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

THE SEXES ARE NOT INTERCHANGEABLE

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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.”¹ 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.²

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.³ 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.⁴ 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.⁵ 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.⁶

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.