

# ETHICS & MEDICS

MARCH 2022 VOLUME 47, NUMBER 3

A Commentary of The National Catholic Bioethics Center on Health Care and the Life Sciences

■ Also in this issue: “The Humanity of the Embryo in Its Origin,” by Rev. Felix E. Dias ■

## THE SEXES ARE NOT INTERCHANGEABLE

Colten P. Maertens-Pizzo



Modern culture increasingly sees biological sex as mutable. It has become popular to believe that sex is easily changed provided sufficient technique because it is context dependent. Katrina Karkazi, writing for *The Lancet*, exemplifies this mindset. She argues, “It is long overdue that we understand sex not as an essential property of individuals but as a set of biological traits and social factors that become important in only specific contexts, such as medicine, and even then complexity persists.”<sup>1</sup> This viewpoint is correct regarding the complexity of sex but sorely incorrect about sex mattering in only specific contexts. Sex is too deeply rooted in human nature to be as trivial as the article implies.<sup>2</sup>

A careful review of sexual differentiation during embryonic development clearly shows how sex resists even the sharpest of sophisticated attempts to alter it. Furthermore, a robust understanding of sexed embodiment recognizes the difference between merely appearing as a sexed individual and the substantial (functional and genetic) structure that underlies our actual sexed embodiment. What was once common knowledge must be reaffirmed: the significance of sex for human beings is not confined to one or a few contexts. Sex is a fact that touches the entire human experience.

Males and females are not interchangeable. This can be proved with the assistance of a standard medical textbook, which will be used in this defense.<sup>3</sup> I will also clarify a few myths and stereotypes about sexual development perpetuated by some gender and sex critics. Although they are correct to challenge gross stereotypes, they err insofar as they argue that sex is essentially mutable. The prevalence of this myth in popular culture is pervasive and has led some biologists to posit theories about sexual development belittling its reproductive aim.<sup>4</sup> Clarifying what we definitively know about sexual development for a wider audience is becoming increasingly pressing.

### Sexual Differentiation in the Embryo

Sexual differentiation during embryonic development is complex, yet it follows a simple principle: genotypic sex determines phenotypic sex. In other words, undifferentiated gonads are differentiated by the presence and activity of critical genes and gene complexes.

Differentiated gonads determine the development of the internal reproductive ducts and external genitalia. Although differentiating gonads can undergo ambiguous development, our criterion for measuring their development remains based on functional grounds.

Indifferent gonads have two structures critical for future sexual development and future functionality: the inner medulla and the outer cortex. An XX chromosomal complex initiates the regression of the medulla and the differentiation of the cortex into an ovary. An XY complex initiates the regression of the cortex and the differentiation of the medulla into the testis. It seems, then, that the presence of cortex and medulla in early embryonic development suggests a general capacity for the individual to develop either ovaries or testis. There is a general, though limited, sense by which this is true. The external genitalia of both sexes develop from a common anlage. The phallus develops into either the penis or clitoris, the urogenital folds develop into either the ventral penis or the labia minora, and the labioscrotal swellings develop into either the scrotum or the mons pubis and labia majora. In the absence of androgens, the external and internal features appear feminine.<sup>5</sup> However, appearances really can be deceiving.

The precursor structures for male and female internal ducts develop early in embryogenesis such that something of both sexes exists in the individual prior to differentiation. However, these precursor structures are more analogous to a sketch for alternate routes rather than the actual laying out of two roads. Since the differentiation of the gonads leads to a regression and reabsorption of the unneeded ductwork, any given human being cannot be both male and female even in potential. Biological sex is a committed development.

Consider male development. The medulla develops into a testis that directs the development of the seminiferous tubules, rete testis, and efferent ductules. In females the medulla regresses and the sex cords are reabsorbed. These regressions coincide with the secretion of sex-specific hormone production and distinct hormonal concentrations. Testes produce hormones called androgens, which promote the further development of male-specific ductwork. Androgens mature the Wolffian ducts and cause the Mullerian ducts to degenerate. Testosterone is the critical androgen for early development of the Wolffian ducts into the vas deferens, seminal vesicles, and the ejaculatory duct. After the Wolffian ducts develop, testosterone is converted into a hormone called DHT, which masculinizes the external genitalia.<sup>6</sup>

Female development is just as mutually exclusive. However, despite clear knowledge about sexual differentiation, many gender critics spread and popularize the myth that human beings are female before the activity of male-specific genes. Although gender critics are correct when they claim that biological sex is far more complex than historically and scientifically presented, their arguments have significant factual limits.

## Parsing Out the Complexities

Although it is factually true that the early embryonic body appears female in its general structure and shape, this fact is superficial. To believe otherwise demonstrates a failure to recognize an important difference between having a generic form supportive of the future development of either sex and actually having the genes and functional capacity necessary for sexual development as male or female. Sexual development depends upon root capacities from one's beginning that are genetic before they are operationally functional.<sup>7</sup>

Sexual development requires a host of genes and gene complexes specific to and exclusive between males and females, a point which is largely neglected by popular understandings of sexed embodiment. Not only does each sex have unique genes for its sexual development, the genes for sexual development that males and females share significantly differ in how the body of each sex expresses them. In other words, males can produce small amounts of estrogens and females can produce small amounts of androgens. However, they each produce and use these hormones in a way unique to their sex based on the location of their secretion, their kind and concentration, and the structures producing and interacting with them.<sup>8</sup>

Hormonal secretion is naturally intertwined with genetics. The development of functional gonads depends upon many individual genes and gene complexes, some residing outside the X and Y chromosomal structure. For example, Anti-Mullerian hormone (AMH) is responsible for the regression of the Mullerian duct in male differentiation. In females this duct becomes the fallopian tubes, uterus, and upper vagina. The gene for AMH is located on chromosome 19, which demonstrates that genes essential for sexual development are found beyond the commonly labeled sex chromosomes.<sup>9</sup>

There is also more complexity to the responsibility for sex-essential genes. It is commonly taught, for example, that presence of the gene SRY in males ensures male development.<sup>10</sup> This is misleading. At the beginning of male development, SRY triggers the differentiation and development of the testes.<sup>11</sup> After sufficient development, the testes produce AMH, which, as mentioned earlier, is located outside the Y chromosome. If the gene for AMH is defective, male development becomes frustrated. This simple observation demonstrates that there is no monolithic gene for male development. Other genes are necessary for functional testicular development.

Female development is just as complex. Here sex theorists are correct to challenge what they call a Dominant Y model of sexual development for "devaluing and neglecting female or female-identified biological processes" and "leading to explanatory gaps in the theory of sex determination."<sup>12</sup> The sexual development of the female body is just as active as the development of the male body, but we know less about ovarian determination because more effort and money went into studying male development.<sup>13</sup> It is clear that cultural bias has influenced how we understand the complexities of sexual development. Nevertheless, the facts of sexual development are clear enough to see through the haze of cultural influence.

Biologists are continually learning more about the complexity of genotypic sex.<sup>14</sup> Tragically, these findings are increasingly misused as evidence for oversimplified accounts of sexed embodiment. To counter this abuse, we need to better inform the popular imagination about the rootedness of sexual capacity. Most human beings have a natural capacity to develop exclusively as either a male or a female precisely because they have a sufficient set of sex-determining genes present throughout their genome.<sup>15</sup>

## Final Clarifications

Altering biological sex could occur only through an extreme factitious endeavor. First, the many genes responsible for present sexual development as either a male or female must be frustrated in their expression. Second, genes necessary for the development of the desired sex that are absent must be supplemented somehow. This is hardly natural. Medical professionals must be clear with their patients and pupils that human beings are either male or female.

We can summarize these needed affirmations as follows: No one can easily alter his or her biological sex, because sexual differentiation follows an internally determined course. Critical genes are present within one's genome and constitute his or her capacity to be male or female. The total set of genes that we have determines our phenotypic sex. Again, indifferent gonads at the early stages of embryonic development are precursors for later, functional structures that differentiate the body into a discrete sex.<sup>16</sup> Upon closer scrutiny, then, the female appearance of early embryonic sex is proved to be superficial, a kind of groundwork that merely appears female.

These observations help us to conclude that the article in *The Lancet* held tightly to an impoverished understanding of the depth and intimacy of sexed embodiment: "For those arenas where it's not clear what purpose sex designation serves, some question whether we need sex designation at all."<sup>17</sup> To the contrary, the purpose of sexed embodiment aims toward reproduction even when we see some functional ambiguity. Moreover, this purpose touches upon all aspects and avenues of our lives. Admittedly, however, we must be careful not to let this understanding ossify into a crass biological reductionism.

*Colten P. Maertens-Pizzo, MA, is a substitute teacher in the Archdiocese of Chicago Catholic School System.*

## Notes

1. Katrina Karkazi, "The Misuses of 'Biological' Sex," *The Lancet* 394.10212 (November 23, 2019): 1898–1899, doi: 10.1016/S0140-6736-(19)32764-3.
2. See Alexander Pruss, *One Body: An Essay in Christian Sexual Ethics* (Notre Dame, IN: University of Notre Dame Press, 2013); and Christopher Tollefsen and Farr Curlin, *The Way of Medicine: Ethics and the Healing Profession* (Notre Dame, IN: University of Notre Dame Press, 2021).
3. Walter F. Boron and Emile L. Boulpaep, *Medical Physiology*, updated edition (Philadelphia: Elsevier, 2012).
4. See Joan Roughgarden, *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People* (Berkeley: University of California, 2004); and Anne Fausto-Sterling, *Sexing the Body: Gender Politics and the Construction of Sexuality* (New York: Basic Books, 2000).
5. Boron and Boulpaep, *Medical Physiology*, 1115–1122.
6. Boron and Boulpaep, *Medical Physiology*, 1117–1119.
7. Tollefsen and Furlin, *The Way of Medicine*, 108.
8. Moran Gershoni and Schmuël Pietrokovski, "The Landscape of Sex-Differential Transcriptome and Its Consequent Selection in Human Adults," *BMC Biology* 15.7 (February 2017), doi: 10.1186/s12915-017-0352-z
9. Boron and Boulpaep, *Medical Physiology*, 1119, 1122.
10. Sarah H. Richardson, *Sex Itself: The Search for Male and Female in the Human Genome* (Chicago: University of Chicago Press, 2015), 127–128.
11. Boron and Boulpaep, *Medical Physiology*, 1124.
12. Richardson, *Sex Itself*, 138.
13. Fausto-Sterling, *Sexing the Body*, chap. 7.
14. Richardson, *Sex Itself*, 204, 208, 212–215.
15. Pruss, *One Body*, 95–102; and Tollefsen and Furlin, *The Way of Medicine*, 105–108.
16. Boron and Boulpaep, *Medical Physiology*, 1115–1124.
17. Karkazi, "Misuses of 'Biological' Sex," 1898.

## THE HUMANITY OF THE EMBRYO IN ITS ORIGIN

Rev. Felix E. Dias



An embryo has the potential to develop into all subsequent stages in the life of a human being, but it cannot develop into an embryo, because it already is one. We can die at any time after we are generated, but we cannot be said to be conceived or have begun at any time other than when we originated. Everyone conceived naturally and normally began their existence in this way and at this point. From this beginning, there has been continuous growth and development, constituted of several milestones within the continuum of our ontogeny.

The Catechism of the Catholic Church holds that the “soul signifies the spiritual principle in man” “by which he is most especially in God’s image.”<sup>1</sup> The Catechism also makes clear with reference to the Council of Vienne that “the unity of the soul and body is so profound that one has to consider the soul to be the ‘form’ of the body” and that this soul defines the human being; and further, that “spirit and matter, in man, are not two natures united, but rather their union forms a single nature.” Pope St. John Paul II’s encyclical *Evangelium vitae* which also referred to *Familiaris consortio*, taught that the human person is a “unified totality,” that is, “a soul which expresses itself in a body and a body informed by an immortal spirit.”<sup>2</sup>

This immortal, God-gifted, human-specific soul is an image of God, what makes a man a man, and that is of the essence in discussions regarding ensoulment of embryos. It is the part of us that is from God and willed by God, the part that makes us human beings and is created for no merit of our own to adore God for eternity in our resurrected body, in an eternal rapture of communion by the grace of his Love.

### Animation and the Soul

Some contend that since a high proportion of embryos die without undergoing successful implantation, embryos are not human before implantation. God would not allow so many human beings to perish without a life being lived, and therefore these embryos cannot be human at that age. Of course, this does not include later embryonic loss, stillbirths, or other prenatal deaths.

Animation was historically linked with quickening, a term for when the mother first feels the prenatal movements of her child. Theologian Rev. Joseph Donceel, SJ, posited that animation required the possession of a spiritual soul, which he also qualified abstractly as a human and intellectual soul, as distinct from vegetative and animal souls.<sup>3</sup> This enabled the conceptualization of delayed animation to suggest the infusion of the spiritual soul at some point after conception, the delay being the time between the beginning of the life of the embryo and the point when he was permitted to be declared alive as an ensouled human being.

However, since animation is connected to the status of being alive, and even the science of his day could well demonstrate that

we were alive from the time of conception, Donceel proposed the use of the term *delayed hominization* to mean the possession or acquisition of the requisite human soul. Today bioethicist proponents of human embryonic manipulation use both *animation* and *hominization* interchangeably. The term *hominization* fails since the embryo is already a human being.

### Potentiality of the Embryo

The concept of potentiality used in a finalistic or teleological sense can be useful in demonstrating that the embryo, who from a unicellular beginning proceeds to become an adult, is indeed the same human being. Therefore, if this adult is a person, then he was a person earlier as well.<sup>4</sup> The concept is abused, however, when someone who is deemed to possess active potential is deprived of personhood because he has not yet achieved this potential. The idea of potential is also abused when attributed interchangeably among subjects possessing intrinsically different natures. While a sperm has the potential to fertilize an oocyte, and the oocyte has the potential to be fertilized, it is specious to suggest that the embryo did not originate in the process by which the gametes cease to be, but is a mere progression in the ontogeny of the oocyte.

The embryo has the potential functionally, structurally, and developmentally to become a fetus based on the definition of these prenatal terms. So too does the toddler have the potential to become a youth and the zygote the potential to become a blastula; however, at no stage after a person is generated does he have the potential to become a human being, because he is a human being already.

There is a difference between the potentials inherent in human ontogeny, the progressive gaining of mental, psychological, intellectual, and sentient capabilities; and the fundamentally different phenomenon of the origination of a new human being. It is impossible for me to have the potential to become a human being even though I have potential to undergo various biological developmental processes and to gain in various intellectual aptitudes.

Functionally, or in terms of associated processes or competencies, the embryo may have the potential to become implanted, the fetus to be born, the infant to breathe, and the young woman to become a mother. The gastrula has the potential to become a neurula, the neural plate has the potential to become a brain, and the student has the potential to learn mathematics. He may develop the potential to do Fourier transformations in his head, to conceptualize superstrings, to see romance in a painting hung up in a gallery, or to give up his life to defend what he believes is true. But achievements of this sort do not confer personhood or hominin status—nor does failure to achieve these deprive him of his soul.

### Ethical Considerations

If human beings ipso facto do have souls, then as far as theologians may be concerned, the personhood of the human being in law needs to be reconciled with that nature. The human being cannot be subject to a legal definition that denies that nature. Yet if prevailing legal definitions of person are employed, he may or may not be included in the definition. Legal definitions are irrelevant as far as his worth is concerned. If human beings are body–soul unities, then there is no question of whether, when, or if ensoulment occurs.

To address the ethical considerations, it is essential to understand whether there is a human being present who has come into being naturally in marital love or the lack of it, microengineered



# THE NATIONAL CATHOLIC BIOETHICS CENTER

600 Reed Road, Ste. 102, Broomall, PA 19008 www.ncbcenter.org

## ETHICS & MEDICS

VOLUME 47, NUMBER 3

MARCH 2022

The views expressed here are those of the individual authors and may advance positions that have not yet been doctrinally settled. Ethics & Medics makes every effort to publish articles that are consonant with the magisterial teachings of the Catholic Church.

robotically under a microscope and cloned via nuclear transfer, or fabricated via cellular aggregation. If a human being *ipso facto* deserves respect, then age, size, and degree of development are irrelevant. So too are his capabilities or aptitudes, possession of philosophical attributes, circumstances of origination, or even his virtue or sinfulness. Likewise, if some entity does not deserve respect, then being born, grown, fulfilled, self-conscious, and able to choose to fight for his rights would not make him any more or less human or dignified.

The advancement in scientific knowledge and the growth of technological capability do not outpace morality—rather, the articulation of morals needs to become sufficiently refined to address scientific and technical novelties. *Donum vitae* referred to fertilization as the beginning of the life of a human being in the context of the evils of IVF, abortifacient birth control products, and outright abortion, but its authors had the foresight to generalize its principles as concerning the “fruit of human generation.”<sup>5</sup>

A human being should not be violated even if there is no God. If I were that tiny helpless human being, it would be me who would be manipulated and destroyed. Whether at a given time you are called zygote, morula, blastula, gastrula, neurula, embryo, fetus, infant, toddler, kid, tween, teen, youth, adult, or geriatric, it would still be you, and it would not depend on whether you were generated naturally in chaste marital love, artificially in a lab, or by any other means, nor whether you had a genome in common with your clone. Accepting that a human being is one of us and accepting his intrinsic worth is vitally important when the dignity due to all by virtue of our personhood may be taken away from us by the authorities because of disease, disaster, senility, or perceived end of usefulness.

One needs to ask why, in terms of therapeutic research, there is such impetus to move from mouse to man even though much that cannot be learned murinally could be gained from chimpanzees and bonobos, and why human embryonic stem cells are so keenly

desired when induced pluripotent cells suffice and adult stem cell research is neglected. With infertility, why are the millions of children around the world who need parents ignored in the headlong desire to create children unnaturally.

The tree of knowledge was forbidden, but the tempter promised that eating of the fruit would make one like God. Today there is a temptation to be a god instead of God, to make our fellow human being in the laboratory, to give and take life at will, to be omnipotent—at least over embryos. Ludwig Wittgenstein may have compared a meeting of philosophers in Cambridge to an outbreak of the bubonic plague, but the enduring power of the intellectual elites is evident in the laws, practices, and public opinion of today.

Bioethicists must harness their power in the pursuit of truth so that at least the legislators and scientists of tomorrow may believe in and do what conforms to the beautiful truth about the origin, dignity, and destiny of every human being. Original sin is real, but let us deny the inclination toward the fig, strive toward the olive, and seek the intercession of the great and powerful St. Michael the Archangel, who reminds by with his very name, *Quis ut Deus?*

*Rev. Felix E. Dias, MA, MEng, PhD, is an independent researcher in the Archdiocese of Colombo in Sri Lanka. He is the founder and former president of Cultura Vitae.*

### Notes

1. *Catechism of the Catholic Church*, 2nd ed. (Washington, DC: United States Conference of Catholic Bishops/Libreria Vaticana, 2016 update), n. 363.
2. John Paul II, *Familiaris consortio* (November 22, 1981), n. 11.
3. Joseph F. Donceel, “Immediate Animation and Delayed Hominization,” *Theological Studies* 31.1 (February 1970): 76–105, doi: 10.1177/004056397003100103.
4. Giuseppe Benagiano et al., “Early Pregnancy Wastage: Ethical Considerations,” *Reproductive BioMedicine Online* 22.7 (June 2011): 692–700, doi: 10.1016/j.rbmo.2011.03.008.
5. Congregation for the Doctrine of the Faith, *Donum vitae* (February 22, 1987), I.1.

