.

The Image of God

All humans possess a spirit or nature that is called to serve, love, and commune with God. All are made in the image of God, with all the inherent privileges and responsibilities that entails. This is not the same, however, as saying that our physical condition is perfect—that there are no genuine birth defects or other ailments. Most Christians will say that God does not make mistakes, in the sense of something slipping past God's attention, yet they will also acknowledge aberrant conditions at birth or later in life that require medical attention. There is an accepted tension that God is in control of his creation, yet allows imperfections, and then calls upon his people to intervene in addressing those imperfections as they are able.

A simple example is the child born with a cleft lip. A glitch in the process of fetal development produces a face with a split upper lip, often with an offset between the two sides. Christians may acknowledge God's sovereignty in the birth of this child, while also affirming God's call to intervene and repair. In more complex examples, repair may not be possible. For most of human history, healing someone from a condition such as hemophilia or sickle cell anemia was beyond the realm of medical science. Living with such a condition does not diminish a person's value or undermine their status as bearing the image of God, but we do no service to anyone by reclassifying the condition as simply on a spectrum of normal human development.

Summary

The intention of many of those who advocate for human sex transition is undoubtedly a desire to help those experiencing emotional pain and to elevate those who have been historically marginalized. But good intention isolated from sound reasoning increases the potential for greater harm. Examples drawn from nature by PCN and others to affirm malleable human sex, in my assessment, are based on a series of logical fallacies:

1. *False dichotomy:* Terms unnecessarily defined to present a false either/or choice (*essential or contingent sex*)

   If a binary sex model for humans is defined as all humans have a clear sex, intersex conditions challenge the model. But that is not the only option. If assessed based on human *design*, with recognition that defects exist for every aspect of human physical development, the binary model holds.

2. *False equivalence:* Erroneously equating two things that bear only superficial similarity

   a. *mammals and nonmammals*

   Citing examples of contingent sex in nonmammals as an argument for contingent sex in mammals is not logical if mammals have no biological capacity to shift from one functional sex to another.

   b. *normal and anomalous fetal development*

   The existence of anomalies in nature (e.g., intersex conditions) is illogically conflated with how nature is designed to function (binary sex in mammals).

   c. *biological mistakes and human worth*

   Characterizing intersex individuals as a third category of human sex to mitigate characterizing individuals as "mistakes" conflates *condition* and *worth*. One may have any number of medical conditions resulting from biological miscues without being devalued as a human being. A condition resulting from a biological mistake does not equate to a person *being* a mistake. Further, removing the language of biological error complicates our ability to diagnose and treat ailments.

3. *Category mistake:* Grouping entities into a single category based on overlapping traits that ignore vital differences (*minimal sexual dimorphism in humans*)

   Claims that human males and females exhibit minimal sexual dimorphism based on overlapping characteristics (sufficient to be considered interchangeable) must downplay the growing body of medical studies detailing significant sexual dimorphism in every organ and function of the body, down to the cellular level. No post-gestational pathways exist to morph one sex into the other.

4. *Is-ought fallacy:* In ethics, one cannot logically derive what ought to be simply from what is observed

   Examples of contingent sex in the animal kingdom are cited as justification for contingent (and fluid) sex in humans. What is observed, however, poorly constrains what ought to be, as is demonstrated by expanding the list of observations. If examples from nature serve as a foundation for what should be considered normal for humans, many human behaviors or identities incompatible with Christian ethical principles can be affirmed.

5. *Conceptual-shift fallacy:* Building an argument with a stated objective, but basing the conclusion on a different argument

   PCN and others build an argument around the science of contingent sex from the animal kingdom and variable fetal development in humans to argue for accepting contingent and fluid sex in humans. But in affirming human sex transitions, the argument switches from science to hypothetical/philosophical ramps from one developmental pathway to another—pathways that do not biologically exist.

Notes

[1]"U.S. Department of Education Releases Final Title IX Regulations, Providing Vital Protections Against Sex Discrimination," U.S. Department of Education, 2024, https://www.ed.gov/news/press-releases/us-department-education-releases-final-title-ix-regulations-providing-vital-protections-against-sex-discrimination.

[2]For example, E. Carrington Heath, *Called Out: 100 Devotionals for LGBTQ Christians* (Westminster John Knox Press, 2022); Cheryl B. Evans, *What Does God Think?: Transgender People and The Bible* (pub. by author, 2017); Colby Martin, *Unclobber: Rethinking Our Misuse of the Bible on Homosexuality* (Westminster John Knox Press, 2022); and James V. Brownson, *Bible, Gender, Sexuality: Reframing the Church's Debate on Same-Sex Relationships* (Eerdmans, 2013).

[3]For example, Wendy Farley, "'So That Nothing May Be Lost': Gender Diversity and the Divine Image," *Reflective Practice: Formation and Supervision in Ministry* 39 (2019): 91–103; Sam Sanchinel, "The Godly 'I Am' of Trans Identity," *Religion and Gender* 13, no. 1 (2022): 69–87, https://doi.org/10.1163/18785417-tat00004; Hannelie Wood, "Inaugurated Eschatology from a Transgender Perspective," *Verbum et Ecclesia* 45, no. 1 (2024): article 2995, https://doi.org/10.4102/ve.v45i1.2995; and David P. Gushee, *Changing Our Mind: A Call from America's Leading Evangelical Ethics Scholar for Full Acceptance of LGBT Christians in the Church*, 2nd ed. (Read the Spirit Books, 2015).

[4]Examples and citations follow below.

[5]Justin Sabia-Tanis, *Trans-Gendered: Theology, Ministry, and Communities of Faith* (Wipf & Stock, 2017); and Justin Sabia-Tanis, "Holy Creation, Wholly Creative: God's Intention for Gender Diversity," in *Understanding Transgender Identities: Four Views*, ed. James K. Beilby and Paul Rhodes Eddy (Baker Academic, 2019), 195–222.

[6]Joan Roughgarden, "The Gender Binary in Nature, Across Human Cultures, and in the Bible," in *Transsexuality in Theology and Neuroscience*, ed. Gerhard Schreiber (Walter de Gruyter, 2016), 413–39; and Joan Roughgarden, *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People*, 10th anniversary (University of California Press, 2013).

[7]Mark Achtemeier, *The Bible's Yes to Same-Sex Marriage: An Evangelical's Change of Heart* (Westminster John Knox Press, 2014).

[8]Austen Hartke, *Transforming: The Bible and the Lives of Transgender Christians* (Westminster John Knox Press, 2018), chap. 4, "And God Said, Let There Be Marshes."

[9]Megan K. DeFranza, *Sex Difference in Christian Theology: Male, Female, and Intersex in the Image of God* (Eerdmans, 2015); and Megan K. DeFranza, "Good News for Gender Minorities," in *Understanding Transgender Identities: Four Views*, ed. James K. Beilby and Paul Rhodes Eddy (Baker Academic, 2019), 147–78.

[10]Linda Tatro Herzer, *The Bible and the Transgender Experience: How Scripture Supports Gender Variance* (Pilgrim Press, 2016).

[11]Jennifer Anne Cox, *Intersex in Christ: Ambiguous Biology and the Gospel* (Cascade Books, 2018).

[12]Myron A. Penner, April M. Cordero, and Amanda J. Nichols, "Sex Determination and the Human Person," *TheoLogica: An International Journal for Philosophy of Religion and Philosophical Theology* 7, no. 1 (2023): 27–55, https://doi.org/10.14428/thl.v7i1.65183.

[13]Penner et al., "Sex Determination and the Human Person."

[14]On a personal note, one of the authors has been a valued friend for many years.

[15]Penner et al., "Sex Determination and the Human Person," 52.

[16]Penner et al., "Sex Determination and the Human Person," 28, 33, 45–52.

[17]An often-cited statistic is up to 1.7% of all live births are intersex. Melanie Blackless et al., "How Sexually Dimorphic Are We? Review and Synthesis," *American Journal of Human Biology* 12, no. 2 (2000): 159, https://doi.org/10.1002/(sici)1520-6300(200003/04)12:2%3C151::aid-ajhb1%3E3.0.co;2-f; and Abigail Favale notes that this number includes multiple characteristics that do not include sexual ambiguity. When limiting to cases of actual uncertainty of sex, the number drops to 0.018%.

Abigail Rine Favale, *The Genesis of Gender: A Christian Theory* (Ignatius Press, 2022), 111–12.

[18]A. Goikoetxea et al., "Sex Change in Aquarium Systems Establishes the New Zealand Spotty Wrasse (*Notolabrus celidotus*) as a Temperate Model Species for the Investigation of Sequential Hermaphroditism," bioRxiv: The Preprint Server for Biology, posted July 28, 2021, https://doi.org/10.1101/2020.08.28.271973.

[19]B. Tezak et al., "Higher Temperatures Directly Increase Germ Cell Number, Promoting Feminization of Red-Eared Slider Turtles," *Current Biology* 33, no. 14 (2023): 3017, https://doi.org/10.1016/j.cub.2023.06.008.

[20]Valerie Schmitt, Nils Anthes, and Nico K. Michiels, "Mating Behaviour in the Sea Slug *Elysia timida* (Opisthobranchia, Sacoglossa): Hypodermic Injection, Sperm Transfer and Balanced Reciprocity," *Frontiers in Zoology* 4, no. 1 (2007): article 17, https://doi.org/10.1186/1742-9994-4-17.

[21]For example, Marcel E. Dorken and Spencer C. H. Barrett, "Phenotypic Plasticity of Vegetative and Reproductive Traits in Monoecious and Dioecious Populations of *Sagittaria latifolia* (Alismataceae): A Clonal Aquatic Plant," *Journal of Ecology* 92, no. 1 (2004): 32–44, https://doi.org/10.1111/j.1365-2745.2004.00857.x.

[22]Jennifer M. Beale and Sarah M. Creighton, "Long-Term Health Issues Related to Disorders or Differences in Sex Development/Intersex," *Maturitas* 94 (2016): 143–48, https://doi.org/10.1016/j.maturitas.2016.10.003.

[23]While the focus here is functional sex, it is acknowledged that environmental stressors, such as hormonal changes that occur at puberty or external influences from social interactions (peers, parents, counselors), can influence how someone feels about their identity.

[24]Alejandro Diaz et al., "Prepubertal Gynecomastia and Chronic Lavender Exposure: Report of Three Cases," *Journal of Pediatric Endocrinology and Metabolism* 29, no. 1 (2016): 103–7, https://doi.org/10.1515/jpem-2015-0248.

[25]Roughgarden, *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People*, 196–206.

[26]Penner et al., "Sex Determination and the Human Person," 32.

[27]Barbara E. Bierer et al., "Advancing the Inclusion of Underrepresented Women in Clinical Research," *Cell Reports Medicine* 3, no. 4 (2022): 100553, https://doi.org/10.1016/j.xcrm.2022.100553; Vered Daitch et al., "Underrepresentation of Women in Randomized Controlled Trials: A Systematic Review and Meta-Analysis," *Trials* 23, no. 1 (2022): 1038, https://doi.org/10.1186/s13063-022-07004-2; and Rachel-Maria Brown et al., "Underrepresentation of Women in Cardiac Imaging Trials: A Review," *American Heart Journal Plus: Cardiology Research and Practice* 13 (2022): 100102, https://doi.org/10.1016/j.ahjo.2022.100102.

[28]Sharonne N. Hayes and Rita F. Redberg, "Dispelling the Myths: Calling for Sex-Specific Reporting of Trial Results," *Mayo Clinic Proceedings* 83, no. 5 (2008): 523–25, https://doi.org/10.4065/83.5.523; Katherine A. Liu and Natalie A. DiPietro Mager, "Women's Involvement in Clinical Trials: Historical Perspective and Future Implications," *Pharmacy Practice* 14, no. 1 (2016): 708, https://doi.org/10.18549/PharmPract.2016.01.708; and Melissa A. Babcook et al., "Representation of Women in Clinical Trials Supporting the FDA-Approval of Contemporary Anticancer Therapies," *Journal of Clinical Oncology* 40, no. 16 suppl. (2022): 6521, https://doi.org/10.1200/JCO.2022.40.16_suppl.6521.

[29]Leigh Gabel, Heather M. Macdonald, and Heather A. McKay, "Sex Differences and Growth-Related Adaptations in Bone Microarchitecture, Geometry, Density, and Strength from Childhood to Early Adulthood: A Mixed Longitudinal HR-pQCT Study," *Journal of Bone and Mineral Research* 32, no. 2 (2017): 250–63, https://doi.org/10.1002/jbmr.2982.

[30]Anita T. Layton and Jennifer C. Sullivan, "Recent Advances in Sex Differences in Kidney Function," *American Journal of Physiology-Renal Physiology* 316, no. 2 (2019): F328–31, https://doi.org/10.1152/ajprenal.00584.2018.

[31]Oleg Varlamov, Cynthia L. Bethea, and Charles T. Roberts Jr., "Sex-Specific Differences in Lipid and Glucose Metabolism," *Frontiers in Endocrinology* 5 (2015): article 241, https://doi.org/10.3389/fendo.2014.00241.

[32]Erik Hrabovszky et al., "Sexual Dimorphism of Kisspeptin and Neurokinin B Immunoreactive Neurons in the Infundibular Nucleus of Aged Men and Women," *Frontiers in Endocrinology* 2 (2011): article 80, 1–15, https://doi.org/10.3389/fendo.2011.00080; There is an interesting tension when citing brain studies in support of sex transition, with claims that there are no meaningful differences between male and female brains: e.g., Penner et al., "Sex Determination and the Human Person," 32; yet also claims that trans individuals have brain structures more comparable to the gender with which they identify: e.g., Loren Haarsma et al., "Congenital Disabilities and Gender Nonconforming Identities as Parts of God's Intended Creation," *Perspectives on Science and Christian Faith* 76, no. 3 (December 2024): 196, https://doi.org/10.56315/PSCF12-24Haarsma.

[33]Dian Li et al., "Sex-Specific Differences in Circumpapillary Retinal Nerve Fiber Layer Thickness," *Ophthalmology* 127, no. 3 (2020): 357–68, https://doi.org/10.1016/j.ophtha.2019.09.019.

[34]Rodrigo Soares Fortunato et al., "Sexual Dimorphism of Thyroid Reactive Oxygen Species Production Due to Higher NADPH Oxidase 4 Expression in Female Thyroid Glands," *Thyroid* 23, no. 1 (2013): 111–19, https://doi.org/10.1089/thy.2012.0142.

[35]G. D. Massaro, J. P. Mortola, and D. Massaro, "Sexual Dimorphism in the Architecture of the Lung's Gas-Exchange Region," *Proceedings of the National Academy of Sciences* 92, no. 4 (1995): 1105–7, https://doi.org/10.1073/pnas.92.4.1105.

[36]Harrison Stratton et al., "Nociceptors Are Functionally Male or Female: From Mouse to Monkey to Man," *Brain* 147, no. 12 (December 2024): 4280–91, https://doi.org/10.1093/brain/awae179.

[37]Cierra J. Walker et al., "Matters of the Heart: Cellular Sex Differences," *Journal of Molecular and Cellular Cardiology* 160 (2021): 42–55, https://doi.org/10.1016/j.yjmcc.2021.04.010.

[38]Jonathan Haidt, *The Anxious Generation: How the Great Rewiring of Childhood Is Causing an Epidemic of Mental Illness* (Penguin Press, 2024).

[39]Penner et al., "Sex Determination and the Human Person," 50–52.

[40]Isabel S. Robinson et al., "Operative Management of Complications Following Intestinal Vaginoplasty: A Case Series and Systematic Review," *Urology* 180 (October 2023): 105–12, https://doi.org/10.1016/j.urology.2023.07.005; and Anne-Marie Amies Oelschlager, Anna Kirby, and Lesley Breech, "Evaluation and Management of Vaginoplasty

Complications," *Current Opinion in Obstetrics & Gynecology* 29, no. 5 (2017): 316–21, https://doi.org/10.1097/GCO.0000000000000391.

[41]Greta Friar, "Sex Chromosomes Responsible for Much More than Determining Sex," Whitehead Institute of MIT, December 13, 2023, https://wi.mit.edu/news/sex-chromosomes-responsible-much-more-determining-sex.

[42]Megan DeFranza provides an extensive review of the many possible pathways and outcomes in DeFranza, *Sex Difference in Christian Theology*.

[43]Bo Huang et al., "Is Differences in Embryo Morphokinetic Development Significantly Associated with Human Embryo Sex?," *Biology of Reproduction* 100, no. 3 (2019): 618–23, https://doi.org/10.1093/biolre/ioy229. These authors note, "Both Y-linked genes and those X-linked genes play an important role in the early embryonic developmental patterns" (p. 263).

[44]A. Jost, "Problems of Fetal Endocrinology: The Adrenal Glands," *Recent Progress in Hormone Research* 22 (1966): 541–74, https://doi.org/10.1016/b978-1-4831-9825-5.50017-8.

[45]Beale and Creighton, "Long-Term Health Issues Related to Disorders or Differences in Sex Development/Intersex."

[46]Klara Anna Capova, "Introducing Humans to the Extraterrestrials: The Pioneering Missions of the Pioneer and Voyager Probes," *Frontiers in Human Dynamics* 3 (2021): 714616, https://doi.org/10.3389/fhumd.2021.714616.

[47]Elizabeth Reis, "Divergence or Disorder?: The Politics of Naming Intersex," *Perspectives in Biology and Medicine* 50, no. 4 (2007): 535–43, https://doi.org/10.1353/pbm.2007.0054; and Stephanie S. Turner, "Intersex Identities: Locating New Intersections of Sex and Gender," *Gender & Society* 13, no. 4 (1999): 457–79, https://doi.org/10.1177/089124399013004003.

[48]Sarah N. Mattson, Nicole Crocker, and Tanya T. Nguyen, "Fetal Alcohol Spectrum Disorders: Neuropsychological and Behavioral Features," *Neuropsychology Review* 21, no. 2 (2011): 81–101, https://doi.org/10.1007/s11065-011-9167-9.

[49]M. H. Kaufman, "The Embryology of Conjoined Twins," *Child's Nervous System* 20, no. 8 (2004): 508–25, https://doi.org/10.1007/s00381-004-0985-4.

[50]Ameet Kumar Jha, Samal Nauhria, and Sabyasachi Maity, "Polymelia (Thoracomelia), an Extremely Rare Appearance of Congenital Anomalic Limb in a Nepalese Child and Its Embryological Basis," *Anatomy & Cell Biology* 56, no. 4 (2023): 584–87, https://doi.org/10.5115/acb.23.179.

[51]With genetic disorders, coding is correctly followed during fetal development, but atypical or defective coding produces adverse health effects.

[52]C. Turleau, "Cri-du-Chat Syndrome," in *Encyclopedia of Genetics* (Elsevier, 2001), 486–87, https://doi.org/10.1006/rwgn.2001.0290.

[53]A. C. Goodeve et al., "Genetics of Haemostasis," *Haemophilia* 18, no. s4 (2012): 73–80, https://doi.org/10.1111/j.1365-2516.2012.02832.x.

[54]Betty S. Pace, Solomon F. Ofori-Acquah, and Kenneth R. Peterson, "Sickle Cell Disease: Genetics, Cellular and Molecular Mechanisms, and Therapies," *Anemia* (2012): 1–2, https://doi.org/10.1155/2012/143594.

[55]Zhihao Yang, "Progress of CRISPR/Cas9 in the Treatment of Sickle Cell Disease," *Highlights in Science, Engineering and Technology* 36 (2023): 110–14, https://doi.org/10.54097/hset.v36i.5648.

[56]Rachel Cohon, "Hume's Moral Philosophy," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (Metaphysics Research Lab, Stanford University, 2018), https://plato.stanford.edu/archives/fall2018/entries/hume-moral/.

[57]ICAI researchers, "Facts and Statistics," International Center for Academic Integrity, 2020, https://academicintegrity.org/aws/ICAI/pt/sp/facts.

[58]Penner et al., "Sex Determination and the Human Person," 40–44.

[59]The list is not exhaustive. More extreme examples could be included such as parasitic sex, exhibited by deep-sea angler fish, with tiny males that latch onto a female, permanently fusing tissues to draw nutrients off the female; or cannibalistic sex, exhibited among amphipods, spiders, and insects, with females that consume a suitor after or during copulation.

[60]Penner et al., "Sex Determination and the Human Person," 27.

[61]David P. Barash and Judith Eve Lipton, *The Myth of Monogamy: Fidelity and Infidelity in Animals and People* (W. H. Freeman, 2001); and K. Kraaijeveld et al., "Extra-Pair Paternity Does Not Result in Differential Sexual Selection in the Mutually Ornamented Black Swan (*Cygnus atratus*)," *Molecular Ecology* 13, no. 6 (2004): 1625–33, https://doi.org/10.1111/j.1365-294X.2004.02172.x.

[62]Bianca S. Rangel et al., "Evidence of Mating Scars in Female Tiger Sharks (*Galeocerdo cuvier*) at the Fernando de Noronha Archipelago, Brazilian Equatorial Atlantic," *Environmental Biology of Fishes* 106, no. 1 (2023): 107–15, https://doi.org/10.1007/s10641-022-01380-z; and André S. Afonso et al., "Evasive Mating Behaviour by Female Nurse Sharks, *Ginglymostoma cirratum* (Bonnaterre, 1788), in an Equatorial Insular Breeding Ground," *Neotropical Ichthyology* 14, no. 4 (2016), https://doi.org/10.1590/1982-0224-20160103.

[63]Shane Nicholas Glackin, "Dolphin Natures, Human Virtues: MacIntyre and Ethical Naturalism," *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 39, no. 3 (2008): 292–97, https://doi.org/10.1016/j.shpsc.2008.06.003.

[64]Margaret C. Tavolga, "Behavior of the Bottlenose Dolphin (*Tursiops truncatus*): Social Interactions in a Captive Colony," in *Whales, Dolphins, and Porpoises*, ed. Kenneth S. Norris (University of California Press, 2023), https://doi.org/10.2307/jj.8306021.

[65]Burney J. Leboeuf, "Sexual Behavior in the Northern Elephant Seal *Mirounga angustirostris*," *Behaviour* 41, no. 1–2 (1972): 1–26, https://doi.org/10.1163/156853972X00167.

[66]Douglas G.D. Russell, William J.L. Sladen, and David G. Ainley, "Dr. George Murray Levick (1876–1956): Unpublished Notes on the Sexual Habits of the Adélie Penguin," *Polar Record* 48, no. 4 (2012): 387–93, https://doi.org/10.1017/S0032247412000216.

[67]Raïssa A. de Boer et al., "Meta-Analytic Evidence That Animals Rarely Avoid Inbreeding," *Nature Ecology & Evolution* 5, no. 7 (2021): 949–64, https://doi.org/10.1038/s41559-021-01453-9.

[68]Leboeuf, "Sexual Behavior in the Northern Elephant Seal *Mirounga angustirostris*."

[69]William A. Haddad et al., "Multiple Occurrences of King Penguin (*Aptenodytes patagonicus*) Sexual Harassment by Antarctic Fur Seals (*Arctocephalus gazella*)," *Polar Biology* 38, no. 5 (2015): 741–46, https://doi.org/10.1007/s00300-014-1618-3.

[70]Mark B Orams, "Historical Accounts of Human-Dolphin Interaction and Recent Developments in Wild Dolphin

Based Tourism in Australasia," *Tourism Management* 18, no. 5 (1997): 317–26, https://doi.org/10.1016/S0261-5177(96)00022-2.

[71]Aru Toyoda et al., "Necrophilic Behaviour in Wild Stump-Tailed Macaques (*Macaca arctoides*)," *Scientific Reports* 14, no. 1 (May 13, 2024): article 10946, https://doi.org/10.1038/s41598-024-61678-z; Russell et al., "Dr. George Murray Levick (1876–1956)"; Jorge Heriberto Valdez Villavicencio and Anny Peralta-García, "First Record of Necrophilia in the Baja California Spiny Lizard *Sceloporus zosteromus* (Phrynosomatidae)," *Revista Latinoamericana de Herpetología* 3, no. 1 (May 28, 2020): 116–17, https://doi.org/10.22201/fc.25942158e.2020.1.128; and Pol Pintanel, Gabriela Obando-Moreno, and Andrés Merino-Viteri, "Necrophiliac Behaviour in the Recently Described Species *Scinax tsachila* (Anura: Hylidae), with a Review of Necrophilia in Amphibians," *Neotropical Biodiversity* 7, no. 1 (January 1, 2021): 53–56, https://doi.org/10.1080/23766808.2021.1879549.

[72]Elizabeth Bernstein, "Polyamory: Lots of Sex, Even More Scheduling," *Wall Street Journal*, January 22, 2024, https://www.wsj.com/lifestyle/relationships/consensual-non-monogamy-ethical-polyamory-85350ebb.

[73]Shanmuga Prema Muppudathi, "Dulosis in Ants," *Research Gate,* 2019, https://doi.org/10.13140/RG.2.2.21246.95043; and Riitta Savolainen and Richard J. Deslippe, "Facultative and Obligate Slavery in Formicine Ants: Frequency of Slavery, and Proportion and Size of Slaves," *Biological Journal of the Linnean Society* 57, no. 1 (1996): 47–58, https://doi.org/10.1111/j.1095-8312.1996.tb01695.x.

[74]Walter H. Piper et al., "Fatal Battles in Common Loons: A Preliminary Analysis," *Animal Behaviour* 75, no. 3 (2008): 1109–15, https://doi.org/10.1016/j.anbehav.2007.10.025.

[75]Deborah A. Giles et al., "Harassment and Killing of Porpoises ('Phocoenacide') by Fish-Eating Southern Resident Killer Whales (*Orcinus orca*)," *Marine Mammal Science* 40, no. 2 (2024): e13073, https://doi.org/10.1111/mms.13073.

[76]Miya Hamai et al., "New Records of Within-Group Infanticide and Cannibalism in Wild Chimpanzees," *Primates* 33, no. 2 (1992): 151–62, https://doi.org/10.1007/BF02382746; and Adriana E. Lowe et al., "Intra-Community Infanticide in Wild, Eastern Chimpanzees: A 24-Year Review," *Primates* 61, no. 1 (2020): 69–82, https://doi.org/10.1007/s10329-019-00730-3.

[77]A. E. Derocher and Ø. Wiig, "Infanticide and Cannibalism of Juvenile Polar Bears (*Ursus maritimus*) in Svalbard," *Arctic* 52, no. 3 (1999): 307–10, https://www.jstor.org/stable/40511783.

[78]Lenka Sentenská and Stano Pekár, "Mate with the Young, Kill the Old: Reversed Sexual Cannibalism and Male Mate Choice in the Spider *Micaria sociabilis* (Araneae: Gnaphosidae)," *Behavioral Ecology and Sociobiology* 67, no. 7 (2013): 1131–39, https://doi.org/10.1007/s00265-013-1538-1.

[79]Penner et al., "Sex Determination and the Human Person," 30.

[80]Abigail Favale, "Gender Identity Theory and Christian Anthropology," *Journal of the Evangelical Theological Society* 67, no. 1 (2024): 125–33.

[81]Alia E. Dastagir, "Marsha Blackburn Asked Ketanji Brown Jackson to Define 'Woman.' Science Says There's No Simple Answer," *USA Today*, March 24, 2022, https://www.usatoday.com/story/life/health-wellness/2022/03/24/marsha-blackburn-asked-ketanji-jackson-define-woman-science/7152439001/.

[82]Penner et al., "Sex Determination and the Human Person," 27, 49.

[83]Penner et al., "Sex Determination and the Human Person," 50–51.

[84]Penner et al., "Sex Determination and the Human Person," 52.

[85]Again, the focus here is on the biology of sex, not societal perceptions of what gendered behavior or characteristics look like.

[86]E. Sandra Byers and Karen Blair, "Sex, Gender, and Sexuality," in *The Cambridge Handbook of the International Psychology of Women*, ed. Fanny M. Cheung and Diane F. Halpern, 1st ed. (Cambridge University Press, 2020), 37–51, https://doi.org/10.1017/9781108561716.005. On the question of Who is a woman?: "Our conclusion is that women are those individuals who identify as being a woman …" (p. 42).

[87]Paul Gewirtz, "On 'I Know It When I See It,'" *The Yale Law Journal* 105, no. 4 (1996): 1023, https://doi.org/10.2307/797245.

[88]Favale, *The Genesis of Gender*, 106.

Adam Smith

DOI: https://doi.org/10.56315/PSCF3-25Smith

Gender Incongruence and the Question of Medicalization

Adam Smith

How should Christians in science engage in the gender debate? Much of that debate is about matters of empirical fact: the causes and consequences of what is called "gender incongruence," and the benefits and harms of various interventions. On the other hand, some thinkers and activists who accept the reality of such facts also deny their relevance, and insist that what matters is simply how a person feels and what a person wants. Neither the "appeal to facts" nor the "appeal to feelings" are legitimate grounds for debating the question of whether gender incongruence is, in some sense, a medical problem to be fixed, or whether it is an identity to be celebrated. Only by making "ethical judgments"—fallible claims about objective values—can we address that question coherently and faithfully.

Keywords: gender, gender incongruence, medicalization, naturalism, normativism

How should Christians in science engage in the gender debate? Much of that debate is about matters of empirical fact: the causes and consequences of gender incongruence, and the benefits and harms of various interventions. Writing in these pages, Tony Jelsma has ably presented much of what is currently known.[1] Christians in science can and should follow Jelsma's lead and help people to tighten what is often a loose grasp of the subject.[2]

But the gender debate at its heart turns on questions that empirical facts cannot resolve, regardless of what the facts may be. Even if the known facts may have recently shifted in favor of those who argue, for example, that puberty blockers do more harm than good,[3] the debate itself seems to be shifting toward those deeper questions, and toward what the trans writer Andrea Long Chu calls "a stronger demand": one grounded in a worldview according to which puberty *itself* is the kind of thing that can do more harm than good, and should perhaps be prevented from occurring until a child is old enough to consent to it.[4]

Christians in science will have to grapple with such claims, not as scientists, but as Christians. The deeper questions and their competing answers are not empirical, they are ethical. At issue is not how the human body works, but how to be a human being. And this ethical question is ultimately theological: any answer to it will always be rooted in a broader vision of human flourishing in which claims about God are decisive.[5]

I am neither a scientist nor a theologian. The argument I make here cannot get at the facts, and it cannot get into the theology. What it can do, I hope, is to make plain *why* empirical facts are not sufficient to resolve the gender debate, and why theology is necessary. I think Christians in science are in a unique position to speak to the controversy, but I think their voice will be clearer if they can appreciate the limits of what they can say as scientists, and the significance of what they can say as Christians. So my purpose here is not to advance my own conclusions about

Adam Smith *is professor of political philosophy and director of the Honors Program at the University of Dubuque, in Dubuque, Iowa.*

gender incongruence; rather, it is to make an argument about the kinds of reasons we can and cannot use to draw any conclusions whatsoever, including those opposite to mine. I am talking about the ground for the debate itself.

I am going to make my argument by considering the gender debate as one example of a type of controversy that includes many similar cases. One of the key points of contention is whether gender incongruence is, in some sense, a medical problem or whether it is better understood as an identity. Thus the gender debate is partly a controversy about "medicalization"—the social process by which certain phenomena get defined in medical terms. If we want to know whether the phenomenon called gender incongruence does or does not count as a medical problem, we need to know how (or if) we can know what counts as a "medical problem" in general. In particular, we need to know which kinds of answers are relevant to this question of medicalization—and which kinds are not.

Both popular and scholarly discourse about medicalization tend toward two competing answers. The first is the one I have already hinted at here, which I will call the "appeal to facts." This is the claim that empirical knowledge about how the body works can tell us what is and is not a medical problem. The second is what I will call the "appeal to feelings." This is the claim that subjective preferences—attractions and aversions, pleasures and pains, likes and dislikes—can tell us what is and is not a medical problem. While they may seem to be rivals, both answers are wrong in the same way. Neither facts nor feelings by themselves can tell us what counts as a medical problem, because neither facts nor feelings alone can tell us what counts as a *problem*, per se. Controversies about medicalization are not debates about whether a certain problem should or should not be treated medically; they are debates about whether or not something is a "problem" in the first place. My thesis is that only by making ethical judgments—fallible claims about what is objectively good and bad for human beings, in which "objective" means "what is good or bad whether you like it or not"—can we offer legitimate answers to the question of medicalization in any particular case, including the case of gender incongruence.

Ethical judgments are neither observations of fact nor expressions of feeling, though they have connections to both. They are similar to claims about empirical facts, in that they are claims about what is objectively the case. But the "case" in question is the moral realm, the realm of values. And they are relevant to claims about feelings, in that they are claims about what we ought to feel. But the question of what we "ought" to like and dislike is very different from the question of what we happen to like and dislike. The latter is a question of subjective values, while the former is a question of objective values. Thus I am arguing from what philosophers broadly call a "moral realist" position.[6]

In this paper I use the term "fact" to refer specifically to empirical facts, of the sort pursued by science (mainly natural sciences such as biology, in this context, but also including social sciences, such as psychology) because my argument is directed against the widespread tendency to treat such facts as if they are *in themselves* evidence for or against certain answers to the question of gender incongruence. I am not suggesting that empirical facts are the only kind of fact—indeed, my argument for the priority of "ethical judgments" over empirical facts and subjective values is an argument for the priority of claims about what moral realists often call *moral* facts. "Moral fact" is another term for "objective value." I use the latter term because I hope it will be less confusing to non-philosophers, to whom this paper is primarily addressed.

I want to emphasize that facts *are* relevant to the question of whether gender incongruence is a medical problem to be fixed or an identity to be respected. So are subjective feelings. My argument is *not* that facts and feelings do not matter here; my argument is that *how* they matter is a question that can be answered only by making an ethical judgment, a claim about what is objectively good and bad for someone. The point is that this judgment is often the hidden assumption on which arguments about gender incongruence in particular and medicalization in general depend, and that this occlusion has consequences. Logical error is the least of these consequences: my claim is that what is centrally at stake in questions of medicalization is our capacity to respect one another as images of God, and that in disputes like this we cannot fully respect one another without treating one another as makers of fallible ethical judgments.

I also want to emphasize that there may be more than one legitimate answer to the question of gender incongruence. Again, I am not arguing for a particular conclusion: I am making an argument about how

to argue. But I do not want to be evasive, and I will state for the record that, in my view, gender incongruence is a (very complicated) problem, and that in some respects the problem may be medical. I believe it is a condition to be lamented and compassionately treated, not an identity to be celebrated. I also suspect that shifting the ground for the debate from empirical facts and subjective feelings to objective values might have the effect of making views like mine more persuasive. Still, it may be possible to coherently defend the contrary position, that gender incongruence is an identity, by making ethical judgments.

Among those who do hold that contrary position, the question of medicalization has long been divisive. I want to start by considering Chu's argument about medicalization, and by emphasizing that Chu is right to insist that medicalization is fundamentally about *respect*.

Medicalization and the Demand for Respect

Trans activists have often based their requests for medical interventions on Judith Butler's familiar contention that not only gender but sex itself is a social construction.[7] For Butler, biological sex is not an empirical reality. It is an illusion of facticity conjured by the repeated "performance" of gender. What follows is the now-familiar demand for the right to change one's sex so that it matches one's gender: since sex was always a social construction, individuals have the right to reconstruct it as they see fit. Among other things, reconstruction may involve drugs and surgeries.

The problem with Butler's view, as Chu points out, is that "[i]f gender really is an all-encompassing structure of social norms that produces the illusion of sex … why would the affirmation of someone's gender identity entail a change to their biology?"[8] This problem has often led trans activists toward an alternative argument, according to which medical interventions are justified by a diagnosis of gender incongruence (the currently preferred term) or gender dysphoria (now used to designate the stress that may or may not accompany gender incongruence itself). The problem with this alternative, for Chu, is that it medicalizes what should be understood as an identity. It turns difference into pathology.[9]

Against both positions, Chu contends that "any comprehensive movement for trans rights must be able to make political demands at the level of biology itself." Chu thinks we should accept that biological sex is a fact, while insisting that the desire to change this fact is not pathological. On the contrary: "justice is always an attempt to change reality." Chu's "stronger demand" is therefore for a universal right to change sex *without* needing to justify it by referring to any facts at all.

> We will never be able to defend the rights of transgender kids until we understand them purely on their own terms: as full members of society who would like to change their sex. *It does not matter where this desire comes from*. (emphasis in the original)[10]

It does not matter, in other words, whether the desire comes from "non-normative exposure to hormones in the womb," or to "unconscious parental conflict," or perhaps to "the obsessiveness and rigidity of patients with ASD [Autism Spectrum Disorder]."[11] It does not matter if it generally has "a complex etiology with hormonal, genetic, epigenetic disruptors, and immunological mechanisms that cause a specific neuropsychological profile," or if it is caused specifically by "a different sexual differentiation of the brain, not concordant with natal sex or sex assigned at birth, as a result of changes in the DNA sequence of the estrogen receptor α- β genes (ESR1 and ESR2) and the AR androgen receptor gene, as well as the CYP19A1 and the CYP17A1 genes."[12] It does not matter if it comes from endocrine-disrupting pollutants,[13] or, in particular, from phthalate esters.[14] It does not matter if it has a "rapid onset" and comes from "social influence, maladaptive coping mechanisms, parental approaches, and family dynamics,"[15] or if papers advancing that hypothesis have been retracted.[16]

All that matters, for Chu, is whether a person desires to change their sex, full stop. Chu assumes that desires themselves are neither good nor bad; what is morally right is the freedom to pursue our desires, so long as they harm no one else, and what is morally wrong is any restriction on that pursuit that is not justified by the need to prevent harm to others. At the same time, Chu also assumes that what counts as "harm" itself depends on what a person desires. Thus, even if she regrets it later, a woman who wants to remove her breast cannot be morally "harmed" by that removal, precisely because it was what she wanted.[17]

Chu's argument is an explicit rejection of any "appeal to facts" that might be made by or on behalf of people with gender incongruence, and an explicit "appeal to feelings" in defense of their absolute right to medical interventions. Chu clearly thinks it is possible to

divorce the need for a medical intervention from the idea of medical need: one need not be understood to have a medical *problem* in order to be given *medicine*. Medical care is for treating problems, but the "problem" in this case is an unsatisfied desire to change sex. There is no possibility for Chu that the desire itself could be the problem (in which case the desire's satisfaction would cause harm) and that this problem might in some respects be understood in medical terms such as those laid out by Jelsma and others.[18]

Chu's argument is admirably coherent—more coherent than Butler's—and it precisely identifies the crux of the matter. Even to label the desire "gender incongruence" (which replaced the older term "gender identity disorder") is still to pathologize it in some sense, and the question is whether the desire is pathological.[19] Thus Chu supports medical intervention to satisfy the desire, but opposes the medicalization of the desire itself. And Chu has a keen sense for what is really at stake in this question: not "health care" but *respect*. To pathologize the desire itself is to show disrespect for people (including children) who must be understood "on their own terms" and recognized as equals.

Chu is right: this is about respect, in that any case of medicalization is always fundamentally about respect. If we think—as we often do—that medicalization is instead about compassion, we fatally misunderstand what we are doing when we define something as a medical problem. Calls to relieve a person's suffering are predicated on claims *that* the person is suffering, and such claims are profoundly implicated in our attempts to recognize one another, in Chu's words, "as full members of society."

To see why medicalization is about respect, it is useful to consider what we are actually *doing* when we define something as a medical problem. In the next section I want to explain in simple terms how the process of medicalization works. The main point is that medicalization is a moral process, not an empirical one.[20]

How Medicalization Works

Note first that we define a great number of human experiences as "medical problems," and that controversy arises in only a few cases. Strictly speaking, common colds and broken bones are all "medicalized," but we take such cases for granted. There are no social movements for or against the medicalization of the flu.[21]

Those cases that do generate controversy can show us what we are doing even when no controversy occurs. Homosexuality, for example, was defined as a medical problem for much of the twentieth century. The medicalization of homosexuality was originally proposed, often by gay people themselves, as a compassionate alternative to its moralization and criminalization. But other gay people were insulted by having their orientation defined in this way. They did not object to the claim that sexual orientation has a biological basis, but to the claim that this biological fact was also a biological problem. Medicalization is normally consensual and occasional conflictual precisely because of this power to *problematize*. We take the medicalization of the flu for granted because we take for granted that the flu is a problem for people with the flu. If we disagree about the medicalization of homosexuality, it is because we disagree about whether homosexuality is a problem for people who are gay, an obstacle to their flourishing.[22]

Whether it is consensual or conflictual, medicalization is therefore always a moral process. Even if science may play a role in it, medicalization *per se* is not a scientific process of empirical discovery. After all, scientific discoveries need not be translated into medical applications. Rather, it is a process by which certain empirical facts, including those discovered by scientists, come to be understood as *mitigating* facts. Medicalization is about blame and excuse. When we "treat" a person's experience in a certain way (as a medical problem), we necessarily "treat" the person herself in a certain way. If you stay home from your job and spend the day swimming, I might treat you as "lazy," in which case I *blame* you. But if you stay home from your job and spend the day vomiting, I might treat you as "sick," in which case I give you an *excuse* for missing work. And as a sick person, you will feel well treated. Likewise, if you pursue relationships with the same sex and I perceive this as a choice, I might treat you as "perverted" and blame you. If I perceive it as natural, I might treat you as "diseased" and excuse you. But you may still feel ill-treated, because while you agree with me that your behavior is "natural," you may not agree that it is a "disease." The question of medicalization is never whether something can be excused; the question is always whether something needs an excuse.[23]

While the case of sexual orientation may be less settled among this readership than it is in the broader society, for better or worse there is now a fairly solid consensus that whether or not gay people are "born

this way," being gay is not a problem to be suffered and, if possible, solved, but is rather an identity to be celebrated. To emphasize the genuine difficulty of determining whether something needs an excuse, it may therefore be helpful to consider a case that is perhaps more challenging to most people's intuitions.

Those of us who are not deaf may be surprised that anyone would object to defining *deafness* as a medical problem. If anything is an obstacle to human flourishing that should, if possible, be removed or ameliorated by medicine, surely deafness is. It seems obviously bad for a person to lose one of her senses; or at least it seems obviously better to be able to hear than otherwise. On the basis of this ostensibly common sense, medical researchers have developed cochlear implants, so that deaf children could hear. Yet many Deaf[24] persons passionately resist this intervention, by which they feel disrespected. They believe that sign language is not a poor substitute for speech, but a unique alternative to it. It is as expressive and sophisticated as any oral language, and it forms the basis for a special culture whose members flourish as well as in any other. On their view, cochlear implants are not a way for Deaf people to overcome natural obstacles; rather, they are unnatural obstacles to the formation of a uniquely Deaf form of life. If you get a cochlear implant at a young age (when the implants are most effective), you are less likely to learn sign language. Some say that such interventions are a form of "ethnocide."[25]

Cases such as sexual orientation and d/Deafness show why medicalization is not only a moral but also frequently a political process. The treatment of certain experiences as problems, and then as problems of a certain kind, involves the treatment of persons in certain ways. These treatments can take the force of law, as when we guarantee sick leave or determine insurance coverage. When people feel insulted by the way they are treated, they may form a shared identity around this experience of disrespect. They may organize against the existing policies which define as a "problem" something they believe is not. Or, they may organize in support of policy changes that would define as a medical problem something not currently understood as such.[26]

Exactly the same moral and often political controversies unfold around a number of other cases. Is obesity a medical problem, or is it an occasion for "fat pride"?[27] Is anorexia something people suffer, or can people legitimately embrace a "pro ana" lifestyle?[28] What about autism—should we describe it as a disability or as a "neurodivergence"?[29] Can the concept of neurodivergence go so far as to embrace conditions like schizophrenia—can we have "mad pride" in the same way we have "fat pride," which is the same as "gay pride"?[30] Or consider the phenomenon of "body integrity disorder," or BID, which is the case that is probably most similar to that of gender incongruence. Just as some people with gender incongruence want to change their body in order to bring their biology more in line with their identity, so some people with BID identify as a disabled person and wish to amputate or paralyze healthy arms, legs, or other body parts in order to "become what they are."

For many people, the rhetorical weight of many of these examples might lend itself to the intuition that gender incongruence is a pathology rather than an identity, and that the morally appropriate response is compassion that aims to resolve a pathology, rather than respect that aims to honor an identity. As I have said, that is indeed my own view. BID in particular may seem more straightforward than cases like d/Deafness, and those sympathetic to the claim that gender incongruence is an identity rather than a pathology might suspect that any attempt to draw an analogy between gender incongruence and BID is probably a spurious argument made in bad faith by gender skeptics.[31] But it is worth noting that Body Dysmorphic Disorder is listed by the NIH as a differential diagnosis for gender dysphoria.[32] It is also worth noting that some clinicians and medical ethicists now justify amputation or paralysis as a legitimate treatment for BID, on precisely the same grounds that are used to justify gender-affirming care.[33] And it is especially worth noting that some people with BID embrace it as an identity, referring to themselves as "transabled."[34]

Yet the examples themselves do not show that my view is correct. If BID is a pathology rather than identity, and if BID is exactly analogous to gender incongruence, then gender incongruence is a pathology. But this is merely a formal argument, and leaves the substantive question unanswered: *is* BID a pathology? And my own question lies behind it: what kinds of answers to such a question are legitimate? Can we answer by pointing to facts about the body, to causes and consequences of BID? Or can we answer by pointing to the feelings of the person with BID, to her preference for being disabled?

To further explore this question, I want to consider one case of medicalization in more detail. The strange case of "drapetomania" dramatizes the blame/excuse structure of medicalization and makes it easier to understand why neither empirical facts nor subjective feelings are enough to tell us what is and is not a medical problem. In particular, it makes plain why Chu's own appeal to feelings cannot secure the respect that Chu rightly believes to be at stake in the debate about gender incongruence, and shows why such respect is actually a matter of making and contesting ethical judgments about what is objectively good or bad for human beings, given some substantive vision of human flourishing. At the same time, the case lends rhetorical weight to the proper concern of people like Chu, which is that medicalization, far from securing compassion for people with problems, can produce the most extreme forms of disrespect: in this case, justification for chattel slavery. This helps to check the passions of those of us who believe, as I do, that to treat gender incongruence as a (medical) problem, and to pursue an accurate empirical understanding of that problem in hopes of developing effective interventions, is to show compassion for people who are suffering. While I believe it is worth taking, there is indeed a real risk that our "compassion" may be a cover for something else.

The Disease Causing Negroes to Run Away

Dr. Samuel Cartwright coined the word "drapetomania" and introduced the concept in 1851, in an article for *DeBow's Review* on "Diseases and Peculiarities of the Negro Race." Slaves suffering from this "disease of the mind" were driven against their best interests to run away from their masters. To attempt an escape was to display the symptoms of drapetomania, and to indicate the proper course of treatment, which under some conditions included "whipping them out of it." In this same article, he also introduced "dysaesthesia aethiopica, or hebetude of mind and obtuse sensibility of body—a disease peculiar to negroes—called by overseers, 'rascality.'"[35]

Cartwright's first move in "Diseases and Peculiarities" is to describe an action taken by another human being ("running away") as a "symptom." Under this description it is no longer an action at all, but a behavior, something which is "induced" and is therefore "curable." That which induces the symptom is revealed as the disease, and specifically as a "disease of the mind." Cartwright invites us to accept the initial plausibility of his diagnosis by claiming that it is as much a mental disease "as any other species of mental alienation."[36] If we believe there is any such thing as mental illness, then we cannot reject the idea of drapetomania out of hand, but must consider it on its merits.

By describing the runaway's action as a behavior which is a symptom of a disease, Cartwright establishes from the outset that the runaway is a certain kind of human being: one who lacks the capacity to decide to run away. A human being who has this capacity does not need the protection offered by slavery. It is this need, this particular lack, which establishes the action as a symptom, and the person as a slave. The logic is internally quite consistent. If the runaway is a "natural slave," someone who lacks a certain capacity for free action that masters have, then running away can only be explained as a malfunction. That Cartwright depends on the assumption, and that the idea of drapetomania reinforces the assumption, does not itself render the assumption wrong. There is no logical problem of circularity here—although there is clearly a moral one, in the sense that we suspect Cartwright is moved to introduce this disease not by empirical curiosity, nor by moral concern, but by the need to prove the assumption right.[37]

Immediately after describing the runaway's action/behavior as a medical problem with a medical solution, Cartwright situates the problem and the solution in a particular moral context. The morally correct relation of the master to the slave is the paternalistic non-moral relation. This paternalistic relationship may be required by the moral law which determines relations between non-equals (for Cartwright, this law is established or at least supported by divine revelation in scripture). But it is not itself a moral relationship, which can only occur between equals. So it is possible for Cartwright to introduce the slave's escape as a medical problem, but only because the moral problem has already been solved.

This paternal relationship prohibits both abuse and respect. Just as children are not "respected" as equals by their parents, but are rather cared for and guided, so, for Cartwright, slaves are not respected as equals by their masters, but are directed and protected. Crucially, the claim that respect is not justified absolutely does not justify abuse: for Cartwright, the prohibition on equal respect and the prohibition on abuse are two sides of the same conceptual coin. The proper relation of master to slave requires *detachment*,

an attitude which makes possible punishment without anger. The presence of punishment (rather than vengeance) and the absence of anger are equally necessary to this attitude. To respect the slave would therefore be to damage him or her, because by definition respect is not what a slave needs.

Rather, the natural need of the slave is only for material goods and "kindness." Kindness must be expressed "without condescension."[38] Of course this prohibition on condescension is not about equal respect. It is not a prohibition on a patronizing attitude. Rather, it prohibits the master from lowering himself. Lowering oneself as a master to the level of one's slave would be wrong because it would be an inaccurate reading of the facts of nature. The white person is not the equal of the black, but is rather the natural superior, and their moral relations must reflect this fact. To be right in our relation to another, we must know what is already true about that other's nature.

If the slave develops a desire for respect, then this manifests a mental disorder. After all, mental disorders are at least in some respects disordered desires—they involve felt needs which if met would harm the person who feels them. Again, there is an implicit invitation to consider the diagnosis as plausible: if you believe in the possibility of disordered desires, you must entertain the logical possibility that the slave's desire for freedom is disordered.

Cartwright argues that the most common cause of the slave's disordered desire for freedom is a failure by the master to maintain a properly paternalist attitude. Paternalism is a virtue that balances between two vicious extremes: familiarity or a pretense to equality, and cruelty (stringency, neglect, "blustering manner of approach").[39] So the cause that motivates attempted escapes is not the slave's passion for respect, for that passion itself is a symptom, something with an environmental cause. Rather, the cause of disordered passions for equal respect is a circumstance which is under the master's control, and for which he is therefore responsible. The master must supply material needs; the master must punish hubris, which is bad for the slave because it will lead him or her to act against his or her own best interests. When circumstances, including material circumstances and the motivational structure of rewards and punishments, are properly arranged, then black people are "easily governed."[40] In modern parlance, there is a "social determinant" for this particular health problem.

And that is what Cartwright does: he defines the slave's desire for freedom as a health problem. For him, it is a health problem as opposed to a moral problem. A health problem is an excuse. A moral problem invites blame. Now we think that Cartwright was wrong about this: the desire for freedom is not a health problem. It is not a moral problem, either. But it is a moral matter, as opposed to a health matter. As a moral matter it is the opposite of a problem. We think the desire for freedom is praiseworthy. Two different mistakes were possible here. One was to blame the slave for desiring freedom. That would be a mistake because the desire for freedom is good, not bad. Another was to deny that the slave's desire for freedom is the sort of thing that can be blamed or praised. Cartwright avoided the first mistake by making the second. Cartwright never blames the slave for running away; rather, he denies that the slave is worth being blamed for any such thing.

Now, the second mistake is what we call an act of medicalization. Cartwright medicalizes the desire for freedom, turning it from a moral problem (in which a master might blame a slave for the attempted escape, call her "foolish" or "ungrateful," disparage his "character," etc.) into a health problem (which provides an excuse for such behavior, which would otherwise invite blame). We know without doubt that this is a bad case of medicalization. But many other cases of medicalization we call good, and for the same reason: they prevent blame by providing excuse.

It seems then that what we need is a critical perspective that can distinguish appropriate from inappropriate cases of medicalization. Presumably, medicalization is appropriate when it is appropriate to define something as a health matter, and inappropriate when the matter so defined is actually not (just) a health matter but (also or otherwise) a moral one. Thus we might consider whether it is more appropriate to define an inability to pay attention in class as "ADHD," for which a student may be prescribed some kind of medicine, or whether it is more appropriate to understand such inattention as a kind of character flaw, for which a student may be held responsible and prescribed some kind of discipline. Among philosophers of medicine, there is a long-running debate between two positions on this question, which are generally known as "naturalism" and "normativism." Naturalism and normativism are simply the technical versions of what I call here the appeal to facts and the appeal to feelings, respectively. I want to briefly summarize the naturalism-versus-normativism debate,

not only to connect my argument to a large literature that some readers may profit from exploring, but also to further clarify the problem with both the naturalist appeal to facts and the normativist appeal to feelings, by noting what naturalists and normativists have to say about the case of drapetomania in particular.[41]

Naturalism and Normativism

A naturalist concept of health supposes that health matters are matters of fact. From this approach, the distinction between health and illness can appear to us before we have the chance to conflate either phenomenon with the feelings we have about it. Although the difference between what we happen to like (health) and what we happen to dislike (illness) tends to match up with the natural distinction, it does not supply the distinction. Naturalist concepts are fairly straightforward. They are what we call "common sense." Cancer is an illness, and we do not like cancer, but our not liking cancer does not render it an illness. In philosophy of medicine, the leading naturalist is Christopher Boorse, who has been defending this approach for decades. Boorse defines health as an absence of disease, and he says that "disease judgments are value neutral … if diseases are deviations from the species biological design, their recognition is a matter of natural science, not evaluative decision."[42]

A normativist concept of health supposes that health matters are projections of values onto facts. From this approach, the distinction between health and illness appears only as the result of that projection: health is something we like, illness is something we don't. Now there are many things we like or dislike that we don't consider matters of health or illness. So the claim that something is a health matter isn't provided by biological facts, but by the way we categorize our values, which tells us which "facts" are "biological" and which are "social" or whatever. And this changes over time, across cultural boundaries. Often, though, to claim that something is a health matter is to pretend that the claim is not a projection of subjective preferences, but a neutral statement about the facts. And this is often in the service of power, which likes to conceal itself. The normativist concept is more often a critique of naturalism than a positive approach in its own right. You can see the critical edge in Sedgwick's assertion,

> All sickness is essentially deviancy [from] some alternative state of affairs which is considered more desirable … The attribution of illness always proceeds from the computation of a gap between presented behavior (or feeling) and some social norm.[43]

It is easy to see how each approach would dispense with the problem of drapetomania. Naturalists would say that drapetomania is a bad case of medicalization because there is no such thing as drapetomania: the facts do not support it. They would also say that drapetomania is an easy test for the naturalist perspective, because the science, in this case, is so obviously bad. Norman Daniels says that cases like drapetomania, where "a departure from a norm clearly was classified as a disease," are evidence not for normativist suspicion but for the naturalist conclusion that "societies sometimes make grievous errors about diseases or egregiously abuse disease classifications." And these examples actually show that "a normative approach to disease carries grave risks: it fails to let us say that these were errors that recognized methods of public reasoning, including the biomedical sciences, helped us expose."[44]

Normativists would say that drapetomania is a bad case of medicalization because it imposes a value (by using the language of "fact") onto people who would otherwise project other values onto their own experience of their bodies and environments. Slaves value their desire for freedom, while masters disvalue it. So drapetomania is not, for the normativist, a scientific mistake which, if avoided or corrected, would have decided the matter for the slave and against the master, and undermined the "social norm" of slavery. Drapetomania is "their view"—the view of white supremacists in the nineteenth century. As Harold Mersky puts it: "*For them*" it was a disease. "*For us* it is not. We cannot escape such relativism."[45]

Without getting too much into the conceptual weeds,[46] I simply want to lay out the decisive problem with each approach. The problem with naturalism—with the notion that the distinction between good and bad medicalization can be drawn entirely with reference to facts which are neutral regarding values—is that the moral question is never what the facts are, but how the facts matter. Now in the case of drapetomania, it is obvious that the facts are not what Cartwright said they were. So, in a sense, the moral question does not arise here, because there is nothing to ask a question about. But this is not evidence for the capacity of naturalism to distinguish good from bad medicalization. Consider the hypothetical. If Cartwright had had access to some advanced MRI machine that fulfilled all the often overblown promises made for that technology and allowed him to locate the "mania for

freedom" inside the slave's skull, we certainly would not accept that as medical evidence for the theory of natural slavery. The "facts" would not sway us here. The whole question is about the meaning of the facts: this is a moral question, and the political question arises because we can disagree about the meanings of facts. Naturalism simply avoids the question altogether. We can sense the problem with naturalism if we ask ourselves whether any set of facts should ever be able to persuade us that racialized slavery is justified.

Naturalism, then, is vulnerable to the objection raised by normativism, not because there are no such things as facts, but because the questions that concern us in a case like this—moral and political questions about human relationships, rather than scientific questions about physical reality—are questions about how the facts matter, not questions about facts themselves.

The problem with normativism, on the other hand, is that, having exposed this flaw in naturalism, by exposing the ineliminable role of values in giving facts their significance, and thus exposing the operations of power in the supposedly neutral discourse of facts, it remains inert in its relativism. Normativism is "critical" in that it exposes pretensions to neutrality, but it is uncritical in that it proceeds on the assumption that the values which are "projected" onto facts can only be subjective values. If the values in question—the meanings of facts—are based only on the preferences of individuals, then there is no sense in which the slave's valuing of their desire for freedom (a desire which certainly could be correlated, by the best science, with biological facts like brain states) is the correct value, while the master's desire for control, concealed behind the pretense of medicine, is the incorrect value. There is only the struggle for power between master and slave, in which we align ourselves retrospectively with the slave because his values happen to be "our" values. The relativism of normativism leaves us unable to say what is wrong with drapetomania: all it can say is that naturalism is just as ill-equipped to make the judgment, and that "our" judgments conflict with "theirs."

With all this in mind, let us return to the case of gender incongruence.

Medicalization and Gender Incongruence

Medicalizing gender incongruence involves isolating a phenomenon in order to describe and explain it with greater precision, here using biological and psychological discoveries available for medical use. We make observations which indicate causal relationships: prenatal hormones, environmental pollutants, social influence, or other factors. We learn how a gender-incongruent person's body works. With this kind of knowledge we may be able to develop interventions that mitigate or even eliminate the incongruence.

None of this requires reacting or responding to the gender-incongruent person *herself* in any particular way. In the scientific attitude, I can learn to "see" how gender incongruence works physiologically or psychologically—I come to understand, with increasing precision, why this person desires to change their sex, why they behave in certain ways—without thereby "seeing" the person herself. An empirical understanding of gender incongruence does not logically entail any moral obligation to the gender-incongruent person, or any moral limit on the pursuit of my own purposes toward her. Knowing how to medically treat the condition called gender incongruence is not the same as knowing how to morally treat the gender-incongruent person. The question is whether the same scientific attitude in which we try to explain the mechanisms of gender incongruence can confirm the claim that gender incongruence, understood as a biological and/or psychological condition, is also a biological and/or psychological *problem*—a "pathology" rather than a "normal variation." My answer is that it cannot.

To medicalize gender incongruence is not only to explain how the gender-incongruent body works: it is also to claim that it works badly for the gender-incongruent person. This is the moral structure of medicalization. To characterize a person's experience as a problem is to take up a certain kind of relationship to the person himself. To treat the person's problem *as* a problem, and as a problem of a certain kind, is to treat the person in a certain way. If we treat the person's experience as a medical problem, we treat him as if the behavior associated with the problem needs an excuse. If something is a problem for a person, it is an obstacle to that person's good. It is "bad for" the person. To say that gender incongruence is a problem, medical or otherwise, is therefore to make a judgment about what is good or bad for people: it is to say, for example, that it is good to be satisfied with your natal sex.[47] In the same way, to say that the flu is a problem, medical or otherwise, is to say that having the flu is bad for you. The difference between these cases is not whether we are able to

describe the "problem" in medical terms (a scientific achievement) but whether we are able to describe it as a problem, period. It is easy to agree that the flu is a problem, but not because we all have the same solid grasp of how influenza works. Likewise, it is hard to agree that gender incongruence is a problem, but the dissensus is not due to a lack of empirical knowledge, even if there is much that we still lack. Rather, it is due to conflicting judgments about what is good for individual people and for human beings.

These judgments cannot be eliminated from debates about medicalization, and it is precisely when we *try* to eliminate them—when we act as if facts (as in naturalism) or feelings (as in normativism) alone can determine what does or does not count as a medical problem—that we disrespect our interlocutors. The reasoning behind the above idea is that what we respect in persons is what Philip Pettit calls their "fitness for responsibility"[48]—their capacity to act intentionally. To define a person's experience as a medical problem is to claim that they do not endorse this experience in that responsible capacity, but rather that their bodies simply suffer it. If they claim to the contrary that their experience (such as their desire to change their sex) is not a problem which excuses their behavior, and that their behavior (such as their visit to the gender clinic) is something which they endorse because they have reason to believe it is good for them, then our empirical grasp of the biological facts which explain their experience is not enough to counter their judgment about that experience. For what we respect in others (and in ourselves) is precisely this natural human capacity to make fallible judgments about what is objectively good and bad for people, judgments which cannot be reduced to statements of empirical fact and so cannot be certified by empirical discoveries. If we wish (as I do) to counter their claim because we think that they are wrong, that this really is bad for them, then we must give them ethical arguments about what is good and bad for human beings, not facts about how their bodies work.

Of course, the gender debate is not usually a contest between naturalists who believe that facts alone can tell us whether gender incongruence is a medical problem and those (like myself) who believe that only objective values can distinguish pathology from identity. The other side of the debate is usually the normativist position that is so perfectly captured by Chu's argument, which is that a person's subjective feelings are enough to decide the matter—even if the person is a child. So it is important to emphasize that the moral structure of medicalization means that normativists are wrong for precisely the same reason as naturalists are wrong. That is, the normativist actually treats his subjective preferences in the same way that the naturalist treats her empirical facts: as "value-neutral." Thus, for Chu, whatever the causes of the desire or the consequences of its satisfaction, it cannot be bad for a person to desire a sex change. All desires are valid in themselves.[49]

But we cannot respect someone by "validating" their desires. Rather, what we respect as personhood is the capacity to make judgments about desires, to determine whether our subjective feelings are objectively good or bad for us. A person, as opposed (perhaps) to an animal acting purely on instinct, does not just subjectively "like" or "dislike" things. A person has likes and dislikes, and also has the capacity to reflect on whether his likes and dislikes are good or bad for her, given the kind of creature she is. A person is always making these judgments, whether implicitly or explicitly. And judgments—unlike desires—can be contested.[50]

What Chu misses is that the transitioner does not simply desire to change sex; he makes a judgment, implicitly or explicitly, that his desire to modify or change his sex is good for him. This is precisely parallel to the slave, who did not simply desire to escape, to "be free," but judged that his desire for freedom was itself a healthy desire, rather than being the symptom of a mental illness. If the master had argued with the slave, if he had tried to persuade him that he was suffering from a problem called "drapetomania," then the master would surely have failed. But by arguing he would also have shown the slave the respect due to an equal in an exchange of respect—this, of course, is precisely what he could not do, because a slave is by definition unworthy of such respect. To contest the enslaved person's judgment would have been to admit that the person was a *person*, not a "natural slave."

No doubt it is because our judgments can be contested that we like to pretend we are not making them—often by appealing to "the facts," as Samuel Cartwright did, or conversely to our feelings, as Andrea Long Chu does, and in many cases by declaring that the one thing we cannot do is to "impose our values," when of course that is the one thing we are always doing, although "imposing" is usually the wrong word for it. The gender debate, like

many other controversies in which the question of medicalization is front and center, is full of this evasion. But the gender debate is also full of demands for respect. And you cannot respect people without making your own ethical judgments and contesting the ethical judgments that others make.[51]

Christians are not all on one side of the gender debate. There is disagreement amongst ourselves. But I think Christians should be able to agree that the proper ground for this debate is the ground I have mapped out here. The fundamental Christian belief about human beings is that they are made in the image of God, and to be made in God's image surely means to be made with the capacity for ethical judgment. We cannot respect others as images of God without respecting them as judges of what is good and bad, as creatures who can be held responsible for their actions precisely because the moral significance of their actions is not fully determined by the subjective feelings that individuals express, or by the empirical facts that science investigates.

Such facts only become morally relevant in light of these judgments, and Christians in science have the opportunity to put empirical knowledge in the context of the Christian vision of human flourishing. Let me emphasize again that nothing I have argued here should be taken to imply that facts are *not* morally relevant. The point is that they do not carry their moral relevance within themselves, so to speak. But facts (and feelings) are vital: we cannot responsibly engage the gender debate *without* taking stock of the relevant facts and feelings. It is true that on my account, facts in themselves cannot tell us whether gender incongruence is a problem. Strictly speaking, we must make an ethical judgment independently of the relevant empirical facts, precisely because we only know which facts are "relevant" *after* we have made the ethical judgment. And this judgment must be connected to a larger vision of flourishing. However, we cannot (and, in practice, do not) make such a judgment behind some veil of scientific ignorance. If we find, for example, that gender incongruence is caused in part by an underdeveloped mind-body connection (as Jelsma suggests), that fact might count as one piece of evidence for the judgment that gender incongruence is a problem rather than an identity—*assuming* we have also made the judgment that an underdeveloped mind-body connection is itself a problem, in the sense of an "obstacle to flourishing" (as indeed we would have, simply by using the loaded term "underdeveloped"). Facts thus establish connections between distinct ethical judgments, and those judgments must be connected if they are to cohere into (or out of, depending on our theories of how this works) a comprehensive vision of human flourishing.

That vision, as I have suggested, is a theological matter, and I will let the theologians explore it.[52] But all of us who are Christians, whether we are scientists or theologians or laypersons, can benefit from being clearer about what the debate is really about, and I hope I have made some contribution toward that work of clarification.

Notes

[1]Tony Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria: A Christian Approach," in *Perspectives on Science and Christian Faith* 74, no. 3 (2022): 130–48, https://doi.org/10.56315/PSCF9-22Jelsma.

[2]The work of psychologist Mark Yarhouse is especially notable in this regard. See Yarhouse, *Understanding Gender Dysphoria: Navigating Transgender Issues in a Changing Culture* (IVP Academic, 2015).

[3]Hilary Cass, "The Cass Review: Final Report," NHS England, 2024, https://cass.independent-review.uk/home/publications/final-report/. Cass's findings have, of course, been widely disputed. See Dori M. Grijseels, "Biological and Psychosocial Evidence in the Cass Review: A Critical Commentary," *International Journal of Transgender Health*, June 2024, 1–11, http://dx.doi.org/10.31235/osf.io/wjafd; Chris Noone et al., "Critically Appraising the Cass Report: Methodological Flaws and Unsupported Claims," *OSF Preprints*, June 11, 2024, https://doi.org/10.31219/osf.io/uhndk; and Cal Horton, "The Cass Review: Cis-Supremacy in the UK's Approach to Healthcare for Trans Children," *International Journal of Transgender Health*, March 2024, 1–25, http://dx.doi.org/10.1080/26895269.2024.2328249. While it had some important effects on health policy in the UK, the review largely "failed to land" in the US. See Jennifer Bock, "Gender Medicine in the US: How the Cass Review Failed to Land," *The BMJ*, May 23, 2024, https://doi.org/10.1136/bmj.q1141.

[4]Puberty, after all, is a traumatic and potentially damaging experience that no one signs up for. On these grounds, Florence Ashley argues that far from being banned or restricted, puberty blockers should be freely available. See Ashley, "Thinking an Ethics of Gender Exploration: Against Delaying Transition for Transgender and Gender Creative Youth," *Clinical Child Psychology and Psychiatry* 24, no. 2 (2019): 223–36, https://doi.org/10.1177/1359104519836462. Emma Colton quotes activist Zinnia Jones, who put it like this: "An inability to offer informed consent or understand the long-term consequences is actually an argument for putting every single cis and trans person on puberty blockers until they acquire that ability." While conservative critics (including Colton) pounced on the presumably absurd suggestion that everyone should be forced to take puberty blockers, Jones was actually pointing out the logical consequences of the consent-based argument against puberty blockers (Emma Colton, "Transgender Activist

Makes Argument for All Children to Be Put on Puberty Blockers Until They Can Determine Identity," *The Washington Examiner*, December 14, 2020, https://www.washingtonexaminer.com/news/1672921/transgender-activist-makes-argument-for-all-children-to-be-put-on-puberty-blockers-until-they-can-determine-identity/). Ashley's argument for making puberty blockers "readily available" is quite serious, but Jones is offering a *reductio ad absurdum* and, in my view, quite an effective one. One important implication of my own argument is that when it comes to the gender debate, arguments about "consent" often miss the point. Jones shows why.

[5]As Oliver O'Donovan puts it, "The ultimate questions of ethics are theological. The penultimate questions are not always so, but to comprehend what moral reason is about, and how it must proceed in a way that satisfies our need for fulfilled lives, ethics must be set in the context of the human relationship to God" (Patricia Paddly, "A Conversation with Oliver O'Donovan," *Wycliffe College Blog*, November 28, 2017, https://wycliffecollege.ca/blog/conversationodonovan). See Oliver O'Donovan, *The Disappearance of Ethics* (Eerdmans, 2024) for O'Donovan's most recent argument for the rootedness of ethics in theology.

[6]On moral realism and the availability of "moral facts," see, for example, Russ Shafer-Landau, *Moral Realism: A Defense* (Oxford University Press, 2003); and Paul Bloomfield, *Moral Reality* (Oxford University Press, 2001). My use of the terms "ethical judgments" and "objective values" is influenced especially by Hans Joas, "Values Versus Norms: A Pragmatist Account of Moral Objectivity," in *The Hedgehog Review* 3, no. 3 (2001): 45, https://hedgehogreview.com/issues/pragmatism-whats-the-use/articles/values-versus-norms-a-pragmatist-account-of-moral-objectivity#:~:text=While%20norms%20refer%20to%20the,to%20only%20one%20of%20them.

[7]"If the immutable character of sex is contested, perhaps this construct called 'sex' is as culturally constructed as gender" (Judith Butler, *Gender Trouble* [Routledge, 1990], 9).

[8]Andrea Long Chu, "Freedom of Sex: The Moral Case for Letting Trans Kids Change Their Bodies," *New York Magazine*, March 11, 2024, https://nymag.com/intelligencer/article/trans-rights-biological-sex-gender-judith-butler.html.

[9]This is the essence of medicalization: turning what had been considered a moral deviation into a medical pathology, or moving, in Conrad's classic formulation, "from badness to sickness." See Peter Conrad, *Deviance and Medicalization: From Badness to Sickness* (Mosby Press, 1980). The intention, often explicit, is to remove the stigma of deviance. Chu's argument is that gender incongruence is *neither* a moral deviation *nor* a medical pathology, which after all is another kind of "deviation"—a deviation from a biological rather than a moral norm, which can carry its own stigma. Thus the puzzle, as the American Psychiatric Association puts it, is "how best to preserve access to gender transition-related health care while also minimizing the degree to which such diagnostic categories stigmatize the very people that physicians are attempting to help" (Author Unknown, "Gender Dysphoria Diagnosis," *Psychiatry.Org*, November 2017, accessed September 4, 2024, https://www.psychiatry.org/psychiatrists/diversity/education/transgender-and-gender-nonconforming-patients/gender-dysphoria-diagnosis#:~:text=Criteria%3A%20Gender%20Dysphoria%20in%20Adolescents%20and%20Adults,-1&text=A%20strong%20desire%20to%20be,the%20anticipated%20secondary%20sex%20characteristics. At the same time, some push the argument further and suggest that *de*pathologizing gender incongruence (as Chu does) comes with its own risk. Thus Max Thornton says that while "it is important to refute the idea that being trans is a disease," it is also important to avoid the "ableism" that this often presumes. He explains,

> On the surface, it may seem compelling to defend transness with statements along the lines of: "I'm not CRAZY, I'm transgender!" Yet to attempt to destigmatize transness by further stigmatizing mental illness is a losing proposition … It concedes to the unjust priorities of an ableist society, with its unspoken corollary: "if I WERE crazy, you would be justified in mistreating me …" (Max Thornton, "Gender Pandemic?," *Queer Disability Studies Network*, October 31, 2021, https://queerdisabilitystudies.wordpress.com/gender-pandemic/)

[10]Chu, "Freedom of Sex."

[11]Juan Pablo Rojas Saffie and Nicolás Eyzaguirre Bäuerle, "Etiology of Gender Incongruence and Its Levels of Evidence: A Scoping Review Protocol," *PLOS ONE* 18, no. 3 (2023): e0283011, https://doi.org/10.1371/journal.pone.0283011.

[12]Rosa Fernández et al., "The Biological Basis of Gender Incongruence," in *Human Sexuality*, ed. Dhastagir Sultan Sheriff (*IntechOpen,* 2022), https://www.intechopen.com/chapters/80813.

[13]Steven David Holladay, "Environmental Contaminants, Endocrine Disruption, and Transgender: Can 'Born That Way' in Some Cases Be Toxicologically Real?," *Human & Experimental Toxicology* 42 (September 2023), https://doi.org/10.1177/09603271231203382.

[14]Jieyu Liu et al., "Long-Term Exposure to Exogenous Phthalate, Masculinity and Femininity Trait, and Gender Identity in Children: A Chinese 3-Year Longitudinal Cohort Study," *Environmental Health* 22 (November 28, 2023): article 81, https://doi.org/10.1186/s12940-023-01031-5.

[15]Lisa Littman, "Parent Reports of Adolescents and Young Adults Perceived to Show Signs of a Rapid Onset of Gender Dysphoria," *PLOS ONE* 13, no. 8 (August 16, 2018): e0202330, https://doi.org/10.1371/journal.pone.0202330.

[16]Suzanna Diaz and J. Michael Bailey, "Retraction Note: Rapid Onset Gender Dysphoria: Parent Reports on 1655 Possible Cases," *Archives of Sexual Behavior* 52, no. 3 (June 14, 2023): 1031–43, https://doi.org/10.1007/s10508-023-02576-9.

[17]Chu writes,

> The freedom of sex does not promise happiness … where there is freedom, there will always be regret … it is one thing to regret the outcome of a decision, but it is a very different thing to regret the freedom to decide … If we are to recognize the rights of trans kids, we will also have to accept that, like us, they have a right to the hazards of their own free will … if children are too young to consent to puberty blockers, then they are definitely too young to consent to puberty, which is a drastic biological upheaval in its own right. (Chu, "Freedom of Sex")

[18]An especially clarifying parallel example of this appeal to feelings in debates about medicalization comes from Alyson Spurgas, writing on the promise of "female viagra." It is worth quoting in full.

> As I examine this sexual marketplace and these debates wear on, I often wonder … why women's desire is constantly being dissected, examined, and worked upon, but never stimulated, enlivened, and aroused *on our*

own terms. Even more so than women's desire, it seems that women's *pleasure* has been almost forcibly shut out of the clinic and the bedroom in too many times and places, or negated in lieu of someone else's pleasure, and that this is still the case today. In this vein, we ought to remember that sexism and misogyny are still prevalent in a variety of insidious forms—within and outside of clinical medicine and scientific laboratories, and with or without prescription drugs. The medical and scientific climate around sexuality and proposed and prescribed treatments are, rather, *effects* of a widespread and willful ignorance of women's pleasure, and thus they represent a larger social lacuna. This is why it seems so imperative to shift the debate from the drugs themselves to the larger medical, scientific, social, cultural, and political milieu in which gender differences are configured and disseminated—configurations that have real consequences for how people experience their own bodies, other people's bodies, and their sex lives. If taking a drug will make women feel the desire that they desire to have, and that is satisfying and pleasurable to them, then, by all means, we should have it! But let's not stuff too many pills down our throats before seriously considering what we want, why we want it, and what we could potentially want for our futures (sexual and otherwise). There are many trajectories to that place of pleasure—if "sexual" pleasure is what we *choose* to pursue. (Alyson K. Spurgas, "We've Come A Long Way, Baby? Pink Pills, Blue Pills, and False Equivalences in the Medical Treatment of Sexual Dysfunction," *SIUE Women's Studies Program*, February 12, 2016, https://siuewmst.wordpress.com/2016/02/12/weve-come-a-long-way-baby-pink-pills-blue-pills-and-false-equivalences-in-the-medical-treatment-of-sexual-dysfunction/)

In my doctoral dissertation, I wrote,

> What then is the test that distinguishes good from bad medicalization, and determines whether "taking a drug" will in this case indicate either care or control, liberation or repression? For Spurgas it is clear: the test is simply "the desire that they desire to have," the pleasure women "choose to pursue," desire "on our own terms." Medicalization went well for men not because it included masculine desires which are objectively good for men, but because it included their desires, period. Men made medicalization work for them by disguising those desires as objectively good. Spurgas rips away this disguise and proposes that medicalization will work well for women when it helps them to pursue their subjective desires as effectively as men can. What better description of a "subjective value" than "the desire we desire to have"? (Adam Smith, *Democratic Medicine: Recognition, Citizenship, and the Politics of Medicalization* [PhD diss., Brandeis University, 2017], 104)

Note that Spurgas's formulation can also sound strangely similar to the way that a theory like Harry Frankfurt's (mentioned below, in note 49) would lead us to think of *objective* values, which are (in Frankfurt's terms) "desires about desires." The difference is that Spurgas does not seem to believe that one can have better or worse "desires about desires," whereas Frankfurt's "second-order desire" is rationally contestable.

[19]The WHO in 2019 updated its diagnosis manual by removing gender incongruence from the list of mental disorders, but the term "gender incongruence" itself is still included (it denotes "a marked and persistent incongruence between a person's experienced gender and assigned sex"); this inclusion, for some activists, is still offensive. "Language, especially when it comes to gender, matters. It is the incongruence part—defined "out of place"—that makes some activists feel the WHO is not as progressive as this move would initially appear," *BBC News* staff, "Transgender No Longer Recognised as 'Disorder' by WHO," *BBC News*, May 29, 2019, https://www.bbc.com/news/health-48448804.

[20]This article, the next two sections in particular, draws freely on my PhD dissertation. See Smith, *Democratic Medicine*. The dissertation does not take up the question of gender incongruence, except in passing, but it does include discussion of many of the other cases mentioned here, and develops in detail the argument that I apply to the gender question in this article.

[21]Peter Conrad notes,

> While much writing, including my own, has been critical of medicalization, it is important to remember that medicalization describes a process. Thus, we can examine the medicalization of epilepsy, a disorder most people would agree is "really" medical, as well as we can examine the medicalization of alcoholism, ADHD, menopause, or erectile dysfunction. (Peter Conrad, *The Medicalization of Society* [Johns Hopkins University Press, 2007], 5)

[22]See Jennifer Terry, *An American Obsession: Science, Medicine, and Homosexuality in Modern Society* (University of Chicago Press, 1999), chap. 2.

[23]This is Talcott Parsons's insight about the "sick role." See Parsons, *The Social System*, 2nd edition (Routledge, 1991).

[24]The capital letter is used to distinguish a condition (deafness) from an identity (Deafness).

[25]See, for example, Owen Wrigley, *The Politics of Deafness* (Gallaudet University Press, 1997). For the specific claim that cochlear implants are a form of "ethnocide," see Robert Sparrow, "Implants and Ethnocide: Learning from the Cochlear Implant Controversy," *Disability and Society* 25, no. 4 (2010): 455–66, https://doi.org/10.1080/09687591003755849.

[26]See Phil Brown and Stephen Zavestoski, eds., *Social Movements in Health* (Wiley-Blackwell, 2005). See also Phil Brown et al., *Contested Illnesses: Citizens, Science, and Health Social Movements* (University of California Press, 2011).

[27]Esther Rothblum and Sondra Solovay, eds., *The Fat Studies Reader* (NYU Press, 2009), write in the foreword,

> Calling fat people "obese" medicalizes human diversity. Medicalizing diversity inspires a misplaced search for a "cure" for naturally occurring difference. Far from generating sympathy for fat people, medicalization of weight fuels anti-fat prejudice and discrimination in all areas of society. People think: If fat people need to be cured, there must be something wrong with them … The pretense of concern for fat people's health wards anti-fat attitudes against exposure as simple hatred. Belief in a "cure" also masks that hatred. It is not possible to hate a group of people for our own good. Medicalization actually helps categorize fat people as social untouchables. It is little surprise, then, that when fat people do fall ill, we get blame, not compassion. We receive punishment, not help. Medical cures are inappropriate when applied to social ills. Such a misdiagnosis can be very dangerous. (xiii–xiv)

Virginia Sole-Smith, author of the widely feted *Fat Talk: Parenting in the Age of Diet Culture* (Henry Holt, 2023), explicitly compares being fat to being gay or being black.

> The solution to racism is not to make everyone white. The solution to homophobia is not to make everyone straight. This is not how we as a culture want to be

proceeding on [anti-fat bias]. (Audio interview with Tonya Mosley, "Diet Culture Can Hurt Kids. This Author Advises Parents to Reclaim the Word 'Fat,'" Fresh Air, *NPR Health*, April 25, 2023, 34:33, https://health.wusf.usf.edu/npr-health/npr-health/2023-04-25/diet-culture-can-hurt-kids-this-author-advises-parents-to-reclaim-the-word-fat)

[28]Unlike "fat pride," "Pro Ana" is no longer much of an active movement, but many Pro Ana advocates took the appeal to feelings to what may be its furthest logical conclusions. On their websites and message boards, the appeal to feelings became a full-throated embrace of a pure will-to-power. The anonymous writer at a site called *Pro Ana Lifestyle Forever* offered a long list of reasons for "why I starve myself," including "because I can," "because I want to," "because I have wanted to be these way forever" and "because it's me." (Author Unknown, "Ana Religion & Lifestyle," *The Pro-Ana Lifestyle Forever* (blog), May 4, 2013, https://theproanalifestyle00.wordpress.com/about/)

Another anonymous writer describes her website as

> a gathering point for sentient individuals who are working to cause changes to occur in body in conformity to will. There are no victims here. This is not a place for the faint-hearted, weak, hysterical, or those looking to be rescued. This is not a place for those who bow to consensus definitions of reality or who believe in the cancerous fallacy that there is any other authority on earth besides their own incontrovertibly self-evident, inherent birthright to govern themselves.

The writer goes on to contrast "rexies" (those who are "pro" ana) with "anorexics."

> You may already know the difference between us rexies and anorexics! If u [sic] want sympathy for your "disease," you are anorexic. If you want respect and admiration for your lifestyle of choice, you are a rexie. Anorexics die. Rexies don't. Have we understood the difference? This site is for us rexies, who are proud of our accomplishments, and the accomplishments that lie ahead. We will never die.

Passages are from a defunct website (Ana's Underground Grotto) quoted in Author Unknown, "The Rise of Pro-79 Anorexia and Pro-Mia Websites," Social Issues Research Centre. Texts are also reproduced at "Ana's Underground Grotto—Original Texts Reproduced from the First Home of Project Shapeshift," Project Shapeshift: ProACTIVE Pro-Ana Positively Alive and Optimally Well!, http://project-shapeshift.net/anas-underground-grotto.html.

[29]As the title of one article puts it: "Autism Is Not a Disease. Stop Trying to 'Cure' Us and Learn to Understand Us." See Jodie Hare, "Autism Is Not a Disease," *Novara Media*, November 25, 2012, https://novaramedia.com/2021/11/25/autism-is-not-a-disease/.

[30]Joseph Straus writes,

> In recent years, a new concept of madness has emerged, one that rejects the medical model … in favor of an appreciation of the diversity of human embodiments, both mental and physical. Under the banner of slogans like "the dangerous gift" (with reference to bipolar disorder), "neurodiversity" (with reference to autism), and "psychocrip" (an in-your-face re-appropriation of a stigmatized category, modeled on "crip" and "queer"), activists are arguing that madness, so long medicalized as "mental illness," may be better understood as part of the natural diversity of human minds, with a claim for acceptance and accommodation rather than normalization and cure. (Joseph Straus, *Extraordinary Measures: Disability in Music* [Oxford University Press, 2011], 34)

Cydney Heed reflects on (and endorses) these developments in "Our Brains Are Not Broken: Mad Pride, Neurodiversity and How Diversity Becomes Disease," *The Michigan Daily*, May 28, 2024, https://www.michigandaily.com/statement/our-brains-are-not-broken-mad-pride-neurodiversity-and-how-diversity-becomes-disease/.

[31]The same reaction has accompanied the similar suggestion that being transgender is analogous to being "transracial," as Rebecca Tuvel argued in her (in)famous *Hypatia* article, "In Defense of Transracialism," *Hypatia: A Journal of Feminist Philosophy* 32, no. 2 (Spring 2017), 263–278, https://doi.org/10.1111/hypa.12327, which prompted demands for retraction (the demands were not met, though the journal did issue an apology, which was itself controversial).

[32]Garima Garg et al., *Gender Dysphoria* (StatPearls Publishing, 2025), https://www.ncbi.nlm.nih.gov/books/NBK532313/.

[33]Rianne M. Blom, Raoul C. Hennekam, and Damiaan Denys, "Body Integrity Identity Disorder," *PLOS ONE* 7, no. 4 (2012), https://doi.org/10.1371/journal.pone.0034702.

[34]Jenny L. Davis, "Narrative Construction of a Ruptured Self: Stories of Transability on Transabled.org," *Sociological Perspectives* 55, no. 2 (2012): 319–40. Consider the way that one person with BID (here called BIID—body integrity identity disorder) approaches the question of whether BID is itself a pathology.

> Some people might well conclude that having BIID causes disease. There is a lot of pain and unhappiness expressed about having BIID. But I would suggest that the pain and unhappiness is not from the BIID. It is from the response of the world to our BIID, or from our inability to get our amputations, paralysis, or whatever done. I actually enjoy my fantasies of being one-legged, and I enjoy my pretending. It is when these crash down in the face of reality that I become distressed. Well, irrespective, if BIID leads to unhappiness, doesn't this make it a disease? Not unless you want to say also that being black in a racist society or being gay in a homophobic society is a disease. The distinction here is important. If there is "disease," then we should look for a treatment to change the condition that leads to the disease. If the condition that leads to the disease is intolerance or failure to understand, this is what we should work to change—not the condition that is not tolerated or misunderstood. I would assert that lack of understanding or intolerance of BIID is a "disease of society," and that that is what we should be trying to treat and cure. (Michael Gheen, "Is BIID an Illness?," *Overground*, accessed November 9, 2016, http://www.overground.be/features.php?page=THE&article=390&lan=en)

Gheen's argument mirrors Chu's: it is not the desire to transition itself that is and causes problems, rather the problems are caused by other people's refusal to accept that the desire is legitimate.

[35]Samuel Cartwright, "Report on the Diseases and Peculiarities of the Negro Race," *DeBow's Review* 11 (1851).

[36]Cartwright, "Report on the Diseases and Peculiarities of the Negro Race."

[37]In my doctoral dissertation, I wrote,

> There is some debate among historians about when and to what extent there appeared in the South an argument that slavery was not a necessary evil but a "positive good" (which is an argument for natural slavery). For a long time it was accepted that the positive good argument was a new development in the South,

arising in the 1820s and responsible for the Garrisonian abolitionist backlash. Larry Tise, in an exhaustive study, challenges the traditional thesis and argues that the notion of slavery as a positive good has a much longer history, and was not unique to the South. See Tise, *Proslavery: A History of the Defense of Slavery in America, 1701–1840* (University of Georgia, 1990). I find Tise convincing, and his argument matters because it indicates that Cartwright's argument was not an aberration, but part of a long-standing way of thought with extensive and (I would suggest) lasting influence. (Smith, *Democratic Medicine,* 121, n. 70)

[38]Cartwright, "Report on the Diseases and Peculiarities of the Negro Race."

[39]Cartwright, "Report on the Diseases and Peculiarities of the Negro Race."

[40]Cartwright, "Report on the Diseases and Peculiarities of the Negro Race."

[41]To be sure, the debate is more nuanced than a brief summary can suggest, and includes various alternative positions that try to reconcile naturalism with normativism, or to carve out a third way. See, for example, Elselijn Kingma, "Health and Disease: Social Constructivism as a Combination of Naturalism and Normativism," in *Health, Illness and Disease: Philosophical Essays,* ed. Havi Carel and Rachel Cooper (Routledge, 2014), 37–43. See also Kingma's "Naturalism about Health and Disease: Adding Nuance for Progress," *Journal of Medicine and Philosophy* 39, no. 6 (December 2014): 590–608, https://doi.org/10.1093/jmp/jhu037. For a similar approach, see Juha Räikkä, "The Social Concept of Disease," *Theoretical Medicine* 17 (December 1996): 353–61, https://doi.org/10.1007/BF00489680.

Some revise the naturalism/normativism debate for more "practical" reasons. George Khushf argues that the value-neutral/value-laden dichotomy becomes less useful in an age when institutions of medicine have so obviously encompassed social and political (thus, value-laden) aspects of life ("An Agenda for Future Debate on Concepts of Health and Disease," *Medicine, Health Care and Philosophy* 10, no. 1 [March 2007]: 19–27, https://doi.org/10.1007/s11019-006-9021-7).

My own view is that the naturalist/normativist dichotomy conceals a deeper consensus, which I too would reject in favor of a third way. I am sympathetic to Richard Hamilton's Aristotelian defense of a "naturalistic ethics," which accepts the naturalist claim that disease is not just a projection of disvalue onto a value-neutral world, but insists against naturalism that value is itself a natural quality (Richard Hamilton, "The Concept of Health: Beyond Normativism and Naturalism," *Journal of Evaluation in Clinical Practice* 16, no. 2 [April 2010]: 323–29, https://doi.org/10.1111/j.1365-2753.2010.01393.x). At the same time, I am also sympathetic to the more Humean approach developed at much greater length by Paul Davies in *Norms of Nature: Naturalism and the Nature of Functions* (MIT, 2001). While I cannot develop such a claim here, I think we need not presume that Aristotelian and Humean approaches are incompatible (for a suggestive argument to this effect, see Jessica Spector, "Value in Fact: Naturalism and Normativity in Hume's Moral Psychology," *Journal of the History of Philosophy* 41, no. 2 [April 25, 2003]: 145–63, http://dx.doi.org/10.1353/hph.2003.0020.) The point is that my own "third way" between naturalism and normativism would feel most at home with those who hold that values come "first," without supposing that values must also be "non-natural."

[42]Christopher Boorse, "Health as a Theoretical Concept," *Philosophy of Science* 44, no. 4 (1977): 542–43, https://www.jstor.org/stable/186939.

[43]Peter Sedgwick, *Psychopolitics* (Harper & Row, 1982), 32.

[44]Norman Daniels, *Just Health* (Cambridge, 2008), 40.

[45]Harold Merskey, "Variable Meanings for the Definition of Disease," in *Journal of Medicine and Philosophy* 11 (1986): 223, https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=df2777f28a612b40dc1b38ed45e13cfb51ded7cc. Emphasis in the original. Merskey is talking here about masturbation, not drapetomania, but the logic of his argument applies.

[46]In my doctoral dissertation, I wrote,

> Naturalist critics of normativism tend to proceed by finding counterexamples that cast doubt on the coherence of normativist concepts, and normativist critics of naturalism do the same. The game is to show that a concept must count as diseases, things that are obviously not, or that it fails to count as diseases, things that obviously are. Even those who seek a middle ground or higher synthesis often follow this strategy. Kingma, for example, supports her synthetic concept by claiming that Boorse's naturalist concept cannot account for paracetamol poisoning, which is what Boorse calls a "malfunction" but is also statistically normal, and thus escapes his definition of malfunction as statistical abnormality. But it is worth noting that, in my view, conceptual success does not work as a standard for deciding between naturalism and normativism, and the strategy of conceptual analysis used by both normativists and naturalists is a dead end.
>
> Maël Lemoine shows the limits of conceptual analysis by distinguishing descriptive from stipulative definitions: to describe is to show how a term is used, while to stipulate is to say how a term should be used. Naturalists and normativists both tend to understand their project as descriptive. Naturalists say that when we call something a disease we are observing a fact, while normativists say that we are expressing a value. Both aim to describe what we are doing when we call something a disease. A descriptive definition produces a concept which renders existing usage more logically coherent, while a stipulative definition produces or implies an account of a concept's appropriate use. Conceptual analysis, as a descriptive project, seems to rule out stipulation, but Lemoine argues that stipulation must precede the analysis itself. While conceptual analysis may exclude "extensional" stipulation (asserting that an existing concept should extend to cases not normally covered—like insisting that pregnancy is a disease), it cannot rule out "intensional" stipulation. Intension means choosing between two different conceptualizations that both capture the same universe of cases but in different terms. For Lemoine, naturalism and normativism are two different intensions: conceptual analysis cannot decide the dispute between them, since the dispute is not about what fits into our concept, but about which concept we should use. If every case of "practical" disease (where disease is defined in normativist terms) is also a case of "theoretical" disease (where it is defined in naturalist terms), then the difference lies in meaning, not in extension … [t]he criterion that could decide which "take primacy" or is "more fundamental" obviously cannot come out of conceptual analysis. (Maël Lemoine, "Defining Disease Beyond Conceptual

Analysis: An Analysis of Conceptual Analysis in Philosophy of Medicine," *Theoretical Medicine and Bioethics* 34, no. 4 [August 2013]: 320)

For his proposed alternative to conceptual analysis, see Lemoine's later essay, "The Naturalization of the Concept of Disease," in *Classification, Disease, and Evidence: New Essays in the Philosophy of Medicine,* ed. Philippe Huneman, Gérard Lambert, and Marc Silberstein (Springer, 2015), 19–41. For a good overview of this emerging critique (and of Lemoine's contribution to it), and for another proposal for an alternative to conceptual analysis, see Jonathan Sholl, "Escaping the Conceptual Analysis Straightjacket: Pathological Mechanisms and Canguilhem's Biological Philosophy," *Perspectives in Biology and Medicine* 58, no. 4 (Autumn 2015): 395–418. The point is that theory (which produces a concept) cannot ground practice (which puts a concept to use), because we must make an ethically loaded choice about which concept to use. This choice cannot be certified by the coherence of the concept itself, since the alternative concept may be just as coherent.

Naturalists and normativists both suppose that their approaches capture what we are doing when we call something a disease: observing a fact or expressing a value. Their concepts of a "medical problem" are then supposed to help us to do this more coherently, so that we do not label as "disease" something which their concept determines is not, or vice versa. The upshot of Lemoine's argument is that naturalists and normativists both misunderstand the activity of defining something as a medical problem, whether we do so with or without the benefit of their conceptual tool. We are not just describing; we are stipulating. We are making claims about how something ought to be described, and our descriptions, whether we describe facts observed or feelings expressed, cannot authorize these claims. Rather, these claims authorize (or fail to authorize) our descriptions. On this point, see Steeves Demazeux, "The Function Debate and the Concept of Mental Disorder," in *Classification, Disease and Evidence: New Essays in the Philosophy of Medicine,* ed. Huneman et al., 80. Demazeaux sums up the point: "entrusting science with settling contentious issues is not enough to make it capable of doing so" (p. 89). See also Valérie Aucouturier and Steeves Demazeux, "The Concept of Mental Disorder," in *Health, Illness and Disease: Philosophical Essays,* ed. Carel and Cooper, 75–89. (Smith, *Democratic Medicine*, 155–58)

[47]It is worth noting at this point that while I have focused on Andrea Long Chu's non-Butlerian version of the pro-trans argument, there are other, perhaps more nuanced, positions that my argument would apply to equally. Danièle Moyal-Sharrock and Constantine Sandis, for example, join with Chu against Butler in acknowledging the empirical reality of biological sex, but they depart from her (and from Butler) by insisting that gender is *also,* in some important sense, empirically real, such that people can be "born trans," precisely because their natal sex does not match their natal gender. Thus they make an "appeal to facts," and include gender among the relevant empirical facts (as opposed to classifying it, as is the more common approach, as a "social construct"). My response to this kind of argument is the same: even if gender is "innate," and people are born with a certain gender (one that either matches or does not match the sex they are born with), that fact does not by itself tell us what to *do* about it. Moyal-Sharrock and Sandis's argument in favor of the right to transition (and to have one's transition acknowledged) depends not on the purported empirical fact of gender, but on the ethical judgment that if there is a conflict between one's natal sex and one's natal gender, it is good to change one's sex to match one's gender. But if there is both natal sex and natal gender, then it would seem equally legitimate to make the opposite judgment: that it is good to change one's natal gender to match one's natal sex; Moyal-Sharrock and Sandis would certainly condemn this as "conversion therapy." The point, again, is that the empirical facts, such as they are, do not themselves tell us which judgment is correct. The facts, as Moyal-Sharrock and Sandis understand them, could not even rule out the possibility that we might be under some moral obligation to *induce* gender incongruence, supposing that were technically possible: why, after all, do we assume that it is better for sex and gender to match than to diverge? See Danièle Moyal-Sharrock and Constantine Sandis, *Real Gender: A Cis Defense of Trans Realities* (Polity, 2024). Thanks to an anonymous reviewer for alerting me to their argument.

[48]See Philip Pettit, *A Theory of Freedom: From the Psychology to the Politics of Agency* (Oxford University Press, 2001).

[49]The idea that desires themselves are morally neutral, and that only *acting* on a desire can be wrong, is central to some of the most radical arguments about sex and sexual identity. Allyn Walker's controversial book *A Long Dark Shadow: Minor-Attracted People and their Pursuit of Dignity* (University of California Press, 2023) is predicated on this distinction: Walker argues for destigmatizing the attraction *as opposed to* the behavior. But radical arguments like this only show what is, in fact, the dominant common sense of our culture.

[50]There are many versions of this claim, both classic and contemporary. Aristotle says in Book I of the *Politics* that whereas animals can express their desires by making cries of pleasure and pain, human beings can, by means of language, call some pleasures "bad" and other pleasures "good." This capacity for making judgments—and for making *different* judgments—about our desires is what makes us, not animals, but *rational* animals (to use the later formulation of Aquinas). A more recent example might be Harry Frankfurt's well-known argument about what he calls "second-order desires"—that humans distinctly have what we call "free will" because they can have not only desires (first-order desires), but desires about desires (second-order desires). Thus I can want a cookie, and wish that I didn't want it (because the cookie is bad for me, meaning that *desiring* the cookie is bad for me). See Harry Frankfurt, "Freedom of the Will and the Concept of a Person," *The Journal of Philosophy* 68, no. 1 (January 14, 1971): 5–20, https://doi.org/10.2307/2024717.

[51]I develop this argument in detail in "The Populist's Feelings, the Expert's Facts, and the Citizen's Peculiar Virtue," in *Engaging Populism: Democracy and the Intellectual Virtues,* ed. Gregory R. Peterson, Michael C. Berhow, and George Tsakiridis (Palgrave Macmillan, 2022), chap. 13.

[52]See Fellipe do Vale's *Gender as Love* (Baker Academic, 2023) for a rigorous and nuanced approach to the theology of gender. Do Vale is particularly good at showing how serious theology helps us escape the dichotomy between "biological essentialists," on the one hand, and pure "social constructionists" on the other. Or, perhaps more precisely, do Vale shows that when we escape that dichotomy, we find ourselves in far more complex territory, in need of far more serious theology.

Bioethics

DOI: https://doi.org/10.56315/PSCF3-25Kao

MY BODY, THEIR BABY: A Progressive Christian Vision for Surrogacy by Grace Y. Kao. Stanford University Press, 2023. 274 pages. Paperback; $30.00. ISBN: 9781503635975.

Surrogacy has long been understudied, underdiscussed, and even dismissed in Christian circles. Kao courageously begins the conversation by marrying a sophisticated argument, stemming from her expertise in ethics, gender, and sexuality, with her personal experience as a surrogate mother.

Kao considers surrogacy a morally good, supererogatory act. Like adoption, it is a form of reproductive hospitality. It engages certain risks for the greater benefit of the relationships between parents, children, and their community. However, Kao suggests that surrogacy is only morally good when it adheres to several conditions. For instance, the intended parents (IPs) should be in a stable marital or otherwise committed relationship, having already struggled with infertility. The surrogate should have experience with healthy pregnancy and be genetically unrelated to the baby. All three should reside in the same jurisdiction and have a strong relationship. The arrangement must be gestational (that is, the surrogate is not a genetic parent). In addition, it must be altruistic, with all costs covered by insurance and the IPs.

Kao supports her argument with scripture, tradition, reason, and experience. Biblical themes of covenant, vocation, and fidelity ground the relationships between the IPs, surrogate, and prospective child. Kao refers to progressive church traditions that address sexuality, marriage, and family alongside science and technology. Drawing on what she calls "secular sources of knowledge" (p. 5), she consults international human rights, professional medical ethics, and reproductive justice (more below). Her own experience as a surrogate literally fleshes out her primary claim: that the God who long ago ended Hannah's suffering (1 Samuel 1) can today use assisted reproductive technology to do the same.

All of the above are important for understanding Kao's constructive argument: a framework of seven ethical principles that should guide surrogacy relationships. The first two principles concentrate on the pre-surrogacy relationship. The IPs and the surrogate methodically reflect on the known implications of surrogacy. Both individually and collectively, they discern their respective reproductive vocations. Such reflection equips these parties to create a moral covenant of fidelity that precedes any legal contract. This covenant outlines a collective understanding of the nature of the relationships between the IPs, the surrogate, and the child during pregnancy and after birth. It expresses shared values and how decisions will be made about expected, unexpected, and worst-case scenarios.

The next set of principles speaks to the time of active surrogacy. Mutual empathy, care, and stewardship set the tone for discussion and decision making if conflicts arise between competing medical interests or legal rights. Mutual disclosure is promoted over secrecy.

The final principles are public and concentrate on justice from a feminist perspective. Kao entreats us to "trust women" as capable of making reproductive decisions informed by experience (pp. 142–45). This does not mean, she cautions, that each woman will always make right decisions or that "anything goes." Women are entitled to moral agency, and that agency depends, of course, on access to reproductive justice, the subject of Kao's final principle. Drawing attention to the fact that women (and children) are chronically placed in precarious situations, reproductive justice calls for the amendment of reproduction-related laws and policies that adversely affect socially vulnerable people, particularly Black and Hispanic women and same-sex couples. Kao concludes her work by identifying creative ways to tackle surrogacy arrangements that, for one reason or another, stand outside this framework, including transnational and exploitative surrogacy.

Throughout this book, Kao uses her experience to address common concerns. One of interest to me is the expectation that the surrogate will develop a maternal closeness with the baby, despite sharing no genetic relationship. After all, even a prophet presumes this natural bond: "Can a woman forget her nursing child, or show no compassion for the child of her womb?" (Isa. 49:15).

Kao recalls that the bond she has with her own children began not during pregnancy but in the weeks following birth. She anticipated having the same experience in a surrogate pregnancy. She did, and she gave the baby freely to the IPs. Kao augments this personal experience—the basis for her "trust women" principle—with studies that show a majority of surrogates develop affectionate feelings like those of a nanny, but not a maternal bond (pp. 44–47). It would be helpful if she attended to research showing a correlation between the migration of fetal stem cells to the pregnant woman's body, particularly, in relation to her brain and to her sense of attachment or bonding.[1]

Some of Kao's principles are informed by experiences that were not ideal. She did not anticipate all the complications that would arise. For instance, Kao struggled with the IPs' refusal of preimplantation genetic testing, and their delay in determining whether Kao would breastfeed or express colostrum and milk for bottle feeding. Such experiences give her clearance to make strong

recommendations on these subjects. They also humanize the text.

Kao's description of ethical surrogacy is detailed and reinforced by numerous studies and resources. Even so, there remain some ethical concerns she might speak to more thoroughly. Many pertain to the presumptions on which her argument rests. She views the following as morally permissible: (a) conception that is not the result of sexual intercourse; (b) IVF, including the discarding of unused embryos (Kao relies on her denomination's stance rather than offering her own sustained ethical defense; see pp. 93–94); (c) risks associated with IVF pregnancy, including preterm birth, placenta previa, and others; (d) embryonic risks associated with preimplantation and prenatal genetic testing; (e) abortion when it is "in [the pregnant person's] or their fetus's best interests" (p. 75); and (f) the conception and parenting of children by same-sex couples. As these matters polarize the church, it would be helpful to have more fulsome explanations of Kao's foundational beliefs and rationale for calling them morally permissible.

Kao acknowledges the concern about the dynamic between environmental sustainability and the human population. Unfortunately, she discusses only the narrow view of antinatalism, claiming that no one should be forced to have fewer or no children (pp. 88–89). More could be said about how a growing population can maintain sustainable lifestyles.

Kao's argument for reproductive justice would be strengthened if greater attention were paid to broader social and economic injustices. Is surrogacy a responsible use of money in a world with parentless children? Kao defends the financial burdens and emotional toll of surrogacy as being on par with those of adoption (p. 80). Insisting that infertile people are not morally obligated to adopt, she maintains that surrogacy serves the public good by fulfilling the human vocation and right to have children (p. 149). This is tenable. However, reproductive justice, as Kao describes it, offers no alternative for parentless children. The named right of adults to have children competes with the unnamed right of children to have parents—a competition that ended unhappily for Sarai, Abram, Hagar, and Ishmael (Genesis 16, 17, and 21).

I continue to wonder about Kao's attention to the rights of adults when I read the title, *My Body, Their Baby*. Does the comma mark a clear separation of the surrogate and the baby? Kao supports this interpretation by reminding the reader that some pregnant women do not experience a maternal bond. And even when a bond exists, the fetus receives no genetic material from the surrogate, making them two separate entities (pp. 63–64). However, Kao fails to cite available research on DNA exchange or epigenetic effects—research that blurs where "my body" ends and "their baby" begins.[2]

The title also fails to show the tension in the book between Kao's feminist approach that stresses personal agency ("trust women") and the social support she needed to live out her decision to be a surrogate. Strong relationships with the IPs and the child were necessary. Her household had to adapt, as well. Kao's spouse underwent medical and psychological testing, along with mandated periods of sexual abstinence. He took on additional household and parenting responsibilities, and regularly administered Kao's estrogen injections because of her fear of needles. Kao's children, too, were told about what their mother was undergoing. They were able to accommodate her need for ample rest while knowing they were not going to have another sibling. As the book ended, Kao and her family regularly visited with the parents and child—a "cousin" to her children. Kao's body was essential for surrogacy, but surrogacy was a shared experience.

As a Christian ethicist and mother of two, I found Kao's work compelling. Scripture does not provide clear moral instruction on the complex matter of surrogacy. It does witness to the importance of community as a place of nourishment and care. Kao admits so herself: "Surrogacy can serve as a metaphor for a deep truth of our Christian tradition—the caring and rearing of children was always intended to be a communal affair, not simply the task of the parents alone" (p. 100). This is a theological and ethical idea worth pondering.

Notes

[1]For example, Mario Valerio Tartagni and Alessandra Graziottin, "The Love-Shaper: Role of the Foetus in Modulating Mother-Child Attachment through Stem Cell Migration to the Maternal Brain," *European Journal of Contraception & Reproductive Health Care* 28, no. 4 (2023): 216–22, https://doi.org/10.1080/13625187.2023.2216326.

[2]See Samira Negahdari, Maede Nilechi, Mehdi Forouzesh et al., "Evaluation of Epigenetic Factors in Surrogacy: A Mini-Review," *Journal of Obstetrics, Gynecology and Cancer Research* 8, no. 2 (2023): 95–104, https://doi.org/10.30699/jogcr.8.2.95.

Reviewed by Aimee Patterson, PhD, The Salvation Army Ethics Centre, Winnipeg, MB R3B 2N8.

Christian Culture

DOI: https://doi.org/10.56315/PSCF3-25Austin

QANON, CHAOS, AND THE CROSS: Christianity and Conspiracy Theories by Michael W. Austin and Gregory L. Bock, eds. Wm. B. Eerdmans, 2023. 286 pages. Paperback; $24.99. ISBN: 9780802882653.

This book is a collection of twenty-four short essays written mostly by Christian academics with a background in philosophy and/or theology. It examines the

relationship between Christian believers—principally white American evangelicals—and conspiracy theories, particularly Covid-19 mandates, the QAnon movement, and the 2020 presidential election. Its stated goals are to shed light on the reasons why Christians get seduced by divisive conspiracy claims and to challenge followers of Jesus to think and communicate according to biblical teachings and the example of Christ.

In their introduction, the editors warn fellow believers that while conspiracy claims sometimes turn out to be true, a majority of them turn out to be false, unlikely, or unjustified. Belief in conspiracy claims is therefore problematic in a community that purports to be lovers of truth. Secondly, conspiracy beliefs often foster tribalistic attitudes and divisive exchanges, hindering the Christian's ability to properly love their neighbor and respect civil authorities, including those whom they suspect of conspiring against them. Thirdly, conspiracy thinking undermines the virtues of hope, forbearance, trust, and gratitude that Christians ought to reflect, provoking them to react impulsively out of fear and anger. American evangelicals are very politically active but also susceptible to having an "us versus them" mentality. Guarding hearts and minds against unproven conspiracy claims is urgent in this age of hyperpolarization (pp. ix–xi). The bulk of the essays in this book therefore promote the moral qualities that followers of Christ should manifest as ambassadors of the Kingdom of God.

Unfortunately, the essays in this book are presented in no particular order; this makes it hard for the reader to gain an overarching perspective. Nevertheless, the essays can be divided into three broad categories: (1) essays that discuss what conspiracy beliefs are and why some are particularly attractive to Christians; (2) essays that critique the evangelical proclivity to confuse civil religion with biblical doctrine, thereby blending their political convictions with their spiritual calling; and (3) essays that exhort Christians to adopt a Christ-like attitude when engaging in polarizing conspiracy talk. The distribution of essays among these categories is uneven. The third category is particularly overrepresented, and this leads to frequent repetition.

Furthermore, insufficient attention is given to unpacking the origins and contents of the conspiracy theories this book addresses. This makes it hard for uninformed readers to grasp the social and epistemic roots of evangelical conspiracism, such as the reasons evangelicals are, in general, more suspicious than the wider populace of public education, academic science, and government-funded social programs. The book also lacks historical, political, and sociological depth. Most of this book's contributing authors, who are almost exclusively drawn from philosophical and theological faculties, show little familiarity with the leading social science research, namely the works of Barkun,[1] Uscinski and Parent,[2] Dyrendal, Robertson, and Asprem,[3] Douglas et al.,[4] and Knight and Butter.[5]

A few essays stand out as superior. Those by Scott Culpepper ("The Cost of Debunking Conspiracy Theories") and Chase Andre ("The Religious Rhetoric of QAnon") are the only contributions that adequately unpack a specific conspiracy theory—the 1980s Satanic Panic and QAnon, respectively. In each case, they demonstrate how Christians embraced attractive falsehoods that bolstered their moral outrage and sense of victimhood, carelessly empowered charlatans by failing to vet extravagant claims, and shut down thoughtful dissent. Essays by Rick Langer ("Testing Teachings and Torching Teachers") and Tim Muehlhoff ("Word Spoken at the Proper Time") rightly encourage Christians to be empathic and humble communicators, fair-minded toward ideological opponents, and aware of their own biases.

Several essays are of questionable merit and pertinence. The essays by Chad Bogosian ("Is It Always Wrong to Believe in A Conspiracy Theory?") and Christian B. Miller ("All Christians Are Conspiracy Theorists") fail to distinguish proven conspiracies (which tend to be simple criminal acts) from speculative conspiracy theories (which frequently resemble far-fetched movie scripts). They recycle the disputable argument of Charles Pigden (among others) that conspiracy theorizing is a legitimate and healthy form of public discourse, while ignoring a wealth of historical and sociological evidence to the contrary.[6] Similarly, Bogosian and Miller work from vague and self-serving definitions of conspiracy, reducing the concept to "actions or plans undertaken by a small group […] to achieve shared goals" (p. 14), and "a small group of people acting in secret" (p. 99)—and not, as is widely understood, a secret plot whose goal is to deceive, manipulate, or harm others illegally and/or maliciously. Bogosian's and Miller's overly broad characterization of conspiracies could risibly include any number of legal, benevolent, and innocuous acts, such as confidentiality agreements, security clearances, surprise birthday parties, and the inscrutable will of a triune God—the latter used by Miller to argue that conspiracism is not in itself problematic since it is practiced daily by all believing Christians. But this is obviously not the sort of "conspiracy" that leads prominent Christian leaders to proffer angry and unfounded accusations in the public square.

Even more problematic are essays by Shawn and Marlena Graves ("Conspiracy Theories and Meaning in Life") and Susan Peppers-Bates ("The Greatest Conspiracy Ever"), which are mired in (left-leaning) political rhetoric, non-sequiturs, and a shallow understanding of the history of conspiracy thinking. Graves and Graves, for instance, attribute the popularity of conspiracy theories

in America—including the recent QAnon panic—to the industrial revolution of the 19th- and 20th-century globalization of markets, both of which, they argue, caused dislocation of communities, "ubiquitous isolation and alienation," and an enduring crisis of meaninglessness (pp. 44–45).

> In the grand context of an industrialized and predatory neoliberal society where communities are fractured and kinship ties are nearly non-existent … where people feel invisible and unmoored, grand conspiracies can function as the gateway to satisfying the drive to find meaning. (p. 45)

Such conclusions smack of circular reasoning, in that any objective historian of conspiracism could easily summon many examples of conspiracy claims, witch hunts, and moral panics that long preceded industrialization and "predatory neoliberalism." The essay then roams off into a discussion on meaningful existence using Klansmen and Nazis as counterexamples, leaving the reader to wonder what any of this has to do with biblical doctrine or the political fears of American evangelicals.

Peppers-Bates's essay is the nadir of this collection. In her words,

> the seemingly peculiar phenomenon of U.S. evangelical Christians accepting baseless conspiracy theories is grounded in a prior, deeper tendency of Judeo-Christianity in general to reduce God to a white male idol, and in particular to silence or ignore the voices of women, people of color, LGBTQI, and other marginalized groups. […] Once a group is demeaned, it becomes much easier to believe that they engage in paedophilia, drink blood, cause COVID, or any number of wild claims. (p. 145)

The logical and factual problems with this essay are legion. Not only is its accusatory tone and excessive use of Foucauldian jargon likely to make the book's target audience stop reading it altogether, it is filled with many misunderstandings of evangelical teachings and culture, often confusing them with those of mainstream Protestants, Catholics, and even white nationalists. It suffocates its reader in a word salad of cryptic terms like "othering," "patriarchization," "white-washing," "white supremacy," and "religious meaning-making." It ends with a misreading of the Parable of the Good Samaritan—the only scriptural reference offered in this essay and one she surprisingly argues is rarely taught in evangelical churches.[7] Poorly researched and argued, it comes across as more paranoid than the conspiracy theories Peppers-Bates set out to debunk, undermining many of the thoughtful reflections offered elsewhere in this book.

While *QAnon, Chaos, and the Cross* contains some excellent and thought-provoking contributions, it falls short of serving a general church-going audience due to its lack of organization, insufficient reliance on the leading academic research, and the incongruity in quality and usefulness of its component parts.

Notes

[1]Michael Barkun, *A Culture of Conspiracy: Apocalyptic Visions in Contemporary America,* 2nd ed. (University of California Press, 2013).

[2]Joseph E. Uscinski, ed., *Conspiracy Theories and the People Who Believe Them* (Oxford University Press, 2019); and Jospeh E. Uscinski and Joseph Parent, *American Conspiracy Theories* (Oxford University Press, 2014).

[3]Asbjørn Dyrendal, David G. Robertson, and Egil Asprem, eds., *Handbook of Conspiracy Theory and Contemporary Religion* (Brill, 2018).

[4]Karen M. Douglas et al., "Understanding Conspiracy Theories," *Advances in Political Psychology* 40, Sup. 1 (2019): 3–35; https://doi.org/10.1111/pops.12568.

[5]Peter Knight and Michael Butter, eds., *Routledge Handbook of Conspiracy Theories* (Routledge, 2020).

[6]See Peter Knight and Michael Butter, "The History of Conspiracy Theory Research," in *Conspiracy Theories & the People Who Believe Them*, ed. Joseph E. Uscinski, 33–46, https://doi.org/10.1093/oso/9780190844073.003.0002.

[7]For example, the wounded Jew in the parable—a victim of a violent robbery—is falsely described as a "leprous Samaritan" to turn the parable into a lesson about racist hatred instead of religious legalism.

Reviewed by Michel Jacques Gagné, historian and the author of Thinking Critically About the Kennedy Assassination: Debunking the Myths and Conspiracy Theories *(Routledge, 2022). He teaches courses in critical thinking, political philosophy, and ethics at Champlain College, St. Lambert, QC.*

DOI: https://doi.org/10.56315/PSCF3-25Alexander

COMING TO FAITH THROUGH DAWKINS: 12 Essays on the Pathway from New Atheism to Christianity by Denis Alexander and Alister McGrath, eds. Kregel Publications, 2023. 294 pages. Paperback; $21.99. ISBN: 9780825448225.

The Four Horsemen of the New Atheists—Richard Dawkins, Christopher Hitchens, Sam Harris, and Daniel Dennett—have faded from the cultural spotlight they once attracted. Their books were not only best sellers but their take-no-prisoner approach toward religion in general, and Christianity in particular, dominated conversations and apologetic efforts in the West for the last two decades. However, times have changed.

The New Atheists are now the Old Atheists. The questions once raised still linger faintly, but cultural conversations have shifted dramatically. Instead of asking, "Does God exist?," there is now an array of books and personalities asking and answering questions of sex, gender, and race, to name but a few. We have new questions and new influencers that now dominate the conversation in academy and household. That being the case, one cannot help but ask: Why write another book about Dawkins? Yet, as it turns out, the Old Atheists are not as irrelevant as one might think. In fact, much of this current cultural moment is a product of their making, one we would be wise to learn from and understand.

Coming to Faith Through Dawkins comprises twelve essays, written by men and women with varying backgrounds from accomplished academics to micro-dosing hippies and everything in between. This broad collection indicates that Dawkins and his atheist popularizers might still have a place in the cultural conversation that ironically is bringing people to faith. Although the title is provocative, not every essay is directly a *coming to faith story* because of Dawkins alone. Instead, the book is composed of real people inviting the reader into their journey to faith in God through the Four Horsemen—who, instead of ushering in an apocalypse of unbelief, brought about in these contributors a turning point to find peace and salvation in Jesus Christ. Although the twelve journeys to faith are distinct, there are key themes that emerge and tie the collection together quite powerfully in the current cultural moment.

First, the stories have not been evangelically sanitized. Unlike a cheesy Hallmark movie that ties up all the loose ends with characters that no one except Ned Flanders can relate to, the contributions are refreshingly honest—a feature lacking in the New Atheist literature. These essays are more like reading the Bible—the stories are of real people and, like real life, are messy. What they show is that a journey to faith is not always a straight line, nor altogether complete; there are loose ends, which is, ironically, juxtaposed to the New Atheist plotline that unbelief has it all figured out. These essays are an invitation into the mind and heart of honest people who came to Jesus and are still journeying with God. As expressed in these narratives, faith does *not* mean that you have all your questions answered, nor that you will not have new questions to ask along the way, nor that doubt is not a real part of life.

Second, these stories masterfully show faith as a journey, best traveled in honesty and humility— something the contributors did not find in the works of Dawkins or Hitchens, who are known for their rhetorical wit and provocative prose. Taking aim at the hubris of the religious, the New Atheist's pride and rebukes became their own worst enemies. Although some people were drawn to their strawman attacks and cheered their ad hominem triumphs, this same condescending tone led many of the contributors to this book to reconsider the validity and veracity of the New Atheists' arguments … or lack thereof. This volume clearly shows that people are looking for honest discussions, presented with the graciousness of mind that comes from those who realize they could be wrong and are willing to face their own doubts.

Lastly, this book is a much-needed encouragement; God is at work in the most stubborn, hostile, and distant of people. From tears to laughter, these essays remind Christians of the importance of sharing our faith and lovingly engaging with people. It must be said that William Lane Craig is a consistent voice in this collection, who encouraged people not only by his clarity of thought but also by his respectful engagement, something the world needs now, more than ever.

Reviewed by Andy Steiger (PhD, Aberdeen), founder and executive director of Apologetics Canada.

Environmental Science

DOI: https://doi.org/10.56315/PSCF3-25MeyaardSchaap

FOLLOWING JESUS IN A WARMING WORLD: A Christian Call to Climate Action by Kyle Meyaard-Schaap. InterVarsity Press, 2023. 208 pages. Paperback; $18.99. ISBN: 9781514004456.

If you, or a Christian friend, are unsure of the appropriate faith response to climate change, this just might be the book to read. If you have been involved with Christian creation care for a while and want to see what the next generation of leaders has to offer, read the book.

The Reverend Kyle Meyaard-Schaap has plenty of experience guiding people through the process of integrating their faith with creation care—from his work with Young Evangelicals for Climate Action, to vice president of the Evangelical Environmental Network, to his current position as the executive director of the Association for a More Just Society in the US. He is ordained in the Christian Reformed Church in North America.

Meyaard-Schaap loves to tell stories throughout the book and does it well. That gives the book an informal but engaging feel. It is a straightforward read: you will not be reaching for a theological or scientific dictionary; you will not have to interpret any charts or graphs. The book covers a wide swath of material in a few pages so, by its design, it is an introductory book. It would serve that purpose better if it pointed the reader to additional readings at the end of each chapter. The book makes extensive use of the Bible; these references should appeal to an evangelical audience, although a scriptural index would have been helpful.

The introduction covers the consensus around climate change, a history of the recent meetings of the Conference of the Parties, the temperature goals that were set at the twenty-first meeting in Paris, and how our actions are inadequate to meet those goals. The key question this book attempts to answer is: How are we supposed to respond to this reality as followers of Jesus?

In the first chapter, "Coal and the Greatest Commandment," Meyaard-Schaap uses a story of an activist against mountaintop removal coal mining to review the associated environmental issues while introducing us to the coal miners, as well as their families and friends. Their culture gives them meaning and pride in what they

do, yet the health issues they experience cannot be minimized. The author examines the complexities of God's greatest commandments as they relate to the people and the mountain.

The second chapter, "How Did We Get Here?," explores the power of story in shaping all aspects of our lives, including faith and politics. The author tells how evangelicalism became associated with Republican politics as well as the politics of oil and big tobacco, and the idea that Earth is temporary. "When this political story is combined with a theological story … climate action is more often than not seen as a partisan threat, a theological heresy, and a dangerous conspiracy—a wild deviation from the stories that have formed them" (p. 35).

Chapter 3, "Recovering the Big Story," examines the relationship between the earth, God, and humans as told in Genesis, Job, John, Colossians, and Revelation. Briefly, God creates a universe that is good and puts humans in the garden to serve and protect the garden. However, as we all know, humans fail miserably in this task and require frequent reminders about God's covenant with all of creation and their role in caring for it. This chapter should whet the appetite of the evangelical reader who regards the Bible as authoritative.

The next chapter, "Climate Action Is Good News," explores some big questions: What is the role of evangelism in a warming world? For whom is the Gospel good news? The author concludes that if we follow the example of Jesus, the Gospel should be good news even for those "bent low by the impacts of a changing climate" (p. 70). Advocating for environmental justice becomes a foretaste of the kingdom to come and it provides an opportunity to share his name and message.

Chapter 5, "Being Pro-Life in the Age of Climate Chaos," deals with the multitude of ways that climate change is affecting and killing people around the world: for example, from the farmer in Kenya, the nine million deaths worldwide due to air pollution, the possibility of pandemics, and more. The poor and those unable to respond to the challenges disproportionately bear the burden of climate change effects. The conclusion: we need to "drastically expand our understanding of what it means to be pro-life" (p. 92).

In chapter 6, "A Story Can Change the World," Meyaard-Schaap advances the thesis that sharing our climate change story is important. But why is it important that we as individuals share our personal stories? We listen to those we trust. Who shares the story is more important than the details of the story. But to be effective we must also listen to the stories of those we are trying to influence. This way we can relate our concerns to their concerns. The chapter shares Katharine Hayhoe's three steps for engaging in effective conversations about climate change: find something you have in common, connect climate change to it, and find a way forward you can agree on.[1] To this, the author suggests we need to add an invitation for action.

The next chapter, "God's Pleasure, Our Joy," focuses on how to sustain advocacy. The author suggests finding a community that allows us to find joy and gratitude, as well as practicing simplicity as a spiritual discipline of climate action. Appendix A gives additional examples of lifestyle changes, including activism. However, he neglects the concept of eco-spirituality; from dialogue with Indigenous peoples to modifications of Ignatian spiritual exercises, this is an active area of exploration within the Christian church.

Chapter 8, "Loving Our Neighbors in Public," addresses the systemic nature of climate change. After a historical review, the author argues that the systems in place are not neutral; they have brought us to the current situation, benefiting some, and hurting others. Because of systemic injustices, Christians must "do justly now." This chapter gives specific and concrete examples of how to engage politically: writing an op-ed piece (with more detail in appendix B), using social media, and yes, of course, voting.

The final chapter, "Christian Citizenship in a Warming World," explores engagement consistent with scripture that is other oriented and Christlike. Meyaard-Schaap suggests that being in a supportive community and anchoring ourselves in spiritual practices are important for keeping God in control, and not our ego, so that others may see the fruits of the Spirit.

Overall, this is a good initial book for understanding a Christian approach to climate change. I wouldn't hesitate to give it to someone who is getting started on their creation care journey. For those who have been involved in the creation care movement for a while, the suggestions for engagement in chapter 8 are well worth reviewing before taking pen to paper or dialing up your congressional representative. The stories are well told, insightful, and memorable. There are many places in this book where references could be made to those who have gone before, who have created the insights that are now standard. But this is not a full academic treatise. It is the responsibility of each generation to take what has gone before and put it into the language and idiom of the current generation. That is how the work continues. Judged in that way, this is a valuable contribution to what it means to be a Christian in a world that is endangered by human-created climate change.

Note

[1]Katharine Hayhoe, *Saving Us: A Climate Scientist's Case for Hope and Healing in a Divided World* (One Signal, 2021), 225.

Reviewed by David A. Larrabee, PhD, professor emeritus of physics, East Stroudsburg University, East Stroudsburg PA, 18301.

Evolutionary Theory

DOI: https://doi.org/10.56315/PSCF3-25Bonitto

THE BLIND SCIENTIST: Unmasking the Misguided Methodology of Neo-Darwinism by Alexander J. Bonitto and John S. Knox. Wipf & Stock, 2024. 110 pages. Paperback; $21.00. ISBN: 9781666783179.

This book is based on a thesis submitted for an MA in Christian Apologetics at Liberty University. At the time of writing, the primary author (Bonitto) had a BS in health sciences, along with an MBA in sports management; the second author (Knox, Bonitto's thesis supervisor), a PhD in theology and religion, an MA in sociology, and a MATS in Christian history and thought. Although neither has a graduate degree in biology, the goal of their book was to

> examine the concepts, contexts and constructions surrounding postmodern scientism—not just to disprove the presuppositions and conclusions of neo-Darwinism—but to demonstrate that science has become far too political, unempirically presumptuous, and precarious in its presentations of "the facts." Rather, this book seeks to carefully weigh the principles and practices of neo-Darwinian theory to determine which tenants [*sic*] could and should be considered truly *scientific* while practicing Jesus's teachings of *grace and truth*. (pp. xv–xvi; emphasis in the original)

The authors first identify five a priori assumptions which undergird neo-Darwinism (pp. 10, 44):

1. Life has evolved via a long series of small incremental steps, from simple toward more complex (gradualism).
2. All life originated from a single organism, and lineage can be traced via an interconnected tree-of-life (common ancestry).
3. "Micro-evolutionary" changes account for "macro-evolutionary" change (within-species changes account for speciation per se).
4. With enough time, random genetic mutations can accumulate and account for the complexity of organisms today ("time and chance").
5. "All scientific explanations must explain any and all phenomena via material causes" (methodological naturalism).

Bonitto and Knox then set out to invalidate all five of these a priori assumptions but use debunked, misunderstood, and/or misrepresented arguments. Early in their treatise they present Behe's irreducible complexity and misguided calculations of the incredible improbabilities of lining up single random point mutations as the only pathway towards increased information content. Undiscussed are more recent and sophisticated advances in genetics which explain the paradoxes that they dwell on (particularly single point mutations being insufficient to account for new complexity, and discordant trees-of-life), such as gene duplication, exaptation, horizontal gene transfer, recombination, mobile genetic elements, and large-scale genomic rearrangements, although they do make one passing reference to "jumping genes" which they identify as "junk DNA" (p. 17).

The Cambrian explosion and broken lineages, including sudden appearances of new species and "missing links," (pp. 47–53, 77) are seen to invalidate gradualism and common ancestry, even though the authors say nothing at all about how fossilization works or its limitations. That is, fossilization is an exceptionally rare and sporadic event (only a miniscule fraction of the organisms that have ever lived become fossilized) and so large morphological changes can occur without leaving any fossil evidence (the gaps and leaps in the fossil record). Bonitto and Knox characterize punctuated equilibrium as merely an ad hoc or circular argument to obfuscate missing data and to "cover up the contracting evidence" (p. 77), even stating that "at best, it is a well-educated guess" (p. 47): Such dismissive comments about an idea that is as well established and widely accepted by experts as punctuated equilibrium are unfortunate. In one specific case (p. 49), they focus on Stephen Meyer's description of a genetic study which examined 2,000 genes in six animals from diverse phyla which *they* felt could not possibly be explained by the tree-of-life hypothesis. However, the original authors of that scientific paper[1] went on to show that the puzzling data were a result of horizontal gene transfer between species (a now well-documented phenomenon which entangles or enjoins the branches of diverse trees-of-life).

Bonitto and Knox go on to reason that "the evidence of the fossil record could not, on its own, refute the synchronic Darwinian model" (p. 8)—evidently suggesting that fossilization and genetic changes were going on at the same time and acting on the same substrate (the organisms) so they *should* produce the exact same Tree-of-life—and then claim that the many discrepancies between the two clearly refute neo-Darwinism. They don't seem to understand that those two forms of Trees are measuring completely different parameters: (1) that two different species (placental versus marsupial mice, for example) can have seemingly identical morphology (reflected in the fossils) but arise from completely different lineages (reflected in the genetic sequences), (2) that a single species can have profoundly different morphologies (breeds of dogs, for example), and (3) that trees-of-life generated from morphological changes are severely lacking in precision and accuracy compared to trees-of-life generated from genetic changes (e.g., with the latter affording one a chance to use genetic testing in order to claim an inheritance dating back a few generations, whereas the former would not).

I find other lines of reasoning that they level against neo-Darwinism to be quite misleading. On the one hand, they employ statements made by dozens of scholars—including Francis Collins, who is listed amongst "Christian scholars who disagree with Neo-Darwinism" (pp. 17–18, 90–91)—which essentially amount to "We don't yet completely understand this-or-that particular element of biology" as evidence against neo-Darwinism. And on the other hand, they frequently include argumentation pertaining to the origin of life, even though neo-Darwinism does not attempt to explain the origin of life.

Credit goes to Bonitto and Knox when it comes to the fifth a priori assumption: methodological naturalism. As they parse that fifth phrase (which I have quoted verbatim above), they are correct. Unfortunately, they have set up a tautology (akin to stating an "assumption" that hydraulic mechanisms can involve fluids only). A *scientific* explanation is, by definition, restricted to material causes. Scientists can directly examine only the material realm; they struggle to operationalize and test non-material matters (not just theological ones, but even matters such as consciousness, mind, love, or whatever preceded the Big Bang). But that does not prevent neo-Darwinists from *believing* privately that non-material causes *might* also be at play without explicitly weaving the latter into their explanations (thus avoiding God-of-the-gaps arguments). And they will call those *belief statements*, not scientific explanations. This does not invalidate neo-Darwinism.

Bonitto and Knox liken neo-Darwinism to the clumsy Ptolemaic cosmological model—which history ultimately revealed to be an unwieldy, indefensible, contrived, ideologically inspired hand-waving invention—and liken more recent attempts at refining the neo-Darwinian synthesis as equivalent to the introduction of epicycles into the Ptolemaic model of the cosmos in a failed attempt to account for contradictory observations. They ask why neo-Darwinists hang on so tightly to a theory that is so evidently flawed and unsupported: they suggest that scientists don't want God to exist, do not want to "let a Divine foot in the door" (pp. 13–14, 19, 31, 78, 92), want to enjoy an immoral lifestyle and want financial stability. They draw lines connecting neo-Darwinism to atheism, Karl Marx's Communism, Hitler's Nazism, nihilism, the horrendous Columbine shootings, and eugenics and social cleansing programs, argumentation that I find to be unhelpful. Although they acknowledge that Darwinism may not be a *sufficient* condition for those aberrations, they then take two steps backward by finishing with "it is undoubtedly a necessary condition. Evidently, bad science can cause bad consequences" (p. 96).

I regret that I cannot recommend this book. I disagree with the authors' conclusions that neo-Darwinism is a product of erroneous presuppositions which may foster "bad thinking," "bad science," and "bad society" (p. xvii). Bonitto notes in the preface that he is "not a professional scientist" and "did not set out to add any new scientific research on evolution or scientific methodology" (p. xv); adding another co-author with doctoral-level training in biology might have been useful and is recommended for their future work on this topic. It is important to have more collaboration between theologians and scientists, each with their unique but complementary perspective on truth (as per Augustine's "Book of God" and "Book of Nature"). Overall, this book is insufficient to address the monumental task of discrediting neo-Darwinism, which is based upon extensive accumulation of data and is backed by the vast majority of the scientific community, including experts in all the relevant areas. I found irony in the penultimate paragraph of the preface to this work in which Bonitto states,

> My goal for this modest book is to illuminate the importance of preconceived ideas when drawing intellectual inferences. One's presuppositions can heavily cloud how a thing is interpreted but true science has always been about filtering out personal biases … Bad thinking leads to bad science, which inevitably ends in a bad society. (p. xvii)

I would reflect those statements back at the authors.

Note

[1]Michael Syvanen and Jonathan Ducore, "Whole Genome Comparisons Reveal a Possible Chimeric Origin for a Major Metazoan Assemblage," *Journal of Biological Systems* 18. no. 2 (2010): 261–75; doi.org/10.1142/S0218339010003408.

Reviewed by Luke Janssen, professor emeritus, McMaster University, Hamilton, ON.

DOI: https://doi.org/10.56315/PSCF3-25Johnson

WHAT HATH DARWIN TO DO WITH SCRIPTURE? Comparing the Conceptual Worlds of the Bible and Evolution by Dru Johnson. IVP Academic, 2023. vii + 224 pages. Paperback; $24.99. ISBN: 9781514003619.

Despite the book's title—*What Hath Darwin to Do with Scripture?*—this is not a typical origins book. For example, its author, Dru Johnson, does not lay out a specific biblical view of the creation narrative and then seek to show how mainstream scientific findings line up (or not) with this narrative. Rather, he starts off with the premise that both the scriptural and evolution narratives are founded on a single principle: becoming fit to live in a world where resources are in short supply. Survival, in each story, depends upon this "fittedness." Furthermore, since God is the Author of both narratives, then "fittedness" for life in each story should be consistent with God's character. But is it? That's the question that runs all the way through this book. On the one side, the book follows the biblical picture of what God states is necessary for Israel to thrive in the midst of scarcity. On the other side, it summarizes the author's understanding of

the current state of evolutionary biology. Do the two stories reveal a commonality as we would expect if a single individual (God) is responsible for both? An all-important question, indeed.

Johnson is a biblical scholar, and his detailed summary of the central role of surviving-through-scarcity in Israel's history is a fascinating read. It starts with Genesis, proceeds through the exodus and on to the prophets, showing at each step what God expects if people are to thrive in a world where scarcity makes life very difficult. Nowhere is that laid out more clearly than in Deuteronomy 28 where the ramifications of obeying (and not obeying) God's commands are laid out in stark detail. Thriving in a world of scarcity is possible, but it requires living in worshipful harmony and obedience with the rules-for-living set out by God. That's the ancient story laid out by the biblical writers.

In considering life in a world where scarcity reigns, Johnson states that there are "remarkable similarities between Darwin's version of natural selection and the biblical discourse on the same topics" (p. 7). It is not that he necessarily thinks the two stories lead to the same conclusion about God. Rather, this is what he wants to test. By placing the way in which they are told against each other, the telling of these two stories "can help us see unseen features that shape the world … and they do so at least in part to convince us how to *live*. These are ethically freighted tales" (p. 12). But is Johnson right about this? Are the goals of the biblical authors and the evolutionary scientists who explain evolution doing the same thing? Do the scientists seek to "convince us how to live" as they shape their story of the evolution of life on Earth? Some do, of course, but when they do so, have they not stepped out of the world of science and moved into the realm of philosophy or religion? The single most important purpose of the biblical story *is* to show us how we ought to live. What about determining how we ought to live from hearing the science story? Well, I think that is more complicated.

Nonetheless, Johnson's main point is well taken. If the Author of both books is one and the same, we should not expect major differences to arise as long as we are laying out each story correctly. I am a biologist, so I will restrict my comments largely to Johnson's description of evolutionary biology. But there is an important point related to the Bible I need to make from the start. He writes that the biblical view assumes "a pivotal reorientation of the cosmos" after the Fall (p. 4). Later Johnson expands on what he considers to be the ramifications of this view: Evolutionary biology assumes that "the metaphysical nature of the universe remains unchanged. The laws of thermodynamics, gravity, electromagnetism, and the like persist. This means that biology plays in the same realm of physics as it always has" (p. 35). In other words, before the biblical Fall (which was almost the entire span of billions of years during which life forms emerged according to evolutionary theory), the cosmos was functioning with a different set of natural laws. I am not a biblical scholar, but I know there is not unanimity on this point among Old Testament scholars. (See Iain Provan's 2014 book, *Seriously Dangerous Religion*, for example). Obviously, Johnson's view of the biblical story makes it difficult to take evolutionary theory seriously because all aspects of evolutionary theory have been formulated under the assumption that the cosmos has always operated under the same natural laws as it does today. Johnson thinks that the biblical authors assumed this was not the case.

Still, despite this initial skepticism brought on by his particular view of the biblical story, the book proceeds to describe Johnson's view of evolutionary theory. He correctly writes that Darwin stressed that competition for fittedness was the fundamental axiom of evolutionary theory. He is also correct to assert that, under certain circumstances, cooperation can be important too. But Johnson writes that this was not introduced into evolutionary theory until the 1930s, and that it conflicted with Darwin's original theory. Actually, it was Darwin himself who predicted that there would be circumstances when cooperation would come into play, even as Darwin correctly pointed out that this would not only *not* be in conflict with natural selection, it would actually be expected.[1] Not only that, but it was Darwin who accurately predicted the concept of kin selection as the basis for altruism in certain circumstances. These concepts were not new to evolutionary theory, somehow proving Darwin wrong as Johnson implies. They were built into the theory of natural selection by Darwin himself almost from its earliest days.[2] But natural selection was and still is at the heart of the theory—even in cases in which the most successful evolutionary strategy is cooperation.

Johnson refers to current evolutionary science as a "moving target" (p. 15), and he implies throughout the book that *core* foundations of evolution are still up for debate and reinterpretation. As a biologist, I don't see it that way, and to the extent that Johnson leaves this impression, I am left with some discomfort with his rendition of the story. Dobzhansky's famous sixty-year-old statement, "Nothing in biology makes sense except in the light of evolution," is just as true today as it was when he first made it. On the other hand, if by "moving target," he means that scientists are still working out the details, that would be an accurate summary of the current state of affairs, and that, after all, is the way science functions. I just wish he had made that clearer. This is especially important given that at several points (see the above discussion of the cosmic Fall), he expresses skepticism about evolutionary theory. His skepticism is also illustrated by this statement: "Most of us are struggling with

what to make of the … fossil record, and that is a right and necessary struggle. The so-called natural history of our planet has a lot of explaining yet to do" (p. 191).

Johnson does not explain who, or why, "most of us are struggling" with the fossil record, but by framing it in this manner and not explaining why he thinks this way, he is in danger of being perceived as not fully examining the evolutionary story he seeks to tell. Regardless of what some biblical scholars may think, evolutionary scientists think the fossil record provides a remarkably revealing picture of how life has unfolded on Earth over hundreds of millions of years.

Johnson spends quite a bit of time examining sexual reproduction in both the evolutionary and biblical accounts. He thinks that mammalian evolution (including our own hominin lineage) has been characterized by a long history of males forcing copulation on females. He cites a paper from 2006 in which forced copulation and/or sexual violence is the norm in guppies, ducks, and several species of flies, but that paper provides no evidence for its pervasiveness within the wider evolution story. More recently, a meta-review of mammalian sexual aggressiveness and coercion throughout the mammalian world identifies only four of thirty-two mammalian orders which have documented examples of such activity, and the author was able to identify only one species which represented a case in which sexual violence provided an adaptive advantage.[3] Johnson's concern, of course, is that if such activity is the norm in the evolutionary story, it creates a conflict between evolutionary and biblical stories. However, we have no reason to think it is the norm.

Continuing his discussion of sexual reproduction, Johnson goes on to draw a conclusion about a particular evolutionarily strategy, one that is of special biblical interest—monogamy. He states, "Monogamy is not evolutionary advantageous. It does not make sense" (p. 136). Actually, there are various types of evolutionary reasoning that explain how monogamy *does* make evolutionary sense under certain circumstances. Frequently the advantages relate to the father's active involvement in parenting and retaining the sort of relationship that will ensure the offspring he is caring for are really his own. Indeed, one investigation suggests that the movement toward monogamy in human evolution (compared to our promiscuous ancestors of several million years ago) may have played a significant role in enabling the massive increase in brain size that characterizes our lineage.[4]

As the book draws to a close, Johnson writes: "Is there a way to reconcile entirely the Hebrew intellectual world to the present evolutionist accounts, theistic or otherwise? I am now less sure …" (p. 175). Although this question remains of the utmost importance, trying to get a clear answer begins with being sure one has an accurate view of both stories. Does this book help to provide such a view? Of that, I am not so sure.

Notes

[1]Darwin, *The Descent of Man*, Kindle Edition (2014), p. 23.
[2]See E. O. Wilson, *The Social Conquest of Earth* (Liveright, 2013) for a discussion of this point.
[3]Marcelo H. Cassini, "Sexual Aggression in Mammals," *Mammal Review* 51, no. 2 (2021): 247–55, https://doi.org/10.1111/mam.12228.
[4]For details, see Carl Zimmer, "Monogamy and Human Evolution," *New York Times*, August 2, 2013, https://www.nytimes.com/2013/08/02/science/monogamys-boost-to-human-evolution.html.

Reviewed by Darrel R. Falk, professor of biology, emeritus, Point Loma Nazarene University, Point Loma, CA.

DOI: https://doi.org/10.56315/PSCF3-25Schaefer

WILD EXPERIMENT: Feeling Science and Secularism After Darwin by Donovan O. Schaefer. Duke University Press, 2022. 328 pages. Paperback; $28.95. ISBN: 9781478018254.

Donovan Schaefer is currently in the Religious Studies Department at the University of Pennsylvania. Although he is a member of a program focused on religion, he describes himself as an atheist. His interest in understanding religion more deeply, particularly as it relates to *affect theory* (an approach to knowledge and culture that focuses on emotions), is exemplified by his scholarly work and his close relationship with Alister McGrath—theologian, historian, mentor, and close friend.[1] While religious research might seem inappropriate for an atheist, one could argue that Schaefer presents an outsider's perspective in religious studies. In *Wild Experiment*, he examines the intersection of affect theory with science, religion, and secularism, and the development of conspiracy theories and racialized reasoning

Schaefer divides his book into Part I: Cogency Theory and Part II: Feeling Science and Secularism. Part I provides readers with a thorough understanding of the epistemological, axiological, and ontological stances present in knowledge making. Schaefer develops his idea to explore the interconnectedness of feelings, emotions, values, beliefs, and life experiences which drive knowledge making. Cogency theory is "a collection of perspectives on how thinking is made by feeling" (p. 10). Schaefer argues that "[n]ew knowledge feels true to us because it lands on our existing landscape of understanding in a way that fits. It clicks with the terrain already in place" (p. 6). Part II examines the historical background of the development of evolutionary theories, and the responses to these theories by religious institutions, particularly the Roman Catholic Church. This section connects the dots between affect, as an intrinsic part of knowledge-making, and evolutionary theories, racism, and the development of conspiracy theories.

Using the "click" metaphor, Schaefer explains how individuals align with information that "feels so good" (a common phrase used in the book). This *good feeling* grounds his cogency theory—the idea that we feel our way to knowing. He believes we cannot separate feelings from understanding because the two concepts are inextricably joined. To develop his theory, Schaefer appeals to Michael Polanyi's *post-critical* understanding of the subjectivity involved in knowledge making, Thomas Kuhn's concept of *incommensurability* arising from the biases brought into science by autonomous individuals, Nietzsche's ontological perspective that we make our own realities based on personal experiences, William James's fallibilist belief that all views are subject to fallibility, and evidence from science and technology studies (STS) that knowledge emerges from lived experiences. He further explains that the feelings involved in knowledge making can readily influence our willingness to accept scientific or biblical evidence—such as those associated with evolution, creation, climate change, and racism.

As Schaefer transitions to Feeling Science and Secularism, readers become aware of the pros and cons of the *click* that drives knowledge making. On the one hand, deriving joy from a topic or a task drives us to learn more, continuing the search for higher levels of understanding. On the other hand, this same joy can also pigeon-hole us into the same ways of negative thinking, as held by those who partake in conspiracy theories, racialized reasoning, climate denialism, and the age-old debate between evolution and creationism. Part II begins by detailing the historical background of the Darwinian era and the controversies that inherently arose within the church. Bringing in cogency theory, Schaefer points out that the feelings associated with religious values (creation, in this case) or scientific evidence (evolution, in this case) can cause us to dig our feet into the sand and refute someone with the same passion we each feel for the subject(s).

How does society breach this barrier and advance when feelings are so strongly held and difficult to address? Schaefer points out that good science employs a healthy system of checks and balances which keeps emotions in check and emboldens an ardent desire to find the truth. This checks-and-balances system embodies what David Hume refers to as "cool passions" and William James as the "nervousness about error" (p. 36). Schaefer suggests Hume's "cool passions" are a drive for knowledge, which is tempered by a desire for truth, and James's "nervousness about error" represents a healthy fear of being wrong, so one strives to "shun error!"[2] However, providing more evidence on a topic will not necessarily bring unity because two people can analyze the same evidence in many diverse ways. Understanding and appealing to the feeling individuals embrace are the keys to unification. We must have a willingness to listen to the "out-group" and try to find "shared vibes," (Schaefer quoting Jose Estéban Muñoz [p. 224]).

As Christians made in the image of God, we are fearfully and wonderfully made, knitted from the core of our being by a loving creator from our mother's womb (Ps. 139:13–16). The thought of being "knit" by our creator suggests craftsmanship in which no two creations are identical. Thus, we could surmise that cogency theory somewhat aligns with our personal identity in and from Christ. We each have our own spiritual gifts, life experiences, and nonnegotiable values which we bring to the table to *mess with* (another common phrase in the book) our interpretations of information. It is our duty as Christians, however, to take accountability for our thoughts and actions and respond to information by following the scriptures. If we remain faithful, limiting emotion as much as possible, we might overcome some of the political and societal challenges we face, as well as issues related to creation care and climate change. I hope that by understanding Schaefer's cogency theory we can more effectively communicate information to a broader audience, inspire people to become more accepting of "others," and become better able to understand how others think and believe.

One observation: *Wild Experiment* has a wealth of information. It covers the complex and interdisciplinary nature of many topics in the social sciences, theology, biology, and history. While I believe Schaefer did his best to condense information, the onus is on the reader to do some additional background reading. I recommend this book for anyone interested in epistemology, behavioral science, STS, or anthropology. It provides a context for knowledge making that most social science and social-science related researchers will find interesting.

Notes

[1]Donovan O. Schaefer, "The Territories of Thinking and Feeling: Rethinking Religion, Science, and Reason with Alister McGrath," *Zygon* 57, no. 1 (2022): 200–222.

[2]William James, *The Will to Believe and Other Essays in Popular Philosophy* (Longmans Green, 1907), 18.

Reviewed by Rebecca Eagle-Malone, assistant professor of biology, Malone University, Canton, OH 44709.

History of Science

DOI: https://doi.org/10.56315/PSCF3-25Acemoglu

POWER AND PROGRESS: Our Thousand-Year Struggle over Technology and Prosperity by Daron Acemoglu and Simon Johnson. PublicAffairs, 2024. 560 pages. Paperback; $21.99. ISBN: 9781541702547.

In this book, two highly acclaimed MIT economists, and Nobel prize winners, make the bold claim that technological progress does not automatically result in

prosperity for all. This is contrary to the claims of what they call the "technology bandwagon," founded on the economic dogma arising from the rise in productivity and wages that occurred over the 20th century. Put simply, this dogma states that "when businesses become more productive they expand their output" which results in "a need for more workers" so they "get busy with hiring" and "collectively bid up wages" (p. 15).

To make its case, the book examines the relationship between technology, wages, and inequality over a thousand years with a view to determining what needs to be done to ensure that all parts of society share in the prosperity arising from innovation. From the opening chapter, it is clear that the authors are concerned about the current direction of digital technology, especially AI and its control by an elite few in Big Tech, what they term "a vision oligarchy" (p. 33) that needs to be "reigned in" (p. 34). Anyone interested in the ethics around technological development and its consequences on society, particularly recent developments in AI, will be interested in these perspectives.

Interpreting the economic and social data over a thousand years through to the present, the authors show how the economic prosperity of the post-World War II years was an outcome of a long struggle over the direction of technological progress and a balancing of power between employer and employee. Various examples are cited by the authors to justify their view that to create an economic elite involves a compelling vision and a social standing that affords opportunity to frame and set the agenda for debates on innovation, prosperity, human flourishing, and how to solve the world's big problems. The influence of the powerful becomes self-perpetuating if they have access to influence policy makers and if their ideas and arguments are persuasive and have broad appeal.

Many illuminating economic facts are employed throughout the book. Typical is that, apart from famine years or other disturbances such as war, food production remained roughly in line with population growth until the early 19th century, and that, despite the innovation of the middle ages, the quality of life of a European peasant changed little over several millennia. Productivity improvements benefited a very small elite of kings and their retinue, nobles, and the clergy.

Turning to the Industrial Revolution, the authors claim the poor did not share the wealth generated through technology innovation because of the bias in automation which favored those wealthy enough to purchase machinery and because of the lack of worker representation in setting wages. They also argue that the "aspirant" class in this period focused on accumulating wealth for themselves and did nothing to alleviate the appalling conditions in the first half of the 19th century. In making this claim, a glaring omission in the authors' analysis of the 18th and 19th century in Britain is the influence of evangelicals in the reform movement, such as the Clapham Sect, and businessmen, such as Cadbury, who conducted his business differently to most, providing homes for his workers and education for their children. This omission is surprising given that these evangelicals shaped institutions and public opinion in ways that the authors view as crucial to bringing about a change of vision in business leaders and institutions, as well as in the public.

The change in direction of technology in the second half of the 19th century plus and institutional changes up to the post-World War II period, ground the authors' conclusion that "the productivity bandwagon depends on new tasks and opportunities for workers and an institutional framework that enables them to share the productivity gains" (p. 218). A key 19th-century transition point was that the direction of technology shifted away from automation and people began to benefit more from the progress of technology. Key examples involve steam and electricity, which created new tasks and job opportunities in transport infrastructure and associated industries, such as steel and coal. Later, as electricity transformed factories by allowing distributed power rather than centralized steam power, there was a significant increase in the demand for engineers and white collar workers, pushing up wages. Contributing to this trend were institutional changes such as trade unions that gave greater bargaining power to workers, creating improved rent sharing between employers and employees. Political representation resulted in regulation with attendant improvements in conditions and public health. After World War II, there was a significant year-on-year increase in the "Total Factor Growth" measure of technological progress, and there was more inclusive economic growth with inequality declining rapidly as wages rose.

The closing chapters of the book focus on digital technology and AI, and detail how the 1,000-year struggle that finally resulted in a more inclusive prosperity began to unravel in the 1980s. Economic growth slowed and labor's share of national income has been on a protracted downward trend in most industrialized economies. The share of wealth in the richest 1% of the population increased from 10% in 1980 to 19% in 2019. Several factors that brought about these changes are reviewed, including the advent of the digital age and the automation of manual labor that it afforded, along with a change in economic doctrine, the erosion of union power, and deregulation that has favored cutting labor costs. All of this, it is argued, has led to a change of vision, often expressed as, "the social responsibility of business is to increase profits" and to generate "high returns for their shareholders" (p. 271), views now taught in most business schools.

The authors also argue that the "move fast and break things" mentality is symptomatic of a shift in the direction of digital technology and that the current AI vision of technology leaders is an illusion. This vision claims that AI will benefit humankind, yet in reality, it sidelines humans while generating huge wealth by reshaping our view of digital and AI technology away from creating new tasks and opportunities toward automating work and cutting labor costs, re-creating the old two-tier society of the previous millennia. Nevertheless, while some data is provided to justify this assertion of the authors in the use of robotics, there is much debate about the real impact of AI among white collar workers, a topic about which the authors offer no projections of their own.

Central to the book's thesis is the claim that a deterministic view of technology is a fallacy. Different choices could have been made in developing AI, away from automation and in directions more beneficial to society. However, what these directions might be are not really examined in any detail. A Christian redemptive approach to culture, while resonating with this nondeterministic view, would want to frame the argument in terms of responsible design choices involving stewardship, love for neighbor, and avoiding technological design that dumbs down humanity or leads to addiction or results in idolatry.

The final chapter outlines how Progressive movement activists, reformers, and journalists changed the views of the public, organized politically, and challenged institutions and government in America in the late 19th and early 20th century, leading to a redistribution of power and a change in direction for technological progress. A three-pronged formula is proposed as a way out of our current predicament: (1) "altering the narrative" and "changing the norms," (2) "cultivating countervailing powers," and (3) providing "policy solutions." How this would work is then sketched out using examples, such as how the environmental movement worked to redirect technologies. The authors' proposals for "Remaking Digital Technologies" were rather weak. Their suggestion that "improving productivity in workers' current jobs" (p. 394) is precisely what companies such as Microsoft would argue they are offering through their "co-pilot." I was also not convinced by the longer section on policy solutions that missed any reflection on proposed standards for responsible AI or policy proposals, such as the EU AI Act, details of which have been under discussion for the last few years.

In the complex world of social history and economics, it is often hard to prove a causal link between one factor and another, let alone when there are several variables in play. No doubt other economists and social historians will have a different take on the role of power and technological progress in shaping our world, and Christians will want to provide an interpretation through the lens of biblical truth. This book does, however, provide a helpful counterpoint to the prevailing AI vision that innovation is essential for growth and prosperity and that regulation stifles progress.

Reviewed by Jeremy Peckham, AI entrepreneur, ethicist, and former CEO, Bewdley, UK.

DOI: https://doi.org/10.56315/PSCF3-25Costa

RADICAL BY NATURE: The Revolutionary Life of Alfred Russel Wallace by James T. Costa. Princeton University Press, 2023. 552 pages. Hardcover; $39.95. ISBN: 9780691233796.

Most people, when asked, "Who is Charles Darwin?," would quickly respond, "Isn't he the survival of the fittest guy?"; or at least make some reference to evolutionary theory. If the same people were asked, "Who is Alfred Wallace?," they probably would furrow their brows and make some guess ("Isn't he the Braveheart guy?!") or proclaim they had never heard of him. But Alfred Wallace (1823–1913) should get as much credit for formulating the theory of evolution as Darwin, and, I would guess, if he were pushed, *more* credit, according to James T. Costa, the author of *Radical by Nature: The Revolutionary Life of Alfred Russel Wallace*.

Costa's 419-page tome (not counting chapter notes, figure credits, and index) was written to mark the 200th anniversary of Wallace's birth. The author argues that Wallace is "not well enough known" in spite of many recent publications documenting Wallace's life and accomplishments (p. xi). Costa attempts to make this book unique in several ways. He hopes that what he has written is an updated story of Wallace's life; the book does include information from newly discovered notebooks and manuscripts. He also wanted this biography to explore Wallace's life "as he lived it, in a narrative that traces the arc of the remarkable adventures, poignant personal life, and breathtaking sweep of thought of this singular human being" (p. xi). Costa intentionally includes vivid descriptions of the landscapes and geology of the places where Wallace collected his vast number of specimens, as well as the cultural context of his life and work.

The biography begins with Wallace's life as a child. His family, although having limited finances, yet encouraged Wallace's innate creativity, reading, love of the outdoors, and intellectual exploration. It is clear that Wallace's keen sense of observation—particularly about place—was born along the River Usk in South Wales. As a young teen, Wallace traveled to London where he spent six years as a surveying apprentice. His curiosity and intellectual pursuits were nurtured in this environment in which he explored science—especially geology, entomology (he loved beetles!), and botany—in the

Zoological Gardens and the Hall of Science. He even started lecturing and writing.

Costa's narrative about Wallace's first two decades of life includes not only information about how he was shaped as a scientist, but also how he was shaped politically and socially—especially by the Owenites, a utopian socialist group, known for promoting cooperation, free thinking, and social equality. They advocated a form of religion based on reason and human goodness. The Owenites were therefore unimpressed by societal hierarchies; their views likely emboldened Wallace to debate with anyone, regardless of social standing. Since Wallace was a self-trained biologist, his courage in engaging the scientific establishment probably stemmed, at least in part, from his interaction with the Owenites.

The majority of this book is dedicated to vivid and detailed descriptions of Wallace's travels, from South America to the Malay Archipelago. The level of detail, including lists and descriptions of collected species, may be overwhelming to some readers. I found the tales of the challenges Wallace faced, fascinating. I was captivated as I pictured how Wallace figured out ways to prevent ants from devouring his precious specimens; escaped shipwrecks; overcame disease, fire, hostile native peoples, injury; avoided snakes; and more. Through all the challenges, Wallace collected, preserved, and sent his specimens back to Great Britain, along with drawings, descriptions, travelogues, and scientific papers. Some of Wallace's drawings as well as photographs and other figures are scattered throughout the book. In the center, there is a section of color photographs from Wallace's notebooks, family portraits, and some of his most interesting collected species.

Costa masterfully reminds readers of the relationship between Wallace's early interest in geology and the theory he was formulating as he connected the places he was in and the species he was collecting. Wallace's deft mind was never satisfied with thinking about discoveries in isolation—everything was related, and he carefully looked for connections between landscape and the creatures that inhabited it.

Toward the end of Wallace's travels, the author nicely begins to unfold the relationship between Wallace and Darwin, including, obviously, the publication of their seminal papers outlining their theories of evolution by natural selection. Costa describes their relationship throughout the book as cordial, even friendly, with Wallace never tilting toward any jealousy that it is Darwin's name more than Wallace's that is so tightly connected to evolutionary theory—even when their papers were first published. I found the correspondence between these two brilliant men fascinating. Darwin was strongly supportive of Wallace's scientific efforts.

Wallace's return to Great Britain after almost two decades of travel did not mean he slowed down. In addition to avid gardening with his wife Annie, with whom he had two children, Wallace sorted, studied, wrote, and spoke. His writings included papers, books, letters, and more. He wrote about his vast collections, published his travelogue, wrote on human evolution, biogeography, and a coevolutionary framework for Earth and life (p. 289). His writings were not restricted to science. Wallace wrote about spiritualism quite extensively, much to the disappointment of the scientific community (p. 314). He even seems to fall prey to a God of the gaps theology (although more of an intellectual "higher power" of the gaps theology for Wallace) when he claimed that human brains were too complex to arise by evolution alone.

Wallace's writings also heralded social justice causes, harkening back to the influences of Owenites. His trip to the United States sparked interest in women's education and rights. During this trip, he traveled to California and met John Muir. These experiences were important in generating his new interest and in his writings about environmentalism, conservation, and land ethics. Toward the end of his life, he even began thinking and writing about extraterrestrial life. Wallace remained an active and vibrant scholar until his death at nearly 91 years old. His last two books were published during the last year of his life.

It's quite clear to me upon reading this biography that Costa is a "Wallaceophile." If I were to find something to criticize about this book (besides the sometimes-exhaustive descriptions of Wallace's collections), it would be that Costa is quite forgiving of any of Wallace's shortcomings. With the exception of chapter 12, "A Tale of Two Wallaces?," in which Costa describes Wallace's extensive foray into spiritualism, Costa seems to write about Wallace in the most favorable light possible. Any suggestion, for example in Wallace's own writings, that he thinks of the people groups he encountered during his travels as less human than civilized Europeans, is excused. Perhaps Costa is right. Wallace was an extraordinary person, one I came to appreciate deeply after reading this book, but we all have our blind spots and Wallace was no exception. In spite of this, I recommend this book to anyone wanting a deeper understanding of one of the most important scientists of the 19th century. It gave me a profound appreciation of the physical danger involved in procuring such an extensive collection of species, the intellectual depth required to pull his vast observations and experiences into a compelling theory, and the intellectual risks Wallace was willing to take to synthesize all his life's experiences. Wallace's life is one worthy of a book of this length and detail.

Reviewed by Sara Sybesma Tolsma, professor of biology, Northwestern College, Orange City, IA 51041.

DOI: https://doi.org/10.56315/PSCF3-25Hannam

THE GLOBE: How the Earth Became Round by James Hannam. Reaktion Books, 2023. 376 pages. Hardcover; $27.00. ISBN: 9781789147582.

One might summarize this book with the classic questions: "What did they know? When did they know it?" That's far too brief a summary, but those are the questions this book addresses, along with how knowledge of the globe spread. James Hannam has given us a well-documented history of belief in a spherical earth from ancient times to the present century.

The author is a British historian of science with a physics degree from Oxford and a PhD in history and philosophy of science from Cambridge. His best-known previous book is *God's Philosophers: How the Medieval World Laid the Foundations of Modern Science* (in the UK), and retitled in the US as *The Genesis of Science: How the Christian Middle Ages Launched the Scientific Revolution*. While his religious beliefs were not completely clear to this reviewer from reading the present book, some online postings indicate he is a Catholic.

Globe is divided into 23 chapters, plus an introduction and an afterword, in about 300 pages. These are followed by about 30 pages of references documenting his sources and 16 pages of bibliography, as well as a thorough index. As one might expect, the chapters are arranged roughly chronologically from ancient Babylon and Egypt up through the Greeks, Romans, Medieval Europe, and on to today. There are separate chapters dealing with India and China throughout many centuries, as well as Persians, Judaism, Christianity, and Islam. The information is often densely packed and it is possible to get lost in details. Historians will find all the details and references they could wish for, while more casual readers may want to look at the bigger picture and pursue details only in sections they find of particular interest.

Today we all know the earth is spherical, but as we look around us on a daily basis the earth appears flat. In ancient times, the idea of a flat earth seemed entirely reasonable. So how did the idea of a spherical earth arise? There are a number of simple observations indicative of this, but many people were not in a position to recognize them. When ships head out to sea one can see the evidence as ships' hulls disappear from view before the tops of their masts. The shadow of the earth on the moon during a lunar eclipse is always curved, but one must understand that the eclipse is a shadow, not an astrological omen. Anyone who travels large distances can see the changes in the night sky as northern stars fall below the horizon when one heads south and southern stars appear higher, but the distance traveled must be hundreds of miles, not tens of miles. All these pieces of evidence came together for the ancient Greeks, but not for anyone else. I will summarize some of the development, hoping this will spur *PSCF* readers to dig into the book itself.

Both ancient Babylon and ancient Egypt built up considerable astronomical knowledge, the former for astrological purposes and the latter to calibrate a solar calendar to predict Nile floods. The shape of the earth was not really a concern for either. There were Greeks, however, who thought about the shape of the earth. One must here be cautious, since claims that Greeks believed in a spherical earth very early may be translation confusions (the Greek word for "round," as in English and Latin, can mean either a disk or a sphere), and other claims are erroneous attributions by later writers. Nevertheless, by the fifth century BC, the Greeks had developed a model of the flat earth as a circular disc surrounded by a spherical universe. In this model, the sun was below the disk at night, but its light still illuminated the moon and the shadow of the disk could cause a lunar eclipse. Furthermore, the moon itself could block one's view of the sun, causing a solar eclipse. Thus, eclipses were recognized as physical phenomena rather than omens; this observation was major progress in scientific understanding.

By the fourth century BC, there were apparently ideas of a spherical earth discussed among a number of Greeks, and some of Plato's writings indicate he believed this. Hannam draws a distinction between believing, as Plato did, and knowing, as Aristotle did. Knowing involved a good deal of evidence and an underlying theory (even though much of Aristotle's theory was actually wrong). Hannam therefore credits Aristotle as the first to know the earth was spherical. This knowledge then spread in the lands conquered by the Greeks, and by their successors, the Romans, a few centuries later.

PSCF readers may be most interested in the chapters dealing with Jewish and Christian beliefs. Hannam indicates that he considers both the Old and New Testaments to have been written from a flat earth perspective. He rarely deals directly with biblical texts but does raise an interesting point regarding passages dealing with the temptations of Christ. Matthew wrote that Satan took Christ to a high mountain to view the kingdoms of the world (possible only on a flat earth), whereas Luke (presumably having had a good Greek education) says Satan took Christ to a high place. The wording in the original Greek text is definitely different, with the latter allowing the possibility of a vantage point above a spherical earth while not confusing readers who believed in a flat earth. We probably will have to wait until we reach heaven to learn what happened and whether this wording difference is significant.

This reviewer, like many others, was long ago taught the myth that Columbus had to convince Spanish authorities that his sailors were afraid of sailing off the edge of

the earth, and that the earth was spherical. The reality was that Europeans at that time were well aware the earth was spherical, and the major issue for Columbus and Spanish authorities was how long the trip would be and whether the ships could carry enough food and water for their crews. The myth relating to Columbus traces mostly to a highly fictionalized biography of him by Washington Irving, amplified by others who wanted to make Christians (especially Catholics) look bad by pushing the false idea of warfare between science and Christianity. Unfortunately, the myth has been very slow to die out.

Who is this book for? I could imagine a history of science course for upper-level undergraduate or graduate students based on it, or selected parts being assigned in such a course. The audience for the book, however, should be much larger. Readers with an interest in history of science or philosophy of science would probably find it interesting and would learn from it. Those who primarily want the bigger picture may want to skim over some details. Anyone who wonders how the spherical earth idea reached and was received by non-western cultures is encouraged to read the book.

Reviewed by Kyle Cudworth, former director, Yerkes Observatory, Williams Bay, WI, and professor emeritus of astronomy and astrophysics, The University of Chicago.

Philosophy of Science

DOI: https://doi.org/10.56315/PSCF3-25Metzinger

THE ELEPHANT AND THE BLIND: The Experience of Pure Consciousness—Philosophy, Science, and 500+ Experiential Reports by Thomas Metzinger. MIT Press, 2024. 648 pages. Paperback; $80.00. ISBN: 9780262547109.

What is consciousness and how can science fruitfully study it? In this book, Thomas Metzinger proposes that the experience of pure awareness occurs without "subjectivity" and will help science uncover the "core causal factors" underlying consciousness. Science can then build on this minimal model for a more comprehensive theory. However, consciousness studies face a major problem: "Three decades after the Association for the Scientific Study of Consciousness was founded in 1994, we still do not even know (or cannot agree on) what precisely it is that needs to be explained" (p. xiv). Toward a solution, Metzinger contends that pure awareness is the simplest kind of experience, namely, the experience of awareness *as such*. With this hypothesis, science might verify whether pure awareness is the phenomenal-neurological boundary between the conscious and the unconscious. Believing that meditation helps people access pure awareness, Metzinger surveyed over 1,400 meditators who have experienced this phenomenon, labelling this the minimal phenomenal experience project (MPEP) and, in this book, reports more than 500 of the 841 narratives from the project. The result: he identifies phenomenal markers that help neuroscience map the causal correlates common to all conscious experiences.

Grouping meditative reports by chapter, Metzinger describes experiences of awareness that come from diverse meditative practices. Though he includes statistical analysis (from the MPEP), he concentrates on filtering reports by qualitative criteria. In each chapter, he selects reports from the narrative part of the survey and then groups them into phenomenal categories. Metzinger investigates over thirty experiences, some of which overlap with ordinary wakeful life (e.g., peace). Others (e.g., luminosity) are less familiar. Several are even difficult to describe without paradoxical metaphor (e.g., timeless change). Intended for a general audience, the chapters are readable and, typically, brief. Since jargon is unavoidable, a glossary clarifies new and abstract concepts. Other virtues of the book: Metzinger proposes a methodology for neuroscience to isolate and reproduce pure awareness, and he also suggests philosophical lessons about how pure awareness informs the theory of evidence. Overall, his reflections might inspire psychology, neuroscience, and philosophy with new phenomenal concepts.

As his main contribution, Metzinger introduces minimal phenomenal experience (MPE) as a trustworthy way of investigating consciousness. Such experiences are the simplest kind —causally and experientially—that we in fact have. In their narrative responses, meditators report either no discernible mental contents (i.e., an experience without a noticeable object) or contents "along with the deeper nature of consciousness" (p. xiii). According to Metzinger, pure awareness is a candidate MPE. He speculates that pure awareness might be the experience of the capacity to know—but without any known object. In his scientific aim to isolate MPE, Metzinger makes two methodological assumptions: (1) Introspective knowledge defines the target for the scientific investigation of consciousness; and (2) if a state is experientially simple, its neurological basis must be correspondingly simple. Without these assumptions, his study cannot help science uncover the neuro-correlates of conscious experience.

Metzinger weaves three major themes throughout his book. First, pure awareness occurs as a global way of being conscious, without discernible contents, and, at times, as a state with ordinary experiences as contents. In full-absorption episodes, for example, meditators report being conscious but without thought and perception, without a localized body-experience, and without felt agency and self-awareness. Meditative experiences in which one is fully absorbed are ineffable but later reportable. If they are states of pure awareness, the only reportable feature is the quality of awareness. As a state

combined with recognizable contents, pure awareness transforms the meditator's perspective; for example, with heightened senses, one feels as though one sees the world as it is for the first time. The visual contents and the quality of awareness are both present. As its global modes and states suggest, if pure awareness involves the most generic phenomenal quality, then experiences are irreducible to contents specific to objects and their properties.

Second, pure awareness alters meditators' familiar embodied experience as thinking, active selves. Awareness, for example, widens as though the body expands. Bodily boundaries dissolve, attenuate, or form the limit of awareness, leading to a felt spatial expansion and oneness with everything. Senses merge, and the self-aware subject disappears. In particular, there is neither a spatiotemporal frame of self-reference nor the experience of a localized self who knows distinct objects. Ordinary wakeful experiences with their objects seem neither internal nor external. Everything but consciousness itself has a dreamlike virtuality. In addition, an impersonal observer—a "bigger" presence than the self—knows what one once knew as his or her wakeful self. Such "virtual" and "nondual" experiences, Metzinger believes, show that the purely aware are not self-aware. If so, being conscious doesn't necessarily involve self-awareness. In practice, a meditator can't mindfully observe the experience of pure awareness, which is just something one falls into and later recalls. Detractors might reply that meditators still have a perspective and are peripherally aware of themselves but without attending to themselves.[1]

Third, pure awareness combines with an experience of knowledge that is, given the above, independent of self-awareness. Based on this, Metzinger contends that the brain simulates our self-awareness, which is really a "complex hallucination" (pp. 80–81, 302–6, 353–71). Put differently, our internal "agent model" is a misleading "hologram," not a mental subject with self-knowledge. The "I" who thinks, perceives, plans, and acts is a fiction. Apparent experiences of the self don't merely fall short of knowledge; the purely aware experience their agent model *as a representation*. This internal modeling is normally transparent: a "virtual self appears, and it seems to be self-aware. Apparently, it really knows that it knows but the virtuality itself, the 'as if' quality is not experienced" (pp. 302–3). As the brain makes mere possibilities look real, a world outside us seems to appear and we experience "ourselves" so reliably that we have no experience of ourselves as a model.

Metzinger eliminates the self altogether from his ontology, a position that seems inconsistent with Christian teaching. The Bible addresses the nature of consciousness indirectly by assuming that we are moral agents and so capable of rational choice and personal knowledge.[2] We are significantly free—not only responsible for our actions but, at times, also worthy of praise and blame. We can, for example, resist our strongest urges for the sake of doing the right thing. A degree of free will justifies praise and blame—and, therefore, the possibility of reward, punishment, and atonement. Moreover, friendship with God is our greatest well-being. Friendships with good people and the shared worthy goals they presuppose involve self-knowledge and agency. If, as Metzinger claims, we don't have the mental properties that define personal agency and knowledge, Christian teachings that presuppose moral agency are false.

Despite Metzinger's careful research, I see no reason to accept his denial of the self, which implies that self-knowledge is merely apparent. His appeal to hallucinations is unconvincing for several reasons.[3] We can be fooled by non-veridical experiences, such as hallucinations. I can't always tell when I'm hallucinating. However, I can discover that I'm hallucinating X by investigating how X appears. Even if I can't *now* distinguish a hallucination from a veridical experience, it doesn't follow that they are indistinguishable and, therefore, the same experience. Moreover, hallucinations present properties—properties that the objects we hallucinate apparently have. If these properties are I-properties (e.g., purposes), they can't exist on their own. Whatever has them is an active, viewing subject—I or you. In addition, if meditators know their self-model *as* a model, they are still self-aware. No one can be aware of a model as such without also being aware of the thing modeled.

Why take meditative reports seriously, especially ones with religious framing that filter the experience? In answering this question, Metzinger implies that we can distinguish religious filters from the experience itself and thus sift the experience from its interpretation. After all, meditative reports are descriptively rich and arise out of diverse traditions. In his epilogue, however, Metzinger applies his findings about pure awareness to ethics and rejects the religious perspectives through which many meditators interpret their experiences. He believes that an ethic without religious belief, especially belief in the afterlife, is openminded. But without justifying his naturalism, Metzinger's stance remains ideology. Religious or not, ideology helps us integrate our experiences with our lives and, if true, clarifies those experiences. Religion doesn't necessarily distort them—although Metzinger claims otherwise.

Often overlooked by Western science, Metzinger explores features of pure experience that alter how we think about consciousness, especially the way it relates to the body, knowledge, and the self. The book is well worth the read for all interested in the phenomenology and science of consciousness.

Notes

[1]Brandon Rickabaugh and J. P. Moreland, *The Substance of Consciousness* (Wiley-Blackwell, 2024), 99–100.

[2]See Richard Swinburne, *Responsibility and Atonement* (Oxford University Press, 1989).

[3]See Walter Hopp, *Phenomenology* (Routledge, 2020).

Reviewed by Jonathan K. Metcalf, Department of Philosophy, Boston University, Boston, MA 02215.

Science and Faith

DOI: https://doi.org/10.56315/PSCF3-25Finnegan

CONJUNCTIVE EXPLANATIONS IN SCIENCE AND RELIGION by Diarmid A. Finnegan, David H. Glass, Mikael Leidenhag, and David N. Livingstone, eds. Routledge, 2023. 346 pages. Hardcover; $128.00. ISBN: 9781032139685. Ebook; $42.36. ISBN: 9781003251101.

"If scientists have explained a phenomenon, where's God?" The basic false forced choice underlying this question is that things happen either (1) because of divine intervention apart from nature's properties and processes, or (2) because of the operation of those properties and processes with no divine influence. This false forced choice underlies God-of-the-gaps reasoning: scientists' explanations leave God nothing to do. For instance, arguing against those who think that cognitive science explanations have done away with religion and God as superfluous, James Jones notes that "these findings do no such thing … The debunkers seem to be assuming that if natural processes are at work, nothing else can be. But no argument is offered to support that assumption" (quoted in Gijsbert van den Brink's essay, p. 218). This is an example of the false forced choice at work, an unexamined assumption of much of the sciences-faith literature. (Indeed, van den Brink seems to cede too much to this false forced choice too often.)

The edited collection, *Conjunctive Explanations in Science and Religion*, explores this milieu. The contributions are helpfully arranged in dialogue with essays and responses by pairs of authors. This arrangement invites the reader to join the conversation with open, critical ears to hear. Another strength of the book is the range of topics addressed by the authors: There are discussions of scientific and theological methodologies with respect to explanation, the question of design in evolutionary biology, consciousness, emergence, psychopathology and religious experience, role of scientific explanations in Christian faith, divine action, Ockham's razor, and how distinct scientific and religious explanations should be.

A weakness of the book is that most authors write and think in terms of "science" as a unitary explanatory enterprise instead of more accurately framing discussion in terms of multiple scientific disciplines—sciences (Alister McGrath's essay is a welcome exception). Explanations can vary widely across the subdisciplines of physics and among the fields of physics, biology, and psychology. The homogenizing of "science" in the abstract is at odds with the variety of scientific explanations authors deal with in specific cases of different disciplines. One could raise a similar complaint about the homogenizing term "religion" when the authors are dealing with different theological and experiential aspects of Christian faith (although David Brown's contribution seems to be an exception, focusing more on what is often critiqued as the "God of the philosophers").

A crucial complex question is how different explanations aimed at distinct questions relate to one another when focused on the same subject matter. An example is explaining why water is boiling in the tea kettle. A thermodynamics explanation would involve features such as heat, pressure, temperature, and volume of water. Meanwhile, a purposeful explanation would be in terms of my desire for some tea. These two explanations involve the same subject matter but are responding to different questions about the water boiling. A conjunctive explanation recognizes that thermodynamics and purpose questions are not only consistent with each other, but both explanations tell us more about the event in question than either explanation alone.

Although the book's authors typically do not develop this point (McGrath is an exception), scientists often engage in conjunctive explanations when there are multiple factors involved in phenomena (e.g., materials sciences, mechanics, electromagnetism, gravity, and thermodynamics in explaining an experiment and its outcomes). Moreover, it is always the case that scientific explanations leave out numerous factors and stability conditions defining the context making scientific explanations of phenomena possible. Philosophers of science have been helpful with filling in many unstated factors and conditions in scientific explanations. The implication is that conjunctive explanations in the sciences always involve more than just scientific materials and factors.

There also is no consensus about what a conjunctive explanation is (not surprising since there is no consensus about what an explanation is, whether in the sciences, theology, philosophy, or any other fields of inquiry). Several contributions illustrate that we are talking about different ways of knowing, the kinds of questions and explanations relevant to those ways of knowing, and how to put all this into fruitful conversations. Most pressing for the contributors to this book—and more controversial among Christians and non-Christians—is what it means to relate different explanations in sciences-faith contexts: If we have a well-attested scientific explanation for some phenomenon, the diversity of life on Earth for instance, what, if anything, can a theological explanation add (explored from a historical perspective in David Livingstone's and Rope Kojonen's essays)?

Theologian Andrew Torrance's essay helpfully argues that a scientific explanation of coming to Christian faith is compatible with a further philosophical/theological explanation from a materialist atheist perspective, a physicalist perspective, or one involving the Holy Spirit's work in a person's life. There is nothing about neurological influences in a person coming to faith that commits one to a materialist explanation being exhaustive. This inference requires further metaphysical assumptions such as reductionism and/or causal closure of the physical to any nonphysical factors. Tom McLeish's essay gives a good discussion with examples of why reductionism often fails in physics (so, why think it holds in any other domains as a general rule?).

Although space does not permit discussion of all the chapters in this book, Torrance's and McLeish's essays illustrate how it is possible to fruitfully situate scientific explanations within larger philosophical and theological frameworks that enhance our understanding of God's good creation. Christians, at least, do not have to be forced to choose between scientific and theological explanations; rather, we can foster mutually beneficial conversations among them.

Reviewed by Robert C. Bishop, Department of Physics and Engineering, Wheaton College, Wheaton, IL 60187.

DOI: https://doi.org/10.56315/PSCF3-25Scheitle

THE FAITHFUL SCIENTIST: Experiences of Anti-Religious Bias in Scientific Training by Christopher P. Scheitle. New York University Press, 2023. 224 pages. Hardcover; $35.00. ISBN: 9781479823710. Paperback; $28.00. ISBN: 9781479823727. Ebook; $35.00. ISBN: 9781479823741.

In *The Faithful Scientist,* Christopher P. Scheitle explores the identities and experiences of scientists-in-training and the impact of religion in their lives. The book makes a compelling argument about the connections among religion, race, gender, and diversity in science. Diverging from previous studies of scientists and religion, Scheitle focuses exclusively on graduate students training for scientific (biology, chemistry, physics) and social scientific (psychology, sociology) careers. The book combines quantitative and qualitative findings, drawing on 1,300 surveys and 65 in-depth interviews with both religious and unaffiliated respondents in the United States. Over six chapters, Scheitle pairs a unique dataset of statistical insights with rich quotations highlighting the lived experiences of students in the sciences. These chapters provide readers with an understanding of the religiosity of scientists-in-training, their beliefs about the relationship between religion and science, the stigma that religious students may experience in academic settings, the relevance of religion to peer and advisor relationships, the motivation that religion can provide to pursue scientific work, and the influence family life can have on the experiences of graduate students as they navigate their identity as developing scientists and as religious individuals.

Scheitle argues against a number of common misconceptions about the relationship between religion and science, such as the idea that top scientists who work at or attend more-prestigious institutions are more likely to be areligious (he finds minimal difference in religiosity based on institutional prestige), or that most scientists see religion as conflicting with science (less than a third of scientists in training hold this view, with the remainder seeing them as either independent or collaborative realms). These insights are likely familiar to those who study the intersection between religion and science or have read previous work by Scheitle, but these findings are also paired with many original insights unique to his sample of graduate students. Among these is discussion of the importance of the advisor-advisee relationship in graduate school and the potential salutary influence of having an advisor of the same faith. Considering the strong positive association between religiosity and the desire to start a family (among Scheitle's sample 75% who report being very religious say having children is very important to them compared with 29% who identify as non-religious), he also shows the increased importance of a department culture that values family and work-life balance for religious graduate students.

A particular strength of Scheitle's work is the way he frames religion as an often-overlooked dimension of diversity in scientific careers. As he shows, not only is religion important to the identities, motivations, and ethics of a sizable minority of graduate students in science, but it also overlaps significantly with other identities that are already underrepresented in scientific careers, such as racial and ethnic minorities, as well as women in the case of some natural science fields. Stigma or instances of being treated with less respect as graduate students due to gender or race were reported by 83% of women, 89% of Black students, and 74% of Hispanic students. For religious graduate students, mistreatment due to race and gender may be compounded by the fact that very (64%) and moderately (46%) religious students reported being treated with less respect due to their religion. In addition to leading students to question their identity as future scientists, religious students who felt they have been treated with less respect were also faced with the dilemma of whether to conceal their religious identity. As with race and gender, discrimination due to religion may lead to fewer students pursuing their field at a higher level, reinforcing their marginal status in the discipline.

One area in which the reader may question the generalizability of Scheitle's findings is the selection of universities from which he drew his sample. Respondents exclusively attend universities in the top 60 (according to *US News* rankings) of their discipline. Given that in some disciplines such as chemistry there are around

200 schools offering a PhD in the field, it would be reasonable to ask whether these programs are truly representative of the range of student experiences. The top 60 universities in a given field may be a model that is emulated by that discipline as a whole and is therefore an adequate sample, but it would have been interesting to see Scheitle discuss this dynamic further. There are also a number of potential policy implications from these findings that could have been covered in more detail.

The Faithful Scientist provides a strong background on the relationship between religion and scientific training revealing the potential challenges that religious graduate students face. Scheitle's research will appeal to a number of different audiences including sociologists, historians of science, and theologians. It would be a benefit to seminary classes on science and religion. Further, the richness of the qualitative data makes the book very readable for a general audience interested in learning more about the relationship between religion and science.

Notes

[1]Elaine H. Ecklund et al., *Secularity and Science: What Scientists Around the World Really Think About Religion* (Oxford University Press, 2019); Elaine Howard Ecklund and Christopher P. Scheitle, *Religion vs. Science: What Religious People Really Think* (Oxford University Press, 2018).

[2]J. Shulman, "Survey of Ph.D. Programs in Chemistry," American Chemical Society, accessed April 10, 2024, https://www.acs.org/education/students/graduate/survey-of-phd-programs-in-chemistry.html.

Reviewed by Brenton Kalinowski, PhD candidate, Rice University, and Elaine Howard Ecklund, Herbert S. Autrey Chair in Social Sciences, professor of sociology and director of the Boniuk Institute for the Study and Advancement of Religious Tolerance, Rice University, Houston, TX 77005.

DOI: https://doi.org/10.56315/PSCF3-25Garte

SCIENCE AND FAITH IN HARMONY: Contemplations on a Distilled Doxology by Sy Garte. Kregel Publications, 2024. 256 pages, foreword by Sean McDowell. Paperback; $21.99. ISBN: 9780825448157.

The author of this book of meditations, Sy Garte, is a now-retired distinguished biochemist who held tenured university positions at NYU, Pittsburgh, and Rutgers. He also served in administrative roles at the NIH and the Uniformed Services University of the Health Sciences. As an author of over 200 scientific papers, he is a first-rate scientist who brings nearly unparalleled scientific expertise to matters of concern for Christians who have an interest in scientific topics. Of particular note, Garte became a Christian quite late in his scientific career (in his 60s), finally rejecting the atheism he had espoused most of his life. (His conversion experience is described in his book *The Works of His Hands*, which has a foreword by Alister McGrath.) This is therefore quite a unique devotional book, for it reflects a full life of secular scientific experience and practical wisdom combined with the zeal of an adult convert. It is clear that Garte has had an inquiring mind and broad interests throughout his entire life, which help keep the book fresh and full of surprises. He grew up in Brooklyn where his mother was a piano teacher and his father a mandolin-playing chemist. Immersed in music, he attended the prestigious New York High School of Music and Art, but later discovered his greater talents lay in science.

There are 44 meditations (or "contemplations" as the sub-title refers to them), each about five pages long. In these, Garte expounds on an interesting scientific fact or idea and links it to some aspect of Christian life, doctrine, or theology. As in his introduction:

> The forty-four chapters are vignettes in various styles. Some include personal stories of my experiences as a scientist, first as an atheist and then as a Christian. And some discuss aspects of science that may be new to you, and even inspiring, in how they relate our faith to God. (p. 14)

There are some connections between the meditations, but generally they may be read in any order, or read only periodically without need of remembering exactly what came before.

One aspect of this book I found particularly helpful are the several resources Garte provides at the end of each chapter for further exploration of the topic of the meditation—usually a scientific topic but sometimes theological or philosophical. There are generally one or two references from two or three of the following categories: books, articles, blogs, and videos. The web-based references are conveniently linked to the author's website (sygarte.com). The videos in particular are excellent learning and teaching resources.

This book is suitable for many audiences, but I would say two categories would be especially well served: non-Christian scientists and engineers, and Christians who have an interest in science but have not done much reading in science and faith. Garte's primary goal as stated in the introduction is to demonstrate the harmony of science and Christianity, thus addressing the perceived conflict between the two, which he believes continues to be a stumbling block for many non-Christians. For a Christian reader, however, Garte's expert treatment of a wide variety of scientific topics and their ties to the Christian life is truly devotional and worshipful. "Distilled doxology" is the phrase Garte uses to describe his project, and indeed he is able to repeatedly take a different scientific topic, strip it down to its basics so that any educated lay audience can understand and, with his fertile imagination and life experiences, tie it to Christianity in original ways, producing a sense of wonder and appreciation for God's providence and grace.

Longtime readers in science and theology will be familiar with most of the topics and themes presented by Garte, but I found that his original approach and expertise were quite interesting and offered some fresh angles. For example, in one meditation he describes gene regulation networks and makes an analogy to Christian social networks and the body of Christ. In another meditation, Garte connects a discussion of the peer-review process in science, including ethical guidelines, with the ethics of living in Christian community and the judgments and corrections that are sometimes necessary there.

Some might describe the final wrap-up sentences of each meditation as too saccharine, but I found that these concluding sentences testify to the pure joy and thrill that Garte feels about his relatively new-found Christian faith—a sentiment that is bursting throughout this entire book. As I read through the meditations, I often found myself reflecting not only on the grandeur of creation and the goodness of God, but also on how amazing it is that the power of the Gospel could convert and call to Christian service an atheist scientist as prominent as Sy Garte.

Reviewed by Peter Walhout, Chemistry Department, Wheaton College, Wheaton, IL 60187.

TECHNOLOGY

DOI: https://doi.org/10.56315/PSCF3-25Kurzweil

THE SINGULARITY IS NEARER: When We Merge with AI by Ray Kurzweil. Viking, 2024. 419 pages. Hardcover; $20.21. ISBN: 9780399562761.

In summer 2014, on my advisor's advice, I began to explore transhumanism as a dissertation topic. I soon encountered Ray Kurzweil's 2005 book, *The Singularity Is Near*, and its forecast that around 2045 computer systems would attain superhuman intelligence. This development, according to Kurzweil, would lead to an age of rapid and unpredictable progress known as the "Singularity." Fundamental changes in the human condition would follow.

But there was a problem: whenever I mentioned Kurzweil, my frustrated advisor would respond, "Ugh! Why should we pay any attention to Ray Kurzweil? How could *he* ever know what will happen in 2045?" (I took such questions seriously, but maybe my advisor just wanted me to think!) My best answer was, "He may be a kook, but many accept his claims. Kurzweil's ideas are affecting society now, so they are worthy of study."

Today, with ChatGPT and other large language model (LLM) systems in everyday use, and more computational tools on the horizon, artificial intelligence (AI) has become a major factor in society. Its benefits are changing how people and organizations operate, how ideas are generated and refined, the way we identify and solve problems, and even how we go to the grocery store. Conversely, AI is a worry to many people, such as educators concerned about its impact on student learning; Noam Chomsky called ChatGPT "plagiarism software." In this context, Kurzweil's new book is a timely—and important—update on his ideas from nineteen years ago.

Kurzweil's introduction and first chapter reiterate his premise that information is the very essence of reality. He sees cosmological history as a series of information-driven epochs—from epoch one, "the birth of the laws of physics," soon after the Big Bang, to epoch six, "where our intelligence spreads throughout the universe" (pp. 7–8). Today, Kurzweil argues, we are entering epoch five, driven by dramatic increases in the cost-performance of computers. It will be, according to the book's subtitle, *When We Merge with AI*.

In chapter two, "Reinventing Intelligence," Kurzweil presents a brief history of AI before drawing comparisons between digital computers and the human brain. His focus is the development and future of brain-computer interfaces. Today's Neuralink trials will, according to Kurzweil, lead to a tomorrow when neocortex functions will occur in hybrid systems, biological brains working seamlessly with artificial computation machinery.

Chapters three through six analyze the potential for AI to exert an influence on important areas of human existence, imagining how they can be accommodated: consciousness and personal identity, quality of life, employment and meaning, and mental health and physical well-being. Kurzweil addressed these things in *The Singularity Is Near* and other books, but in *Nearer* he goes into greater depth, and in a more straightforward and factual manner. If his previous work was a Singularity sales pitch, his 2024 text is framed as an update or progress report.

In chapter seven, Kurzweil addresses forms of "peril" that will intensify with progress toward the Singularity. He recognizes that AI can be weaponized by terrorists and hostile states, but he does not directly address the possibility that sentient computers could become hostile toward human civilization. (For that possibility, see Nick Bostrom's 2014 book, *Superintelligence: Paths, Dangers, Strategies*.) Ever an optimist, Kurzweil believes people—individually, corporately, and working with AI—can identify and overcome such threats.

Kurzweil's final chapter is a six-page "Dialogue with Cassandra," an exchange between Ray and an unidentified being, perhaps an AI. Their discussion touches many top-level concerns that people express about futuristic technology. The dialogue effectively summarizes Kurzweil's views of the past and hopes for the future.

The book concludes with a 20-page appendix, 88 pages of notes and references, and a 19-page index.

My advisor's views notwithstanding, I am much more impressed with Kurzweil now than I was before, though I still have many reservations about his claims. *The Singularity Is Nearer* is a much better book, though it must be read with an attitude toward critical thinking. No human—or AI—can predict the future with accuracy, but it is often possible to identify consequenses and trends that will affect it. Even when they are wrong, futurists help us think through important matters in advance, in the here and now. Superhuman AI and the transhumanist future that may proceed from it speak to matters of theological importance. Believers would do well to consider these matters in advance, so I recommend *The Singularity Is Nearer*, but with some cautions.

First, although Kurzweil has some religious sensibilities, he is an atheist. His attitude toward religion was expressed long ago in *The Singularity Is Near*. Against its central place in human history, he dismisses religion as "deathist rationalization—that is, rationalizing the tragedy of death as a good thing" (p. 372). Asked if God exists, his (in)famous answer was "Not yet." He is waiting for his AI god to appear after 2045 in some kind of post-secularity superintelligence.

Kurzweil's atheism undermines his arguments. Unlike so-called Christian transhumanists, who also aspire to transcend the human condition through technoscience, his notions of transcendence are without roots. He relies on human conceptions of good or bad, ethical or not, without links to God or anything else that is objectively transcendent. So, he would optimize many things, but it seems progress and optimization only mean getting something he wants, nothing more.

Second, even before his Singularity, Kurzweil believes in predestination. He consistently describes computation progress as *inexorable, inevitable, necessary, destined, fated,* and other terms of certitude. He correctly anticipates social disruptions on the way to the Singularity, but he is unyielding about their resolution; society shall yield. Limits are intolerable and unsustainable; for in Kurzweil's view, informational determinism is built into the cosmos. Yes, short-term delays are possible, but our technological destiny shall have its way.

Third, like its predecessor, *The Singularity Is Nearer* is a sales pitch, though more informative. Consider again what transhumanists promote: a future that is, quite literally, dehumanized. Although created in the image and likeness of God, with physical bodies like our Lord Jesus, biological human beings are to be replaced, our cognitive faculties disembodied, our minds uploaded into computer systems. However, when the Singularity is past, will anyone other than transhumanists regard the new world's inhabitants as human? Kurzweil's 2005 subtitle, *When Humans Transcend Biology*, reveals the goal, but transcendence that eliminates our biology is inherently dehumanizing.

The Singularity Is Nearer has a softer tone, with a subtitle less offensive to those who love humanity: *When We Merge with AI*. It seems that "we" are retained. The claim is that human beings have always loved their tools, haven't they? So, transhumanists aren't doing anything different! Nothing has changed, even as they would fundamentally change our existence. Kurzweil and his allies want to minimize resistance to AI bliss, so for marketing purposes, human life, faulty as it is, will remain, at least in their rhetoric. Nevertheless, the book makes it clear that AI will dominate our being, progressively changing and eventually eliminating our created nature. Kurzweil's dream remains inhuman.

The transhumanists leave many important factors out of the picture. Their future is not defined, yet they claim it is inevitable? May not society say no? Should not governments regulate AI? What does Christian faith have to say about technology and the future? With concerns like these unanswered, Kurzweil's claims are empty, distasteful, and impossible to swallow. Perhaps my advisor was right after all.

Reviewed by David C. Winyard Sr., Department of Engineering, Grace College & Seminary, Winona Lake, IN 46590.

THEOLOGY

DOI: https://doi.org/10.56315/PSCF3-25Sapolsky

DETERMINED: A Science of Life Without Free Will by Robert M. Sapolsky. Penguin, 2023. 528 pages. Hardcover; $35.00. ISBN: 9780525560975.

and

DOI: https://doi.org/10.56315/PSCF3-25Mitchell

FREE AGENTS: How Evolution Gave Us Free Will by Kevin J. Mitchell. Princeton University Press, 2023. 352 pages. Hardcover; $30.00. ISBN: 9780691226231.

For almost as long as we have written records, humans have been discussing how free our will is. In ancient times, the constraining factor was typically the gods or fate. There are still today some theologians who believe a proper understanding of the divine compels them to recognize what Luther called "the bondage of the will." That is, on theological grounds, they deny free will. More common now, however, are those who deny any room for free will on the basis of what they consider to be a proper understanding of science.

Prominent among the latter is Stanford biologist and neurosurgeon Robert Sapolsky, whose book *Determined: A Science of Life Without Free Will* argues that there is no free will and that if there is no free will, then it is wrong

to hold people morally responsible for their actions. His argument against free will rests on two main premises:

1. We know the laws of physics well enough to say that freedom cannot be a property of material entities.
2. Human beings are nothing but matter.

I agree with the claim that there are always conditions around free will, and so to some extent this can condition moral responsibility. Nonetheless, whereas Sapolsky accepts the antecedent (there is no free will) and thus is forced by logic into what he calls the "nutty" consequent (denying moral responsibility), I can't bring myself to believe that people are never morally responsible, and so I have to deny the antecedent. The irony of this is that if Sapolsky is right, then I can't help coming to that position! And I can no more be held rationally responsible than morally responsible on Sapolsky's account. Everything that happens is just the result of the initial conditions and the immutable laws of physics. That is a grim view of the world.

Some will respond that Sapolsky is right about the first premise, but then also claim that we humans have immaterial minds or souls, and that this is the origin of our free will. For us as Christians, that isn't a ridiculous proposition: we are committed to the existence of an immaterial personal being (or rather, tri-personal being), and we believe that such a God has free will. So, I won't claim this response defending free will is unreasonable. But this implies a substance dualism (between physics/brain and mind/soul), and I am not convinced that some kind of substance dualism of human beings is necessary to preserve free will. I am more interested in the project of seeing the continuity of ourselves with the rest of the created order, even though in some ways we are remarkably different kinds of beings.

Is there then a way of showing that free will could have emerged from the evolutionary process that produced our bodies? A new book, *Free Agents: How Evolution Gave Us Free Will* by Kevin Mitchell, claims to do just that. Mitchell is a professor of genetics and neuroscience at Trinity College Dublin. He does not argue from religious grounds at all, and sometimes makes sweeping and unjustified assertions that go well beyond science: "There is no cosmic purpose at play—merely thermodynamic tendencies" (p. 42). What kind of empirical experiment would show that?! But it is true that the facts of science have to be interpreted, and metaphysical commitments certainly come into play.

Most significant in this regard is the ontology of life that Mitchell develops. I have always thought that what Holmes Rolston called the "Three Big Bangs" is a very helpful way of naming important ontological developments in natural history—even if the dividing lines are not absolutely stark: (1) the origin of matter/energy; (2) the origin of life; and (3) the origin of sentience. It seems to me that Sapolsky doesn't really recognize the significance of the second and third of these. For him, living things (and *a fortiori* sentient humans) are no different in kind than nonliving systems. There might be a greater degree of complexity to our material parts, but essentially we are the same as a tornado or a car (p. 5).

In contrast, Mitchell makes a very important contribution by showing the difference that life makes. He is not reintroducing the kind of vitalism that flourished in the eigtheenth and nineteenth centuries, but simply describing the different way of being that living organisms have, beginning with single-celled organisms. "Life is not a state; it is a process" (p. 26). The material particles, from which an organism is built, are constantly changing. What keeps it identifiably the same organism is a continuity of chemical processes occurring inside a membrane that separates it from the "outside" world. It takes in free energy to keep these processes going, and thus persists through time with a degree of independence from the environment around it.

But aren't these just deterministic processes? No! says Mitchell. Living things are not just input/output machines operating deterministically: "What distinguishes living organisms is that *they do things, for reasons*. They behave in a truly purposeful manner. This is not an illusion or just a convenient way of talking about them: it's the right way of thinking about them" (pp. 22–23). The ontological category of life must be described differently than matter/energy.

So how can a single-celled organism do things for reasons? There might be some difficulty with language here. Mitchell is not claiming that single-celled creatures have free will, or are sentient, or have moral responsibility for their actions. But he claims that they make decisions based on information—even knowledge—and that is fundamentally different from simply reacting to external stimuli. The information comes first from natural selection: "By continually selecting individuals that are most adapted to their environment, natural selection effectively packs knowledge about the world into the physical structure of living organisms" (p. 49). I found myself continually wondering whether words like "decision" and "knowledge" apply to single-celled organisms, but I am persuaded that whatever we call it, it is different than what goes on in nonliving things and begins to show the building blocks of our free will.

As organisms become more advanced by developing sensors, more information is conveyed into them, and they must develop control systems for acting on that information. The key is that they can represent sensory information internally without acting on it. The more sophisticated organisms become, the control systems guide action over longer and longer periods of time.

"Organisms develop internal systems of evaluation that free them from the brutal life-or-death judgment of natural selection. Crucially, all these systems are informational. Meaning becomes the currency of cognition" (p. 67).

Mitchell walks us through increasingly complex organisms like the hydra and *C. elegans*, and then those with bigger brains, nervous systems, and sensory equipment. We see the rudiments of self-knowledge developing when organisms must be able to distinguish between changes to the immediate environment they have made, versus similar changes made by other organisms. This is not yet the sort of free will that we have, but it is the development of subjective agency, which is another building block for full-blown free will.

Also necessary is that the future is genuinely open. For this, Mitchell leans on an interpretation of time and quantum physics developed by Lee Smolin and Clelia Verde in which what we experience as the present, is simply the transition from the indefinite possibilities of the future to the definite and unchangeable past. The present complete state of a physical system does not fully predict the next state of that system, and that opens the door for "higher-level features to have some causal influence in determining which way the physical system will evolve" (p. 164). My one course in quantum physics more than two decades ago doesn't qualify me to evaluate this interpretation.

The "higher-level features" Mitchell points to are called organizational structures or the functional architecture of the organism. This is where he loses me. He moves from control systems of greater complexity to a sense of self, to higher-level functional architectures that are responsible for choosing among possible options. Over and over, he emphasizes (rightly, to my mind) that it is not neurons or brains that have free will, it is the organism as a whole that does. But I don't see how that has been scientifically explained.

Mitchell has made an important point (which Sapolsky misses) about the categories of life being fundamentally different from nonlife. But now I wonder whether Mitchell has not quite recognized the importance of the third Big Bang: sentience. This too is a different ontological category (though, again, it might come in degrees and resist stark dividing lines), and therefore necessitates different categories of explanation. That doesn't mean you need something more than matter to make it work, any more than we need something more than matter to make life work. But I am not persuaded that we get free will and moral responsibility explained by functional architectures.

Free will is a capacity of sentient beings, and both free will and sentience have so far resisted scientific explanation (the latter being called the "hard problem" of consciousness). Maybe they won't always resist, but even if they do, that shouldn't make us doubt free will any more than we doubt sentience.

Reviewed by Jim Stump, vice president of programs at BioLogos and host of their Language of God *podcast. Jim's latest book is* The Sacred Chain: How Understanding Evolution Leads to Deeper Faith *(HarperOne, 2024).*

Letters

Gender Nonconformity in the Next Life

In the article by Haarsma et al., "Congenital Disabilities and Gender Nonconforming Identities as Parts of God's Intended Creation" (*PSCF* 76, no. 3 [December 2024]: 190–206), the authors build a case for acceptance of the disabled in the Christian community, especially for individuals with gender nonconformity. Their calling this to our attention is to be applauded. Haarsma et al. frequently suggested that a postlapsarian viewpoint has prejudiced the view of disabilities; they make a good scientific case for disabilities existing before Adam and Eve sinned. They further suggest that variation, largely due to mutation, is necessary for evolution to occur and is to be appreciated. However, they take some positions that I consider inconsistent with and misunderstanding of the evangelical church. (I felt it necessary to consult a specific, modern document, that of my church Christ Community Evangelical Free Church (EFC) "Exploring God's Design for Male and Female Flourishing in the Church," not at all suggesting it is representative of all evangelical churches or of all churches represented in the ASA. Gender nonconformity is mentioned with compassion, but no specific connection to anyone's sin is mentioned.)

We have all observed that insensitive Christians often ask well-meaning questions, but I think that the authors have exaggerated the degree this happens as a result of a mistaken belief that disabilities are due to the Fall in Genesis. I doubt that the average church-goer is concerned about theodicy when they offer to pray for a disabled brother or sister. The authors regret "mistaken pity" (p. 197) for the disabled; however, arguably "pity" is what motivates the use of adaptive technology for the deaf to hear and the blind to see.

The most obvious cases of gender nonconformity are genetic and apparent at birth or at least by puberty. Gender dysphoria has not been studied enough to know the causes but perhaps is due to brain anatomy and function, so that the individual's assigned sex at birth is not how they view themselves. Some may want physical or

psychological intervention. It seems to me that conforming to one sex or the other is a valid choice.

Haarsma et al. discussed eunuchs who were born that way as being gender nonconforming. If the individual wants to stay in a nonbinary condition and serve God, living a devoted single life certainly has the approval of Jesus in his call for the eunuchs who chose that way for the sake of the kingdom of God. Nevertheless, the eunuch by commitment must be joyful in service as a spiritual discipline; unfortunately, the quoted passage on the top of p. 194 stings with sarcasm. "'God wants to heal you!' She is undoubtedly thrilled by this opportunity … She doesn't have the intimacy that prayer or accountability or sarcasm require." Is it not possible to assume the best about the questioner and possibly build the intimacy? Eunuchs are offered a reward in Isaiah 56, as noted by Haarsma et al. and the authors of the EFC document noted above.

Will Jesus heal the disabled in the next life? Let us consider Jesus's first coming. Jesus opened his ministry in Luke 4 by saying he had come to bring sight to the blind. Jesus offered a choice to disabled individuals prior to most of his healing miracles. Most of them wanted the cure. There appeared to be no limit to what Jesus could do. The man born blind in John 9 was healed and could see; whereas, even with modern medicine, children who are born blind and have surgery later cannot adjust to the experience of sight and prefer blindness. Jesus must be able to rewire the brain. In Mark 8, the blind man got sight in two stages: firstly, he saw what he thought were trees walking about; and, secondly, he had full sight.

Haarsma et al. seem to suggest that some disabled individuals may not want to be healed (p. 193, top of right-hand column), thereby choosing to retain their identity, even in the next life (p. 198). It is true that Jesus's resurrected body bore his scars but that was to show Thomas that he was the same Jesus as was crucified. We surely take with us our memories that were conditioned by our genes and our neuroanatomy, but we will have a new body. Paul deals with the question of the resurrected body in 1 Corinthians 15:38, "But God gives it a body as he has determined and to each kind of seed its own body." All of God's seeds together will be a perfect garden.

Stephen Reinbold
ASA member

The Authors Reply to Stephen Reinbold

We thank Stephen Reinbold for his thoughtful letter and his spirit of promoting discussion. He asks, "Will Jesus heal the disabled in the next life?" We agree that there is much we do not know about what form our resurrection bodies will take. What concerns us in this article is harm caused in *this* life by common beliefs that all congenital disabilities resulted from the marring of God's creation by sin.

Imagine a young Christian with a congenital disability absorbing the default teaching of their church that—although they are not culpable for their condition and although the church loves and supports them—they are fundamentally flawed; they are not what they *ought* to be; they would not exist as they do if humans had not sinned. Now imagine that same young Christian raised in a church that teaches that—although their disability causes them difficulties—they are *already* fully human; they are part of God's intended diversity for humanity; their unique gifts and full participation are valued; they are accepted as they are even as the church supports them in whatever healing they might or might not seek in this life or the next.

Stephen points out that individual Christians might mean well when they say insensitive things. We agree. Poor theology can lead well-intentioned Christians to do harmful things, including many that have harmed disabled individuals both individually and structurally. As we point out in the article, our collective views of eschatology shape the world we build now, including its social structures and dynamics. Few denominations might formally teach that congenital disabilities are a result of sin, but such lay beliefs are commonplace, and there is no shortage of books and articles that make this claim.[1] We hope more Christians will discuss this. If our article is on the right track, churches could teach their members that at least some congenital disabilities are part of God's intended diversity for humanity. Better theology might prompt the same loving intentions to produce better action.

There is a parallel situation with gender nonconforming identities. (To be clear, we do *not* think gender nonconformity is itself a disability.) As Stephen's letter points out—and as several individuals on the "diving deeper" discussion pointed out—there is a wide variety of types and causes of gender nonconforming identity. Even within the narrower category of transgender individuals, there is a wide variety. One person might have known from before puberty that their psychological gender, and the social gender identity they desire, is at odds with their anatomical sex. Another person might have been cis-gender through mid-puberty, then entered a time of uncertainty, and after discerning for a while might have decided that they are non-binary (some such individuals, but not all, develop a clearer gender identity as they age).

Our question is this: What should churches teach to, and about, such individuals? Again, imagine a young

transgender Christian in two different churches. Both churches urge loving care for all individuals. Both churches teach that the young person is not personally culpable for their gender minority status. Both churches seek to lovingly come alongside the young person to help them avoid taking sinful actions and avoid cultivating sinful habits of thought. However, one church teaches that the existence of non-binary gender is a result of humanity's fall into sin. It teaches that, although the young person might not be culpable, any attempts to live or think in ways other than binary gender is to participate in that sin. Another church teaches that, although that young person's gender identity is uncommon, it is not a result of sin, but is, in fact, part of God's intended diversity for humanity. This church affirms the young person's identity and questions as normal, while helping them to find ways to live as a loving and obedient child of God. We think the latter theology is more likely to be correct. And the research literature strongly indicates that the latter approach correlates with healthier psychological outcomes for young LGBTQ+ Christians.

Note

[1]In addition to the literature we pointed to in our article, see, for instance, Kristi Upson-Saia, "Resurrecting Deformity," in Darla Schumm and Michael Stoltzfus, eds., *Disability in Judaism, Christianity, and Islam* (Springer: 2011) 93–122; Lisa D. Powell, *The Disabled God Revisited: Trinity, Christology, and Liberation* (T&T Clark, 2023); and Caroline Walker Bynum, *The Resurrection of the Body in Western Christianity, 200–1336* (Columbia University Press, 1995). Bynum's discussion included Bonaventure's view as fairly typical, according to "the elect will rise with all their deformities removed" (p. 254). Augustine too thought that we will be raised "with an amended and perfected body" (*Enchiridion*, chapter 87: "The Case of Monstrous Births"), though he thought some martyrs would bear marks of their martyrdom as signs of their faith.

Loren Haarsma
ASA Fellow

Thanks for Hal Poe's Article on C.S. Lewis

I was delighted to read Hal Poe's article, "C.S. Lewis on Science and Technology" (*PSCF* 76, no. 3 [December 2024]: 178–89). Although I have known and appreciated the works of C.S. Lewis for many years, it was helpful to have his scientific thought gathered into one review article. Hal revealed much more in scope and depth than I knew about. Not only does Lewis's work help in Christian apologetics, but it also bridges the traditional gulf between the humanities and the sciences that C.P. Snow famously wrote about ("The Two Cultures").

Back in 1980, I received an unexpected gift from C.S. Lewis. As one of the volunteers for the recently formed C.S. Lewis Institute in Washington, DC, I was helping to organize a symposium on the emerging topic of recombinant DNA, "The Church in the Genetics Age." I wanted to find a real practitioner in the field of genetic engineering, so I met with Dr. David A. Jackson, the scientific director of a new company called Genex Laboratories. David Jackson did not have a particular religious interest, but he knew of C.S. Lewis from his novel *Till We Have Faces*. It was this connection that intrigued him enough to join the symposium, and he provided authoritative and up-to-date scientific information about DNA for the event.

The C.S. Lewis Institute is still thriving through its Fellows programs in 24 cities around the US and the world. It began in 1976 through the efforts of volunteers who were challenged and inspired by another professor from Oxford, James Houston. The intent of the Institute was not to focus on the literary work of C.S. Lewis, but rather on the way that Lewis exemplified how a Christian can integrate personal and professional life. This, of course, is also a central interest of ASA.

Paul Arveson
ASA Fellow

American Scientific Affiliation

The American Scientific Affiliation (ASA) is a scholarly and professional society. We are an international community and fellowship of Christians engaged in the interface of vital faith-science questions. Founded in 1941, the mission of the ASA is interpreting, integrating, and communicating the discoveries of science with insights of scripture and Christian theology. *Perspectives on Science and Christian Faith* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community. The ASA Statement of Faith is at www.asa3.org → ABOUT → Statement of Faith.

PSCF Discussions

We encourage members to submit comments and questions on the articles published in this journal on the ASA **PSCF Discussion Forum** at www.asa3.org → RESOURCES → Forums → PSCF Discussion.

Diving Deeper Discussions (DDD) is a monthly series of Zoom discussions for ASA members and their friends to think more deeply about an article or book review published in *Perspectives on Science and Christian Faith*. The discussions are held on the second Saturday of every month at 2 pm Eastern time. Recordings are stored on the ASA YouTube channel. Upcoming DDD are posted as upcoming events on the ASA community calendar.

Canadian Scientific & Christian Affiliation

The Canadian Scientific and Christian Affiliation is the expression of the ASA in Canada. It was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science and Christian Faith* and the *God and Nature* magazine). The CSCA subscribes to the same statement of faith as the ASA; however, it has its own governing body with a separate annual general meeting in Canada.

Canadian Scientific and Christian Affiliation, PO Box 63082, University Plaza, Dundas, ON L9H 6Y3. Website: www.csca.ca.

How Do I Join the ASA?

Anyone interested in the objectives of the Affiliation may have a part in the ASA. Membership and subscription applications are available at www.asa3.org → MEMBERSHIP → Join ASA or Subscribe to PSCF.

Regular Membership: Open to all persons who give assent to our statement of faith and meet at least one of these criteria: (1) have attained a bachelor's or higher degree in a science-related discipline, where science is interpreted broadly to include any disciplines of natural and social science, health sciences, technology, engineering, and mathematics (such as but not limited to, anthropology, archaeology, economics, history, medicine, political science, psychology, and sociology), or (2) are philosophers, historians, Bible scholars, theologians, or other professionals whose vocational activity contributes to the intersection of faith and science. Regular members receive all member benefits and publications and take part in all the affairs of the ASA, including voting and holding office.

Associate Membership: Available to those interested who may not meet the criteria of a regular member but can give assent to our statement of faith. Associates receive all member benefits and publications and take part in all the affairs of the ASA except voting and holding office.

Student/Early Career Membership: Available to anyone enrolled in an undergraduate or graduate program, or to advanced high school students as well as to early career professionals (defined as the first three years from the last degree). Student/early career members are eligible to participate in all the affairs of the ASA except voting and holding office.

Friend: An individual or student wishing to participate in the ASA without giving assent to our statement of faith may become a Friend. All benefits apply with the exceptions of voting rights and holding office. Friend dues are the same as the selected membership type.

Subscriptions to *Perspectives on Science & Christian Faith (PSCF)* are available at $55/yr. (individuals), $100/yr. (institutions), and $20/yr. (student premier).

How Do I Find Published *PSCF* Articles?

Articles appearing in *Perspectives on Science and Christian Faith* are abstracted and indexed in the *ATLA Religion Database; Christian Periodical Index; EBSCO; ESCI; Gale: Cengage Learning; Religion Index One: Periodicals; Religious & Theological Abstracts*, and *Guide to Social Science and Religion in Periodical Literature*. Book Reviews are indexed in *Index to Book Reviews in Religion*.

Contents of past issues of *PSCF* are available at www.asa3.org → PUBLICATIONS → PSCF Academic Journal.

DOI: https://doi.org/10.56315/PSCF3-25Complete

American Scientific Affiliation
218 Boston St, Ste 208
Topsfield, MA 01983-2210

Phone: (978) 887-8833
E-mail: asa@asa3.org
Website: www.asa3.org

"Upholding the Universe by His Word of Power" Hebrews 1:3

Editorial

Articles

Book Reviews

Letters

Volume 77, Number 1 **March 2025**