

D R A F T

THE X-CLUB:

SEX, BIOLOGY, AND POLITICAL ECONOMY IN THE NINETEENTH CENTURY

Ann Mari May, Ph.D.
Associate Professor of Economics
University of Nebraska-Lincoln
Lincoln, NE 68588-0489
402 472-3369
amay@unlnotes.unl.edu

*Draft prepared for presentation at the Association for Heterodox Economics, London, England, July 2005. Please do not copy with consent of author.

THE X-CLUB:
SEX, BIOLOGY, AND POLITICAL ECONOMY IN THE NINETEENTH CENTURY

ABSTRACT

The last third of the nineteenth century has often been referred to as the era of popular science. In this period, men of science in England and in the United States lectured publicly on social issues with the authority of science. One of the most contested social issues was the “Woman Question.” The “Woman Question,” which began the century as a reference to women’s suitability for political suffrage and its attendant need for prudence or virtue, came increasingly to be associated with women’s suitability for the higher learning. As more women entered the higher learning in the last third of the nineteenth century and as they began to challenge their role in the higher learning moving from as *consumers qua students* to *consumers qua faculty*, arguments about women’s biological inferiority reemerged and with a new authority – science. This paper examines the role of science in the shaping perceived biological differences which, along with metaphors increasingly popular in political economy, were used to limit women’s participation in the higher learning. The articulation and dissemination of these arguments by “men of science” significantly influenced the character of women’s participation while preserving men’s privileged position in the higher learning.

KEYWORDS

History of thought, history of higher education, political economy of gender, nineteenth century

JEL Codes: I23, N00

“The history of men’s opposition to women’s emancipation is more interesting perhaps than the story of that emancipation itself.”

Virginia Woolf

INTRODUCTION

During the last third of the nineteenth century, so-called “men of science” became popular figures drawing large audiences to their lectures and offering their scientific expertise on vexing social issues of the day. Increasingly urban audiences met to hear the academic elite in science, political economy, and medicine discuss the problems of the day applying metaphors from science and drawing analogies with nature in order to persuade and defend various positions and policy conclusions. Their lectures, in addition to receiving detailed coverage in the popular press, were often written up in books -- sometimes selling thousands of copies.

Capturing the increasing interest in popular science was a new monthly magazine, *Popular Science Monthly*. The *Popular Science Monthly* began publication in 1872 and ran, in its first volume, excerpts from Herbert Spencer’s soon to be published book *The Study of Sociology*.¹ Of course the editor of *Popular Science Monthly*, Edward L. Youmans, was on one side of the Atlantic while Herbert Spencer, the political economist, was on the other. Yet it was Youmans, popularizer of science, that was to become Spencer’s most ardent supporter and it was their shared belief in the conservation of energy and the principles of evolution that formed a basis of their intellectual sympathies.

Co-editing the *Popular Science Monthly*, yet seldom mentioned, was Edward Youmans brother, William Jay Youmans. Trained in medicine and graduating in 1865, Youmans left to study abroad with none other than Thomas Huxley – Darwin’s bulldog (Desmond 191994). Huxley, known for his total devotion to science and seemingly total abhorrence for religious strictures on science, was the impetuous behind the formation of the X-Club and primary architect of the popular science movement.

The X-Club of London met for the first time in January of 1864.² Like many dinner clubs for

men, the X-Club provided a forum for discussion, intellectual exchange of information, not to a forum for promoting their own professional advancement. Just as the Political Economy Club of London, founded in 1821, brought men of letters together who held a shared belief free trade, the X-Club brought men of influence together with a shared commitment to evolution.³ In fact, it was the perceived need to provide a system of mutual support to promote change that served as a foundation for the establishment of both of these men's groups. However, X-Club members called upon the authority of science to advance its agenda on a variety of issues -- the most controversial issues of the day -- and it was X-Club members that proved to be most influential and have the widest impact on thought both within science and outside of science as well.

Although Huxley claimed that "The club has never had any purpose except the purely personal abject of bringing together a few friends who did not want to drift apart," Roy MacLeod and W.H. Brock have argued differently. Pointing to religious controversy which prompted the declaration of science and belief as an impetus for the founding of the X-Club, MacLeod and Brock (1976) allude to the cultural conflicts between science and religion that were a primary source of tension throughout much of the nineteenth century. The X-Club provided a seemingly small but, in the end, enormously influential mechanism for the advancement of science and for challenging the authority of religion and clergy in the nineteenth century. As Ruth Barton reminds us that "They were not merely aiming to establish science as one profession among others: rather, they were challenging the profession that had the unique role of cultural leadership, educating the public mind, guiding public morals, and legitimating the social order" (Barton 1998: 413-414).

In this sense, the X-Club was in the business of establishing cultural hegemony and in the nineteenth century, cultural hegemony was located primarily through access to higher education -- an institution that was undergoing significant change with the increasing participation of women. In some rather curious ways, the X-Club provided a mechanism for the transfer of knowledge by "men of science" -- knowledge that would serve to protect their interests in a less direct but nonetheless influential way -- through the dissemination of ideas about women's suitability for the higher learning and their capacity to

participate in the higher learning.

This paper examines the history of thought on ideas about women's biological inferiority – ideas that were used to limit women's access to the higher learning. It provides a tale of the interesting ways in which metaphors from the science of energy and biology were appropriated and used, along with metaphors available from political economy, to argue for women's inferiority and justify their exclusion from the higher learning. The argument presented here is not that these “men of science” somehow conspired to develop a menacing theory to justify women's exclusion, but more that preexisting masculinist cultural biases along with good old fashioned self-interest provided a framework in which these theories of women's inferiority seemed not only plausible, but reasonable. Moreover, they were popular – drawing upon societal fear of a declining middle-class and increased immigration within the US. As we shall see, the transmigration of ideas on women's biology had no borders and was used, particularly in the US, to limit women's participation in the higher learning.

SEX, BIOLOGY, AND THE 'WOMAN QUESTION'

Throughout the eighteenth century and into the nineteenth century, women and men were presumed to have vastly different capabilities and medical explanations and remedies reflected these presumed differences. For example, male children, presumed to be stronger than female children, were said to be easier to deliver as it was thought that birth reflected not only the efforts of mother but also efforts of the child to be born. Being presumed to be more developed intellectually than female, male children were thought to have a longer period of gestation as well.⁴ The theme of women being considered as developed as children was reflected in law as well. In English common law, could not sign valid legal contracts. Contracts signed by women would be deemed to be void for lack of equity B the same reason that children cannot sign valid contracts today. In 1771, Massachusetts common schools required boys to learn how to read and write B girls only to read and write Aif they shall be capable” (Jernegan 1931: 105).

Although the biology of sexual difference and women's inferiority was present from the colonial era on, it was in the last third of the nineteenth century that the arguments of difference became focused with new intensity on the deleterious effects of too much education for women and the message delivered with a new authority -- *science*. Whereas religious doctrine and folklore were relied upon to locate woman under the authority of her husband in the seventeenth and eighteenth centuries, *science* was called upon to establish sexual difference in the late nineteenth century and the (male) medical establishment along with purveyors of popular science were there to offer their interpretations.

The rationale for women's exclusion in both political and intellectual life shifted from women's incapacity for reason to the constraining "reality" of women's reproductive physiology. Perhaps because of the persistent prodding of writers such as Mary Wollstonecraft, John Stuart Mill, and Harriet Turner, and others or the increasing participation of women in the higher learning as students, brought about, in the US, through passage of the Morrill Act, by the mid-nineteenth century explicit biological explanations for women's exclusion were not as compelling and not nearly as prevalent as they were at the beginning of the century.

As for women's capacity for virtue, while prevailing views until the beginning of the nineteenth century had emphasized women's moral deficit and lack of prudence, as Aristotle would have called it, by the beginning of the nineteenth century women were increasingly viewed as the moral repositories for society. With the rise of the market system and the emergence of *separate spheres* for men and women or what has also been called the *public/private split*, women's place in the home was increasingly viewed as a refuge from the vexations of the market. According to historians Linda Kerber (1976), Nancy Cott (1977), Ruth Bloch (1978), the *separate spheres* notion describes the gendered nature of the separation of home and work in this period, with men properly occupying the public sphere and women the private sphere or the home. The *domestic code* further defined appropriate behaviors for women within their sphere in which women's charity, cooperation, moral superiority and obedience were seen as necessary antidotes to the competitive, self-interested ambition required of men in the emerging market system.

As mothers of future citizens, women's role within the home took on new importance.

Responsible for the early childhood education of children, women were increasingly responsible for instilling virtue and, to do their job properly, needed to possess not only high moral standards but a sound education. Particularly important was the education of male children who were expected to participate as citizens in the political decisions of a new and fragile republic – a republic in which both honorable and intelligent men were needed as rulers.

The problem, of course, was one of institutions. The institution of the higher learning was powerful in conferring status and authority to men in the eighteenth century and would continue to do so in the nineteenth century. Yet it was an institution in transition, mirroring the sweeping changes in the broader culture that came with commercialization. Whereas the colonial college in the US was founded to supply a learned clergy “for the moral betterment” of society, it was by mid-century, it was an institution transforming itself to accommodate this newly emerging commercial culture. Whereas earlier in the century it might be viewed as an arena for the development of civic virtues and moral training, by the end of the century it was increasingly the arena for professionals to acquire the training necessary to better themselves. Universities became gateways to professions in both politics and commerce holding a central location in the formation of status in society.

It was this central location that, along with the emergence of such notions as *separate spheres* and *republican motherhood*, put the higher learning as an institution in the center of the controversy over women’s equality -- a controversy which came to be known as the “Woman Question.” Women’s access to the higher learning was supported by their increased authority within the home, yet it also undermined the separate spheres notion by propelling them into the public sphere – and a particularly influential public sphere at that. As result, in the last third of the nineteenth century the role of women in the higher learning was a significant social issue in both the US and in Europe and women’s role became the topic of conversation in public forums, private parlors, and dining clubs through England and the US. In their position of authority, “men of science” were particularly well situated to propose solutions to the vexing “Woman Question.”

* * *

As Carroll Smith-Rosenberg and Charles Rosenberg (1984) have demonstrated, women were commonly viewed as “the weaker vessel” at the dawn of the nineteenth century. Physicians, who typically lacked a good deal of education, often viewed the female nervous system as more delicate and prone to over-stimulation (Smith-Rosenberg and Rosenberg 1984: 13). Yet general concerns about education and health were not gender specific and were instead focused on young children in general. Physicians in the early nineteenth century warned of the dangers of “early mental precocity,” but they warned of the dangers for all children, not just female (Brigham 1832: 40) However, the rise of women’s participation in the higher learning brought about new anxieties about women and education – anxieties that would be addressed by a member of the Harvard medical faculty, Edward H. Clarke.

In his popular book *Sex in Education; A Fair Chance for the Girls* published in 1873, Clarke used a number of examples of young women permanently injured by the stress of higher education – girls discretely assigned anonymity by virtue of the alphabet (Clarke 1873). Miss D, a Vassar student who had been a healthy girl began to suffer a variety of ills from headaches, to fainting spells, to sparse menses and, upon graduation, was an invalid (Clarke 1873: 79-85). Miss A, who entered a seminary at the age of fifteen in good health, eventually experienced uncontrolable twitching of a rhythmical sort in the muscles of her face and, at the perhaps unusually kind advice of her physician, took two years in Europe to recuperate (Clarke 1873: 65-72). And then there was Miss G, who had entered a Western college and who later died as Clarke said “not because she had mastered the wasps of Aristophanes and the *Mechanique Celeste*, not because she had made the acquaintance of Kant and Kolliker . . . but because, while pursuing these studies, while doing all this work, she steadily ignored her woman’s make” (Clarke 1873: 105-06). Although girls might be capable of the mental exertion necessary in the higher learning, this education, he argued, goes against the “laws of nature.”⁵

While the argument that women’s efforts in the higher learning might hurt themselves was compelling to some, the argument that women’s education was hurting the health of their children held perhaps more sway. This threat, the threat of middle-class white women having fewer children and perhaps even harming the health of the children they had, reflected or at least played into what was an

existing heightened concern on the part of medical doctors over the prevalence of abortion and growing xenophobic fears brought about by increased immigration and declining birth rates of white women (Newman 1999). It is at least worth noting that the Comstock Law, which was passed in 1873 and which banned the distribution of birth control information, reflected in many ways the medical professions' preoccupation with access to information to women's bodies as well as social fears of declining birth rates for white middle-class Americans. Clarke spoke to deep seated societal fears when he said, "In our schools it is the ambitious and conscientious girls, those who have in them the stuff of which the noblest women are made, that suffer, not the romping or lazy sort; and thus our modern ways of education provide for the 'non-survival of the fittest'" (Clarke 1873, 112).

The allusion to Darwin found in "Clarke's little book" is not, of course, accidental. Also recently published in 1871 was Darwin's *Descent of Man and Selection in Relation to Sex* (Darwin 1871). In it, Darwin expresses his misogynistic view of women arguing that women were less developed in an evolutionary sense than men. According to Darwin, men attain "a higher eminence, in whatever he takes up, than can women – whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands (Darwin [1871] 1896: 564)." Moreover, Darwin goes on to point out that "If two lists were made of the most eminent men and women in poetry, painting, sculpture, music . . . history, science, and philosophy, with half-a-dozen names under each subject, the two lists would not bear any comparison. We may infer, from the law of the deviation from averages, so well illustrated by Mr. Galton, in his work on 'Hereditary Genius,' that . . . the average mental power in man must be above that of women. (Darwin [1871] 1896: 564). This view of women as less evolved was one later shared by Spencer and one not inconsistent with prevailing views on women's inferiority.

In reality, the compelling aspect of Clarke's book is to be found in the myriad ways in which he borrows metaphors from science to speak to a variety of social fears while at the same time reaffirming preexisting misogynistic biases about women's inferiority. Going through seventeen editions, the book was demonstrably popular. Not only did it speak to deep seated fears in the American public, but it did so with the new vernacular of science. Drawing upon the primary preoccupation of early nineteenth century

science – energy.

Edward Clarke in his *Sex in Education*, embraced a few of women's physiology which reflected a belief in the vital forces notion – a view that the body was a closed energy system in which effort directed from one activity could harm another. According to this view, also known as *conservation of energy*, overexertion in one part of the body would deplete the health of some other part. For Clarke, the special demands that nature imposes upon a young woman in puberty limit her ability to engage in *steady* effort directed at the brain without incurring undue stress on the reproductive system. Clarke argued that an education for young women similar that of young men calls for sustained and continuous effort which is out of harmony with the rhythmical periodicity of the female organization@ (Clarke 1873: 83). While young men develop into manhood through a more gradual or *persistent* process of maturation, women develop in a relatively short period of time. According to Clarke, AWhen school makes the same steady demand for force from girls who are approaching puberty, ignoring Nature=s periodical demands, that it does from boys, who are not called upon for an equal effort, there must be failure somewhere@ (Clarke 1873: 97).

As early as the 1850s, William B. Carpenter began to apply Hermann von Helmholtz's principle of the *conservation of energy* to the physiology of the body (Hall 1979: 131-32). Although this rather Newtonian view of the body as machine was challenged, it nonetheless dominated medical perspectives throughout the nineteenth century. Moreover, while Carpenter's work relating the principle of *conservation of energy* to the human body was developed in the 1850s, it was the British political philosopher and popularizer of Darwin, Herbert Spencer, who is often credited with applying the *concentration of energy* or, as he preferred call it, *persistence of force* to the human body.⁶

Spencer, more than any other nineteenth century political philosopher, represented the most prolific and relentless of the so-called Amen of science,@ known for taking concepts popular in medicine, physics, and biology and applying them to a variety of social problems. In fact, it was Spencer himself who is often credited with coining the term “evolution” as a description of Darwinian natural selection

and for applying this biological concept to rationalize inequality in income in market systems.⁷ However the origin of the notion known as the *conservation of energy* and its application to women and education has a rich and complicated origin that reveals much about the use of science in the service of ideology and one in which Spencer played a large role.

In his numerous writings, Spencer used the metaphors of science to develop a political economy of gender. This political economy of gender was, according to Patricia Vertinsky, preoccupied with order and scarcity (Vertinsky 1987: 14). The need to *obey the laws of nature*, carefully allocating their *scarce* vital energy and weakened by the *periodicity* of their constitution, *taxed* women with a special energy demand – a *price*, Vertinsky says, women had to pay for the future preservation of society (Vertinsky 1987: 15). Melding metaphors from science into a vision of the political economy of gender, Spencer spoke to the anxieties raised by a market system – a market system, at times, seemingly out of control.

Although in the *Social Statics* (1851), Spencer would claim that “equity knows no difference in sex,” by the 1870s Spencer’s view of women and equity had substantially changed. In *The Study of Sociology* (1873), published in the same year as Clarke’s *Sex in Education* (1973), Spencer argues that men and women are not mentally alike. Invoking the theory of vital forces to the human body along with a Darwinian perspective, explains how it is that women fall short intellectually and emotionally compared with men. According to Spencer:

The first set of differences is that which results from a somewhat earlier arrest of individual evolution in women than in men; necessitated by the reservation of vital power to meet the cost of reproduction . . . This rather earlier cessation of individual evolution thus necessitated, showing itself in a rather smaller growth of the nervo-muscular system, so that both the limbs which act and the brain which makes them act are somewhat less, has two results on the mind. The mental manifestations have somewhat less of general power or massiveness; and beyond this there is a perceptible falling short in those two faculties, intellectual and emotional, which are the latest products of human evolution – the power of abstract reasoning and that most abstract of the emotions, the sentiment of

justice – the sentiment that regulates conduct irrespective of personal attachments and the likes and dislikes felt for individuals (Spencer 1873: 341-42).

In these few lines, Spencer manages to adopt a Newtonian habit of thought in his embrace of vital forces as a metaphor for the body, a Darwinian habit of thought in his notion that women are less developed or evolved than men, and asserts a masculinist notion of science as detached rational inquiry. In so doing, he manages to wrestle from women even their authority over emotional development, making the highest form of expression for such, the capacity for abstract reasoning and emotional detachment. Although the application of the *concentration of energy* to the human body, and specifically to the mind, appeared in William B. Carpenter's work beginning in the 1850s, it was Spencer the political economist, not Carpenter the physician, who brought the concept from a general principle in science to one increasingly focused on women (Hall 1979).

If there was some confusion as to who was responsible for applying what has since come to be known as the first law of thermodynamics to the human body, it is perhaps understandable. In 1873 when Spencer and Clarke both published their works, women's education was a topic of considerable public debate and Spencer a member of the highly influential X-Club of London – a club known for aggressively taking on topics of considerable public debate. The X-Club, which first met in January of 1864, provided an informal network for men of science to meet over dinner and plot their defense of evolutionary theory, scientific advocacy, not to mention their own professional advancement. Although Thomas Huxley, founder of the X-Club, claimed that "The club has never had any purpose except the purely personal object of bringing together a few friends who did not want to drift apart," Ruth Barton has argued that "They were not merely aiming to establish science as one profession among others: rather, they were challenging the profession that had the unique role of cultural leadership, educating the public mind, guiding public morals, and legitimating the social order" (Barton 1998: 414).

Among X-Club members were Spencer and fellow traveler John Tyndall.⁸ Tyndall had previously translated the work of Hermann von Helmholtz who, along with Julius Robert Mayer and James Prescott

Joule developed the *conservation of energy* theory which served as the foundation for the first law of thermodynamics. Moreover, although not on the list of original members, Carpenter had been asked to join the new club at its inception, but declined to do so (Barton 1998: 412.) Spencer, as a member of the X-Club, began by addressing religious opposition to Darwinian thought in the 1860s and turned to providing a scientific foundation to the vexing Woman Question in the 1870s. The X-Club would prove to be a valuable mechanism for the exchange of information among men – information that would help to frame women’s capacity and explain her exclusion in the higher learning. Not only did X-Club members exchange information and views on matters related to the social issues of science, but other “men of mark” were invited to their meetings – men such as Charles Darwin, Hermann von Helmholtz, as well as Americans Asa Gray, Louis Aggasiz and Edward L Youmans (MacLeod 1970: 312). It was, of course, through publications such as *Popular Science Monthly* edited by Youmans, that much of Spencer’s mischief found a wide and largely appreciative audience.

CONCLUSION

In the end, the primary argument of Clarke was one against equal or identical coeducation. Perhaps not surprisingly, Clarke points out that it is against identical co-education that physiology protests; and it is this identity of education, the prominent characteristic of our American school-system, that has produced the evils described in the clinical portion of his essay (Clarke 1873: 122). According to Clarke, young women’s organization requires an education that is not steady and consistent but attendant to the periodicity of her constitution. Young women can attend the same institutions but should not receive the same instruction as that of a young man. Moreover, all male institutions such as Harvard (not surprisingly the institution where Clarke had taught for twenty years prior) could become co-educational without harm to the fairer sex provided that they received instruction appropriate to a young woman’s organization, but alas this would be too expensive. As Clarke points out,

Harvard College, for example, rich as it is supposed to be, whose banner . . . is the red flag that

the bulls of female reform are just now pitching into, B Harvard College could not undertake the task of special and appropriate coeducation, in such a way as to give the two sexes a fair chance . . . without an endowment, additional to its present resources, from one to two millions of dollars . . . This obstacle is of course a removable one. It is only necessary for those who wish to get it out of the way to put their hands in their pockets, and produce a couple of millions. The offer of such a sum, conditioned upon the liberal education of women, might influence even a body as soulless as the corporation of Harvard College is sometimes represented to be (Clarke 1873: 149-50).

Although the arguments of physicians like Clarke were influenced more by medical folklore than medical science (some empirical studies available did contradict the prevailing wisdom) they were, nonetheless, taken as a fact by Regents and others seeking to control the social ills that might result from women entering the higher learning. In 1877, Regents of the University of Wisconsin explained that "At stated times, nature makes a great demand upon the energies of early womanhood and that at these times great caution must be exercised lest injury be done" (Board of Regents 1877: 45). By 1895, faculty at the University of Virginia were convinced pronouncing that women students were indeed often "unsexed" by academic strains (Rudolph 1962: 326-27).

In response to the concerns raised about women's increasing participation in the higher learning, many colleges and universities began to add physical education requirements for women in an effort to offset the deleterious effects of intellectual strain. When enrollment of women students increased at what was thought to be an alarmingly high rate at Northwestern, engineering classes were added (Woody 1929: 317-18). Medical schools instituted quotas on the number of women students, and a variety of institutions prescribed lighter course loads for women or refused to admit women into particular programs of study (Smith-Rosenberg and Rosenberg 1984: 16). At Stanford University, when enrollment of women grew from 25 percent in 1892 to 33 percent in 1895 to 40 percent in 1899, a limit was adopted to stem the dangerous tide (Rudolph 1962: 323-24). Apparently Mrs. Stanford, founder of Stanford University and wife of railroad magnate Leland Stanford, who had no use for government restriction on

immigrant labor, found the free marketplace of ideas less appealing.⁹ In the end, even learned men with the strongest of free market leanings were compelled by the logic of forced exclusion.

Such is the way in which the argument for women's exclusion from the higher learning went forward in the nineteenth century. It was an argument that did not prevent women from entering the higher learning as *students qua consumers*. As the expanding university system could not survive without greater numbers of students and government support could not easily be accomplished without at least some deference to democratic principle. Yet women were directed in their supporting role to occupy space in ways that did not conflict with the tenants of the *domestic code* and which did not offer to produce a new and competing class of professionals.

As Lawrence Summer's comments made at the January 14, 2005 conference on Gender and Diversity in Science and Engineering Workforce reveal, the "Woman Question" maintains its vitality and women's role in the higher learning continues to be a contested terrain into the twenty-first century (Summers 2005). It is, therefore, worth contemplating why, despite significant increases in the number of women doctoral recipients over the past thirty years, women have failed to prosper as faculty in the male-dominated environment of the higher learning? What is at stake in the higher learning? Why does the higher learning remain a contented terrain?

To answer these questions requires that we examine the political economy of gender in the institution of higher education and requires us to think about the institution as something other than a meritocracy in which the "'best' ideas bubble to the surface" (Strassmann 1993: 56). It requires that we understand how it is that institutions – even institutions of higher learning -- distribute power, the ways in which the social construction of gender is used to signify and maintain power relationships, and requires that we examine the mechanisms by which power is articulated, as Joan Scott says, through "culturally available symbols"(Scott 1996: 167 and Dzuback 2003).

Higher education remains a contested terrain today just as it was in the nineteenth century when women began to call for equal access and an authoritative voice. Although much has changed in the matter of one hundred and fifty years, the question of women's suitability for the higher learning

continues to be raised by powerful men with the authority to speak, and women continue to “counter for themselves the misogynist voice of literate opinion on women’s inferiority” (Kelly 1982: 11).

REFERENCES

- Astell, Mary. [1730] 1970. *Some Reflections Upon Marriage*. New York: Source Book Press.
- Barton, Ruth. 1987. "John Tyndall, Pantheist: A Rereading of the Belfast Address." *Orsis*, 2nd Series, Vol 3: 111-34.
- Barton, Ruth. 1990. "'An Influential Set of Chaps': The X-Club and Royal Society Politics 1864-85." *The British Journal for the History of Science* 23(1): 53-81.
- Barton, Ruth. 1998. "Huxley, Lubbock, and Half a Dozen Others: Professionals and Gentleman in the Formation of the X Club, 1851-1864." *Isis* 89(3): 410-444.
- Bateman, Katherine Saunders. 1994. *Sex in Education as a Case Study in the Establishment of Scientific Authority in the Service of a Social Agenda*. Master's Thesis. Dartmouth.
- Bloch, Ruth. 1978. "American Feminine Ideals in Transition: The Rise of the Moral Mother 1785-1815" *Feminist Studies* 4 (Summer): 100-126.
- Board of Regents, University of Wisconsin. *Annual Report for the Year Ending, September 30, 1877*. Madison: 45.
- Botting, Eileen Hunt and Christine Carey. 2004. "Wollstonecraft's Philosophical Impact on Nineteenth-Century American Women's Rights Advocates." *American Journal of Political Science* 48(4): 707-22.
- Bowler, Peter J. 1975. "The Changing Meaning of Evolution." *Journal of the History of Ideas* 36(1): 95-114.
- Bullough, Vern and Martha Voght. 1984. "Women, Menstruation, and Nineteenth-Century Medicine" in Judith Walzer Leavitt (ed.) *Women and Health in America: Historical Readings*. Madison, Wisconsin: University of Wisconsin Press: 28-37.
- Briggs, Le Baron Russell. 1911. *To College Girls and Other Essays*. Boston: Houghton Mifflin Company.
- Brigham, Amariah. 1832. *Remarks on the Influence of Mental Cultivation Upon Health*. Hartford: F. J. Huntington.
- Coats, A. W. 1961. "The Political Economy Club: A Neglected Episode in American Economics

- Thought." *The American Economic Review* 51 (4): 624-37.
- Carpenter, William B. [1865] 1981. "On the Correlation of the Physical and Vital Forces." in Edward L. Youmans (ed.) *The Correlation and Conservation of Forces*, pp. 402-33. New York: Arno Press.
- Chronicle of Higher Education*. World Beat. 2003. "Court Bans Female-Professor Quota at U. of Oslo." February 28.
- Clarke, Edward H.. 1873. *Sex in Education; A Fair Chance for the Girls*. Boston: James R. Osgood & Co..
- Cohen, Sol, (ed.) 1974. *Education in the United States: A Documentary History*, Volume 3. New York: Random House.
- Cott, Nancy F. 1977. *The Bonds of Womanhood: 'Woman=s Sphere' in New England, 1780-1835*. New Haven, CN: Yale University Press.
- Desmond, Adrian. 1994. *Huxley: From Devil's Disciple to Evolution's High Priest*. Great Britain: Addison Wesley.
- Dirix, M.E. 1869. *Woman's Complete Guide to Health*. New York: Townsend & Adams.
- Douglas, Ann. 1977. *The Feminization of American Culture*. New York: Doubleday.
- Drake, Judith. (pseudonym). [1696] 1970. *An Essay in Defence of the Female Sex*. New York: Source Book Press.
- Dzuback, Mary Ann. 2003. "Gender and the Politics of Knowledge." *History of Education Quarterly* 43 (2):
- Farnham, Christie Anne. 1994. *The Education of the Southern Belle: Higher Education and Student Socialization in the Antebellum South*. New York: New York University Press.
- Fellman, Anita Clair and Michael Fellman. 1981. *Making Sense of Self: Medical Advice Literature in Late Nineteenth-Century America*. Philadelphia, PA: University of Pennsylvania Press.
- Fetter, Frank Whitson. 1975. "The Influence of Economists in Parliament on British Legislation from Ricardo to John Stuart Mill." *The Journal of Political Economy* 83 (5): 1051-64.
- Geiger, Roger L. 2000. "The Superior Instruction of Women= 1836-1980." in Roger Geiger (ed.) *The*

- American College in the Nineteenth Century*. Nashville, Tennessee: Vanderbilt University Press.
- Graham, Patricia Albjerg. 1978. "Expansion and Exclusion: A History of Women in American Higher Education." *Signs* 3 (4): 759-73.
- Hall, Vance. M.D. 1979. "The Contribution of the Physiologist, William Benjamin Carpenter (1813-1885), to the Development of the Principles of the Correlation of Forces and the Conservation of Energy." *Medical History* 23 (2): 129-55.
- Hewett, Waterman Thomas. 1905. *Cornell University: A History*. New York: University Publishing Society.
- Heyck, T.W. "From Men of Letters to Intellectuals: The Transformation of Intellectual Life in Nineteenth-Century England." *The Journal of British Studies* 20 (1): 158-83.
- Historical Statistics of the United States* (1975), Part I (Washington DC: Bureau of the Census).
- Hoffer, T.B., S. Sederstrom, L. Selfa, V. Welch, M. Hess, S. Brown, S. Reyes, K. Webber, and I. Guzman-Barron. 2003. *Doctorate Recipients from United States Universities: Summary Report 2002*. Chicago: National Opinion Research Center.
- Hofstadter, Richard. 1944. *Social Darwinism in American Thought*. New York: George Braziller, Inc.
- Hutcheon, Linda. 2003. "Rhetoric and Competition: Academic Agonistics." *Common Knowledge* 9 (1): 42-49.
- Jacobs, Jerry A. 1996. "Gender Inequality and Higher Education." *Annual Review of Sociology* 22: 153-85.
- Jensen, J. Vernon. 1970. "The X Club: Fraternity of Victorian Scientists." *The British Journal for the History of Science* 5 (17): 63-72.
- Jensen, J. Vernon. 1988. "Thomas Henry Huxley's Lecture Tour of the United States, 1876." *Notes and Records of the Royal Society of London*, 42 (2): 181-195.
- Jensen, J. Vernon. 1993. "Thomas Henry Huxley's Address at the Opening of the Johns Hopkins University 1876." *Notes and Records of the Royal Society of London* 47 (2): 257-69.
- Jernegan, Marcus Wilson. 1931. *Laboring and Dependent Classes in Colonial America 1607-1783*.

- Chicago: University of Chicago Press.
- Kamensky, Jane. T. 1995. *The Colonial Mosaic: American Women 1600-1760*. New York: Oxford University Press.
- Kelly, Joan. 1982. "Early Feminist Theory and the 'Querelle des Femmes', 1400-1789," *Signs* 8 (1): 4-28.
- Kerber, Linda K. 1976. "The Republic Mother: Women and the Enlightenment -- An American Perspective" *American Quarterly* 28 (Summer): 187-205.
- Kerber, Linda K. 1985. "The Republican Ideology of the Revolutionary Generation." *American Quarterly* 37 (4): 474-95.
- Knoll, Robert E. . 1995. *Prairie University: A History of the University of Nebraska*. Lincoln, Nebraska: University of Nebraska Press.
- MacLeod, Roy. 1970. "The X-Club: A Social Network of Science in Late-Victorian England." *Notes and Records of the Royal Society of London*, 24 (2): 305-322.
- MacLeod, Roy. 1971. "The Royal Society and the Government Grant: Notes on the Administration of Scientific Research, 1849-1914." *The Historical Journal* 14 (2): 323-58.
- MacLeod, Roy. 1971. "Of Medals and Men: A Reward System in Victorian Science, 1826-1914." *Notes and Records of the Royal Society of London* 26 (1): 81-105.
- Manion, Jennifer. 1997. "The Young Ladies' Academy of Philadelphia: Attitudes Toward the Formal Education of Women in America, 1790-1800." *Penn History Review* (Spring) Online. Available: www.history.upenn.edu/phr/archives/97.manion.html.
- Martineau, Harriet. 1837. *Society in America*. New York: Saunders and Otley.
- May, Ann Mari. 1998. "Women and the Higher Learning in America: Veblenian Insights on the Leisure of the Theory Class" in Doug Brown (ed.) *Thorstein Veblen in the Twenty-First Century*. Cheltenham, UK: Edward Elgar.
- May, Ann Mari. 2004. "The 'Woman Question' and the Higher Learning" presented at the 2004 International Association for Feminist Economics Conference. Oxford, England.

- Mims, Edwin. 1946. *History of Vanderbilt University*. Nashville: Vanderbilt University Press.
- Morantz-Sanchez, Regina Markell. 1985. *Sympathy and Science: Women Physicians in American Medicine*. New York: Oxford University Press.
- Nash, Margaret A. 1997. "Rethinking Republican Motherhood: Benjamin Rush and the Young Ladies' Academy of Philadelphia." *Journal of the Early Republic* 17 (2): 171-91.
- Nash, Margaret A. 2000. "A Salutory Rivalry: The Growth of Higher Education for Women in Oxford, Ohio, 1855-1867." in Roger Geiger (ed.) *The American College in the Nineteenth Century*. Nashville, Tennessee: Vanderbilt University Press.
- Neal, James A. 1795. *An Essay on the Education and Genius of the Female Sex*. Philadelphia: Jacob Johnson & Co.
- Newcomer, Mabel. 1959. *A Century of Higher Education for American Women*. New York: Harper and Company.
- Newman, Louise Michele. 1999. *White Women's Rights: The Racial Origins of Feminism in the United States*. New York: Oxford University Press.
- Norton, Mary Beth. 1980. *Liberty's Daughters: The Revolutionary Experience of American Women, 1750-1800*. Boston: Little Brown.
- Pizan, Christine de. [1431] 1982. *The Book of the City of Ladies*. Translated by Earl Jeffrey Richards. New York: Persea Books.
- Rosenberg, Charles E. 1967. "Factors in the development of genetics in the United States: some suggestions," *Journal of the History of Medicine* 22 (January): 31-33.
- Rosenberg, Charles E. 1976. *No Other Gods: On Science and American Social Thought*. Baltimore: The Johns Hopkins University Press.
- Ross, Dorothy. 1991. *The Origins of American Social Science*. Cambridge: Cambridge University Press.
- Ross, Earle D. 1942. *Democracy's College: The Land-Grant Movement in the Formative Stage*. Ames, Iowa: Iowa State College Press.

- Rotundo, E. Anthony. 1993. *American Manhood: Transformation in Masculinity from the Revolution to the Modern Era*. New York: Basic Books.
- Rudolph, Frederick. 1962. *The American College and University: A History*. New York: Alfred A. Knopf.
- Rury, John and Glenn Harper. 1986. "The Trouble with Coeducation: Mann and Women at Antioch, 1853-1860." *History of Education Quarterly* 26 (4): 481-502.
- Rush, Benjamin. [1794] 1981. *Benjamin Rush's Lectures on the Mind*. Eric T. Carlson, Jeffrey L. Wollock, and Patricia S. Noel (eds.). Philadelphia: American Philosophical Society.
- Schbanoff, Susan. 1983. "Comment on Kelly's 'Early Feminist Theory and the Querelle des Femmes, 1400-1789.'" *Signs* 9 (2): 320-326.
- Scott, Joan Wallach. 1996. "Gender: A Useful Category of Analysis," in Joan Wallach Scott (ed.) *Feminism and History*. Oxford: Oxford University Press:152-80.
- Senior, Nassau. 1830. "Definition of High and Low Wages."
- Sherwood, Sidney. 1900. *The University of the State of New York*. Washington, DC: Government Printing Office.
- Smith-Rosenberg, Carroll and Charles Rosenberg. 1984. "The Female Animal: Medical and Biological Views of Women and Her Role in Nineteenth-Century America," in Judith Walzer Leavitt ed. *Women and Health in America: Historical Readings*. Madison, Wisconsin: University of Wisconsin Press, 12-27.
- Solomon, Barbara Miller. 1985. *In the Company of Educated Women: A History of Women and Higher Education in America*. New Haven, CT: Yale University Press.
- Spencer, Herbert. [1873] 1966. *The Study of Sociology*. Ann Arbor: The University of Michigan Press.
- Strassmann, Diana. 1993. "Not a Free Market: Rhetoric and Disciplinary Authority in Economics," in Marianne A. Ferber and Julie A. Nelson (eds.) *Beyond Economic Man: Feminist Theory and Economics*, pp. 54-68. Chicago: University of Chicago Press.
- Summers, Lawrence H. 2005. "Remarks at NBER Conference on Diversifying the Science & Engineering

Workforce.” January 14. On-line.

Available:www.president.harvard.edu/speeches/2005/nber.html.

Tattle-well, Mary and Joane Hit-him-Home (pseudonyms). 1640. *The Women’s Sharpe Revenge: or an answer to Dir Seldome Sober that writ those railing pamphlets called the Iuniper and Crabtree lectures, & c.* London: I.O.[kes] and are to be sold by Ia. Becket at his shop in the inner Temple-gate.

Teller, James D. “Huxley’s Evil Influence.”

Thomas, M. Carey. [1900] 1969. "Education of Women," in *Monographs on Education in the United States*, Nicholas Murray Butler, (ed.) New York: Arno Press and the New York Times.

Tocqueville, Alexis de. [1835] 1956. *Democracy in America*, New York: Simon and Schuster, Inc.

Todd, Jan. 1998. *Physical Culture and the Body Beautiful: Purposive Exercise In the Lives of American Women 1800-1870*. Macon Georgia: Mercer University Press.

Trecker, Janice Law. 1974. ASex, Science, and Education,@ *American Quarterly* 26, 4 (October): 352-66.

Youmans, Edward L. [1865] 1981. *The Correlation and Conservation of Forces*. New York: Arno Press.

Veblen, Thorstein. 1993. [1918 ed]. *The Higher Learning in America*. New Brunswick, NJ: Transaction Publishers.

Vertinsky, Patricia. 1987. “Exercise, Physical Capacity, and the Eternally Wounded Woman in Late Nineteenth Century North America.” *Journal of Sport History* 14 (1): 7-27.

Vine, Phyllis. 1976. “The Social Function of Eighteenth-Century Higher Education.” *History of Education Quarterly* 16 (4): 409-24.

West, E.G. 1964. “The Role of Education in Nineteenth-Century Doctrines of Political Economy,” *British Journal of Educational Studies* 12 (2): 161-72.

Woody, Thomas. 1929. *A History of Women=s Education in the United States*, 2 volumes. New York: The Science Press.

Woolf, Virginia . 1972 [1929]. "Women and Fiction" in reprinted in Leonard Woolf (ed.), *Collected Essays: Virginia Woolf*, Vol. II. London: Chatto and Windus.

Woolstonecraft, Mary. 1975 [1792]. *A Vindication of the Rights of Woman with Strictures on Political and Moral Subjects*. Carol H. Poston (ed.) New York: W.W. Norton & Company.

Zschoche, Sue. 1989. ADr. Clarke Revisited: Science, True Womanhood, and Female Collegiate Education, @ *History of Education Quarterly* 29,4: 545-69.

Endnotes

¹ *Popular Science Monthly* 1872 May through September.

² See Ruth Barton on formation of the X-Club.

³ See A.W. Coats (1961): 625.

⁴ The notion that women are less developed than men has a long history. M.G. Delaunay in *Popular Science Monthly* writes of this notion arguing that in all animals the female was formed sooner than the male. Quoted in Vertinsky 1987): 15.

⁵ Many physicians also believed that too much education for women might result in mental illness for women as well. Citing evidence from New York insane asylums, Dr. Ralph W. Parsons, for example, argued that women who undertook the modern system of education were far more likely to suffer from insanity (Bullough and Voght 1984: 33). And some unlucky patients such as Clarke's Miss E suffered both: dysmenorrhoea and eventually complete loss of Athis function,@ along with a Arush of blood to the head@ with Avagaries and forebodings and despondent feelings.@ Alas, Clarke reports that he was Afinally obliged to consign her to an asylum@ (Clarke 1873: 86-87).

⁶ For another discussion of this controversy see Edward L. Youmans, Editor's Table. 1872. *The Popular Science Monthly*, Vol. 1 (May):753-55.

⁷ According to P.J. Bowler, Carpenter was actually one of the first to use the term "evolution" in referring to Darwinian natural selection and Herbert Spencer obtained the word from him. See P.J. Bowler (1975: 95-114).

8. The original members of the X-Club were John Tyndall, Thomas Huxley, Joseph Hooker, George Busk, Edward Frankland, Herbert Spencer, John Lubbock and Thomas Hirst and soon William Spottiswoode (modestly) dubbed Xperienced Hooker, Xcentric Tyndall, Xalted Huxley, Xhaustive Spencer, Xemplary

Busk, Xpert Frankland, Xtravagant Hirst, Xquisit Lubbock, and Xcellent Spottswode. See Roy M. MacLeod (1970): 310-11.

⁹ Mrs. Jane Stanford retains a prominent note in the history of higher education for her call for the firing of Edward Ross from Stanford. Ross, having supported free silver and restrictions on immigrant labor, found himself in less than good favor with Mrs. Stanford.