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Gender Identity

Do the brains of politicians and poets differ? Can we find a rice-grain of Beethoven's brain shared by all composers and a different rice-grain of Picasso's brain shared by all painters—anatomical markers of ability in performing and graphic arts? Perhaps. No one's looked. But it is known that the part of the brain controlling left-hand fingers is larger in string players than in anyone else.¹

As we have seen, among our vertebrate relatives, the two male genders of plainfin midshipmen fish have different brains, and in tree lizards, the three male genders develop with different hormone profiles. Ample biological precedent supports the hypothesis that different behavioral temperaments in humans, including gender expression, could spring from differences in brain organization. Might we, for example, detect differences in the brains of transgendered and nontransgendered?

TRANSGENDER BRAINS

Three rice-grains of brain in and around the hypothalamus are sexually dimorphic in males and females—SDN-POA, BSTc, and VIP-SCN. Of these, only BSTc differs between transgendered and nontransgendered people—this rice-grain of brain is perhaps a gender-identity

locus. The data supporting this claim may be thin but should be taken seriously.

Two studies have analyzed a total of thirty-four brains preserved in formaldehyde in a reference collection at the Netherlands Brain Bank.² The collection includes brains of people identified as heterosexual nontransgendered male, homosexual nontransgendered male, heterosexual nontransgendered female, and transgendered women with varied sexual orientations. Here's what was found:

1. Among nontransgendered heterosexuals, the males' BSTc was about 150 percent the size (2.5 cubic millimeters) and number of neurons (33,000) of females' (1.75 cubic millimeters and 19,000 neurons): straight males bigger than straight females.
2. For the homosexual nontransgendered males, the BSTc was the same as for the heterosexual nontransgendered males: gay males same as straight males.
3. Among the six transgendered women, the BSTc matched that of the nontransgendered women, not the nontransgendered men: transgendered women same as nontransgendered women. ←
4. For the one transgendered man examined, the BSTc size and neuron count fell squarely in the male range and outside the female range: transgendered man same as nontransgendered man. ←

The studies included photographs of the spots in the brain where the BSTc occurs, so comparisons are readily visible, supplementing the graphs and tables of data. Another finding was that the size and neuron count of the transgendered women didn't relate to the age at which they transitioned. The femalelike number of neurons in the BSTc of transgendered women is "related to gender identity *per se* rather than to the age at which it became apparent." The investigators suggest that the neuronal differences between transgendered and nontransgendered people are "likely to have been established . . . during early brain development,"³ just as testosterone organizes BST dimorphism in rodents soon after birth.⁴

The results are announced as though the traditional gender binary had been upheld, as though transgendered people had at long last been revealed as a rare form of intersex: "The present findings . . . clearly sup-

port the paradigm that in transsexuals sexual differentiation of the brain and the genitals may go into opposite directions and point to a neurobiological basis of gender identity disorder.”⁵ Similarly, an earlier paper from the same laboratory states, “Transsexualism is biologically conceptualized as a form of pseudohermaphroditism limited to the central nervous system, as the biological substrate of gender identity.”⁶

These studies actually subvert the gender binary rather than supporting it. The three sexually dimorphic neural clusters vary independently of one another, leading to eight brain types, not two. For example, let *P* stand for a large SDN-POA and *p* for a small one, *B* for a large BSTc and *b* for a small one, *S* for a large VIP-SCN and *s* for a small one. *P* might correlate with an XY chromosomal makeup, *p* with an XX chromosomal makeup, *B* with a masculine gender identity, *b* with a feminine gender identity, *S* with same-sex sexual orientation and *s* with between-sex sexual orientation (see next chapter). We can see that eight brain configurations occur: *PBS*, *pBS*, *PbS*, *pbS*, *PBs*, *pBs*, *Pbs*, and *pbs*. These might correspond to various arrangements of chromosomes, gender identities, and sexual orientations. Of course, many more brain varieties may be found if more size classes and more sections of the brain are counted. But even if brain variation is scored only in binary sizes, large and small, and only at three independent sites, then eight brain types result, not two. No scientific reason supports selecting two of these eight as normal while declaring the rest abnormal. Moreover, these eight types of brains can be plugged into bodies with at least two genital configurations—those with a penis, *C*, and those with a clitoris, *c*. Eight brain types and two body types then lead to sixteen people types: *PBSC*, *pBSC*, *PbSC*, *pbSC*, *PBsC*, *pBsC*, *PbsC*, *pbsC*, *PBSc*, *pBSc*, *PbSc*, *pbSc*, *Pbsc*, *pbsc*, and *pbsc*. You get the idea: brain-body combinations are limitless.

The discovery of more of these variable brain features will fill out the rainbow of brain morphology, dissolving any belief in a binary brain, just as the research on hormones dissolved the belief in a binary biochemistry. Nonetheless, medical scientists presently envision unraveling a cornucopia of “neurobiological diseases and disorders,” the “tip of the iceberg . . . for many sexually dimorphic brain areas . . . and related clinical disorders.”⁷ Not to worry—won’t happen. Our task as informed readers of science is to extract as best we can the data from the layers of medical prejudice in which they’re embedded.

The studies of transgender brains have revealed an organic counterpart to some of the variation in gender identity—a valuable finding. We transgendered people wish to say, “We told you so.” Coming out as transgendered means realizing something deep about ourselves. Why do some people find us more believable once the organic connection is evident? Couldn’t they have taken us at our word without dissecting six formaldehyde-soaked brains? } e

WHEN GENDER IDENTITY DEVELOPS

When does gender identity form during development? When and how do these BSTc regions form? Gender identity, like other aspects of temperament, presumably awaits the third trimester, when the brain as a whole is growing. In males, three periods during life show unusually high testosterone levels. One is in the middle trimester, when the genitals are developing; the second is around birth; and the third is at puberty. The time around birth may be when the brain’s gender identity is being organized—cognitive lenses that instinctively distinguish who will be emulated from who will be merely observed.

To determine when gender identity develops, a good strategy is to find an early limit and a late limit, and work in from these two end points. One clue that gender identity can’t occur much earlier than the third trimester of pregnancy is the absence of sex-hormone receptors from the brains of mid-trimester embryos. It has become clear that the external genitals differentiate before the brain does.⁸ Penis development, for example, depends on the concentration of testosterone and its products during the middle trimester. In cases of hypospadias—a common intersex form in which the urinary opening is not at the tip of the penis, but at some location on the underside—boys have gender-typical male identity and male gender-typical forms of play and presentation.⁹ Here penis morphology is not connected to male identification. The male hormones affecting gonadal morphology, which act in the middle trimester, apparently do not affect the brain’s later acquisition of gender identity circuitry.

Similarly, boys whose genitals are ambiguous at birth—*guevedoche*—mature at puberty into men and affirm a male identity. Originally stud-

ied in the Dominican Republic, more examples have now been investigated in Papua New Guinea, Mexico, Brazil, and the Middle East.¹⁰ Guedoche also show that the period when genitals form precedes that when gender identity forms. A low testosterone level when the genitals are forming affects genital morphology, but a presumably high testosterone level later on leads to male-typical gender identity.

Some XY people become intersexed because they have receptors that don't bind very tightly to testosterone. This trait, called androgen insensitivity syndrome (AIS), is X-linked. The genital morphology in AIS is variable, but unlike hypospadias and guevedoche, many AIS people identify as female. Presumably, the body's partial unresponsiveness to testosterone is not restricted to the time of genital formation, but lasts throughout embryonic growth, allowing some AIS people to develop female and others male gender identity.¹¹

In congenital adrenal hyperplasia (CAH), the adrenal gland produces more than the usual amount of androgen. In girls, these hormones masculinize the genitals, leading to a large clitoris and sometimes labia fused into a partial scrotum. CAH girls almost always mature identifying as female. The androgen produced from the adrenal gland, while higher than typical in girls, is apparently still less than that produced by the testes of boys. Hence a female gender identity develops, even though some impact on genital morphology is evident.¹²

Similarly, in other primates, genital masculinization and behavioral masculinization take place at different times.¹³ Taken together, these results imply that gender identity develops sometime after the middle trimester of pregnancy, when genital morphology is taking shape. At the earliest, then, gender identity forms about three months before birth, when the middle trimester ends and the third trimester begins.

Turning to the late end of the range, anecdotes and case studies reveal that gender identity must already be determined by several months after birth. Attempts to change a person's gender identity by rearing the child in one direction or another have simply failed, often tragically. Textbooks in medicine once asserted that a child's gender could be "assigned" by the child's upbringing. In 1997, however, a bombshell exploded in the field of child psychiatry: the textbooks were shown to be based on fraudulent information.

Textbooks claimed that "(1) individuals are psychosexually neutral at

birth, and (2) healthy psychosexual development is dependent on the appearance of the genitals."¹⁴ The capstone evidence for this belief came from a case of a baby boy whose penis was irreparably damaged during a circumcision procedure at seven months and who was reassigned at the age of seventeen months to live as a female. The boy's name was changed to a girl's name (Bruce to Brenda, originally reported as John to Joan), and he was raised as a girl. His testicles were removed, and a semblance of female genitals was surgically constructed in their place at twenty-two months. Female hormones were prescribed to begin at puberty. Because the boy had an identical twin whose penis was not damaged during circumcision and who was raised as a boy, a comparison was possible. The supervising physician, John Money, a famous and powerful professor at Johns Hopkins University, reported in 1972 that the boy reassigned to live as a girl was developing into a perfectly typical girl, interested in "dolls, a doll house, and a doll carriage," in contrast to his brother's interest in "cars, gas pumps, and tools."¹⁵ On this basis, the textbooks taught that gender identity is determined by the way the baby is raised.

Given what's known about sex hormones and development, the received psychological wisdom that babies are psychosexually neutral seems highly unlikely, and the theory that we figure out as babies what our gender is by looking at our genitals in the mirror seems farfetched. Nonetheless, this dogma went unchallenged in medicine for twenty-five years, until courageous researchers, together with the courageous boy himself (now a man), spoke up.¹⁶ In fact, "Brenda" never accepted the identity imposed upon him and transitioned at age fourteen to living as a teenage boy, changing his name to David. The medical reports about his supposedly successful development as a female were not true. He is now married and the father of an adopted family.

One of the authors of the exposé admitted to being "shit-scared" in coming forward with the truth, and the man whose sex had been reassigned has been acclaimed as a "true hero" for agreeing to detail to investigators a long and painful period during his life. The human as well as scientific dimensions of the case, together with the evidence of cover-up and apparent fraud, have been beautifully documented in the investigative reporting of John Colapinto.¹⁷

In rebuttal, child psychiatrists produced a very brief report on one counterexample. An XY baby whose penis was irreparably damaged

during a circumcision at age two months was reassigned to live as a female at age seven months. The girl was interviewed at age sixteen and at twenty-six and was living socially as a woman. She sought and obtained surgery to construct female genitals and completely identifies as female.¹⁸

Taken at face value, these gender reassignment cases imply that the late limit for gender identity development is sometime between seven months (when the assignment did work) and seventeen months (when the assignment didn't work). I'll take twelve months as a working figure. Combining the data for the early and late limits, gender identity appears to form sometime between three months before birth and twelve months after birth.

I envision gender identity as a cognitive lens. When a baby opens his or her eyes after birth and looks around, whom will the baby emulate and whom will he or she merely notice? Perhaps a male baby will emulate his father or other men, perhaps not, and a female baby her mother or other women, perhaps not. I imagine that a lens in the brain controls who to focus on as a "tutor." Transgender identity is then the acceptance of a tutor from the opposite sex. Degrees of transgender identity, and of gender variance generally, reflect different degrees of single-mindedness in the selection of the tutor's gender. The development of gender identity thus depends on both brain state and early postnatal experience, because brain state indicates what the lens is, and environmental experience supplies the image to be photographed through that lens and ultimately developed immutably into brain circuitry. Once gender identity is set, like other basic aspects of temperament, life proceeds from there.