

# Who Says “I Do”?

## Reviewing Judith Butler & Gayatri Chakravorty Spivak, *Who Sings the Nation-State? Language, Politics, Belonging* (2007)

Noa Ben-Asher<sup>†</sup>

**ABSTRACT:** This Book Review offers an analogy between two forms of resistance to legal discrimination by marginalized minorities: singing the national anthem in Spanish on the streets of Los Angeles in the spring of 2006 by undocumented immigrants, and possible future public marriage ceremonies by LGBT people and other marriage outlaws. Based on the conceptual grounds laid by Judith Butler and Gayatri Spivak, and earlier by Hannah Arendt, the Review uses an analogy to the public singing of the anthem in Spanish in order to argue that the performance of public marriage ceremonies by LGBT people and other marriage outlaws may achieve two significant political goals: performative contradiction and political speech acts.

INTRODUCTION.....	246
I. WHO SINGS THE NATIONAL ANTHEM? .....	247
A. Singing the Anthem as Performative Contradiction .....	249
B. Hannah Arendt: Freedom, Action, Speech .....	252
II. WHO DECLARES MARRIAGE? .....	255
A. Saying “I Do” As Performative Contradiction .....	256
B. Saying “I Do” As Political Speech Action.....	257
1. Distinguishing Political Action From the Economy .....	257
2. Reclaiming the Public Sphere.....	258
CONCLUSION.....	259

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<sup>†</sup> Associate-in-Law, Columbia Law School. LL.B., 1999, Bar-Ilan University School of Law; LL.M., 2001, NYU School of Law; J.S.D., 2006, NYU School of Law. For helpful discussions of this Review I thank Samuel Bray, Ariela Dubler, Elizabeth Emens, Katherine Franke, Janet Halley, Joseph Landau, Jessica Roberts, Bertrall Ross, Mo Siedor, Anna Marie Smith, and Max Symuleski. I also thank Zachary Herz for an insightful editing process.

With word and deed we insert ourselves into the human world, and this insertion is like a second birth, in which we confirm and take upon ourselves the naked fact of our original physical appearance. This insertion is not forced upon us by necessity, like labor, and it is not prompted by utility, like work . . . . [I]ts impulse springs from the beginning which came into the world when we were born and to which we respond by beginning something new on our own initiative.

– Hannah Arendt, *The Human Condition*<sup>1</sup>

## INTRODUCTION

Who sings the national anthem? Who says “I Do”? This Review offers an analogy between two forms of resistance to legal discrimination by legally marginalized national and sexual minorities: singing the national anthem in Spanish in the streets of Los Angeles in the spring of 2006, and public marriage ceremonies by marriage outlaws.<sup>2</sup>

*Who Sings the Nation State?*<sup>3</sup> is a discussion between philosophers and cultural theorists Judith Butler and Gayatri Spivak about the possible meanings for politics, rights, and belonging of the public act of undocumented immigrants singing the national anthem in Spanish. Although this act of singing may not produce any real results in immigration laws, the authors offer a fascinating analysis of the ways in which this act of singing can be politically significant. The fact that a marginalized group sings a song of belonging in the public sphere of a nation whose current laws do not indicate such belonging is a contradictory moment that reveals a gap between legal freedom and the actual practice of freedom. Therefore, this act of singing can be seen as the incipient moment of a claim to rights.

The right to marry is also often viewed as the legal expression of belonging to the society in which one lives. Thus, recent bans on same-sex marriage such as Proposition Eight in California have been characterized as a low point for LGBT rights in the United States.<sup>4</sup> This essay argues, however, that today we

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1. HANNAH ARENDT, *THE HUMAN CONDITION* 176-77 (2d ed. 1998).

2. By “marriage outlaws” I refer to all those who enter forms of marriage that are not recognized by state laws, including, but not limited to, LGBT marriages.

3. JUDITH BUTLER & GAYATRI CHAKRAVORTY SPIVAK, *WHO SINGS THE NATION-STATE?: LANGUAGE, POLITICS, BELONGING* (2007).

4. CAL. CONST. art. I, § 7.5 (“Only marriage between a man and a woman is valid or recognized in California.”); *see also* ALA. CONST. amend. 774 (recognizing no same-sex marriage or similar unions); ALASKA. CONST. art. 1, § 25 (recognizing no same-sex marriage, but remaining silent as to other types of same-sex unions); ARIZ. CONST. art. XXX (“Only a union of one man and one woman shall be valid or recognized as a marriage in this state.”); ARK. CONST. amend. 83 (declining to recognize same-sex unions entered into elsewhere, and placing all power to determine who may marry and the “legal rights, obligations, privileges, and immunities of marriage” in the state legislature); COLO. CONST. art. 2, § 31 (recognizing only marriage between one man and one woman as valid); FLA. CONST. art. 1, § 27 (recognizing no same-sex marriage or similar unions); GA. CONST. art. I, § IV, para. 1 (recognizing neither same-sex unions entered into elsewhere, nor judicial jurisdiction over same-sex unions); HAW.

face a unique opportunity for radical political action that engages marriage laws in ways *other than* direct appeals to legal inclusion. LGBT people and other marriage outlaws can engage the public sphere by performing public marriage ceremonies.

The Review proceeds in two parts. Part I begins with an analysis of the main arguments of *Who Sings the Nation-State?*, focusing on the act of singing the national anthem in public and in Spanish by undocumented immigrants as a unique form of political resistance and performative contradiction. This is followed by a brief account of Hannah Arendt’s theory of political action, which greatly influenced the theories of speech, rights, and resistance offered in *Who Sings the Nation-State?* Part II borrows the conceptual framework sketched in Part I to suggest a thought experiment regarding contemporary avenues of political action by marriage outlaws. Specifically, I suggest that performance of public marriage ceremonies by couples and groups whose marriages are not recognized by current state laws may be understood as performative contradiction and political speech-action.

### I. WHO SINGS THE NATIONAL ANTHEM?

I think the national anthem ought to be sung in English and I think people who want to be a citizen of this country ought to learn English, and they ought to learn to sing the national anthem in English.

– President George W. Bush<sup>5</sup>

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CONST. art. I, § 23 (declaring that the legislature has power to reserve marriage to opposite-sex couples); IDAHO CONST. art. III, § 28 (recognizing only marriage between man and woman as valid); KAN. CONST. art. 15, § 16 (same); KY. CONST. § 233A (recognizing neither same-sex marriage, nor any “substantially similar” legal status); LA. CONST. art. XII, § 15 (same); MICH. CONST. art. I, § 25 (recognizing no same-sex marriage or “similar union”); MISS. CONST. art. 14, § 263-A (recognizing no same-sex marriage, but remaining silent as to other types of same-sex unions); MO. CONST. art. I, § 33 (same); MONT. CONST. art. XIII, § 7 (providing for no recognition of same-sex marriage); NEB. CONST. art. I, § 29 (recognizing no same-sex marriage or “other similar same-sex relationships”); NEV. CONST. art. 1, § 21 (recognizing only marriage between man and woman); N.D. CONST. art. XI, § 28 (recognizing no same-sex marriage and giving no other same-sex unions “substantially equivalent legal effect”); OHIO CONST. art. 15, § 11 (recognizing no same-sex marriage or other union “intend[ed] to approximate the design, qualities, significance or effect of marriage”); OKLA. CONST. art. II, § 35 (neither recognizing same-sex marriage, nor allowing for the benefits of marriage to be “conferred upon unmarried couples or groups”); OR. CONST. art. 15, § 5(a) (recognizing only marriage between one man and one woman as valid); S.C. CONST. art. XVII, § 15 (extending no recognition or validity to same-sex unions); S.D. CONST. art. XXI, § 9 (providing no recognition or validity for any form of same-sex relationship); TENN. CONST. art. XI, § 18 (recognizing only marriage between a man and a woman); TEX. CONST. art. 1, § 32 (declaring that marriage consists only of union between a man and a woman, and allowing no recognition of “any legal status identical or similar to marriage”); UTAH CONST. art. I, § 29 (providing no recognition of any type of same-sex partnership); VA. CONST. art. I, § 15-A (recognizing no same-sex marriage or any legal status designed to approximate marriage); WIS. CONST. art. XIII, § 13 (recognizing neither same-sex marriage nor anything “substantially similar”); 23 PA. CONS. STAT. §§ 1102, 1704 (2008) (defining marriage as between one man and one woman).

5. Eyder Peralta, Claudia Feldman & Julia Mason, *Bush Says Sing It in English: Spanish Song Inspired by the National Anthem Heats Up Debate*, HOUSTON CHRON., Apr. 29, 2006, at A1 (quoting President George W. Bush’s statements on April 28, 2006).

In the last two decades illegal immigration has become an issue of increasing regulatory concern and the U.S. Congress has intensified control of immigration by increasing penalties for existing immigration-related crimes, and by adding several new immigration-related crimes.<sup>6</sup> Beginning in the winter of 2006-2007, worksite enforcement has increased through well-publicized raids.<sup>7</sup> By 2008, immigration-related prosecutions accounted for the majority of new federal criminal cases,<sup>8</sup> and “a trend is emerging . . . to use criminal convictions as a mode of enforcement against all forms of immigration outside the law.”<sup>9</sup> At the same time, the U.S. economy relies on over seven million unauthorized workers, who account for an estimated five percent of the total U.S. workforce.<sup>10</sup>

In the spring of 2006 members of the House of Representatives attempted to pass a bill that would, among other things, *require* the federal government to take custody of undocumented aliens detained by local authorities, and mandate that employers verify workers’ legal status through electronic means.<sup>11</sup> This attempted legislation led to extensive public protests and street demonstrations by immigrants around the United States. Two days before the “Day Without an Immigrant” national boycott of businesses and work on May 1, 2006, a British music producer decided to market *Nuestro Himno* (Our Anthem), a Spanish translation of the national anthem.<sup>12</sup> As part of these demonstrations, non-citizens sang the U.S. national anthem in Spanish.<sup>13</sup>

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6. See, e.g., 8 U.S.C. § 1326 (2000) (providing criminal penalties for reentry or attempted reentry without authorization after removal or after having departed while a removal order was in effect). See generally Juliet Stumpf, *The Crimmigration Crisis: Immigrants, Crime, and Sovereign Power*, 56 AM. U. L. REV. 367, 379-86 (2006).

7. In fiscal year 2002, the federal government arrested 510 unauthorized workers and employers in workplace raids. U.S. Immigration & Customs Enforcement, Frequently Asked Questions About Worksite Enforcement, <http://www.ice.gov/pi/news/factsheets/worksite.htm> (last visited Feb. 24, 2009). Worksite arrests rose to 1292 in fiscal year 2005 and then leapt to 4940 in 2007. *Id.* Large-scale raids resulted in the arrests of 1297 workers at six branches of meat processor Swift & Co. in December 2006, 350 workers at a New Bedford, Massachusetts leather goods factory in March 2007, and 390 workers at the Agriprocessors meat plant in Postville, Iowa in May 2008. See Yvonne Abraham & Brian R. Ballou, *350 Are Held in Immigration Raid: New Bedford Factory Employed Illegals, US Says*, BOSTON GLOBE, Mar. 7, 2007, at A1; Michael Scherer, *Dashboard: Migrant Crackdown*, TIME, May 26, 2008, at 14.

8. Spencer S. Hsu, *Immigration Prosecutions Hit New High*, WASH. POST, June 2, 2008, at A1. The number of convictions for immigration offenses climbed from 6197 in fiscal year 1995, to 14,277 in fiscal year 2002, and then to 31,208 in fiscal year 2004. In fiscal year 2004, immigration-related crimes accounted for 33.9% of all federal criminal convictions. See Hiroshi Motomura, *Immigration Outside the Law*, 108 COLUM. L. REV. 2037, 2088 n.218 (2008).

9. Motomura, *supra* note 8, at 2088 (giving the example of a workplace raid in May 2008 in Postville, Iowa, where the government pressured unauthorized immigrants arrested in a workplace raid to plead guilty to immigration-related criminal charges and agree to removal as part of criminal sentencing).

10. *Id.* at 2052-55 (citing JEFFREY S. PASSEL, PEW HISPANIC CTR., THE SIZE AND CHARACTERISTICS OF THE UNAUTHORIZED MIGRANT POPULATION IN THE U.S.: ESTIMATES BASED ON THE MARCH 2005 CURRENT POPULATION SURVEY 9-14 (2006)).

11. See Border Protection, Antiterrorism, and Illegal Immigration Control Act of 2005, H.R. 4437, 109th Cong. §§ 220, 701 (2005).

12. Peralta, *supra* note 5.

13. *Id.*

The singing of the national anthem in Spanish was met with strong disapproval from many members of the public. President Bush declared that "the national anthem ought to be sung in English," and that "people who want to be a citizen of this country ought to learn English and they ought to learn to sing the national anthem in English."<sup>14</sup> Several Republican senators, including Majority Leader Bill Frist, were appalled by the notion of a Spanish version of the national anthem and submitted a nonbinding resolution that the anthem and the Pledge of Allegiance should be sung and recited only in English.<sup>15</sup>

This is the background for Judith Butler and Gayatri Spivak's *Who Sings the Nation-State?* Singing the anthem in Spanish in the context of protest against increasingly anti-immigrant policies should be understood, according to Butler, as a claim to more than the national anthem itself:

The assertion not only claims the anthem, and so lays claim to rights of possession, but also to modes of belonging, since who is included in this "we?" For the "we" to sing and to be asserted in Spanish surely does something to our notions of the nation and to our notions of equality. It's not just that many people sang together—which is true—but also that singing is a plural act, an articulation of plurality.<sup>16</sup>

While the anthem is typically sung by ostensible U.S. citizens in English, here it is sung as a plural act by non-citizens in Spanish. Those who are singing it are not performing it as part of a patriotic ritual. They are protesting a denial of basic human rights. This act of singing thus stands in a unique position to law: It is a political protest and a claim to belonging that challenges current notions of the nation and equality.

#### *A. Singing the Anthem as Performative Contradiction*

Butler and Spivak's principal argument in *Who Sings the Nation-State?* is that the event of publicly singing the anthem in Spanish is a significant articulation of freedom. The anthem is not only sung in the language of a minority—it is also sung in the streets. This act (rather than, for example, singing in one's home) results in what Butler calls "performative contradiction," referring to an act that reveals its own contradiction: saying "I am equal" when by standard legal measures one is not, for example. This is

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14. *Id.* This singing aberration sparked a media concern regarding the anthem proficiency of English-singing U.S. citizens, and in the midst of the storm, ABC News reported a poll revealing that "61 percent of Americans cannot correctly recite the lyrics, much less sing them." Howard L. Rosenberg & Claire Shipman, *Oh Say Can You Sing . . . the National Anthem?*, ABC NEWS NIGHTLINE, May 8, 2006, available at <http://abcnews.go.com/Nightline/story?id=1937527&page=1>; see also Philip Rucker, *Trail Would Proudly Hail The Star-Spangled Banner*, HOUSTON CHRON., Aug. 28, 2005, at A9.

15. Z. Byron Wolf, *Spanish Anthem Been Around for Over 85 Years*, ABC NEWS: U.S., May 1, 2006, available at <http://abcnews.go.com/US/story?id=1911431&page=1>.

16. BUTLER & SPIVAK, *supra* note 3, at 59.

how Butler explains the “performative contradiction” in the act of singing the anthem in public:

[T]he street is also exposed as a place where those who are not free to amass, freely do so. I want to suggest that this is precisely the kind of performative contradiction that leads not to impasse but to forms of insurgency. For the point is not simply to situate the song on the street, but to expose the street as the site for free assembly. At this point, the song can be understood not only as the expression of freedom or the longing for enfranchisement—though it is, clearly, both of these things—but also as restaging the street, enacting freedom of assembly precisely when and where it is explicitly prohibited by law.<sup>17</sup>

A clarification of this understanding of the right to assembly is necessary here. The above assertion that undocumented immigrants do *not* enjoy First Amendment protection of the right to free assembly is imprecise. Indeed, aliens within the United States are entitled to the protection of certain constitutional provisions, including the First Amendment.<sup>18</sup> Those who sang the anthem in the streets of Los Angeles enjoy the same First Amendment rights to free assembly that any U.S. citizen would. Therefore in that sense, there is no performative contradiction on First Amendment grounds because the singers were not taking a right that was formally denied to them.

Nonetheless, Butler’s notion of performative contradiction may still have purchase for two reasons. First, the singing of the anthem in the streets of Los Angeles by undocumented immigrants can be seen as taking a right to free assembly that is *de facto* denied to them. By this I mean that the danger of deportation and other legal sanctions that undocumented immigrants face when singing in the streets makes their freedom to assemble theoretical. While

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17. BUTLER & SPIVAK, *supra* note 3, at 63.

18. Courts have established that aliens within the territory of the United States are entitled to certain constitutional protections, including those guaranteed by the First Amendment. *U.S. v. Verdugo-Urquidez*, 494 U.S. 259, 270-271 (1990); *Bridges v. Wixon*, 326 U.S. 135 (1945) (resident aliens are “invested with the rights guaranteed by the Constitution to all people within our borders. Such rights include those protected by the First and Fifth Amendments and by the due process clause of the Fourteenth Amendment.”); *Am.-Arab Anti-Discrimination Comm. v. Reno*, 70 F.3d 1045, 1056 (9th Cir. 1995) (foreign policy powers which permit the political branches great discretion to determine which aliens to exclude from entering this country do not authorize those political branches to subject aliens who reside here to a fundamentally different First Amendment associational right); *Parcham v. Immigration & Naturalization Servs.*, 769 F.2d 1001, 1004 (4th Cir. 1985) (“It has long been held that aliens residing in this country enjoy the protection of the First Amendment. Included in that protection is the right to peaceful expression of views through public demonstration.”(citations omitted)); *see also Plyler v. Doe*, 457 U.S. 202 (1982) (illegal aliens are protected by the Equal Protection Clause); *Mathews v. Diaz*, 426 U.S. 67, 77 (1976) (finding that the Fifth and Fourteenth Amendments protect even illegal or involuntary aliens within the jurisdiction of the United States from deprivation of life, liberty, or property without due process of law); *Kwong Hai Chew v. Colding*, 344 U.S. 590, 596 (1953) (holding that a resident alien is a “person” within the meaning of the Fifth Amendment); *Russian Volunteer Fleet v. United States*, 282 U.S. 481 (1931) (holding Just Compensation Clause of Fifth Amendment applicable to resident aliens); *Wong Wing v. United States*, 163 U.S. 228, 238 (1896) (resident aliens entitled to Fifth and Sixth Amendment rights); *Yick Wo v. Hopkins*, 118 U.S. 356, 369 (1886) (Fourteenth Amendment protects resident aliens).

everyone (citizen and non-citizen) has the formal First Amendment right to sing the anthem or any other song in the street, undocumented immigrants face the threat of deportation if they do. So the street is symbolically important here, because by exercising their First Amendment right of free assembly, immigrants can make the irony of having such rights *but not others* visible in the public sphere.

Second, the act of singing can be seen as laying a claim to equality-related rights (such as the right to work) that the immigrants do *not* enjoy. In that sense, when immigrants sing "*somos iguales*" ("we are equal") in the middle of the anthem there is a demand for broader substantive equality. This singing thus becomes a radical symbolic speech act asserting an equality that is in fact denied by the prevailing legal regime. Saying "I am equal" when one is in fact *not* equal is the core of the contradiction. For these two reasons, the act of singing the anthem in public can fairly be depicted as a "performative contradiction."

And while saying "I am equal" does not in fact make the speaker equal in the present or even in the future, the authors eloquently maintain that such performative contradictions are not useless. Instead, the demand for freedom and equality is "the incipient moment of the rights claim, its exercise, but not for that reason its efficacy."<sup>19</sup> Therefore, the singing is politically significant because "[t]here can be no radical politics of change without performative contradiction."<sup>20</sup> Further, "[t]o exercise a freedom and to assert an equality precisely in relation to an authority that would preclude both is to show how freedom and equality can and must move beyond their positive articulations."<sup>21</sup> Namely, even if actual equality will appear in no other universe than that of the speech act itself that says, "I am equal," this utterance is politically significant as the birth of the rights claim. This gap between the reality of equality and its utterance makes the claim radical because it performs the contradiction by saying "I am" (equal) when one in reality is not. Such performative contradictions "must be relied upon, exposed, and worked on to move toward something new."<sup>22</sup> Thus, "we can understand it as a mobilization of discourse with some degree of freedom without legal legitimation on the basis of which demands for both equality and freedom are made."<sup>23</sup>

In sum, the force of the claim made in the spring of 2006 by the undocumented immigrants singing the national anthem in Spanish in the streets of Los Angeles lies in what Butler calls an "exercise of the freedom in incipient form: it starts to take what it asks for."<sup>24</sup> The singers ask for freedom and

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19. BUTLER & SPIVAK, *supra* note 3, at 64.

20. *Id.* at 66.

21. *Id.* at 66-67.

22. *Id.* at 67.

23. *Id.*

24. *Id.* at 68.

equality, and start to take it by the symbolic act of singing. This public act of singing is “enacting the freedom it posits, and positing what is not yet there.”<sup>25</sup> Thus, although public singing cannot legalize undocumented immigrants or grant them equal rights under the law, it makes a demand on freedom that often goes unobserved by legal theorists. Freedom is an ongoing process, and “to make the demand on freedom is already to begin its exercise.”<sup>26</sup> This demand underscores “the gap between [freedom’s] exercise and its realization.”<sup>27</sup> This public manifestation of the gap brings it into public discussion “in a way so that that gap is seen, so that that gap can mobilize.”<sup>28</sup>

Finally, the mobilization of such gaps (between freedom and its realization), as the authors of this important discussion agree, is one of the main current tasks for global feminism. Feminism, according to Spivak, “might seek to reinvent the state as an abstract structure with a persistent effort to keep it clean of nationalisms and fascisms.”<sup>29</sup> Singing the national anthem in Spanish—although in a mode that is performative and utopian—is actually a claim to these abstract structures of the state and to its governance.

### *B. Hannah Arendt: Freedom, Action, Speech*

As shown above, the authors view the performance of the anthem as performative speech that makes a political demand for equality and freedom for undocumented immigrants. The authors’ study of this specific instance of political speech is largely informed by Arendt’s remarkable attention to political speech, especially as laid out in *The Human Condition*. In fact, as Butler professes, “Arendt is probably one of the first twentieth century political theorists to make a very strong case for performative speech, speech that founds or ‘enstates’ a new possibility for social and political life.”<sup>30</sup>

I will briefly outline Arendt’s account of “action” as an exceptional human activity that is distinct from the activities of “work” and “labor.” Part II of this Review will then argue that Arendt’s theory of action can be especially helpful today in the articulation of a political response to the fortification of marriage as a strictly heteronormative institution.

Action, according to Arendt, is the human activity that is directly related to politics. Within what she calls “*vita activa*” Arendt “designate[s] three

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25. *Id.*

26. *Id.*

27. *Id.*

28. *Id.* at 68-69.

29. *Id.* at 77.

30. *Id.* at 27. Notably, the authors, especially Butler, confess an ambivalent relationship to *The Human Condition*. Butler’s criticism focuses on the text’s uncritical account of the Greek private sphere, and especially the fact that as a condition for politics as the domain of the public sphere, women, children, slaves, and others had to become essentially stateless in their own state. BUTLER & SPIVAK, *supra* note 3, at 15-16. I intend to explore this critique of Arendt elsewhere.



fundamental human activities: labor, work, and action."<sup>31</sup> These three activities are fundamental "because each corresponds to one of the basic conditions under which life on earth has been given to man."<sup>32</sup> The activity of labor "corresponds to the biological process of the human body, whose spontaneous growth, metabolism, and eventual decay are bound to the vital necessities produced and fed into the life process by labor."<sup>33</sup> The activity of work "corresponds to the unnaturalness of human existence, which is not embedded in, and whose mortality is not compensated by, the species' ever-recurring life cycle."<sup>34</sup> Work provides things that are "'artificial' . . . [and] distinctly different from all natural surroundings."<sup>35</sup>

Action is "the only activity that goes on directly between men without the intermediary of things or matter," and which "corresponds to the human condition of plurality, to the fact that men, not men, live on the earth and inhabit the world."<sup>36</sup> For Arendt, "this plurality is specifically *the* condition . . . of all political life."<sup>37</sup> The problem is that "[while] we have become excellent in the laboring we perform in public, our capacity for action and speech has lost much of its former quality since the rise of the social realm banished these into the sphere of the intimate and the private."<sup>38</sup> Arendt's theory is that our modern age has "carried with it a theoretical glorification of labor and has resulted in a factual transformation of the whole society into a laboring society."<sup>39</sup> The tragedy is that "[i]t is a society of laborers which is about to be liberated from the fetters of labor, and this society does no longer know of those other and more meaningful activities for the sake of which this freedom would deserve to be won."<sup>40</sup>

Action is significantly different from work and labor because it is "not forced upon us by necessity, like labor, and it is not prompted by utility, like work."<sup>41</sup> Namely, there is a special set of activities that Arendt has in mind, and that she demonstrates through Greek history, philosophy, and culture. The ancient Greeks practiced these activities in public, though only once labor and

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31. ARENDT, *supra* note 1, at 7.

32. *Id.*

33. *Id.*

34. *Id.*

35. *Id.* Arendt further explains,

All three activities and their corresponding conditions make up the most general condition of human existence: birth and death, natality, and mortality. Labor, assures not only individual survival, but the life of the species. Work and its product, the human artifact bestow a measure of permanence and durability upon the futility of mortal life and the fleeting character of human time. Action, in so far as it engages in the founding and preserving political bodies, creates the condition for remembrance, that is, for history.

*Id.* at 8-9.

36. *Id.* at 7.

37. *Id.*

38. *Id.* at 49.

39. *Id.* at 4.

40. *Id.* at 5.

41. *Id.* at 177.

work were taken care of in the household. The only purpose of action was the unique deeds and speeches in the public sphere. This was politics. Thus, “[t]o act, in its most general sense, means to take an initiative, to begin . . . to set something into motion . . . .”<sup>42</sup> Although this may be shocking or offensive to some today, what Arendt refers to as action was *not* efficient, predictable, or rational. Rather, “[i]t is in the nature of beginning that something new is started which cannot be expected from whatever may have happened before . . . . [T]he fact that man is capable of action means that the unexpected can be expected from him, that he is able to perform what is infinitely improbable.”<sup>43</sup>

Action is expressed by speech and in public. It “becomes relevant only through the spoken word in which [one] identifies [oneself] as the actor, announcing what he [or she] does, has done, and intends to do.”<sup>44</sup> Speech is more important in action than in any other human activity because “[i]n acting and speaking, [humans] show who they are, reveal actively their unique personal identities and thus make their appearance in the human world . . . .”<sup>45</sup> To be political, speech and action can only take place in public, “where people are *with* others and neither for nor against them—that is—in sheer human togetherness.”<sup>46</sup> The publicity of the act is crucial here because “[w]ithout the disclosure of the agent in the act, action loses its specific character and becomes one form of achievement among others.”<sup>47</sup>

In sum, Arendt’s *The Human Condition* defines the Greek form of political action as (1) performative speech, (2) in public, and (3) that does not directly arise from the human conditions of work and labor. In the context of *Who Sings the Nation-State?*, singing the anthem may be seen as political action. In the next section I will argue for precisely such political action in the realm of marriage.

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42. *Id.*

43. *Id.* at 177-78.

44. *Id.* at 179. The acts of speech and naming also link man to God. In the book of Genesis God creates the world through speech. “And God said, Let there be light. And there was light,” *Genesis* 1:3 (King James); “And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters,” *Genesis* 1:6 (King James); “And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so,” *Genesis* 1:9 (King James).

45. ARENDT, *supra* note 1, at 179.

46. *Id.* at 180 (“Because of its inherent tendency to disclose the agent together with the act, action needs for its full appearance the shining brightness we once called glory, and which is possible only in the public realm.”).

47. *Id.*

## II. WHO DECLARES MARRIAGE?

Marriage is a sacred institution between a man and a woman . . . I will work with congressional leaders and others to do what is legally necessary to defend the sanctity of marriage.

– President George W. Bush<sup>48</sup>

This Review argues that *Who Sings the Nation State?* can inform our current thinking about marriage equality. As of today the marriage equality movement in the United States has not succeeded in achieving its basic goal of full marriage equality. Many states have barred same-sex marriage, either through state constitutional amendments or state statutes.<sup>49</sup> Most recently, on November 4, 2008, the people of California passed Proposition Eight, the California Marriage Protection Act, amending the state constitution with the language that “only marriage between a man and a woman is valid or recognized in California.”<sup>50</sup> Similar bans were passed in Florida and Arizona.<sup>51</sup>

This Part conceives of public marriage ceremonies by marriage outlaws as political speech and argues that two related legal-political goals may be achieved by saying “I do” in such public marriage ceremonies. First, such ceremonies may constitute “performative speech” analogous to singing the national anthem in Spanish, and as such, can be the incipient moment of a rights claim to marital equality. Second, such ceremonies may offer a new forum for political speech actions as theorized by Arendt—a type which has not been seriously pursued thus far in the course of the LGBT march toward legal inclusion in the institution of marriage.

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48. Pam Belluck & Katie Zezima, *Same-Sex Marriage: The Overview; Marriage by Gays Gains Big Victory in Massachusetts*, N.Y. TIMES, Nov. 19, 2003, at A1 (quoting statements by President George W. Bush on November 18, 2003).

49. See *supra* note 4.

50. Proposition Eight overturned the California Supreme Court’s decision of June 2008 in *In re Marriage Cases*, 183 P.3d 384 (Cal. 2008), which found it unconstitutional for the State of California to exclude same-sex couples from access to state-sponsored marriage. The ban had more than fifty-two percent of the vote. DEBRA BOWEN, CAL. SEC’Y OF STATE, STATEMENT OF VOTE: NOVEMBER 4, 2008 GENERAL ELECTION 9 (2008), available at [http://www.sos.ca.gov/elections/sov/2008\\_general/sov\\_complete.pdf](http://www.sos.ca.gov/elections/sov/2008_general/sov_complete.pdf). At the time this article went to press, the California Supreme Court had agreed to review legal challenges to Proposition 8, but refused to permit weddings to resume pending a final decision. See Maura Dolan & Jessica Garrison, *Justices Will Hear Prop. 8 Challenges*, L.A. TIMES, Nov. 20, 2008, at A1.

51. Same-sex marriage bans passed by bigger margins in those states than in California. See Jesse McKinley & Laurie Goodstein, *Bans in 3 States on Gay Marriage*, N.Y. TIMES, Nov. 5, 2008, at A1.

A. *Saying "I Do" as Performative Contradiction*

Currently there are two main conditions for law's recognition of a marriage as valid: (1) heterosexuality and (2) monogamy. To clarify my terms, by "heterosexuality" I mean that a legally recognizable marriage must be between (what the law defines as) a man and a woman,<sup>52</sup> and by "monogamy" I refer to the *numerical* requirement, and not to the idea of fidelity that is often associated with the word.<sup>53</sup> Nonetheless, marriages that do not fulfill one or both conditions can and do take place. They are all around us, taking various forms, with different ceremonies and rituals. LGBT marriages, multiple-partner marriages, and other non-recognized marriages take place with or without Proposition Eight and other legislative bans or permissions. What if we redirect these celebrations of non-recognized marriages from private commitment ceremonies into the public sphere? We may initiate a performative contradiction as defined by Butler. *The right that is claimed would at the same time be taken by the individual/s to whom it is denied.*

I offer this analogy between public marriages of marriage outlaws and singing the anthem for three main reasons. First, the *type of speech* in both scenarios, when performed in the public sphere, is unique in the sense that it communicates a message that is beyond the actual content of the speech. Namely, by saying "I do" in public the speaker conveys more than a commitment to one's partner or partners. The "I do," when uttered in the public sphere can also mean an actual refusal of current legal rules of recognition,<sup>54</sup> meaning something like, "while you, the state, do not recognize this marital bond, I do." Likewise, as discussed above, by singing the U.S. national anthem in Spanish, the speaker communicates something other than patriotic commitment to the nation. Second, the legal exclusion of these two minorities

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52. There are some well-known exceptions to this rule. For example, all fifty states and the District of Columbia have some variation of a prohibition of incest. These include both criminal proscriptions and marriage proscriptions (voiding marriages between persons too closely related or prohibiting clerks from issuing such persons marriage licenses). For discussion of the well-recognized diversity of these statutes see, for example, Courtney Megan Cahill, *Same-Sex Marriage, Slippery Slope Rhetoric, and the Politics of Disgust: A Critical Perspective on Contemporary Family Discourse and the Incest Taboo*, 99 NW. U. L. REV. 1543, 1577-88 (2005).

53. For an elaborate discussion of law's contribution to exclusive sexual behavior between two people, see Elizabeth F. Emens, *Monogamy's Law: Compulsory Monogamy and Polyamorous Existence*, 29 N.Y.U. REV. L. & SOC. CHANGE 277, 361 (2004), which states,

Law contributes to the norm of compulsory monogamy in many ways. Most obviously, in many states, the criminal law penalizes married people who engage in nonexclusive sexual behavior, through adultery laws, and also married people who try to marry or cohabit with additional partners, through bigamy laws. Moreover, the marriage law in all fifty states prevents multiple parties from marrying one another, and no U.S. jurisdiction's domestic partnership laws permit multiple partners to register.

*Id.* (citations omitted).

54. A rule of recognition is "accepted and used for the identification of primary rules of obligation. . . . Wherever such a rule of recognition is accepted, both private persons and officials are provided with authoritative criteria for identifying primary rules of obligation." H.L.A. HART, *THE CONCEPT OF LAW* 97-107 (3d prtg. 1972).

solidifies two fundamental identifications of the majority of U.S. citizens: English-speaking and heterosexual. As President Bush's statements made explicit, marriage can involve only one man and one woman, and the national anthem should only be sung in English. Third, both groups stand in a special relation to the economy. They are not granted equal rights, but at the same time they are key players both in the work force and as consumers. Nonetheless, these particular types of speech (singing the anthem and saying "I do") make a demand on the state that *does not* directly appeal to this relation to the economy. I will return to this later.

In contrast with marriage equality litigation, by performing public marriage ceremonies one actually starts to take what one asks for. Alongside the formal legal route to marriage recognition, public marriage ceremonies can be viewed as an alternative political claim of marginalized individuals and groups who start to take the rights they are seeking. In analogy to the public singing of the national anthem, those who are denied the right to marry may be taking the incipient step toward the recognition of the marriage by actually performing it. In this sense, these public wedding ceremonies would be viewed as a demand on the state to recognize these marriages.<sup>55</sup>

### *B. Saying "I Do" As Political Speech Action*

Public marriage ceremonies can be viewed as an example of Arendtian political speech.<sup>56</sup> Marrying is a deed that is enacted by performative speech—"I do." I pursue the Arendtian framework here for two main reasons. First, Arendt distinguishes work and labor from action. This distinction deserves special attention today, especially given the current role of the LGBT community as an important player in the economy. Second, given the narrow notions of liberty that have emerged in LGBT rights jurisprudence as manifested, for example, in *Lawrence v. Texas*,<sup>57</sup> Arendt's insistence that political action must *not* be privatized may provide some guidance in evaluating the goals of LGBT politics for the future.

#### *1. Distinguishing Political Action From the Economy*

Action, the sphere of the political, is distinct from work and labor. Thus saying "I do" in public is politically distinct from protests in the style of a "day

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55. Importantly, these two speech acts are distinguishable in so far as singing the anthem is not a demand to recognize the act of singing itself but what it symbolizes (freedom, equality), whereas saying "I do" is a claim to the right of marriage itself. This Review nonetheless focuses on the analogous aspects of these speech acts.

56. Notably, it is quite possible that, given Arendt's characterization of the Greek private sphere as the proper sphere of work, labor, and domesticity, bringing marriage into the public sphere may be altogether problematic in an Arendtian world. I plan to pursue this issue elsewhere.

57. 539 U.S. 558 (2003).

without a me.” By this I refer to protests that demonstrate the importance of a marginalized group to the economy. Action is the human condition where humans interact to declare their *unique presence* in the world, not their dollar value in the economy.

Interestingly, very much like “Day Without an Immigrant” during the spring of 2006, “Day Without a Gay” was announced in response to the passing of Proposition 8.<sup>58</sup> This protest was aimed at demonstrating the dependence of the economy on the LGBT community.<sup>59</sup> LGBT individuals were urged to strike (“call in gay”) and boycott all stores for one full day. This protest says: “Your economy depends on us, look what happens when we pull out.” Even if such protests were successful in hurting the economy and proving the economy’s dependence on LGBT people or on undocumented immigrants,<sup>60</sup> they are significantly different from the performative contradiction and the political speech act of singing the anthem in Spanish or performing marriage ceremonies. There is an implicit premise in these protests that LGBT people would not have a strong rights claim were it not for their purchasing power and their participation in the workforce.

Saying “I do” in public is a significantly different type of political speech. Saying “I do” and singing the anthem challenge the nation-state to assess its national and sexual boundaries, but *not* by re-affirming the capitalist economy as the standard by which value is measured. As Spivak has remarked in the context of the anthem, “the point here is to oppose unregulated capitalism, not to find in an unexamined membership with the capitalist state the lineaments of utopia.”<sup>61</sup>

## 2. Reclaiming the Public Sphere

By claiming the public sphere in public marriage ceremonies we may also begin to move past what has been referred to as the “domesticated liberty” of

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58. See John Keilman, *Day Without a Gay: Homosexuals Urged To Skip Work*, CHI. TRIB., Dec. 9, 2008, at C2.

59. “Day Without a Gay” was announced as following:

[O]ur community contributes \$700 billion a year to this economy (the same amount as the bailout), yet we are not given equal protections under the law that every citizen deserves. As such, it is time we make a stand. During the largest shopping season of the year, we ask that you do one very important thing: Don’t Buy Anything! What would happen to this world if the LGBTQ community didn’t exist? Why is it that we continue to contribute to an economy and government that does not contribute to us? Let’s answer these questions on December 10th.

Day Without A Gay—Join The Impact, <http://jointheimpact.wetpaint.com/page/Day+Without+a+Gay?> (last visited Apr. 22, 2009).

60. In fact, “Day Without a Gay” did not have the impact of other protests in the aftermath of Proposition 8. Matthai Kuruvila, “*Day Without a Gay*” *Demo Fizzles*, S.F. CHRON., Dec. 11, 2008, at B3 (“The day’s events drew only scattered support in the Bay Area, the heart of the gay rights movement, and also criticism.”).

61. BUTLER & SPIVAK, *supra* note 3, at 77.

*Lawrence v. Texas*.<sup>62</sup> In *Lawrence*, the Supreme Court struck down Texas sodomy laws as unconstitutional and recognized the right to sex between two consenting adults *in private*. Under the *Lawrence* framework, the decriminalized homosexual behavior is tolerated only if it takes place between consenting adults in private. This scope of liberty carves sexuality out of the visible public sphere and is thus limited. As Katherine Franke has argued, "the liberty principle upon which the opinion rests is less expansive, rather geographized, and, in the end, domesticated. It is not the synonym of a robust liberal concept of freedom."<sup>63</sup>

Now that the criminal stigma has been removed at least from private LGBT consensual sex, the marriage movement can engage the public sphere in creative ways that will expand arrangements of kinship and sex in ways that the narrow legitimization of acts of sex in *Lawrence* did not. Arendt's insights that action is the most significant human condition, that for an act to be political it *must* be public, and that "with word and deed we insert ourselves into the human world," should inform future consideration of LGBT rights claims.

#### CONCLUSION

[H]aving recourse to sovereignty against discipline will not enable us to limit the effects of disciplinary power.

– Michel Foucault<sup>64</sup>

Public singing of the national anthem in Spanish and public marriage ceremonies by marriage outlaws constitute performative contradictions and political speech acts. The practice of freedoms does not need to appear in the form of constitutional litigation or appeals to legislation. There can be other ways. Public singing and public marriage ceremonies are examples of such alternative forms of emancipation, ways in which "we should be looking for a

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62. See *Lawrence*, 539 U.S. 558; Katherine M. Franke, *The Domesticated Liberty of Lawrence v. Texas*, 104 COLUM. L. REV. 1399, 1408 (2004).

63. Franke, *supra* note 62, at 1401. For example, as Franke notes, "[i]t is hard to imagine Justice Kennedy using as an example the public display of explicitly erotic same sex behavior to illustrate the right at issue . . ." *Id.* at 1407.

64. MICHEL FOUCAULT, "SOCIETY MUST BE DEFENDED": LECTURES AT THE COLLÈGE DE FRANCE, 1975-76, at 39 (Mauro Bertani & Alessandro Fontana eds., David Macey trans., Picador 2003) (1997).

We now find ourselves in a situation where the only existing and apparently solid recourse we have against the usurpations of disciplinary mechanics and against the rise of a power that is bound up with scientific knowledge is precisely a recourse or a return to a right that is organized around sovereignty, or that is articulated on that old principle. Which means in concrete terms that when we want to make some objection against disciplines and all the knowledge-effects and power-effects that are bound up with them, what do we do in concrete terms? What do we do in real life? . . . We obviously invoke right, the famous old formal, bourgeois right. And it is in reality the right of sovereignty. And I think that at this point we are in a sort of bottleneck, that we cannot go on working like this forever; having recourse to sovereignty against discipline will not enable us to limit the effects of disciplinary power.

*Id.*

new right that is both antidisiplinary and emancipated from the principle of sovereignty.”<sup>65</sup> Participants in these speech acts make a demand on society, but that demand is not made by direct appeal to courts and legislators. Thus we initiate alternative forms of engagement with rights—an engagement where subjects refuse the process of subjugation but without recourse to legalism.

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65. *Id.* at 39-40.



# Which Came First, the Data or the Politics? Disentangling Questions About Women’s Aptitude for Science

Review of *Why Aren’t More Women in Science?  
Top Researchers Debate the Evidence* (Stephen J.  
Ceci & Wendy M. Williams eds., 2007)

Carlin Meyer<sup>†</sup>

INTRODUCTION.....	262
I. THE ONGOING NATURE VS. NURTURE DEBATE.....	265
II. WHAT DO THE DATA SAY?.....	269
A. Gender May Explain a Good Deal.....	272
B. Gender May Explain Little: The Socio-Cultural Camp.....	278
III. A NATURAL EXPERIMENT: THE STORY OF BEN BARRES.....	283
IV. THE CHALLENGE OF COMPLEX SYSTEMS.....	284
V. SCIENCE IN THE SERVICE OF THE STATUS QUO.....	286
VI. THE LEAP FROM DATA TO CONCLUSIONS.....	287
VII. INTERVENTIONS WHILE THE QUESTIONS REMAIN OPEN.....	293

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<sup>†</sup> Professor, New York Law School. Great thanks are due to many people for the birthing of this piece amidst difficult times (for the country, and for me). First and foremost, I must thank the editors of the *Yale Journal of Law and Feminism* for their patience in accommodating numerous delays due to personal circumstances. They have been a pleasure to work with and generous in their treatment of my repeated entreaties for more time. I particularly want to thank BJ Ard for the most helpful edit letter I have ever received. And I especially want to thank Bradley Powles, my patient and hard-working research assistant, without whose efforts there would be no book review. Thanks are also due to my faculty assistant Sonyd Ortiz, without whom nothing would be possible, to Professor Stephen J. Ellmann, whose comments are always thoughtful and useful, and to Judy Rabinovitz, whose comments and encouragement were immeasurably helpful. Finally, I want to thank my mother Lee and my sisters Muffie and Erica Meyer, who shouldered many burdens which should have been mine during recent days, as they have done so many times before.

Biology gives you a brain. Life turns it into a mind.

– Jeffrey Eugenides, *Middlesex*<sup>1</sup>

There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.

– Mark Twain, *Life on the Mississippi*<sup>2</sup>

## INTRODUCTION

Is the dearth of women in STEM fields—science, technology, engineering, and math—primarily a product of innate or evolved gender difference, social conditioning (acculturation), discrimination, or “all of the above”?<sup>3</sup> The answer we select might influence not only where we put societal resources, but also the outcomes of individual life choices.<sup>4</sup> In addition, it may affect legal battles over everything from educational equity in schools and colleges to academic tenure decisions.<sup>5</sup> But what if there can be no definitive answer? What if, indeed, we cannot meaningfully distinguish what is innate (nature) from what is generated by historical and environmental (including cultural) influences? How then should we decide questions of resource allocation and make wise career path or tenure decisions? We must, I think, presume that more than 2000 years of ideology asserting the inferior intelligence and lack of rationality of women has resulted in an extraordinary depth of systemic discrimination against them in science, as elsewhere, that justifies shifting the burden of proof to those who

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1. JEFFREY EUGENIDES, *MIDDLESEX* 479 (2002).

2. MARK TWAIN, *LIFE ON THE MISSISSIPPI* 173 (Oxford Univ. Press 1996) (1883).

3. WHY AREN'T MORE WOMEN IN SCIENCE?: TOP RESEARCHERS DEBATE THE EVIDENCE (Stephen J. Ceci & Wendy M. Williams eds., 2007) [hereinafter *WOMEN IN SCIENCE*]. The sweeping inclusion of “science” in STEM is not quite accurate; while women are relatively well-represented in biology and medicine overall—though not in certain subfields—there are far fewer women than men in physics and computer science. Males enroll and receive degrees in the “hard” sciences in far greater numbers than do women. See Stephen J. Ceci & Wendy M. Williams, *Are We Moving Closer and Closer Apart? Shared Evidence Leads to Conflicting Views*, in *WOMEN IN SCIENCE*, *supra*, 213, 220-21; Janet Shibley Hyde, *Women in Science: Gender Similarities in Abilities and Sociocultural Forces*, in *WOMEN IN SCIENCE*, *supra*, at 131, 131; Doreen Kimura, “Underrepresentation” or Misrepresentation?, in *WOMEN IN SCIENCE*, *supra*, at 39, 43. I use STEM to refer to those sciences that are predominately male, as well, of course, as technical, engineering, and math fields.

4. One could ask similar questions about the dearth of women partners in law firms, members of Congress, economics professors, leading newspaper and television commentators, or presidents of universities. Indeed, isolating the inquiry to women in the STEM professions distorts the inquiry by treating the question without putting it in the larger context of the advancement of women generally. Contributor Virginia Valian, in *Why So Slow: The Advancement of Women*, advances in a broader context the thesis she applies in *Women in Science* to women in STEM professions—that “a set of implicit, or nonconscious hypotheses about sex differences plays a central role in shaping men’s and women’s professional lives.” VIRGINIA VALIAN, *WHY SO SLOW: THE ADVANCEMENT OF WOMEN* 2 (1998).

5. See, e.g., John Tierney, *A New Frontier for Title IX: Science*, N.Y. TIMES, July 15, 2008, at F1 (describing investigators at some federal agencies who examine grant-recipient physics and engineering departments at major universities for possible discrimination against women).

would assert any other significant cause for the dearth of women at any level of any profession.<sup>6</sup>

Stephen J. Ceci and Wendy M. Williams, editors of *Women in Science*, don't purport to answer the question they pose, but rather to present the arguments in brief essays by fifteen "top researchers on gender differences in cognition in the United States, Canada, and the United Kingdom."<sup>7</sup> Their hope is that, "armed with accurate information, readers can decide [the answer] for themselves . . . based on scientific evidence, not politics or personal beliefs."<sup>8</sup> Contributors were chosen because their "scholarship in this area is well known, respected, and evidence based."<sup>9</sup> They were asked to support their arguments with data, and relied variously on results of standardized testing, behavioral observation under controlled circumstances, sociological data, psychological studies, survey data, neuroimaging and neuroscience data, animal studies concerning the influence of hormones on development, and clinical data about humans born with sexual abnormalities.

According to the editors, however, although the writers "often resummairize the same or similar data," they "interpret them quite differently."<sup>10</sup> Yet the editors remain curiously hopeful that presenting the data will "enable[] us to come to a shared understanding of whether there are sex differences in cognitive ability and, if there are, what role they play in career

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6. Contributor Doreen Kimura asserts that it is "standard form to assume that if there are fewer than 50% women in any cohort, the situation is undesirable and indicates some form of systemic or deliberate discrimination." Kimura, *supra* note 3, at 39. I don't know to whose "standard form" Kimura refers, but it is not mine. Most who challenge the dearth of women in any particular job or professional category are working with statistics more like contributor Valian's, Virginia Valian, *Women at the Top in Science—and Elsewhere*, in *WOMEN IN SCIENCE*, *supra* note 3, at 27, 27 (citing her own and others' work finding that "women make less money and advance more slowly . . . in every field . . . including nursing"), or those available from the Michelle R. Clayman Institute for Gender Research at Stanford University showing that, despite the fact that, in 2001, women earned 37% of all science and engineering degrees, only 15.4% of full professors in those fields were female, Michelle R. Clayman Institute for Gender Research, Status of Women Academics in the Sciences and Engineering, [www.stanford.edu/group/gender/ResearchPrograms/GenderInScienceAndEngineering/Statistics.html](http://www.stanford.edu/group/gender/ResearchPrograms/GenderInScienceAndEngineering/Statistics.html) (last visited Mar. 24, 2009). Job evaluation studies consider a field to be male- or female-dominated only when 70% or more of its members are of one sex, and the Equal Employment Opportunity Commission (EEOC) will not find a hiring pattern to be presumptively discriminatory until it is demonstrated that the rate of hiring for the group discriminated against is less than 80% that of the dominant group, typically as measured by the applicant pool or those who are shown to have the qualifications required for the job. See *Am. Fed'n of State, County & Mun. Employees, AFL-CIO v. Wash.*, 770 F.2d 1401 (9th Cir. 1985).

7. Wendy M. Williams & Stephen J. Ceci, *Introduction* to *WOMEN IN SCIENCE*, *supra* note 3, at 4, 4.

8. *Id.* at 5. The authors claim to bypass "emotion, rhetoric, and politics" to "explore the hard science underlying gender differences in cognitive ability and their origins." *Id.* But the science presented is deeply inferential, and I wonder at their confidence that so-called "hard" science can solve a question that is so quintessentially one of complex human behavior, choices, and values. See *infra* Part IV.

9. Williams & Ceci, *supra* note 7, at 20.

10. *Id.* at 4.

imbalances.”<sup>11</sup> Although the editors have done a masterful job of selecting contributors, summarizing their arguments, and outlining the numerous issues and weakness in contributors’ arguments, I doubt their effort is likely to produce a “shared understanding” among either their contributors or their readers. Rather, what they demonstrate is the inconceivability of a science, especially one purporting to answer questions about the nature of men and women, that is free of “politics and personal belief.”<sup>12</sup>

As writers Donna Haraway, Sandra Harding, and others have argued, and as this volume so plainly attests, when it comes to gender, scientific “answers” are themselves inevitably deeply influenced by ideological and cultural factors.<sup>13</sup> What is studied and publicized, how results are interpreted—these are anchored in individual and institutional stances and attitudes that are themselves products of a history of gender discrimination. Yet people, institutions, and juries must make choices based on the limited and partial evidence available to them.

*Women in Science* confirms my suspicion that these choices should be made with a skeptical attitude toward scientific data that purport to find gender difference, and an even more skeptical view of assertions that these differences, when shown, explain such multiply-caused (or overdetermined?) phenomena as the dearth of women in science. Rather, we would be wise to place a heavier reliance on the lessons of history, the teachings of humanists (including writers and filmmakers), and the partial but direct experiences of those who stand outside the mainstream of science and ideology, as well as of those who have directly encountered its biases. Several *Women in Science* contributors follow this path. Others, however, draw unwarranted conclusions from their data, conclusions that carry the danger of inappropriately reinforcing the status quo.

It is certainly true that males and females, as we have defined them—by sexual organs and sex-linked hormonal development—are different. And it may be that some of those differences can be linked to differences by gender in behavioral tendencies. But the danger in spending our resources on a quest to

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11. *Id.* at 11. The data they present goes well beyond questions of cognitive *ability*, and addresses purportedly “natural” gender-based proclivities (inclinations, drives, or preferences) for types of occupations, as well as structural barriers to women’s participation in the sciences (long and sometimes unpredictable hours, lack of accommodation for caretaking obligations, and the like).

12. Patricia Adair Gowaty, editor of the excellent (and in some ways similar) volume, *FEMINISM AND EVOLUTIONARY BIOLOGY: BOUNDARIES, INTERSECTIONS AND FRONTIERS* (Patricia Adair Gowaty ed., 1997), found herself in a swirl of controversy and intense emotion when she sponsored a conference on the subject. Patricia Adair Gowaty, *Preface* to *FEMINISM AND EVOLUTIONARY BIOLOGY*, *supra*, at xi, xii-xiii. The *Women in Science* editors were themselves criticized for inviting certain commentators to present “both sides” of the gender difference debate despite their being overtly partial to specific explanations. Williams & Ceci, *supra* note 7, at 5.

13. See, e.g., Donna Haraway, *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective*, in *THE FEMINIST STANDPOINT THEORY READER: INTELLECTUAL AND POLITICAL CONTROVERSIES* 81 (Sandra Harding ed., 2004); Sandra Harding, *Rethinking Standpoint Epistemology: What Is “Strong Objectivity”?*, in *THE FEMINIST STANDPOINT THEORY READER*, *supra*, at 127.

find such differences is that it will almost inevitably end up reinforcing a powerful ideology of gender difference that has cabined women's opportunities more than it has or will shed light on the significance of gender.<sup>14</sup> Moreover, given what we have long known about the enormous variety in human behavior, and the powerful impact of history, culture, and ideology on it, and given what we are learning about environmental influences on brain development, it is unlikely that there exist strong biological links between gender and behavior. The notion that, were we able accurately to identify such links, they would explain the dearth of women in the sciences—when achieving positions and success in science depends on multiple factors, and relatively few of these factors depend on the traits and behaviors of the individual scientist—belongs in the category of science fiction, not science.

### I. THE ONGOING NATURE VS. NURTURE DEBATE

Frogs and snails and puppy-dogs' tails/  
That's what little boys are  
made of.

– Nursery Rhyme<sup>15</sup>

When I was a young feminist in the late 1960s, we took as gospel that the dearth of women in science and throughout the professions was a matter of discrimination, not difference in innate ability.<sup>16</sup> Reacting to more than a century of women's confinement to the "separate sphere" of the home and concomitant exclusion from public and professional life, we were certain that to the extent that fewer women sought degrees, were hired, or advanced in science and other fields, this disparity was primarily a matter of acculturation and discrimination, not "natural" (innate or genetic) differences between the sexes. Men might be bigger, stronger, and have deeper voices, and there might be genetic differences in sexual and reproductive roles, but these differences were irrelevant to career choice except in very limited arenas, such as professional sports. The fact that boys might seem more aggressive and competitive at play, or choose trucks rather than dolls, was purely a matter of socialization.

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14. This is not to argue that we should halt studies of gender difference in cognition. Rather, it is to argue that these studies would be better accomplished with the aid of persons whose explicit purpose is to examine the research question, design, and execution for gender bias, rather like ethics committees examine for ethical compliance. And it is to suggest that funding should be prioritized for those studies whose purpose is linked to a positive social good such as understanding of brain injury and illness, rather than those studies geared toward establishing gender difference independent of plausible social benefits.

15. WILLIAM S. BARING-GOULD & CEIL BARING-GOULD, *THE ANNOTATED MOTHER GOOSE: NURSERY RHYMES OLD AND NEW, ARRANGED AND EXPLAINED* 175-76 (1962).

16. "A smaller percentage of women get advanced degrees in most of the natural sciences (although not biology) than in most of the social sciences, the humanities, medicine, law, business, or nursing." Valian, *supra* note 6, at 27. Yet "[w]omen make less and advance through the ranks more slowly not just in the natural sciences, but in every field . . . including nursing." *Id.* (citation omitted).

A combination of more gender-neutral parenting and removal of overt barriers to women's public participation in the world of work and politics would surely open the doors to predominately male professions, as surely as it would open the doors to predominately female professions for men. Over time, women would transform predominately male professions, making them more hospitable to women, and the numbers would even out. Those of us who went into law fully expected that legal change—the removal of barriers to women's full participation in the economy and in politics, and to women's self-determination within the family—would greatly increase women's numbers and position in every occupation. Happily, these changes seemed to materialize in many areas (especially law), although gaps in pay, position, and prominence continued to be a problem, and some areas, including STEM fields, seemed especially resistant to penetration by women.

Then, one by one, my feminist friends began raising children and discovering that, despite their best efforts, (most of) their boys tended to be aggressive in play and begged for toy guns, while (most of) their girls opted for cooperative imagination games and asked for make-up. Can it all be socialization, we wondered, when we dressed *our* children in neutral colors (no pinks or blues for them), used the same tones of voice with both our girls and our boys, and gave them the same toys and cues? While some of us simply adjusted the time frame, realizing that social conditioning embedded in everything from pop culture to religion was not likely to be overcome by a generation or two of gender neutral childrearing, many others concluded that gender difference was at least as much a matter of genetics as acculturation, if not more so.

How could it be otherwise? This is not a puzzle that can be solved by laboratory testing and experimentation, nor by better and sharper brain imaging. We will never discover a male gene, hormone, or brain region inextricably linked to guns any more than we will find one linking female brains to make-up. Psychological testing of and behavioral experiments with young boys and girls will never be able to definitively distinguish the effects of acculturation from “innate,” or biologically determined, behaviors.<sup>17</sup> Among other things, acculturation begins in utero, and it would be difficult to ethically fashion experiments evaluating the impact of uterine influences.<sup>18</sup> And, as

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17. Baron-Cohen seeks to support his claim that boys' brains “systematize” while girls brains are empathic (“affective”) using studies of year-old infants finding that boys' eyes focused longer on “videos of cars going past” while girls focused longer on faces. Simon Baron-Cohen, *Sex Differences in Mind: Keeping Science Distinct From Social Policy*, in *WOMEN IN SCIENCE*, *supra* note 3, at 159, 168. The leaps from such evidence to the conclusion that the boys are attempting to understand the mobile while the girls are seeking to empathize are obvious. We need to be especially skeptical about such a leap because Baron-Cohen's conclusions accord so closely with folk wisdom about gender difference.

18. Evidence is accumulating that fetuses respond in utero to sound, and are able to retain memory of auditory and other inputs, including language patterns, post-birth. Other areas (smell, for example) have not been well-studied, but an entire industry promoting pre-natal learning has arisen in response to more than two decades of research. See, e.g., David E. Chamberlain, *What Babies Are Teaching Us*

some *Women in Science* authors point out, the line between nature and culture may itself be conceptually flawed, in that environmental—including socio-cultural—influences on the “natural” development of the brain begin immediately. Every millisecond the brain responds to the influences of both its own biological (hormonal) environment and to external stimuli, opening some neural pathways and not others, uniquely altering and shaping its response to the next stimulus and directing its continued development.<sup>19</sup>

Hence it is no surprise that neither science nor feminism has resolved the nature/nurture debate.<sup>20</sup> Sociobiologists continue to attempt to explain everything from male rape to female nurturing as a matter of genetic predisposition based in evolutionary necessity.<sup>21</sup> Post-modern feminism has responded that gender is imbedded in language,<sup>22</sup> hence expression of gender difference at early ages is to be expected but does not demonstrate the dominance of nature because language, according to some theorists, is a largely cultural artifact.<sup>23</sup> However, if language itself had a genetic basis, might it not express, as some research seemed to show, a basic difference between the sexes?<sup>24</sup> Carol Gilligan’s research revealing a gender difference in moral

*About Violence*, PRE- & PERINATAL PSYCHOL. J., Winter 1995, at 57, available at <http://www.birthpsychology.com/violence/chamberlain1.html> (citing research showing that “[f]or two decades we have had proof that full-term newborns, prematurely born babies, and even babies in utero are capable of classical conditioning and habituation” and that “[r]ecognition learning of musical passages, stories, voices, native language sounds and even children’s rhymes have been shown at birth and during intra-uterine life”); see also David E. Chamberlain, Prenatal Memory and Learning, <http://www.birthpsychology.com/lifebefore/earlymem.html> (last visited Mar. 10, 2009). For one example of a company marketing pre-natal learning products, see Babyplus Prenatal Education System, <http://www.babyplus.com/prenatallearning.php> (last visited Mar. 10, 2009).

19. See *infra* notes 135-140 and accompanying text.

20. Most participants in this debate agree that it is a matter of which is dominant, since clearly both nature and nurture, or biology and culture, play a part. See, e.g., Russell Gray, “*In the Belly of the Monster*”: *Feminism, Developmental Systems, and Evolutionary Explanations*, in FEMINISM AND EVOLUTIONARY BIOLOGY, *supra* note 12, at 385, 385-86.

21. DAVID P. BARASH, SOCIOBIOLOGY AND BEHAVIOR 8 (1982); see also EDWARD O. WILSON, SOCIOBIOLOGY: THE ABRIDGED EDITION 300 (1980). For example, Gowaty likens it to behavioral ecology in framing it within the rubric of evolutionary biology. Patricia Adair Gowaty, *Introduction to FEMINISM AND EVOLUTIONARY BIOLOGY*, *supra* note 12, at 8. The definition of sociobiology is not entirely clear. For contemporary criticisms and defenses of expanded understanding of sociobiology, see generally the essays in FEMINISM AND EVOLUTIONARY BIOLOGY, *supra* note 12, particularly Caitilyn Allen, *Intextricably Entwined: Politics, Biology, and Gender-Dimorphic Behavior*, in FEMINISM AND EVOLUTIONARY BIOLOGY, *supra* note 12, at 515, 515, asking the question “[w]hy are feminists and evolutionary biologists at odds?” (and offering explanations grounded in the different aims of science (open-ended speculation) and feminism (political and cultural change)).

22. Susan Gal, *Between Speech and Silence: The Problematics of Research on Language and Gender*, in GENDER AT THE CROSSROADS OF KNOWLEDGE: FEMINIST ANTHROPOLOGY IN THE POSTMODERN ERA 176 (Micaela di Leonardo ed., 1991)

23. *Id.* at 180; see JUDITH BUTLER, GENDER TROUBLE: FEMINISM AND THE SUBVERSION OF IDENTITY (1990).

24. Noam Chomsky is perhaps the most notorious proponent of innate grammatical and syntactical linguistics. Since the late 1950s, his work has often been opposed by structuralist philosophers throughout the academy including many feminists, despite the fact that Chomsky himself has spoken very fondly of the feminist movement, calling it “the most important development to come out of the Sixties.” One former student wrote in *Mother Jones* that “Chomsky thinks he is a feminist, but—at heart—he’s an old-fashioned patriarch. . . . He just has never really understood what the feminist

reasoning was widely misinterpreted as signaling biological difference between the sexes.<sup>25</sup> Cultural feminists lauded women's supposedly more caring and cooperative behavior, but neither focused nor agreed on its origin, which was largely irrelevant to their enterprise.<sup>26</sup> And although emerging "queer theory" sometimes challenges the use of sex as a category at all, its challenge—in a world pervasively differentiated along gender fault lines—has yet to gain significant traction.<sup>27</sup>

Yet, part of our cultural legacy—ironically, one perhaps most often challenged from within academia—is an Enlightenment faith in the power and objectivity of science, which asserts authority on the basis of its purportedly value-neutral measurement, and the replicability of its "hard" data.<sup>28</sup> And so, to shore up the strength or defend against criticism of policy choices (or their results), many turn to scientific "data" that purport to justify those choices. This was the path taken by Harvard President Larry Summers when, in 2005, he offered his now infamous suggestion that the dearth of women in scientific academia (at Harvard and in general) might be partly due to innate sex differences in cognitive ability. But, perhaps not surprisingly given his leadership role in academia, Summers touched off a firestorm that led not only to his resignation, but also to a lively revival of the nature/nurture (biology/environment; nature/culture) debate and to publication of the collection of essays that is the subject of this review.<sup>29</sup>

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movement is about." Jay Parini, *Noam Is an Island*, MOTHER JONES, Oct. 1998, at 36, 39. When asked if there was any validity to this claim, Chomsky said he was in no position to judge, but he admitted, "in fact, it's a criticism I've been hearing for years, from friends and others. And I think there's probably some validity to it." *The Radical Vocation: An Interview with Noam Chomsky*, Interview by Adam Jones with Noam Chomsky, in Cambridge, Mass. (Feb. 20, 1990), <http://adamjones.freesevers.com/chomsky.htm#interview>.

25. Steven Hartwell, *Promoting Moral Development Through Experiential Teaching*, 1 CLINICAL L. REV. 505, 519 n.52 (1995).

26. Mark M. Hager, *Sex in the Original Position: A Restatement of Liberal Feminism*, 14 WIS. WOMEN'S L.J. 181, 184-86 (1999) (recognizing that there are multiple positions which cultural feminism might take, including "biological essentialism" and "the commonplace assertion that trait are labeled 'male' and 'female' by cultures," but criticizing either basis).

27. See ANNAMARIE JAGOSE, QUEER THEORY: AN INTRODUCTION 1-6 (1996) (discussing the difficulty in defining a singular "queer theory" but stating broadly that queer theory debunks "stable sexes, genders and sexualities . . . out of a specifically lesbian and gay reworking of the post-structuralist figuring of identity as a constellation of multiple and unstable positions"); see also Jennifer Finney Boylan, *The XY Games*, N.Y. TIMES, Aug. 3, 2008, at 10 (arguing that Olympic games testing for sex cannot define a biological line differentiating male from female, and that efforts to "impose a binary order upon the messy continuum of gender" are "bound to fail").

28. The division of the sciences into "hard" and "soft" itself has a notably gendered aspect.

29. Williams & Ceci, *supra* note 7, at 7; Diane F. Halpern, *Science, Sex, and Good Sense: Why Women Are Underrepresented in Some Areas of Science and Math*, in WOMEN IN SCIENCE, *supra* note 3, at 121, 121-30; Benedict Carey, *Criticism of Gender Theory, and a Scientist Under Siege*, N.Y. TIMES, Aug. 21, 2007, at F1; see also Peter A. Lawrence, *Men Women and Ghosts in Science*, PLOS BIOLOGY, Jan. 2006, at 4(1): e19. I do not propose here to address the controversy over what Summers meant by his remark that "most of what we've learned from empirical psychology in the last fifteen years has been that people naturally attribute things to socialization that are in fact not attributable to socialization." The editors of *Women in Science* and at least one of its authors have interpreted him to mean that a significant "cause" of female under-representation is that there are "too few women with the



## II. WHAT DO THE DATA SAY?

We have, as human beings, a storytelling problem. We're a bit too quick to come up with explanations for things we don't really have an explanation for.

– Malcolm Gladwell, *Blink: The Power of Thinking Without Thinking*<sup>30</sup>

*Women in Science's* editors skillfully present the issues, summarize the data, and posit a research agenda to promote further clarity. But “there are so many ways of looking at sex difference on cognitive measures,” as they recognize, that one’s “conclusion will depend on the way one approaches the question.”<sup>31</sup> This understated point may be why gender controversies are so persistent and so intense, especially within the sciences.<sup>32</sup> Those who lean toward cultural and historical explanations for differences in the social positions of males and females wonder why if, as Haier points out, “[m]ost of the differences [in “cognitive strengths and weaknesses” by gender] are rather small and may have no practical consequences,” so much attention and so many resources have been devoted to finding them.<sup>33</sup> We wonder whether part of the explanation may lie not only in a male-dominated history dismissive of the issues and perspectives of women, but also in the embodiment within science of an ideology of objectivity, neutrality, and (more recently) individualism, which themselves grow out of that history.

Beginning in the 1980s, many feminist scholars of science began to assert what they termed “standpoint theory” as a challenge to the supposed objectivity of science and other truth-seeking epistemologies.<sup>34</sup> These writers, although

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cognitive abilities that are needed for careers in science and math.” Summers’ first example of what empirical psychology has purportedly revealed relied on much-criticized conclusions drawn from the so-called “separated twin studies.” See, e.g., Paul Ehrlich & Marcus W. Feldman, *Genes, Environments & Reductionism*, 136 DAEDALUS 5, 5-6 (Spring 2007).

30. MALCOLM GLADWELL, *BLINK: THE POWER OF THINKING WITHOUT THINKING* 69 (2005).

31. Williams & Ceci, *supra* note 7, at 11. The editors do not address whence, if not from politics and personal belief, one’s choice of approach might derive.

32. See *supra* note 12 (describing controversy surrounding the feminism and evolutionary biology conference).

33. Richard J. Haier, *Brains, Bias, and Biology: Follow the Data, in* WOMEN IN SCIENCE, *supra* note 3, at 113, 113 (2007). Haier himself persuasively argues that, because male and female brains are anatomically different, we can learn much about the brain’s function in general by comparing them. See Richard Haier, Professor, Univ. of Cal.-Irvine Med. Sch., Speech at American Enterprise Institute’s Conference on Women and Science (Oct. 1, 2007), available at <http://www.aei.org/events/filter.all,eventID.1536/transcript.asp>. Perhaps, but the data revealed by such studies is not self-interpreting, and within a culture in which cognitive difference is so often assimilated to a binary hierarchy which favors men even when it (occasionally) purports to highlight women’s advantage or greater skill, the data are likely to be misinterpreted.

34. See the essays in THE FEMINIST STANDPOINT THEORY READER, *supra* note 13. See also Joan Williams, *Is Law an Art or a Science?: Comments on Objectivity, Feminism and Power*, 7 AM. U. J. GENDER SOC. POL’Y & L. 373, 375 (1999) (“[P]eople often confuse objectivity critiques with the belief

differing in the degree to which they were willing to abandon traditional notions of objectivity and what they meant by the term, were unified in bringing attention to the importance of power in determining the allocation of scarce scientific resources: determining what gets studied, where resources are spent, what conclusory leaps are apt to be made from the data, and how those leaps are portrayed in mainstream media. These writers were also unified on the position that the views, issues, concerns, and realities of women and other groups previously underrepresented (or entirely absent) among decisionmakers were not adequately taken into account. And they demonstrated the many ways in which that failure undermined the objectivity of science itself. Issues of importance to the less powerful had been ignored. But equally important, critical examination of the data from “below”—examination that might question the assumptions underlying study design or interpretation of results from the perspective of the powerless—was largely absent.

*Women in Science*'s laudable aim is, in part, to redress this situation (the majority of its authors are women researchers), yet it presents its contributors as offering an objective alternative to mere “politics or personal belief.” Ultimately, the essays it contains demonstrate how little can be resolved by the data, and how much is driven precisely by deeply-ingrained standpoints which are themselves a product of politics and personal belief.<sup>35</sup>

Those who believe that cognitive gender difference explains the “science gap”—primarily Kimura and Baron-Cohen<sup>36</sup>—tend to rely on the highly culturally and historically specific assumptions that individual ability and inclination explain professional success; that cognitive ability is in significant measure innate rather than cultivated, conditioned, and defined by culturally and historically specific influences; and that preference is generated in great measure by ability. These assumptions pervade the effort to explain job distribution using standardized test data, and the further reliance on data

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that nothing is true . . . This is silly: it mistakes a conversation on epistemology, on what truth claims mean, with a claim that truth claims are incoherent.”).

35. Editors Ceci & Williams note that “[t]he way the arguments are framed makes it difficult to pit one type of evidence against the other,” precluding one’s ability to determine which way the preponderance of the evidence leans. Ceci & Williams, *supra* note 3, at 213. But they decline to address whether it is possible to frame the arguments such that they fully engage, given that each embodies within it numerous unproven (and perhaps unprovable) assumptions about human nature, human culture, and, indeed, the nature of science itself. The depth of difference in ideological or cultural underpinning may well make them simply incommensurable.

36. Others read the data to potentially support cognitive gender difference, but disclaim any certainty with respect to its explanatory significance in relation to the dearth of women in some sciences. See Ruben C. Gur & Raquel E. Gur, *Neural Substrates for Sex Differences in Cognition, in WOMEN IN SCIENCE*, *supra* note 3, at 189, 189, 195-96 (stating that although “findings substantiate some hypotheses . . . for sex difference in cognition,” “[t]he state of knowledge on the neurobiology of sex difference is far from enabling strong statements”; and “biology can only offer a limited perspective and . . . not much more than conjectures” (emphasis added)); Haier, *supra* note 33, at 113-14, 116 (citing studies that show gender difference in cognitive ability but opining that “[a]t this stage of research, it is not certain that genes play a role either in mathematical talent among individuals or in any sex differences in the size of the talent pool” and declining to speculate about behavioral outcomes).

indicating that high scorers obtain elite jobs,<sup>37</sup> to argue that they do so because they have greater ability. (They also underlie the tendency of at least some scientists, represented, in this volume, by Doreen Kimura, to view their own data without adequately situating it socially and historically.)<sup>38</sup> Not coincidentally, these arguments tend to justify the status quo.

Some who emphasize innate cognitive difference caution that other factors may also help explain women's absence from STEM fields, but they still fail to explore the way in which hidden assumptions might be deeply and problematically influencing their emphasis or conclusions (although, in fairness, they were held to a strict word limit).<sup>39</sup>

Only Kimura and Baron-Cohen are willing to assert a clear link between innate gender difference in brain function (hence aptitude) and professional outcomes (fewer women in science; fewer men in nursing and education).<sup>40</sup> Others, such as Gur and Gur and Haier agree that the data seem to suggest, if not establish, cognitive gender difference, but they call for further research and are less ready to affirm the link between the differences identified and career outcomes.<sup>41</sup> Lubiniski and Benbow, while relying to some extent on evidence supporting different "ability patterns" by gender, also identify differences in potentially socially conditioned "interest" and the highly culturally specific

37. See David S. Lubinski & Camilla Persson Benbow, *Sex Differences in Personal Attributes for the Development of Scientific Expertise*, in *WOMEN IN SCIENCE*, *supra* note 3, at 79.

38. Kimura writes that it "is almost certainly correct" that "the lower number of men in [nursing and education] reflect a lesser talent or interest" in those fields. *Kimura, supra* note 3, at 39. Kimura is evidently blissfully unaware that males predominated in the field of education for centuries and that, in nursing, males advance more rapidly than females, as Valian reports, *supra* note 6. It does not seem to occur to Kimura that men's lesser interest in nursing in the past might have had more to do with the low salaries and lack of prestige commanded by the profession until relatively recently than any intrinsic disinterest in or capacity for the work involved.

39. Baron-Cohen explicitly warns that scientists must be "sensitive to this history of conflict," in which researchers like him were accused of gender essentialism, "by cautiously looking at the evidence and being careful not to overstate what can be concluded." Baron-Cohen, *supra* note 17, at 160. But Baron-Cohen then goes on to do what he warns against. Based on limited and contested data, he concludes not only that female brains are characterized by empathic ("affective," "emotional") responses while male brains systemize and are rule-oriented, such that "the explanation is exact, and its truth value is testable," but also that these are "wholly different kinds of processes" which "*depend on separate, independent regions in the human brain.*" *Id.* at 160-61 (emphasis added). His latter statement fails to acknowledge research which suggests that our complex brains and the regions within them are interdependent and pliable in ways that we have not begun to fathom. See, e.g., NORMAN DOIDGE, *THE BRAIN THAT CHANGES ITSELF: STORIES OF PERSONAL TRIUMPH FROM THE FRONTIERS OF BRAIN SCIENCE* (2007) (stating that victims of accidents who lose certain brain functions are able to recover by rewiring neuronal circuits); OLIVER SACKS, *MUSICOPHILIA* 163 (2007) (citing evidence that visual cortex of persons blind from birth adapts to other uses). Moreover, in constructing a dichotomy between empathic and systemic responses as "wholly different" processes, Baron-Cohen seems to exhibit precisely the lack of "sensitivity" he warns against. Granted, his word count was limited, but his contribution includes not even a scintilla of reflection on the degree to which the studies on which he relies (his own and others') might be influenced by a history of assigning the less valued trait—typically emotion (affective empathy) to women, and the more valued one—often reason (systemizing thought)—to men.

40. See Baron-Cohen, *supra* note 17; Kimura, *supra* note 3.

41. See Gur & Gur, *supra* note 36; Haier, *supra* note 33.

“number of hours [men and women are] willing to devote to their careers” as important factors in the dearth of women holding advanced positions in science.<sup>42</sup>

The remainder, a majority of them women, argue that much of the data suggesting ability difference is flawed (and perhaps always will be), and that the inferences drawn from it are even worse. These authors argue that socio-cultural explanations better elucidate women’s relative absence from the sciences, and most challenge “the assumption that there is a direct relationship between cognitive ability, career choice and success.”<sup>43</sup>

But almost all on both sides agree on the following propositions: Although there are cognitive and developmental differences between those we typically designate male and those we typically designate female, the evidence “says nothing about individuals”;<sup>44</sup> the differences within genders are greater than those between them; and both nature and nurture play a part in female/male development—indeed, Hines and Halpern argue that, given what we know about the brain, the dichotomy between natural and environmental influences is virtually incoherent.<sup>45</sup>

#### A. *Gender May Explain a Good Deal*

Ultimately, although several authors interpret the data as supporting meaningful cognitive difference between the sexes, only Kimura and Baron-Cohen are willing to conclude that there is a definite link between that difference and the dearth of women in science.<sup>46</sup> Others, although they treat as helpful data purporting to demonstrate meaningful cognitive difference by sex,

42. Lubinski & Benbow, *supra* note 37, at 80. Of course, “willing” is a loaded word, one which locates women’s hours of work in individual choice rather than such institutional factors as discrimination or a patriarchal allocation of responsibility for child and elder care.

43. Halpern, *supra* note 29, at 121; Hyde, *supra* note 3, at 212; *see also* Sheri A. Berenbaum & Susan Resnick, *The Seeds of Career Choices: Prenatal Sex Hormone Effects on Psychological Sex Differences*, in *WOMEN IN SCIENCE*, *supra* note 3, at 147, 154 (“It is also important to recognize that career outcome and its value depend not just on individual characteristics but on the actions of social institutions.”).

44. Baron-Cohen, *supra* note 17, at 159.

45. *See* MELISSA HINES, *BRAIN GENDER* 4 (2004); Halpern, *supra* note 29, at 127 (“The distinction between biology and experience is hopelessly blurred when you consider that the architecture of the brain is also shaped by experience . . .”). Halpern points to data showing, for example, that areas of the brain related to spatial skills were enlarged in London cab drivers. *Id.* For similar data related to musicians and enlargement of the corpus callosum, *see*, for example, SACKS, *supra* note 39, at 94 (citing Christian Gaser & Gottfried Schlaug, *Brain Structures Differ Between Musicians and Non-Musicians*, 23(27) *J. NEUROSCIENCE* 9240 (2003); and Siobhan Hutchinson et al., *Cerebellar Volume of Musicians*, 13 *CEREBRAL CORTEX* 943 (2003)). In a later study, Maguire along with colleague Woollett demonstrated that the “[g]rey matter increases in various parts of the brain [that] have been identified in a number of skilled groups such as musicians, mathematicians, bilinguals, jugglers, and medical students” may come at a mental cost in performing other memory tasks. Katherine Woollett & Eleanor A. Maguire, *Navigational Expertise May Compromise Anterograde Associative Memory*, 47 *NEUROPSYCHOLOGIA* 1088 (2009) (citations omitted).

46. *See* Baron-Cohen, *supra* note 17; Kimura, *supra* note 3.

are more reluctant to assume that it contributes significantly to explaining employment outcomes.<sup>47</sup> Kimura and Baren-Cohen, but also Newcombe, Geary, Newcombe and Lubinski, and Benbow emphasize data revealing male performance superiority in areas that are arguably important to success in STEM fields, such as mathematics reasoning, spatial ability (especially mental rotation tasks), and mechanical reasoning, as well as greater orientation to objects rather than people.<sup>48</sup> These proclivities, some suggest, lead to a gender difference in preferred activities (types of play, for example, and affinity for school subjects) and thus widen the gender gap in both ability and interest.<sup>49</sup> Females, the argument goes, tend to avoid STEM areas as they grow older, and instead to prefer subjects and fields that favor their own skills and interests as well as those that are more people-oriented.<sup>50</sup> These scholars focus heavily on test scores and experimental data revealing “large effect sizes favoring males”<sup>51</sup> on tests of mental rotation of objects in space and mechanical reasoning (“imagining real-world interactions of mechanical items”).<sup>52</sup> In addition, “men generally greatly outnumber women at the high end of math and spatial reasoning tests,”<sup>53</sup> and contributing researchers Lubinsky and Benbow have shown that science professionals at elite universities are chosen largely from the extreme high end of the ability curve.<sup>54</sup> In addition, some (like Baron-

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47. Berenbaum & Resnick, *supra* note 43 (acknowledging hormonal influences but emphasizing the importance of social and institutional forces); Nora S. Newcombe, *Taking Science Seriously: Straight Thinking About Spatial Sex Differences*, in *WOMEN IN SCIENCE*, *supra* note 3, at 69, 75 (“... I doubt that extra increments of the same cognitive ingredients explain much variance.”)

48. See, e.g., Baron-Cohen, *supra* note 17.

49. See Kimura, *supra* note 3, at 41 (taking issue with those who suggest childhood social conditioning leads to adult outcomes and arguing that it is “equally possible,” indeed “probable,” that “superior abilities influence the activities rather than the other way around”). Several other contributors disagree with Kimura on this point. See, e.g., Jacquelynne S. Eccles, *Where Are All the Women? Gender Differences in Participation in Physical Science and Engineering*, in *WOMEN IN SCIENCE*, *supra* note 3, at 199, 209 (arguing that early preferences are based not on differences in aptitude, but rather “inaccurate stereotypes” that “begin influencing educational decisions quite early in life”); see also Newcombe, *supra* note 47, at 71 (pointing to evidence that low-income youngsters did not exhibit sex differences in two spatial tasks, and suggesting that “[t]he most natural explanation . . . is that boys in low-income environments lack access to the experiences that enhance spatial skill (e.g., computer games, puzzles, and building sets)”).

50. Ceci & Williams, *supra* note 3.

51. Kimura explains,

Effect size refers to the magnitude of the difference between two means, taking into account the variability or dispersal of the scores around each mean. If variability is small, there is less overlap between the groups, so the effect size is larger. If variability is large, effect size will be smaller.

Kimura, *supra* note 3, at 40 n.1.

52. *Id.* at 40.

53. *Id.* at 40; Lubinski & Benbow, *supra* note 37, at 79.

54. Lubinski & Benbow, *supra* note 37, at 80. Their Study of Mathematically Precocious Youth (SMPY) focuses on “the talented” top 1% of math test-takers because “most STEM professionals come from those in the top 10% in ability.” *Id.* See Larry V. Hedges & Amy Nowell, *Sex Difference in Mental Test Scores, Variability, and Numbers of High-Scoring Individuals*, 269 *SCIENCE* 41 (1995) (reviewing the findings of six studies showing that “males outnumbered females in the top 1% of mathematics and spatial reasoning ability by a ratio of 7:1” and concluding that “small mean differences [in ability]

Cohen) offer data suggesting greater object-orientation on the part of males, and people-orientation on the part of females (data which is strongly challenged by Hyde and by Spelke and Grace).<sup>55</sup>

Experiments with young children indicate that some of these differences are present at early ages, and other data reveal that they occur “across cultures that vary in social pressures to conform to a gender norm.”<sup>56</sup> In addition, while “both sexes benefit by short-term intensive training on spatial tasks,” average differences by gender remain, and have “not radically” changed “over the past three or four decades.”<sup>57</sup>

In addition, some point to evidence of gender difference in prenatal and early post-natal hormonal development—evidence that has been linked to behavioral difference in animal experiments as well as clinical observation of humans with unusual sexual development.<sup>58</sup> For instance, Kimura notes that male rats are better than females at learning spatial mazes, but these differences “can be reversed by hormonal manipulation in early postnatal life.”<sup>59</sup> And she and Geary point out that male meadow voles, but not other types of voles, develop better spatial ability during their hormone-induced mating season, seemingly because their mates, unlike those of other types of voles, are territorial and widely dispersed, so that success at sexual competition (which is

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combined with modest differences in variance” might explain women’s under-representation in the sciences). As Williams and Ceci point out,

Everyone agrees that [the 50% mark of the ability distribution] is not where the action is; females do as well or better than males in math and science, on average. They get better grades, take more demanding coursework, matriculate in college in greater numbers, graduate in higher numbers (57% of all graduates of four-year programs are now female), and profess greater post-secondary professional aspirations. Scientists, especially those in mathematically intensive fields, do not come from the middle of the ability distribution.

Williams & Ceci, *supra* note 7, at 12. Notably, however, despite significantly superior scoring by Singaporean and Japanese girls over American and Canadian boys on international tests (on tests in 2002 and 2003, Japanese girls outscored U.S. boys by 62 points and Singaporean girls by 104, whereas U.S. boys only outscored U.S. girls by 2-5 points), Valian, *supra* note 6, at 29, this pattern has neither led to larger numbers of girls in those societies entering STEM professions, nor to a predominance of Singaporean or Japanese Nobel winners in math or science.

55. Hyde, *supra* note 3, at 131-45; Elizabeth S. Spelke & Ariel D. Grace, *Sex, Math, and Science*, in *WOMEN IN SCIENCE*, *supra* note 3, at 57, 58 (pointing to some data that females actually learn some “object mechanics” tasks earlier than males, and that “male and female toddlers learn at indistinguishable rates how to fit blocks into holes and build towers”).

56. Kimura, *supra* note 3, at 41.

57. *Id.* But as the *Women in Science* editors point out, in 1975 “there was a substantial male advantage in the mean scores on the British Volume and Heaviness test, but . . . this advantage disappeared by 2004”; further, while in 1983 the top 1% on the SAT-M (math) reflected a male to female 13:1 ratio, by 2005 that ratio had shrunk to 4:1. Williams & Ceci, *supra* note 7, at 11-12. Plainly, what constitutes a “radical” change may depend on one’s (political?) predisposition.

58. See, e.g., Kimura, *supra* note 3, at 41.

59. *Id.* From this data, Kimura draws the inference that early interest rather than early experience causes later-life gender difference in spatial ability. See also David C. Geary, *An Evolutionary Perspective on Sex Differences in Mathematics and the Sciences*, in *WOMEN IN SCIENCE*, *supra* note 3, at 173, 175-76 (extrapolating from hormonal influences on meadow voles to support his evolutionary explanation of gender difference in spatial ability).

central to species survival) depends on spatial ability.<sup>60</sup> Geary, in *An Evolutionary Perspective on Sex Differences in Mathematics and the Sciences*,<sup>61</sup> asks readers to “consider the possibility that [evolution has selected for] sex differences in certain cognitive abilities and personal interests [that] contribute to long-term engagement in mathematical and scientific endeavors and to ease of learning some aspects of [these].”<sup>62</sup>

Although all contributors are psychologists, it is notable that Gur and Gur and Haier, who focus on evidence emerging from neuroscience imaging, are far more hesitant to make leaps from anatomical to behavioral difference, let alone to employment outcome difference. It may be that this is because they are all too aware of the tentative nature of their own results—and the results of neuroscience in general—and the degree to which drawing even the most limited conclusions from such preliminary and potentially flawed data would entail making giant leaps.

Gur and Gur, for example, confirm that there are both anatomical (structural) and physiological (functional) differences between male and female brains. But the meaning of these differences remains murky at best, and they clearly opine that “[t]he state of knowledge on the neurobiology of sex differences is far from enabling strong statements.”<sup>63</sup> Describing findings that males have a larger volume, but females a larger percentage of “grey matter,” which “can be considered as the hardware necessary for computation,”<sup>64</sup> they go on to suggest that “it can be argued that women have compensated for smaller cranial volume by packing a higher percentage of tissue with computational power.”<sup>65</sup> “Can be considered” and “can be argued” reveal just how underdeveloped the neuroscience imaging project is, and just how far we have to go before it will offer us answers to questions about why there aren’t more women in science. The region of the brain responsible for interhemispheric communication, Gur and Gur tell us, “is larger or at least more bulbous in women” (male brains are more lateralized than those of females) and “females displayed increased bilateral hemispheric activity for a

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60. *Id.* at 173-76. Similarly, Newcombe hypothesizes that “evolutionarily important behaviors such as male-male sexual competition” (the necessity to “navigate around the territory so as to have sexual access to as large a number of fertile women as possible”) explain “men’s superior showing on tests of ability to mentally rotate three-dimensional objects.” Newcombe, *supra* note 47, at 69, 72. Geary admits that his approach is highly speculative, typically uses terms like “may” and “potentially,” and freely admits that “the knowledge bases, technical skills, and conceptual insights in mathematics and the sciences arise from a poorly understood interaction between inherent cognitive and motivational biases and culture-specific educational goals and opportunities.” Geary, *supra* note 59, at 173-74.

61. Geary, *supra* note 59, at 173.

62. *Id.*

63. Gur & Gur, *supra* note 36, at 195.

64. *Id.* at 192.

65. *Id.* It surely “can be argued,” but how will we determine if it is correct and, if so, what implications it has for gender difference? We may someday learn more, but at the moment we are dealing in speculation upon speculation about the revelations of a new technology.

variety of cognitive tasks.”<sup>66</sup> But the conclusions that can be drawn from these revelations about male/female anatomy are hardly obvious, and Gur and Gur do no more than suggest that one can legitimately hypothesize that further study *might* reveal a link to behavior.<sup>67</sup>

The results of neuroimaging studies demonstrate that women and men use different regions of the brain more intensely when performing particular language or spatial problem-solving tasks. Gur and Gur note that several studies show that when handling a three-dimensional virtual maze, “[w]omen used more parietal and prefrontal regions (the latter suggesting it was an effortful task), whereas the men relied more on the hippocampus, suggesting an automatic encoding of geometric-navigation cues.”<sup>68</sup> While the authors avoid the temptation to leap to the conclusion that males are therefore hard-wired to be better at such tasks, the “suggestion” is less likely to be closely examined by readers, much less media sensationalists, who may likely view this as a reconfirmation of previously held views. Closer examination might raise pertinent questions about the ages and experiences of the test subjects, and whether any comparative studies across age had been done that might demonstrate that the “automatic encoding,” like that of bike-riding skill, was characteristic of a learned skill rather than an innate brain function.<sup>69</sup> It would be interesting to compare the brain regions of people just learning to ride bikes to those of people who have ridden bikes for a significant period of time to see whether something similar could be found, but to my knowledge we have not yet developed the technology for recording the neuroimages of someone riding a mobile bicycle. However, we do have information suggesting that a great deal of brain development, and perhaps usage, is environmentally driven; for example, the size of various brain structures in musicians differs substantially from the size observed in non-musicians, and there is a strong correlation between these differences in anatomy and “the age at which musical training began and the intensity of practice and rehearsal.”<sup>70</sup>

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66. *Id.*

67. Notably, one thesis they offer concerning the “behavioral effects” of male/female brain difference is that “[f]or females, better interhemispheric communication confers advantage in language and the ability to better integrate verbal-analytical . . . with spatial-holistic . . . information processing.” *Id.* at 196. For those like Kimura who are dismissive of discrimination as a primary cause of women’s absence from the sciences, this hypothesis raises the question of why women don’t occupy the majority of positions of authority in communicative fields, and those fields that require “holistic” approaches.

68. *Id.* at 194.

69. They might also enquire whether women’s compensatory, cooperative approach to navigation—asking directions—is a more effective and successful strategy for daily success and effective pursuit of science than the individual cognitive efforts purportedly measured by test scores or pictured in brain images. See Haier, *supra* note 33, at 114, to reference to the popular idea that “men allegedly do not ever ask for or read directions.”

70. SACKS, *supra* note 39, at 94. We know that humans develop automated responses that are stored separately from other memory. See *id.* at 204-06 (describing the case of Clive Wearing, who lost all experiential memory, so had no awareness of himself or his past, yet retained the ability to sing, conduct a choir, and play the piano). It would therefore seem logical and likely that any “automated” brain response is as much or more a matter of learning than physiology. See also MICHAEL S.



Moreover, based on evidence related to gender difference in blood flow, cerebral glucose metabolism and neurotransmitter function, Gur and Gur posit that women's brains may "better equip them for sustained mental activity."<sup>71</sup> If they are right, the evidence suggests that women ought to have an *advantage* in those sciences that demand sustained mental activity (and I cannot at the moment think of any sciences that do not).

Haier, whose studies have shown differences between male and female brain activity, makes no claim that his findings suggest anything significant about women's participation in STEM fields; his main aim seems to be to argue for keeping an open mind and continuing to study gender difference in cognition, because results might have uses (for example, medical interventions and the like) sufficiently valuable to make it worth the price paid by women (and some men) in popular and scientific misreading of the data.<sup>72</sup> He contributes evidence from his own and others' neuroscience studies, which use PET scans and MRIs to compare the brain activity of males and females performing certain specific tasks, and to examine the relationship of structural differences in male and female brains to general intelligence. For instance, he points to one widely reported study indicating that brain regions previously linked to IQ performance differ substantially in men and women. He argues that these studies may, if replicated, demonstrate that "men and women achieve the same general cognitive capability using different brain architectures."<sup>73</sup> In another example of gender difference, he points to a PET scan study of twenty-two males and twenty-two females taking the math SAT, or SAT-M, which revealed that "the harder the temporal lobes were working in the men, the better

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GAZZANIGA, RICHARD B. IVRY & GEORGE R. MANGUN, *COGNITIVE NEUROSCIENCE: THE BIOLOGY OF THE MIND* 101-05 (3d ed. 2009) (describing brain plasticity and explaining "topography," that is, the mapping of images in the brain). Increased amounts of grey matter have also been shown in mathematicians, bilinguals, jugglers and medical students. See Woollett & Maguire, *supra* note 45 (listing studies supporting each of these findings, and presenting research suggesting that increased gray matter in London taxi drivers in one brain region may come at the cost of brain function governed by other regions).

71. Gur & Gur, *supra* note 36, at 196.

72. As early as 1974, psychologists who examined studies on gender difference warned against biases that often lead to erroneous findings of difference. Among these were significant over-reporting of difference or positive results—for every twenty studies, nineteen findings of little or no difference go unreported, but the one positive finding is splashed across the media. In addition, stereotypes about sex differences influence the perceptions of both researchers and participants, distorting their experimental results and their interpretation of them. See ELEANOR EMMONS MACCOBY & CAROL NAGY JACKLIN, *THE PSYCHOLOGY OF SEX DIFFERENCES* 3-8 (1974) (describing biases in both reporting and interpretation of data). Writers—both popular and scholarly—want to relate social behaviors to gender ("Men are from Mars, Women are from Venus," after all) and to differences in male and female brains. See, e.g., JOHN GRAY, *MEN ARE FROM MARS, WOMEN ARE FROM VENUS* (1992). There have been a spate of recent books and articles making claims similar to those of writer Louann Brizendine, who claims that "the female brain is so deeply affected by hormones that their influence can be said to create a women's reality," and there are "sex-specific female brain circuits . . . for talking, flirting, and socializing." LOUANN BRIZENDINE, *THE FEMALE BRAIN* 3, 36 (2006).

73. Haier, *supra* note 33, at 115.

their score,” whereas no such relationship—nor any other—was found in the brains of women.<sup>74</sup>

As noted earlier, Haier is careful to note that “[m]ost of the differences [in cognitive performance by gender] are rather small and may have no practical consequences,” but he holds out hope that the research will shed light on the origins “of rather substantial cognitive differences among individuals.”<sup>75</sup> That may be so, and may have important uses in treating disease and disability. But what needs careful examination is whether, given the very minor differences revealed by many of these gender-based studies, and the questionable meaning and potentially negative effects of others (especially the testing data), cognitive science might be better served by studies that ask different questions, focus on different issues, and are differently designed.<sup>76</sup>

### *B. Gender May Explain Little: The Socio-Cultural Camp*

I note the obvious differences/ between each sort and type,/ but we are more alike, my friends,/ than we are unlike.

– Maya Angelou, *I Shall Not Be Moved*<sup>77</sup>

By contrast, contributors who emphasize the environmental factors argue both that the evidence of innate cognitive difference is flawed, and that the inferences concerning STEM careers drawn from it are insupportable. They

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74. *Id.* at 114.

75. *Id.* at 113.

76. Neuroscience is one of the areas in which women are increasingly well-represented at the graduate levels, which may ensure that questionable inferences will be less likely to be drawn from the data being produced, and study subjects may shift. Emma Hitt, *Careers in Neuroscience: From Protons to Poetry*, 318 *SCIENCE* 661 (2007) (describing the most recent survey of neuroscience programs, which found that women were more than sixty percent of neuroscience graduate students, but that the number of tenure-track faculty had changed little since 1998 and the percentage of women full professors remained a “low 21 percent”). Of course, this latter finding is a matter of concern, since if women lack positions of authority in these fields despite their graduate numbers, one cannot be confident that their perspectives will succeed in gaining a hearing, much less in changing the subjects studied or the approaches taken. Indeed, even if a few women reach positions of authority, it is often by virtue of mimicking the pattern of the male figures who came before them. Yet there is some hope that a few generations of women scientists in authority will produce change, just as women in other fields have. For instance, although women in the legal field have not shattered the “glass ceiling” that limits their numbers at the top of the profession, they have contributed to making significant change in the law itself, as well as in institutional culture. Women have spearheaded doctrinal change in everything from sexual harassment (a concept that did not exist before women’s articulation of it as a form of discrimination) to marital rape (which was not punishable as rape). See generally *GENDER AND LAW: THEORY, DOCTRINE, COMMENTARY* (Katherine T. Bartlett, Angela P. Harris & Deborah L. Rhode eds., 3d ed. 2002). For exploration of ways in which, despite the law, gender inequality is perpetuated, see generally *DEBORAH L. RHODE, SPEAKING OF SEX: THE DENIAL OF GENDER INEQUALITY* (1997). For strategies of change, see generally *WOMEN AND LEADERSHIP* (Barbara Kellerman & Deborah L. Rhode eds., 2007). And it is not coincidental that the demise of the *in terrorem* method of Socratic teaching, personified by Kingsfield in *THE PAPER CHASE* (Thompson Films 1973), gave way in most law schools soon after women entered the profession in significant numbers.

77. *MAYA ANGELOU, I SHALL NOT BE MOVED* 5 (1990).

argue that sociological and historical evidence—particularly a long history of discrimination against women in the very definition and structuring of “science”—better explains the STEM gender gap.<sup>78</sup> Disputing the claimed male cognitive edge, they point out that girls, on average, get better grades than do boys in both math and science, and outperform males in elementary and middle school on some mathematical tests (arithmetic and calculation).<sup>79</sup> Standardized test results, especially at extreme ends of the score curve, may be measuring test-taking skill (and gendered biases) rather than cognitive difference.<sup>80</sup> And Japanese, Taiwanese and, lately, Singaporean females have been significantly outscoring American and Canadian males on global mathematics tests, so cultural factors are plainly influential.<sup>81</sup> Elizabeth S. Spelke and Ariel D. Grace cite numerous studies challenging the Baron-Cohen “evidence” that males predominate in science because they are more “object-oriented” or more numerically or “spatially gifted,” to conclude that the

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78. See, e.g., Williams & Ceci, *supra* note 7, at 15 (citing a study that supported claims of stereotype threat, showing that girls performed significantly better on identical tests when asked their gender after the test than when asked before); Spelke & Grace, *supra* note 55, at 63 (citing studies showing a tendency of respondents to rate “average” application packages significantly lower when labeled female—45% positive outcomes for females compared to 70% for males—and to question whether “exceptional” female candidates’ work was wholly their own four times more frequently than they questioned male candidates’ work). On stereotype threat, see also Halpern, *supra* note 29, at 127-28.

79. See, e.g., *id.* at 123-24; Hyde, *supra* note 3, at 134.

80. See, e.g., Hyde, *supra* note 3, at 138-42 (discussing how boys accrue an advantage in problem solving skills due to course selection and girls are adversely affected by a stereotype threat when asked to identify their gender before math tests); see also Spelke & Grace, *supra* note 55, at 60 (discussing the gender bias in testing). Contributor Carol Dweck points out that studies have shown steady improvement in performance on math and spatial ability testing over time, and offers the insightful hypothesis that conceiving of abilities in terms of “earned abilities” rather than “gifts,” thereby emphasizing the possibility of improvement rather than the inevitability of failure, might further reduce apparent gender difference. Carol S. Dweck, *Is Math a Gift? Beliefs That Put Females at Risk*, in *WOMEN IN SCIENCE*, *supra* note 3, at 47, 48-49. As Spelke and Grace point out, the most commonly used measure of mathematical aptitude, the SAT-M, “is composed of many different types of items, some of which are solved faster by the strategies females tend to favor and others by the strategies males tend to favor.” Spelke & Grace, *supra* note 55, at 60. As a result, male/female test outcomes depend on the balance between types of questions. But without “an independent understanding of the nature of mathematical aptitude and its distribution across the sexes,” one cannot determine the appropriate balance, and SAT-M performance “cannot, in itself, provide that understanding.” *Id.*

81. Valian, *supra* note 6, at 29-30. On cultural difference, see also Seth Mydans, *A Different Kind of Homework for Singapore Students: Get a Date*, N.Y. TIMES, Apr. 29, 2008, at A9 (discussing a growing campaign by Singapore’s government to encourage students not to wait until their career is established before having kids: “[T]oo few of the country’s most eligible women, those with college degrees, [are] marrying and having children”). Obviously, a national campaign to discourage women from pursuing careers is likely to impact women’s prevalence and success in STEM professions. Women’s participation in science in the United States was actively discouraged for most of its history. Indeed, the growth of the professions themselves was in several, if not all, cases inextricably intertwined with the exclusion of women. See, for example, Jennifer Block’s brilliant history of the medicalization of childbirth in *JENNIFER BLOCK, PUSHED: THE PAINFUL TRUTH ABOUT CHILDBIRTH AND MODERN MATERNITY CARE* (2007).

“research provides no evidence that boys engage with objects more intensely or systematically.”<sup>82</sup>

Melissa Hines and Diane F. Halpern, in separate essays, challenge the claims of Doreen Kimura and others who argue that pre- and post-natal hormones lead to gender difference in cognitive ability. Hines, a researcher for thirty years on the influence of sex hormones on behavior and author of *Brain/Gender*, a balanced presentation of the science to date, titles her essay *Do Sex Differences in Cognition Cause the Shortage of Women in Science?*, and answers the question with an emphatic “no.”<sup>83</sup> She points out that standard deviation measures of gender difference in cognition are small (0.9 or less) compared with, for example, height (2.0), but concedes that they might still be significant.<sup>84</sup> The differences demonstrated, however, are by no means self-evidently innate.

It is true, she writes, that numerous experimental (non-human) animal studies have verified that pre- and neo-natal hormones influence brain development, and some human behaviors have been linked, through observation of subjects born with genetic disorders that affect hormone production, to behavioral difference. For instance, girls born with an adrenal gland malfunction such that they overproduce testosterone “show increased male-typical toy, playmate, and activity preferences” and “reduced heterosexual activity and interest.”<sup>85</sup> But the degree to which these factors influence adult preferences, choices, or activity, is far from clear, and the influence of environmental factors is likely far more significant.

Hines cautions against jumping to conclusions about hormone influence, noting that 1960s and 1970s studies purporting to show elevated IQ scores from pre-natal androgen exposure suffer from serious selection biases. Noting that “general intelligence does not show an appreciable sex difference,”<sup>86</sup> she points out that studies showing gender difference (mental rotation, spatial perception, math and verbal ability) have “generally not supported organizational hormone influences” and argues that claims to the contrary “do not have a sound

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82. Spelke & Grace, *supra* note 55, at 58. The contributors also note that other work shows “that girls have no edge in learning about people and their mental states,” despite popular mythology to the contrary. *Id.* Although contributors address the interest rather than abilities of women, they may well be influenced by popular mythology, and they surely (though unintentionally) reinforce it. See Baron-Cohen, *supra* note 17, at 160 (noting that girls are more empathetic); Eccles, *supra* note 49, at 202-03 (commenting that women are more likely to enter helping professions).

83. Melissa Hines, *Do Sex Differences in Cognition Cause the Shortage of Women in Science?*, in *WOMEN IN SCIENCE*, *supra* note 3, at 101.

84. *Id.* at 102. “Sex differences of 0.8 *d* or larger are considered large, those of about 0.5 *d* are considered moderate, those of about 0.2 *d* are considered small, and only those smaller than 0.2 *d* are considered negligible.” *Id.* (internal citation omitted).

85. *Id.* at 105. Hines explains that hormones influence behavior in two ways: early production affects the organization of the brain (“organizational influences”), while transient fluctuations in adulthood can activate neural circuits to produce temporary behavioral change (“activational influences”); both are at play in cognitive difference debates.

86. *Id.*

empirical basis.”<sup>87</sup> Indeed, she argues that “more relationships have been observed in the direction opposite that predicted (e.g., testosterone relating negatively to spatial and numerical abilities) than in the anticipated direction.”<sup>88</sup>

Hines also challenges studies purporting to show that female hormones negatively influence women’s performance on certain cognitive functions at which males excel, noting a variety of weaknesses in the data, and pointing to both lack of replicability and contrary studies.<sup>89</sup> She concludes that there is sound evidence of neither hormonal nor genetic difference by gender in cognitive ability.<sup>90</sup> Instead, she points to historical and cross-cultural evidence concerning career patterns and math and science performance success, which she claims have far greater explanatory power.<sup>91</sup> Pointing to research demonstrating the importance of positive expectations to success, she highlights the danger of explaining women’s absence from STEM fields as resulting from cognitive deficits.<sup>92</sup>

Halpern, too, challenges the hormone studies and conclusions drawn from those studies,<sup>93</sup> but the focus of her essay, like that of Hyde, is to point to the far more convincing explanatory power of socio-cultural factors.<sup>94</sup> Noting the strong evidence “that experience alters brain structures and cognitive abilities” so that “[t]he distinction between biology and experience is hopelessly blurred,”<sup>95</sup> Halpern points to evidence of the variety of ways that everything from “stereotype threat” and lowered expectations to the structuring of tenure requirements better explain the dearth of women in STEM fields.<sup>96</sup>

Hyde’s essay both challenges the soundness of the data purporting to show any ability difference<sup>97</sup> and gathers data demonstrating sociocultural explanations for any such differences, pointing to different treatment by gender from “family, neighborhood, peer, and school.”<sup>98</sup> She points to data showing that stereotype threat impedes test performance,<sup>99</sup> studies showing the

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87. *Id.* at 105-06.

88. *Id.* Although most scientists point to them, animal studies purporting to show that sex-linked hormones drive behavioral difference suffer from the necessary but problematic assumption that the highly developed conceptual and abstract thinking which typifies human consciousness has a smaller impact on human behavior than hormonally- or genetically-driven animal instinct. This may be the case, but it is hardly obvious that the leap is warranted, especially when it comes to sexual activities which, in the case of human beings, are so emotionally complex and mediated by culture.

89. Hines, *supra* note 83, at 105-09.

90. *Id.* at 109.

91. *Id.*

92. *Id.* at 109-10.

93. Halpern, *supra* note 29, at 126-28.

94. *Id.* at 127-29.

95. *Id.* at 127.

96. *Id.* at 127-28 (pointing to the “large and old literature in psychology” demonstrating the impact of lower expectations on performance); *id.* at 128-30 (discussing structural explanations).

97. Hyde, *supra* note 3, at 131-34.

98. *Id.* at 135-38.

99. *Id.* at 138.

successful impact of training on improving performance,<sup>100</sup> and research showing that, for example, “cross-cultural differences in mathematics performance are enormous compared with gender differences in any one country” and that the magnitude of the difference *within* any one country “correlates . . . with the percentage of women in the workforce.”<sup>101</sup>

Newcombe challenges the claims of evolutionary psychologists, noting that “spatial skill is needed to weave or make baskets or pottery”<sup>102</sup> and that there is a problem with extrapolating to humans the “beautiful observational and experimental evidence” of meadow voles (whose males exhibit superior spatial ability during the mating season when they need to seek out females).<sup>103</sup> Humans, she points out, lived in social groups, not widely separated territories, so there would have been no need to develop spatial skills to compete for females. Rather, “the skills it takes to impregnate many females probably include such abilities as charm and stealth, more than the ability to find one’s way among a cluster of huts.”<sup>104</sup>

Those who challenge the view that gender difference is innate and behavioral difference is thus predetermined typically emphasize the importance of socialization and cultural influences and boundaries. Valian introduces the concept of “gender schemas” to explain women’s absence from STEM professions.<sup>105</sup> These schemas are drawn from commonly held folk wisdom about gender difference, which leads to male group advantage (social capital), which parlays into even greater advantage through accumulation, much in the way traditional capital accumulates.<sup>106</sup> Thus the view that males are innately superior to females at STEM occupations becomes a self-fulfilling proposition.<sup>107</sup>

Dweck similarly argues that the view that math ability is a “gift” disadvantages most girls from the start, and that those intrepid females who persist in math are ultimately discouraged by the attitudes of teachers and peers.<sup>108</sup> Many contributors point out that a host of factors other than cognitive ability, such as female preferences, and the desire (or, I would add, social pressure) to balance work and family, all play a part in keeping women out of

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100. *Id.* at 139.

101. *Id.* at 140.

102. Newcombe, *supra* note 47, at 72.

103. *Id.* at 72-73.

104. *Id.* at 73.

105. Valian, *supra* note 6, at 32.

106. See also Leonid Rozenblit & Frank Keil, *The Misunderstood Limits of Folk Science: An Illusion of Explanatory Depth*, 26 *COGNITIVE SCI.* 521, 522 (2002) (furthering this compounding explanation by stating that “knowledge of complex causal relations is particularly susceptible to illusions of understanding”).

107. Valian, *supra* note 6, at 34 (discussing the manner in which advantage, reinforced by prevailing gender *schemas*, compounds into greater advantage).

108. Dweck, *supra* note 80, at 470.

STEM fields.<sup>109</sup> Spelke and Grace argue that, even if males did have an edge, it would not explain the extreme under-representation of women in STEM fields, particularly in light of increases in the number of women obtaining advanced STEM degrees.<sup>110</sup> Rather, they too focus on a history of discrimination and discouragement, as well as on institutional failures to attract and retain women.<sup>111</sup>

### III. A NATURAL EXPERIMENT: THE STORY OF BEN BARRES

Male and female represent the two sides of the great radical dualism.  
But, in fact, they are perpetually passing into one another.

– Margaret Fuller, *Woman in the Nineteenth Century*<sup>112</sup>

Another sort of evidence about why more women do not stick with STEM professions is captured in the story of Ben Barres, widely reported in the press.<sup>113</sup> Barres, a top neuroscientist, detailed the discrimination he faced trying to establish a career in neurobiology as *Barbara* Barres, before completing treatments to make him, as *The Wall Street Journal* put it, “fully male.”<sup>114</sup> As Barbara, although she was the number one science and math student in her high school, she was advised by a guidance counselor to apply to a local college rather than accept a spot in a prestigious university like MIT. She declined to follow this advice, but faced persistent discrimination at MIT. After Nancy Hopkins and colleagues at MIT released a study in 1999 revealing gross disparities in hiring, promotion, and tenure of women unexplained by other factors, MIT president Charles Vest publicly affirmed that discrimination was responsible.<sup>115</sup>

109. Of course, innateness advocates argue that these preferences are genetically and hormonally programmed, and, many would suggest, driven by evolutionary necessity. *See, e.g.*, Geary, *supra* note 59, at 175.

110. Some authors also point to evidence that the number of faculty hires is not keeping pace with the number of females obtaining advanced degrees in math, engineering, and the sciences. *See, e.g.*, Williams & Ceci, *supra* note 7, at 15 (summarizing the hiring dropoff data).

111. Innate-difference advocates counter that more males choose to continue beyond the Ph.D. because, due to superior aptitude, they enjoy the work more, and point to Lubinsky and Benbow’s finding that only the very top test performers, who are overwhelmingly male, get the elite jobs. They also suggest that women’s (impliedly innate or evolutionarily ordained) preference for families and nurturing makes the possibility of STEM science success remote due to its time demands and career trajectory. *See, e.g.*, Geary, *supra* note 59, at 183.

112. MARGARET FULLER, *WOMAN IN THE NINETEENTH CENTURY AND OTHER WRITINGS* 75 (Donna Dickenson ed., Oxford Univ. Press, 1994) (1855).

113. Ben A. Barres, *Does Gender Matter?*, NATURE, July 13, 2006, at 133.

114. Sharon Begley, *He, Once a She, Offers Own View on Science Spat*, WALL ST. J., July 13, 2006, at B1.

115. *A Study on the Status of Women Faculty in Science at MIT*, MIT FACULTY NEWSLETTER (Mass. Inst. of Tech.), Mar. 1999, available at <http://web.mit.edu/fnl/women/fnl114x.pdf>; *see also* Carey Goldberg, *M.I.T. Admits Discrimination Against Female Professors*, N.Y. TIMES, Mar. 23, 1999, at A1.

When Barbara was the only one in her otherwise all-male math class to solve a particularly difficult problem, her professor suggested that her boyfriend had done it for her. Barbara had difficulty finding someone willing to serve as her thesis advisor, and, later, as a Ph.D. student, she was passed over for a fellowship for which she had been told she was best qualified. She had published six papers; the ultimate recipient had published one.

By contrast, “Ben” rapidly became a sought-after and leading neuroscientist, whom Stanford’s president personally wooed away from Oxford University to head Stanford’s respected neuroscience lab. Barres points to numerous forms of discrimination faced by women, from attitudes about women to structural demands on scientists that serve to exclude women.<sup>116</sup> All these forms feature prominently in tenure battles concerning women in math and science departments, and any number of judicial decisions examine them. But most convincing is Barres’ account of the scientist overheard to remark after he lectured to top scientists at a prestigious seminar: “Ben Barres gave a great seminar today, but then, his work is much better than his sister’s.”<sup>117</sup> Ben, of course, *is* his sister.

#### IV. THE CHALLENGE OF COMPLEX SYSTEMS

But experience is by far the best demonstration . . . .

– Sir Frances Bacon, *Advancement of Learning and Novum Organum*<sup>118</sup>

Barres’ story is the kind litigators yearn for—the story that clinches a jury verdict. But Barres, who hails from the natural sciences, where “proof” is a matter of measurement, tells us that “anecdotes . . . are not data.”<sup>119</sup> He is wrong: Anecdotes are extremely important pieces of data.<sup>120</sup> Indeed, it may be that when it comes to understanding human behavior—for example, why we choose certain careers or organize our professions the way we do—history and the humanities will turn out to be more important than the measurements of traditional science.<sup>121</sup>

116. See Mark L. Adams, *The Quest for Tenure: Job Security and Academic Freedom*, 56 CATH. U. L. REV. 67, 87-89 (2006).

117. Barres, *supra* note 113, at 134.

118. FRANCIS BACON, *ADVANCEMENT OF LEARNING AND NOVUM ORGANUM* 331 (rev. ed., Willey Book Co. 1944).

119. Barres, *supra* note 113, at 134.

120. See, e.g., SACKS, *supra* note 39, at xiii-xiv (arguing the importance of both narratives that form the basis of clinical evidence and neuroscience findings).

121. See THOMAS LAQUEUR, *MAKING SEX: BODY AND GENDER FROM THE GREEKS TO FREUD* 6 (1990) (explaining that the modern and “dominant . . . view since the eighteenth century . . . that there are two stable, incommensurable, opposite sexes” has not existed forever, and that only in recent history has “[b]iology—the stable, ahistorical, sexed body” been treated as “the epistemic foundation for prescriptive claims about the social order”). LaQueur’s point is the relatively uncontroversial one (at



Within science there is movement away from traditional methodology as well. Complex-systems theorists argue that a science which seeks truth by breaking things down into smaller and smaller component parts (for example, molecules, atoms, sub-atomic particles, and quarks, or DNA, genes, neurons, synapses, and electrical impulses) is unable to comprehend realities as complex as the brain, cognition, and behavior.<sup>122</sup> These fields require the observer to step back to look at the forest, rather than simply measure the trees, even though tree measurements can tell us useful information about the forest (for instance, its age). Science may eventually help us rule out certain explanations, like genetic determinism. But like the proverbial blind men examining different parts of the elephant, the scientist who measures smaller and smaller parts of the human organism can learn important things about how it functions, but will not thereby truly be able to comprehend the beast. For that, we need historians, humanists,<sup>123</sup> and practitioners of the “softer” sciences.<sup>124</sup>

Traditional science’s methodology, these theorists contend, is ineffective to comprehend complex systems—whether social or neurological—especially when those systems are living, changing, and evolving. No matter how precise the measurement (in our case, of biological and neurological processes by gender), no matter how sophisticated our performance data, these methods cannot begin to truly comprehend the operation of the human brain, much less the behaviors that flow from the relation between brain, body, environment, and culture. According to complex systems writers, there are simply too many interacting elements to comprehend the whole by measuring component parts, especially because as we observe one part (which, in observing, we alter), the others are changing, adapting, discarding, and looping back upon themselves. Our research results are old before we can read them; our findings are

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least for academics in modern times) that science has a history which is highly culturally and contextually influenced. Put another way, inasmuch as the empirical sciences employ quantitative measures to analyze qualitative values, they can never fully explain individual choices arising in particular historical and cultural contexts.

122. See generally STUART A. KAUFFMAN, *REINVENTING THE SACRED: A NEW VIEW OF SCIENCE, REASON, AND RELIGION* (2008). This argument is typically phrased as a critique of reductionism, i.e., the impetus to study subjects in narrowly construed syllogistic schemas and devise increasingly complicated and isolated rules to explain them, in order to satisfy an aesthetic desire for absolute system predictability in emulation of classical science via Newton and Simon Laplace. A quintessential modern reductionist thinker, as identified by Kauffman, is Nobel Laureate physicist Steven Weinberg: “[A]ll explanatory arrows point downward, from societies to people, to organs, to cells, to biochemistry, to chemistry, to physics.” *Id.* at 17. By this hierarchy, *Women in Science* could in time be better written by physicists than any other scientists, but the rejoinder from complexity theorists would be that Weinberg and his ilk fail to recognize that absolute system predictability is no longer feasible in the wake of Heisenberg, Einstein, and Gödel, and, furthermore, that no reductionist framework could ever take into account all the ontologically emergent entities that have and may become real in the course of a complex system’s development.

123. See TIM O’BRIEN, *THE THINGS THEY CARRIED: A WORK OF FICTION* (1990) (describing fiction as presenting a truer picture of human behavior and emotion than factually accurate narrative).

124. While the line between hard and soft science is hard to pin down, most characterize sociology, anthropology, and psychology as “soft.”

influenced by the past and we are, by observing and measuring, causing changes which render our own study results already obsolete.

If this is so, no amount of measurement will yield a definitive answer to the question *Women in Science* poses. Scrutiny of brain processes will surely yield answers to many puzzles and solutions to many medical conundrums. In law, it can yield information about individual brain function which may have important implications for questions of capacity and ability. What it cannot do is answer complex questions of causation, such as those involving female prevalence, or lack thereof, in the sciences. Such questions are far too deeply intertwined with hundreds of years of accumulated human social behavior, resulting in complex social systems that cannot be comprehended by measurement, however careful, nor by science's traditional method of experimental confirmation or disconfirmation.

#### V. SCIENCE IN THE SERVICE OF THE STATUS QUO

The whole problem with the world is that fools and fanatics are always so certain of themselves, but wiser people so full of doubts.

– Bertrand Russell<sup>125</sup>

Historians, particularly intellectual historians, play an especially important role when it comes to understanding science's efforts to map gender difference.<sup>126</sup> Science can be a dangerous tool. Grave injustice, indeed, serious harm has been done to women in the name of scientific proof of gender difference.<sup>127</sup> Hines, citing Stephen Jay Gould's famous *Mismeasure of Man*, reminds readers that "some eminent 19th-century scientists," including Paul Broca and social psychologist (and student of craniology) Gustave Le Bon, "contended that women and Black men were less intelligent than White men because they had smaller brains."<sup>128</sup> Le Bon wrote that:

All psychologists who have studied the intelligence of women . . . recognize today that they represent the most inferior forms of human

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125. HAL URBAN, *THE 10 COMMANDMENTS OF COMMON SENSE* 101 (2008).

126. Especially helpful in thinking about science and gender difference are intellectual historians like LAQUEUR, *supra* note 121, and SANDER GILMAN, *DIFFERENCE AND PATHOLOGY: STEREOTYPES OF SEXUALITY, RACE AND MADNESS* (1985).

127. However, once in a while its errors inured to women's benefit, as when scientists insisted that insemination without female orgasm was impossible. See LAQUEUR, *supra* note 121, at 2-3, 9 ("Any [eighteenth century] medical book or one of the scores of popular midwifery, health, or marriage manuals circulating in all the languages of Europe" would have reported that orgasm occurred "when the seed issues in the act of generation" (quoting NICHOLAS VENETTE, *CONJUGAL LOVE; OR THE PLEASURES OF THE MARRIAGE BED CONSIDERED IN SEVERAL LETTERS ON HUMAN GENERATION* 41 (London, 1750)) and that without orgasm "the fair sex [would] neither desire nuptial embraces, nor have pleasure in them, nor conceive by them" (quoting Aristotle, *Aristotle's Master Piece*, in *THE WORKS OF ARISTOTLE THE FAMOUS PHILOSOPHER*, at 5, 10 (William Salmon ed., 1828) (alteration in LAQUEUR)).

128. STEPHEN JAY GOULD, *MISMEASURE OF MAN* 104-05 (1981); Hines, *supra* note 83, at 102.

evolution and that they are closer to children and savages than to an adult, civilized man. They excel in fickleness, inconstancy, absence of thought and logic, and incapacity to reason.<sup>129</sup>

Scientists helped justify women's exclusion from a wide range of activities based on innate gender differences: physiological and anatomical (such as childbirthing role; pelvic and leg construction; physical "weakness"),<sup>130</sup> psychological (female hysteria and emotion), and, of course, cognitive. Law disseminated bad science and enshrined these "mismeasures" in precedent.<sup>131</sup> Women were excluded from education, economic independence, and a wide array of jobs and professions, as well as sterilized and institutionalized, as a result.<sup>132</sup> Confirmation of gender difference led in the nineteenth century to justification for a "separate spheres" ideology that confined women to homes where domestic violence was hidden from view, and justified the use of physical violence to handle creatures whose hysteria and irrationality purportedly led them to misbehave.

## VI. THE LEAP FROM DATA TO CONCLUSIONS

If a man is offered a fact which goes against his instincts, he will scrutinize it closely, and unless the evidence is overwhelming, he will refuse to believe it. If, on the other hand, he is offered something

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129. GOULD, *supra* note 128, at 105 (cited in Hines, *supra* note 83, at 102 (quoting Le Bon)). Le Bon's certainty about female inferiority was as evident as his xenophobia:

In the most intelligent races, as among the Parisians, there are a large number of women whose brains are closer in size to those of gorillas than to the most developed male brains. This inferiority is so obvious that no one can contest it for a moment; only its degree is worth discussion.

*Id.* at 104.

130. See LAQUEUR, *supra* note 121, at 6 ("Biology—the stable, ahistorical, sexed body—is understood [beginning with eighteenth century] to be the epistemic foundation for prescriptive claims about the social order."); see also Brief for the State of Oregon at 18, *Muller v. Oregon*, 208 U.S. 412 (1908) (No. 107). The famous Brandeis brief justifying shorter hours of work for women contained such scientific truths as "[l]ong hours of labor are dangerous for women primarily because of their special physical organization . . . . Besides these anatomical and physiological differences, physicians are agreed that women are fundamentally weaker than men in all that makes for endurance: in muscular strength, in nervous energy, in the powers of persistent attention and application." *Id.*

131. See, e.g., *Muller v. Oregon*, 208 U.S. 412, 421 (1908) ("That woman's physical structure and the performance of maternal functions place her at a disadvantage in the struggle for subsistence is obvious. . . . The two sexes differ in structure of body, in the functions to be performed by each, in the amount of physical strength, in the capacity for long continued labor, particularly when done standing, the influence of vigorous health upon the future well-being of the race, the self-reliance which enables one to assert full rights, and in the capacity to maintain the struggle for subsistence."); *Bradwell v. Illinois*, 83 U.S. 130, 141 (1872) ("The natural and proper timidity and delicacy which belongs to the female sex evidently unfits it for many of the occupations of civil life.").

132. See Stephen Jay Gould, *Carrie Buck's Daughter: A Popular, Quasi-Scientific Idea Can Be a Powerful Tool for Injustice*, NAT. HIST., July 1984, at 14 (describing sterilization based on eugenic theory unsupported by fact but affirmed by the Supreme Court in *Buck v. Bell*, 274 U.S. 200, 207 (1927), with Holmes' famous quotation: "Three generations of imbeciles are enough."); Alan Wolfe, *The Gender Question*, NEW REPUBLIC, June 6, 1994, at 27 ("Of all the ways that one group has systematically mistreated another, none is more deeply rooted than the way men have subordinated women. All other discriminations pale by contrast.").

which affords a reason for acting in accordance with his instincts, he will accept it even on the slenderest evidence.

– Bertrand Russell, *Proposed Roads to Freedom*<sup>133</sup>

As is probably obvious, I share the skepticism of those who, while they accept that there may be developmental and cognitive differences by gender, challenge the degree to which such differences have explanatory power and, as importantly, highlight the historical evidence that wrongheaded and potentially dangerous conclusions are likely to be drawn from limited data. This is especially so with regards to such issues as the gender gap in the sciences or occupations, dependent as these problems are on so many interacting factors. As contributor Geary notes, “the knowledge bases, technical skills, and conceptual insights in mathematics and the sciences arise from a poorly understood interaction between inherent cognitive and motivational biases and culture-specific educational goals and opportunities.”<sup>134</sup> The cognitive and motivational biases are themselves highly influenced, the evidence suggests, by culture and environment.

Sophisticated geneticists and neurologists point out that environment is operating on our one hundred trillion neural pathways and one billion neurons every millisecond, and that those pathways are neither predetermined by genes, nor uniform by gender.<sup>135</sup> Multiple combinations of genes, together with virtually limitless variation in neural pathways, make for extraordinarily varied human behavior. As one columnist noted, “if a trait like aggressiveness is influenced by just 100 genes, and each of those genes can be turned on or off, then there are a trillion trillion possible combinations of these gene states.”<sup>136</sup> As well-respected population theorists Paul Ehrlich and Marcus Feldman write, evolutionary psychology—the notion that evolution favors certain behavioral

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133. BERTRAND RUSSELL, *PROPOSED ROADS TO FREEDOM: SOCIALISM, ANARCHISM AND SYNDICALISM* 147 (1919).

134. Geary, *supra* note 59, at 173-74.

135. See ERIC R. KANDEL, *IN SEARCH OF MEMORY: THE EMERGENCE OF A NEW SCIENCE OF MIND* 109-10 (2006); see also Ehrlich & Feldman, *supra* note 29 (offering a cogent explanation for why genes do not and cannot predetermine behavior). Each human brain has about one billion (1,000,000,000) nerve cells (neurons) connected by one hundred trillion (100,000,000,000,000) synapses (connections). Nicholas Wade, *Brainpower May Lie in Complexity of Synapses*, N.Y. TIMES, June 10, 2008, at F6. Each synapse contains about a thousand (1000) different proteins, and these, in turn, operate within smaller units of proteins, varied in composition. *Id.* Each of these synapses has evolved into a highly complex mechanism, and each such mechanism is influenced each millisecond by environmental inputs which affect and alter its functioning. See Halpern, *supra* note 29, at 123 (“Learning is both an environmental and a biological phenomenon” guided by “experiences from the[] environment . . . which direct[] further learning and alter[] the underlying structures in the[] brain.”); see also HINES, *supra* note 45, at 4 (observing that “the distinction between biological and social influences is in some senses false. All our behavior is controlled by our brain and, in this sense, is biologically based.”).

136. David Brooks, *The Luxurious Growth*, N.Y. TIMES, July 15, 2008, at A19 (quoting Jim Manzi, *Undetermined*, NAT. REV., June 2, 2008, at 26); see also Haier, *supra* note 33, at 116 (pointing out that if one identical twin is schizophrenic, the other has only a fifty percent chance of sharing the condition, so something other than genetics is at work); Wade, *supra* note 135.

traits and not others—is based on “the misconception that genes are somehow determining our everyday behavior and our personalities.”<sup>137</sup> Moreover, studies have, for many years, and especially in the last decade (with improved brain imagining technology), demonstrated the remarkable adaptability of the brain. Regions dedicated to the performance of one function can, when the usefulness of that function is diminished, shift to the performance of other tasks. For example, the primary visual cortex in persons who are blind can assume the sensory role of heightening hearing and touch.<sup>138</sup> And when one brain region is injured, other regions are often deployed to take over its function.<sup>139</sup> One of the most useful results of research on gender difference in brain anatomy and physiology might be to suggest different pathways for avoidance of, and recovery from, brain damage between males and females.<sup>140</sup>

At this stage in our understanding, for nearly every piece of data there is either a contrary explanation or another bit of data suggesting an opposite conclusion.<sup>141</sup> For example, from data showing a significant drop-off between the numbers of women achieving Ph.D.s in STEM fields and those moving on to become assistant professors, and a further drop between assistant and full professor, one might discern a pattern of hiring discrimination based in gender stereotyping of one sort or another (women are a presumptive waste of resources because they will drop out, get pregnant, or quit, or they might have children and lack adequate time to devote to science). Alternatively, one might argue that cognitive deficiencies or evolved traits make these “stereotypes” accurate and real, and conclude, as does Kimura, that “it must logically follow that hundreds of better qualified men have been passed over in the zeal to artificially raise the numbers of women in science.”<sup>142</sup> (You can expect to see

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137. Ehrlich & Feldman, *supra* note 29, at 6; see also Carl Zimmer, *Expressing Our Individuality, the Way E. Coli Do*, N.Y. TIMES, Apr. 22, 2008, at F1 (deriding genetic determinism by pointing out that genetically identical *e. coli* bacteria exhibit widely varying behavioral traits due to environmental conditions and the “noise” of their own proteins, despite possessing only one fifth the number of genes as humans and far simpler systems). Ehrlich and Feldman point out that the “twin studies” on which Summers and *Women in Science* contributors rely have been discredited as “proof” of such determinism because they fail to account for the myriad non-genetic explanations for similar outcomes in later life.

138. See SACKS, *supra* note 39, at 163.

139. WILLIAM J. WINSLADE, *CONFRONTING TRAUMATIC BRAIN INJURY: DEVASTATION, HOPE, AND HEALING* 23-34 (1998) (citing the findings of Dr. Nancy C. Andreasen that “[d]ifferent areas of gray matter are specialized in different functions, such as moving, seeing, touching, listening, thinking, or modulating physical functions such as eating or sleeping. Often these areas are redundant—that is, several areas can perform the same function. Thus, when one communication center is knocked out, another may be able to take over in its place.”).

140. See MCKAY MOORE SOHLBERG & CATHERINE A. MATEER, *COGNITIVE REHABILITATION: AN INTEGRATIVE NEUROPSYCHOLOGICAL APPROACH* 65-66 (2001) (pointing to the lack of research in this area and citing, among others, Kimura).

141. See, e.g., John Noble Wilford, *Almost Human, and Sometimes Smarter*, N.Y. TIMES, Apr. 17, 2007, at F1 (reporting that young chimpanzees outperformed humans on a series of memorization and recall computer tests). Should we assume that this demonstrates superior chimp brain capacity or might we conclude, as the researchers speculated, that chimps are good at rote tasks because they lack sufficient brain capacity to be distracted by more complex conceptual thinking or planning?

142. Kimura, *supra* note 3, at 43-44.

Kimura cited by defendants when Title IX of the Civil Rights Act is used to challenge school and college science and math programs with few female participants.)<sup>143</sup>

Writers on both sides of the debate emphasize that there are alternative interpretations of the data they assemble, yet are emphatic in supporting the conclusions that they draw from the data. To cite but one example, Kimura points out that “there have been studies showing that adults who engage in spatially demanding activities also generally engaged in such activities in childhood . . . .”<sup>144</sup> After noting that most social (soft!) scientists interpret this data to mean that “childhood experience determined the adult pattern,” she argues that the opposite is “probable”: that “superior abilities influence the [early childhood] activities rather than the other way round.”<sup>145</sup>

Moreover, the ability to be a good STEM scientist requires far more than superior math and mental rotation skills. As Harvard physicist Howard Georgi wrote in the *Harvard Crimson* in 2005:

Talent is not a unitary thing, [but] multidimensional and difficult to measure . . . . Many different kinds of talents are critical to the advancement of . . . any . . . science interesting enough to be worth doing . . . . The spread of talents within any group, sex, race, etc., is very large compared to any small average differences that may exist between such groups . . . . [and] [t]alent can be developed and enhanced by education, encouragement, self-confidence, and hard work.<sup>146</sup>

Patterns emerging from the cognitive, experimental, observational, and brain imaging data suggest gender difference in the emotional and behavioral realms in such areas as “aggressive play, gross motor behavior, and sexual behavior.”<sup>147</sup> But what are we to make of the explanatory power of these differences in relation to participation in STEM sciences? Gross motor skills are not those typically required for physics, computer science, or (most) engineering. Brain imaging data is primitive at best, is typically based on small

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143. See Elizabeth Weil, *Teaching to the Testosterone*, N.Y. TIMES, Mar. 2, 2008, § 6 (Magazine), at 39 (describing the current resurrection of single-sex education in public schools, often justified by supposed neurological differences between genders).

144. Kimura, *supra* note 3, at 41. Cf. John Schwartz, *She's Studying. He's Playing.*, N.Y. TIMES, June 14, 2005, at F1 (reporting that young female chimpanzees learn to fish for termites more quickly than do males because they observe their mothers closely, while the young male chimps are off playing, “mimic[king] some of the findings from the human child development literature” (quoting Dr. Elisabeth V. Lonsdorf, director of field conversation at the Lincoln Park Zoo in Chicago)). Does this not suggest that if mothers were engaged in complex engineering tasks or mathematical calculations, girls might learn them while boys were off playing?

145. Kimura, *supra* note 3, at 41.

146. Valian, *supra* note 6, at 28 (quoting Howard Georgi, *Talent, Skills in Math and Science Hard To Quantify*, HARV. CRIMSON, Jan. 21, 2005, available at <http://www.thecrimson.com/article.aspx?ref=505377>).

147. Williams & Ceci, *supra* note 7, at 14 (discussing the pivotal contributions of Maccoby and Jacklin to the study of sex differences).

and non-representative samples, and requires large interpretive leaps.<sup>148</sup> Cooperation, rather than aggression or competition, is equally if not more important in the projects of today's science.<sup>149</sup> And it requires a leap of Olympic proportions to suggest that science geeks and major league sports figures are propelled by evolutionary necessity to their rather different behavioral patterns. Behavioral studies of humans are problematic because they cannot rule out social and cultural explanations; indeed, the more we learn about brain development, the more it becomes clear that environmental influence begins in the womb and continues rapidly and continuously thereafter.

Decision-makers also tend to overemphasize such evidence as test score data, animal studies, and brain imagery<sup>150</sup> (and tend to engage with highly speculative theories when they are tied to such accepted theories as evolution), while under-emphasizing, if not altogether dismissing, sociological and historical evidence, which, unlike "hard" sciences, can neither be replicated nor, generally, falsified.<sup>151</sup> This means that scientists' choices of what issues to

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148. See, e.g., Stephen Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397 (2006) (reviewing state of neuroimaging technology and pointing out weaknesses in it); see also Benedict Carey, *Searching for the Person in the Brain*, N.Y. TIMES, Feb. 5, 2006, § 4, at 1 (quoting Dr. J. Anthony Movshon, director of the Center for Neural Science at New York University, on how neuroimaging technology has been disappointing inasmuch as it "has told us nothing more than what a neurologist of the mid-20th century could have told you about brain functions and where they're localized").

149. Of course, cooperation is contextual, and the notion that there might be a determining biological basis for it borders on the absurd. See, e.g., Gal, *supra* note 22, at 179 (noting that the Malagasy of Madagascar explicitly associate different styles of speech with men and women, and that women are excluded from public power because they are viewed as too confrontational). Regarding the importance of cooperation in science, the sheer size of many projects makes cooperation necessary. Recent examples are as varied as DNA mapping, efforts to understand and curb global warming, space station rescues, and the like. See also Editorial, *An Unnecessary Battle: Neuroscientists and Geneticists Don't Need To Be at Loggerheads Over the Biology of Mental Disorders*, NATURE, July 10, 2008, at 137 (decrying the conflict over the appropriate methodology to ascertain source of mental disorders and urging cooperation); cf. Lawrence K. Altman, *The Doctor's World; Cooperation v. Competition*, N.Y. TIMES, Apr. 14, 1987, at C2 (discussing a feud between American and French researchers over who should receive credit for discovering the AIDS virus; in light of the epidemic surrounding the discovery, the fight for professional recognition seems petty to many onlookers).

150. See, e.g., Morse, *supra* note 148, at 403 (coining the phrase "Brain Overclaim Syndrome" to describe the tendency of new brain imaging data to have a "rationality-unhinging effect"); see also Deena Skolnick Weisberg et al., *The Seductive Allure of Neuroscience Explanations*, 20 J. COGNITIVE NEUROSCIENCE 470, 475-77 (2008) (showing that neuroscientific evidence interferes with the ability to judge the quality of explanations for everyone but experts in the field).

151. The foundation of the scientific method and science's claim to authority are rooted in its ability to show that certain propositions can be shown by replicated experiments to be false. A proposition—for example that water at sea level on this planet will boil at ten degrees centigrade—can be falsified by heating water to that temperature repeatedly under the same conditions and showing that it does not boil. Ideally, this method yields useful results when it is appropriately used. It strives to find replicable data, to control for factors extraneous to its investigation, and to rule out (or falsify) competing hypotheses. The problem arises when scientists claim authority for their answers to questions and phenomena too complex for proper controls to be put in place, or neglect to account for the influence of their own bias as an extraneous factor.

Some historical claims are proven false, but history's claims are based in realities too complex and unique to be experimentally falsified.

study, what experiments to conduct, and what results to publicize are enormously powerful. For this reason, Haier is surely mistaken that “[t]he hardest part of science is going wherever the data take you.”<sup>152</sup> The harder and more important tasks are determining which data to seek in the first place and how to interpret them, for example, determining whether to interpret data revealing chemical, biological, or neurological difference as linked to behavioral difference or career outcomes. Indeed, perhaps the hardest part is recognizing when one’s own biases and those of one’s discipline are influencing, perhaps subtly, where the data lead.

Still, it is possible that innate differences, however slight, may generate social factors that, over time, alter brain structure in ways that build on and enlarge differences by gender, and that they do ultimately impact career choices. We are a long way from knowing this with any certainty. In the meantime, what should we do? Try to create and encourage gender neutrality at earlier and earlier ages, to see how reversible social patterns are? Alter the teaching about gender in educational institutions and (good luck!) popular culture? Devote more resources to recruitment and training of women, and make STEM and other fields more hospitable to them?

And why would we want to do the latter—spend resources on gaining greater entry of women into STEM fields if, in the end, the future of scientific inquiry lies not in those sciences that primarily rely on measuring component parts of systems in order to understand them (and are thereby more easily able to make claims to the purported objectivity of their careful and replicable measurements), but in those that study complex systems, aware of the inevitable subjectivity and partiality of their conclusions? Why not instead encourage women to eschew STEM professions in favor of the social sciences or the natural science study of complex systems, from biological to ecological and everything in between?

The answer, I think, is twofold. First, STEM professions remain powerful and important ones—and gender discrimination will never be overcome by finding, in Donna Haraway’s words, “one more excuse for not learning any post-Newtonian physics.”<sup>153</sup> These are professions that speak with great authority, and whose conclusions and findings have not only been given great weight, but also have been and continue to be critically important to human life. Women need to be part of the process of determining what is studied and how, and what conclusions are to be drawn from the data. We need to be able

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152. Haier, *supra* note 33, at 118. In a later piece arguing for continued study of the connection between race and IQ, Ceci and Williams similarly ignore the question of resource allocation, and minimize the possible negative impact of the choice of what to study on perpetuating stereotypes. Instead, they frame the race and IQ question as one of “free speech in science,” focusing on the harm to individual careers rather than the potential harm to social groups, or to science itself from misdirecting resources. See Stephen Ceci & Wendy M. Williams, *YES: The Scientific Truth Must Be Pursued*, 457 *NATURE* 788, 789 (2009).

153. Haraway, *supra* note 13, at 84.



to assert with authority that it does *not* make sense to devote resources to this or that study, as much as to argue for where resources *should* be spent. Moreover, to say that the future of science lies elsewhere is to overstate the case. Important advances in global communications and transportation, as well as in other areas, continue to depend on STEM fields, especially the applied sciences (like engineering and computer engineering), and women cannot afford to allow males to dominate them. Indeed, the continued success of STEM fields may demand, and in any event these fields can surely benefit from, the perspectives that women and others also largely absent from these fields are able to bring.

## VII. INTERVENTIONS WHILE THE QUESTIONS REMAIN OPEN

Equality . . . is the result of human organization . . . . We are not born equal . . . .

– Hannah Arendt, *The Origins of Totalitarianism*<sup>154</sup>

One of my favorite New Yorker cartoons is one by Mischa Richter depicting two gentlemen (academics? judges? bums?) at a bar, grasping drinks as one declares: “Then we’ve agreed that all the evidence isn’t in, and that even if all the evidence were in, it *still* wouldn’t be definitive.”<sup>155</sup> This is surely the case, and will continue to be the case, regarding whether there are meaningful cognitive differences in ability by gender. Yet, as Columbia Law Professor Patricia Williams has noted, scientists like those contributing to this volume have a luxury that decision-makers lack. They are free to “hold themselves open to a wide, sometimes endless range of variables that might contribute to cause and effect, right down to the clichéd flapping of butterfly wings in the Amazon causing storms in British Columbia.”<sup>156</sup>

For lawyers, on the other hand, as for policy-makers and judges, the “goal is closure, rather than eternal exploration.”<sup>157</sup> Those deciding where to focus

154. HANNAH ARENDT, *THE ORIGINS OF TOTALITARIANISM* 301 (1951).

155. Mischa Richter, *Unnamed Cartoon*, NEW YORKER, June 15, 1987, at 30, available at <http://www.cartoonbank.com> (search “Entire Site” for “36147”); see also J.B. Handelsman, *Unnnamed Cartoon*, NEW YORKER, Mar. 9, 1987, at 36, available at <http://www.cartoonbank.com> (search “Entire Site” for “35845”) (illustrating a scruffy Charles Dickens with his publisher, who is holding a manuscript and demanding: “I wish you would make up your mind, Mr. Dickens. Was it the best of times or was it the worst of times? It could scarcely have been both.”). Each cartoon, in its way, depicts the gulf between those who yearn for the clarity of mathematical precision and those who insist upon acknowledging (and depicting) life’s ambiguities. Perhaps the difference between the “hard” sciences and the “soft” sciences and humanities is, in the end, less about method than about personality.

156. Patricia J. Williams, *Divining Demeanor*, NATION, June 25, 2007, at 10.

157. *Id.* See also Allen, *supra* note 21, at 515, 517-20 (making a similar point in relation to science and feminism). Scientists have the luxury of “wholesale conjecture,” see *supra* note 2 and accompanying text, while feminists who seek to overcome a history of gender stereotyping and prejudice are driven to emphasize the potentially harmful nature of unrestrained inquiry. Feminism seeks concrete and immediate political change and—like administrative decision-makers—must be ever

resources, or whether certain evidence demonstrates gender discrimination, must always act without complete information.<sup>158</sup> University presidents like Summers have to determine the amount and type of resources to devote to altering the male/female ratio in STEM fields.<sup>159</sup> Foundations need to determine whether to undertake or fund programs to increase young women's participation in the sciences. Judges have to resolve disputes under Titles VII and IX of the Civil Rights Act (or the Constitution). Not to act, or to decline to accept certain evidence, is itself a decision to perpetuate a status quo which may be, and likely is, discriminatory, and deeply harmful not only to girls and women (as well as boys and men), but also to a society seeking to compete globally in STEM fields or, more importantly, to join in collaborative STEM efforts across national boundaries.

Ben Barres wrote that, despite the blatant discrimination he faced, he did not turn away from science because he experienced himself as male, and hence did not internalize the self-doubt a female repeatedly sent an ego-battering message of inferiority likely would.<sup>160</sup> Today, assumptions that women are less qualified, able, or eager to become STEM scientists are daily damaging women who might, like Madame Curie and numerous others before and after her, contribute greatly to social progress and enjoy fulfilling lives.

But, as Kimura argues, there is more than one way to skin a cat, and we might spare women the pain of rejection and ego-battering by simply accepting that women not only make better biologists than physicists, but also that they are happier working with people and solving concrete problems than they would be if they were immersed in lonely, more abstract problems in mathematics, physics, or engineering.<sup>161</sup> The trouble with such presumptions is

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sensitive to the ways in which science's tentative hypotheses are likely to play out in public consciousness. Unlike feminists, however, administrators who face the pressure of competing demands may, like Summers, run with the superficial expression of a scientific hypothesis and ignore the harm a tentative suggestion may cause. Carefully cabined suggestions do not good headlines make, and they do not frequently help resolve controversial policy issues. The harm caused by merely purporting to "follow the data" may far outweigh the value of the study, and the hypothesis may even take on a life of its own. See *supra* Part V. Administrators who act on conjecture—or use it as a basis not to act—enact the very harm that feminists seek to prevent.

There are, of course, times when the evidence is nearly conclusive—as with the theory of evolution—yet public controversy remains. But apart from these (usually faith-generated) controversies, most controversies are due to a lack of factual certainty.

158. Scientists, too, must make decisions about what research studies to undertake. I take for granted that because there are differences in the pattern of development in XY and XX generated brains (as well, of course, as those with atypical sex chromosomes), Haier, *supra* note 33, is correct that studying such differences is likely to be helpful in understanding the human brain.

159. After *Grutter v. Bollinger*, 539 U.S. 506 (2003), public universities may be limited in the manner and degree to which they do this if there is a lack of evidence that the institution historically discriminated against women, or women in STEM fields.

160. Barres, *supra* note 113; see also Dweck, *supra* note 80 (describing the effects of stereotyping on girls' math performance).

161. Another version of this argument is that women's superior social intelligence leads them to shy away from occupations which seem to aim primarily at increasing the deadliness of war-making. Although I am not partial to this cultural feminist view, a friend who now does bio-medical research at

not only that they tend rapidly to become self-fulfilling prophecies, but also that they generate further searches for gender difference which are used to justify the result of what we know to be centuries of junk science about—and flat-out discrimination against—women.

One thing cognitive science has taught us is that people understand the world by categorizing it. People, rather than genes or hormones, create categories like “gender,” “ability,” and “merit,” and determine how to structure education, evaluate skills, and organize fields and occupations. And, unfortunately, people have a historically well-documented tendency to attribute innate and cognitive difference to those who appear, talk, or act differently than themselves.<sup>162</sup> Given all of this, the best course to take when all the evidence will never be in, and would not in any case likely offer definitive answers, is to assume relatively equal gender capacity and to err on the side of presuming discrimination as the strongest explanation for the dearth of women in science, as in Congress and in high-level positions almost everywhere. For the sciences, this means devoting extra resources to ensure full female participation in STEM subjects (especially computer science and engineering) from early in girls’ lives, and doing so for far longer than a few generations (after all, women were excluded from equal education in most, if not all, parts of the globe for many generations).<sup>163</sup> It means redesigning curricula so that they appeal to females. It means subsidizing private efforts to create math and science computer games that are appealing to girls, and making them readily available to girls at early ages and at low cost.

Additionally, it means demanding of those who suggest that scoring at the top 0.01% of the SAT-M curve is the primary skill necessary to succeed in STEM professions whether advancement might rest more on cooperative and collaborative capabilities that combine the problem-solving capabilities of numerous individuals across wide expanses of geographic and cultural space. If so, it might be time to rethink hiring criteria to take these skills into account, and to design brain-imaging and other studies to investigate cooperative problem-solving. Such research might uncover regions of the human brain as yet insufficiently tapped.

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Harvard quit her theoretical physics post-graduate position because the uses of her work seem to be entirely aimed at war-making.

162. See ANIKA K. WARREN, *CASCADING GENDER BIASES, COMPOUNDING EFFECTS: AN ASSESSMENT OF TALENT MANAGEMENT SYSTEMS* (2009) (describing the tendency of talent-management systems to look for traits like those of the white males who already hold top management positions).

163. See, e.g., MICHAEL L. PENN & RAHEL NARDOS, *OVERCOMING VIOLENCE AGAINST WOMEN AND GIRLS: THE INTERNATIONAL CAMPAIGN TO ERADICATE A WORLDWIDE PROBLEM* 25 (2003) (framing the Indian proverb, “Investing in a girl is like watering a plant in a neighbor’s garden,” in the context of girls’ contemporary lack of education relative to boys throughout the developing world); BARBARA MILLER SOLOMON, *IN THE COMPANY OF EDUCATED WOMEN: A HISTORY OF WOMEN AND HIGHER EDUCATION IN AMERICA* (1985) (describing several centuries of struggle to gain access to higher education by women in the United States).

Several of *Women in Science's* contributors have useful suggestions: Dweck proposes curricula aimed at instilling in women the understanding that ability can be "grown" and is not natural and innate;<sup>164</sup> Spelke and Grace propose a "grand experiment" focusing on overcoming social stereotyping about female ability and interest;<sup>165</sup> and Hines implies that devoting resources to overcoming teacher biases about the relative abilities of girls and boys might dramatically change female performance.<sup>166</sup> Halpern reminds us that the simple step of making science and math more hospitable to women by creating more flexible career options is important as well;<sup>167</sup> Hyde reminds us that important components of assuring female success are "family, neighborhood, peer and school influences";<sup>168</sup> and Berenbaum and Resnick add that it may be equally important to value women's contributions outside the sciences precisely to ensure that those who truly want them have access to science and math careers.<sup>169</sup> (Eccles also makes this point in a different way.<sup>170</sup>)

All these societal interventions are important and there are many other possibilities. The important point is that, for the sake of science as well as individual women, we cannot collectively rest on seductive explanations of gender difference; we must shoulder the burden to prove that we collectively, along with the particular institutions that "do science," have devoted significant resources to recruiting and training women and to making the environment (including the timing of tenure clocks and the distribution of lab space) hospitable to them. We need to reassess our definition of "success" so that collective achievement and the abilities that underlie it—the ability to share and give credit and the ability to subordinate individual ego to collective good—are valued equally to risk-taking and single-minded study. We also need to place the political and judicial burden of disproving discrimination on institutions, such that, if they cannot demonstrate by clear and convincing evidence that they have instituted meaningful measures to overcome bias against and offer supports for women, they must try harder and do more. For the sake of science and of society, they can do no less.

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164. Dweck, *supra* note 80, at 50-52.

165. Spelke & Grace, *supra* note 55, at 65.

166. Hines, *supra* note 83, at 109-10.

167. Halpern, *supra* note 29, at 129.

168. Hyde, *supra* note 3, at 135.

169. Berenbaum & Resnick, *supra* note 43, at 155.

170. Eccles, *supra* note 49, at 208-09.