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THE POLITICAL SCIENCE OF HORMONE FOLKLORE*

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The idea that men and women “naturally” think and act differently because they have distinctly male or female brains has gotten a fresh public airing courtesy of Larry Summers’ recent endorsement. In the ensuing fray, Summers’ supporters have claimed that skeptics of the innate-differences explanation for sex disparities in advanced math and sciences are “on a collision course with the findings of science and the spirit of free inquiry.”¹

In the spirit of free inquiry, then, this is an excellent opportunity to offer a summary of “the findings of science” bearing on this topic, namely, those studies that tie prenatal hormone exposures to the development of masculine and feminine traits and cognitive skills. This body of work is extremely influential, and the theory of hormonally driven sex differentiation of the brain (organization theory) has largely achieved the status of “fact” among both the lay public and many scientists. A number of Summers’ supporters in the recent firestorm directly invoked the hormonal theory. Writing in the conservative National Review Online, psychologist Judith Kleinfeld laid out the dominant theory of sex differences in a nutshell:

The fetus begins development as a female. At about the third month of pregnancy, if the male Y chromosome is present, male sex hormones start to circulate. These sex hormones not only shape external sexual organs, like the penis and testicles. These sex hormones also affect the neurological structure of the human brain. Male sex hormones shape a cognitive ability important to success in physics and engineering, the ability to visualize three-dimensional objects in space.²

Kleinfeld went on to describe how this would affect the sex ratio of a science faculty: “It’s off-the-map talent, not just being good at something, that earns you a full professorship at elite universities like Harvard or MIT. Some will be female, but more will be male.”

* This is a shortened version of a talk presented for the panel *Sex, Science, & Rights* at the Columbia University Seminar for the Study of Sexuality, Gender, Health, and Human Rights, on February 16, 2005. Research, on which this essay is based, was supported by a dissertation fellowship from the Social Science Research Council Sexuality Research Fellowship Program.

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¹ Stephen Pinker, *Sex Ed: The Science of Difference*, NEW REPUBLIC, Feb. 14, 2005, at 15.

² Judith Kleinfeld, *Truth to Power*, NATIONAL REVIEW ONLINE, Jan. 25, 2005, at <http://www.nationalreview.com/comment/kleinfeld200501250746.asp> (last visited Apr. 30, 2005).

Here I present evidence supporting a very different interpretation of the large body of research to which Kleinfeld referred. To anticipate my conclusion, the scientific basis for the theory of hormonal organization of the human brain is weak and contradictory.

To appreciate the basis for my analysis, it is important to understand two things about organization-theory research. First, these studies are quasi-experiments. In true experiments, subjects would be randomly assigned to receive particular hormone exposures, and their development would be observed over the lifespan, keeping rearing experiences and environments constant across experimental and control groups. Of course this is not possible with humans, so scientists must piece together evidence from animal studies, and from individual human quasi-experiments that are by definition partial and uncontrolled. The interpretation of every quasi-experiment is dependent on careful placement within the overall body of evidence from related studies. Second, because organization theory was initially developed to explain the mating behavior of small mammals, the core of the theory, as well as most of the experimental animal data in the research network, concerns the development of masculine or feminine sexuality (i.e., erotic interests and sexual behaviors). Thus, “organization theory” research on sexuality forms the core of current scientific understandings of ‘innate’ sex differences in the brain.

The following analysis is based on the first systematic analysis of organization theory research on human sexuality from its introduction in the late-1960s through the mid-1990s.³ While others have focused on methodological weaknesses which call into question the *results* of particular studies, I focused on the *structure* of these 75 studies and their relation to one another, which allows me to evaluate the coherence of the evidence overall. I employed a set of symmetry principles which specify the necessary relationship of definitions and measures within networks of studies that comprise only quasi-experiments. A very simple version of the symmetry principles is to think of each quasi-experiment as a test of the relationship between hormonal ‘inputs’ and behavioral ‘outputs.’ To fit together in the network of organization theory research, there has to be some congruence among the kinds of inputs (e.g., types of hormones, times of exposures) that are considered similar for evaluating trends in the findings, and also among outputs (e.g., behavioral “masculinity” or “femininity”) that are considered similar.

Examining how feminine sexuality is explicitly and implicitly defined in this research provides a good example of my results. First, most scientists treated the meaning of “feminine sexuality” as so obvious that it did not require explicit definition. However, that agreement on the surface is misleading. I found that the working definition of feminine sexuality changed dramatically over time, to the point that later studies outright contradict the earlier studies.

³ See generally Rebecca M. Young, *Sexing the Brain: Measurement and Meaning in Biological Research on Human Sexuality, 1967-1995* (doctoral dissertation in Sociomedical Sciences, Columbia University) (on file with author).

Feminine sexuality in the earlier studies looks frankly Victorian: it is diffuse, dependent, receptive, romantic, and slow-moving. Female sexual activity is not so much an end in itself as it is a means for fulfilling desires for love and motherhood. Responsive rather than autonomous, female sexuality requires a masculine sexual partner to move it from mere *possibility* to *expression*. Masculine sexuality in these studies is the mirror image of feminine sexuality: active and energetic, initiating, dominant, penetrating, frequent, intense, and genitally focused. Masculine sexual activity is its own end, unsentimental and undiluted by romance. A description of arousal in “masculinized” women is illustrative:

The arousal was in the women’s own genitals and was such as might lead to masturbation in the absence of a partner. It was not the sentimental arousal, more typical of the normal female, which leads to romantic longing for the loved one alone and which will, in his absence, require waiting for his return.⁴

Literally all studies conducted up to about 1980 adhere pretty well to this model, but important changes emerged in the early 1980s. In this later group of studies, normal female sexuality is active and physical, incorporating elements that had previously been clear indicators of masculine desire and behaviors. The new norm after 1980 placed a relatively high value on the quantitative aspects of sex (libido, number of partners, frequency of sexual activity) for *both* men and women. Particular activities that had been considered masculine were now treated as normal for women, too. Feminine women were *expected* to report masturbation, and even, as time went on, initiation of sexual activity. Consider, for example, a study that linked prenatal DES exposure to “de-feminization,” which is taken to include *lower* “sexual desire and enjoyment, sexual excitability, and orgasmic coital functioning” as well as *lower* levels of masturbation and sexual dreams.⁵ It is remarkable that these findings are presented as *de-feminization*. Earlier studies always had framed lower rates of sexual activity, masturbation, libido, multiple orgasm, and lower number of partners as the *feminine* expectancy, while higher rates were interpreted as evidence of *masculinization*.

Virtually all studies after 1980 that describe feminine sexuality follow this pattern, though the quiet shift in definitions masks the fact that studies considered to be mutually supportive are actually in direct contradiction to each other. Similarly extreme inconsistency in definitions undermines each subset of studies that are supposed to examine hormonal influence on specific psychosexual “outcomes” of brain organization, such as “homosexuality.” Aside from hidden shifts in definition, there are other serious problems, many of which have been noted by other critics, such as missing or inappropriate control groups, statistical methods that load the dice in favor of the theory, and selective reference in later

⁴ A.A. Ehrhardt et al., *Influence of Androgen and Some Aspects of Sexually Dimorphic Behavior in Women with the Late-Treated Adrenogenital Syndrome*, 123 JOHNS HOPKINS MED. J. 115 (1968).

⁵ See H.F.L. Meyer-Bahlburg et al., *Sexual Activity Level and Sexual Functioning in Women Prenatally Exposed to Diethylstilbestrol*, 47(6) PSYCHOSOMATIC MED. 497 (1985).

studies only to earlier studies that support current models, while omitting either non-supportive or contradictory evidence.⁶ Since these sexuality studies are the theoretical and empirical core of organization-theory research, incoherence in these studies fundamentally undermines the current evidence for hormonal organization of the human brain.

If the evidence is so shaky, why does it seem so solid, even to many well-trained scientists? Well, it conforms so nicely to cultural ideas about masculine and feminine nature, and the naturalness of sex differences, that very few people bother to actually look very closely at the research. But the conviction that hormones can be characterized as “masculine” and “feminine,” and the resulting simple notion that these substances carry out a program of sex differentiation that maps neatly onto observed sex differences, is really based on hormone folklore, not evidence.

Conservatives weighing in on the Summers affair have touted the science of difference, with one dubbing this work “one of the large elephants in the academic living room that nobody is supposed to notice.”⁷ Perhaps feeling “outgunned” by the science, feminists and other progressives often cede the discussion about innate sex differences, preferring in the recent debates to sidestep this issue and instead emphasize data on discrimination and socialization. My analysis suggests that this is premature. The “elephant in the room” is a fragile, paper elephant, and we should welcome this opportunity to shine a bright light on these studies.

⁶ See, e.g., A. FAUSTO-STERLING, *MYTHS OF GENDER: BIOLOGICAL THEORIES ABOUT WOMEN AND MEN* (1st ed. 1985); H.E. Longino & R. Doell, *Body, Bias, and Behavior: A Comparative Analysis of Reasoning in Two Areas of Biological Science*, 9(2) *SIGNS: J. WOMEN CULTURE & SOC'Y* 207 (1983).

⁷ John Leo, *What Larry Meant to Say*, US NEWS & WORLD REP., Feb. 14, 2005, at 70.