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The Limitations of Women in Science at Six Midwestern Colleges due to the Adherence to Conceptions of Gender Differences Between the Sexes in the Years of 1880 through 1940

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Introduction

It is difficult for college students today to imagine life when the term "discrimination" had not yet been defined or conceived. Yet only a little more than a hundred years ago women were first entering the academic world alongside men. These were often middle class women whose primary interactions with men had been through courtship and marriage. It was questioned whether women's intellectual ability and physical stamina were strong enough to persevere through the college experience. Scientists and physicians, writing for the general public, cited evidence that besides physical distinctions between the sexes, there were also intellectual and emotional differences. For this reason women were guarded especially closely at college and often were housed in private homes in town. In such an atmosphere, collegiate women in the decades before and after the turn of the century could not possibly be immune from the effects of society's conceptions of gender differences. But exactly how would their effects be manifested? Women's choices of curricula exhibit their perception of themselves. Specifically, throughout the period between coeducation's acceptance and the second world war, women's decisions to major in science were contingent on women's intentions for their post-collegiate use of the degrees, encouragement or discouragement, and the prestige science as a field of study held in the general public and workplace.

The basis for this study was six midwestern colleges: Antioch College, Yellow Springs, Ohio; Denison University, Granville, Ohio; Illinois Wesleyan University, Bloomington, Illinois; Knox College, Galesburg, Illinois; Monmouth College, Monmouth, Illinois; and The College of Wooster, Wooster, Ohio. These schools were selected on the basis of location, similarity in size, and relative prominence between 1880 and 1940. The Midwest as a region was chosen for

several reasons. First of all, most similar studies have been limited to colleges on the east coast or in California (a noted exception being one by Joan Zimmerman on Grinnell College in Iowa). The Midwest, if any stock is placed in stereotypes, is a region with a more pedestrian approach to life than either coast; perhaps the different social milieus affected gender roles. Finally, midwestern colleges were chosen for the practical reason that travel to the schools would be possible on a limited budget and time available.

This study covers the 60 year interval from 1881-1939, and this time-span is treated as three separate divisions of roughly 19 years each. Both the range of years and the designation of periods were chosen with reason. Experiments in coeducation had existed before the Civil War, but the arguments against it, resting on the assumption that women were too weak mentally and physically to suffer the hardships of college life, began to wane in the 1880's. Many midwestern schools opened their doors to women shortly before 1880; women in the classroom were not too controversial when this study of women scientists began: Antioch, had been coeducational from its founding in 1853; Illinois Wesleyan, 1870; Knox, 1870; Wooster, 1874; Denison, 1900; and Monmouth, before 1880. The period between 1880 and 1900 is marked by the relative novelty of coeducation and frequent references by educators in women's colleges on the east coast to "sex solidarity." By 1900 all of the selected schools were coeducational, the controversy concerning coeducation had ceased, and the feminization of science had begun through the creation of the science of home economics (referred to also as domestic science and sanitary science). It is, therefore, fitting that this year serve as the break between the first and second period. By 1920, women entering college were decidedly less concerned with the quality of education they achieved. Science, especially chemistry, had been popularized and glorified through its usefulness

in World War I. Industry at this time was booming and calling for male scientists while ushering females into the newer, less prestigious jobs in science. Women occasionally were hired in academia, but very few received tenure or recognition. During World War II women were hired in scientific occupations with an ease with which they had never before been acquainted. The study of women in science during and directly after the second world war deserves thorough research in itself alone; therefore, 1939 was chosen as the final year for this study. The divisions into periods also facilitated statistical analyses.

Sources, for the most part, were not difficult to locate. For information concerning degree and course offerings, faculty members, extra-curricular activities, and the number of graduates in degree programs, I relied primarily on the bulletins of the schools; travel to each of the schools was, therefore, necessary. When describing the course curricula in the paper, references have been made only if the information was derived from a source other than the college bulletins. Graduates of Denison, Knox, and Wooster have written some excellent histories of their alma maters, and these proved helpful in clarifying information collected from the bulletins. Illinois Wesleyan and Antioch each published books concerning their respective colleges, but these books were, unfortunately, not as helpful as those from Denison, Knox, and Wooster. Monmouth, alone, had no available secondary source material concerning its history. Further help in location of additional, unpublished material was rendered by the college archivists at Knox and Denison. The quantity and quality of data from the colleges were largely dependent on the completeness of their archives. For example, at Denison, Knox, and Wooster faculty reports, tabular studies of the graduates, and commencement programs which clarified the majors of the bachelor of arts candidates were available. Illinois Wesleyan, through no fault of the current archivist, lacked references such as these;

however, even more unfortunate, the Alumni Office, the only other conceivable source of this information, refused to aid the research.

Period One: 1881-1899

During the latter part of the nineteenth century, the prime controversy concerning the higher education of women was whether or not women should receive an equal education to men. The most controversial argument concerning higher education was in discernment of which careers were suited for women. The conception was solidly established that women were not planning on using their degrees for more than teaching a few years to then retire when they married. In the 1880's arguments concerning coeducation were prevalent; prime examples of this are the often heated arguments between Charles Eliot, president of Harvard University (an all male institution) and Martha Carey Thomas, president of Bryn Mawr (an all female institution). While most university presidents were not vocal like Eliot, their concurrence with him can be found in the policies of the schools in the Midwest. Women were housed in a separate part of campus, and the sexes dined separately. Women were not barred from classes, but they did not tend to choose the more masculine fields of study such as science, law, and medicine. Much of the rhetoric of this period suggested that women were welcome on campus primarily to mold the men into more moral people. While M. Carey Thomas promoted a sex solidarity that bound women together in support of career aims by excluding men from significant roles in their lives, women at the coeducational colleges of the Midwest experienced vague explanations and policies which caused segregation, thus leading them to remain within their traditionally female sphere.

College students during the late nineteenth century were offered choices of programs of study, and each led to a specific degree. They did not choose a discipline, or "major" such as chemistry, and focus their studies upon it. Rather, they chose a complete field, such as science. Not all schools offered the same choice of degree courses, but all offered a Classical course and most also had Science courses. The following chart shows the courses of study, degrees to which they led, and frequency of their appearances in the six schools of this study.

Table 1.

Degree Courses at Six Midwestern Colleges between 1880 and 1899

	Antioch	Denison	IWU	Knox	Monmouth	Wooster
Classical	X	X	X	X	X	X
Scientific	X	X	X	X	X	
Latin-Scientific			X			
Philosophic		X	X			X
Literature		X		X		X

As shown in the chart, not all of the six schools offered a scientific or Latin-scientific course. For this reason, when percentages of science students are reported for the period between 1880 and 1899, Wooster College will not be included. The degree programs of the Young Ladies Institute and Shepardson College, both all female schools and of Granville, Ohio, were included in the chart above as offering courses in science, but their women students are not part of the ratios of science graduates by sex because women in Granville took separate classes at distinct colleges apart from the men at Denison College.

separate classes at distinct colleges apart from the men at Denison College. Differences between the necessary courses for a particular degree were slight. The classical course usually required two more semesters of Latin while the scientific course demanded an additional class in chemistry. Not all degree courses were considered equal in difficulty. The bachelor of literature was considered less rigorous and as a woman's degree because its uses were less vocational that the other degrees. Nineteenth century science was observational rather than experimental, and an education in natural science, often titled natural philosophy, was not as prestigious as a classical education. For this reason, the bachelor of science was sometimes considered the short-cut through college because its students were spared from the trials of learning Greek and Latin. Women were afforded the opportunity to receive a bachelor of science at the five schools in which it was offered.

The practice of coeducation was not enacted in totality at the colleges, nor were the designations of women's courses of study followed as strictly as the administrations had expected. Each college adopted distinct regulations regarding choice of degree programs for women. The prior existence of a female academic community frequently limited women's access into the male's more prestigious, academic walls. Hence, schools which had previously been, or currently were, affiliated with a separate institution for women were generally more conservative in their tolerance for women in degree programs with men. However, when women first entered a local academic community through the enactment of coeducation, colleges frequently offered identical courses for women and men.

In the twentieth century bulletins from Knox College, the statement concerning the history of the college claimed that "in 1874 the full college course was definitely thrown open to women, and degrees were granted to

them upon an equality with men."[1] The female seminary at Knox, however, continued its existence throughout the latter part of the nineteenth century. Granting women the right to attend classes at the college created for women four educational options between 1870 and 1891 while their male peers had only two. Women could follow the college's curricula, which had previously been open for men only, and choose to receive either a bachelor of arts or bachelor of science degree from Knox College; they could also combine a college course with that of the seminary which would have, it was assumed, required six years of study; or women could follow the traditional four year seminary course that included music and art but led to a certificate of achievement rather than a degree. A separate course offered specifically for women through the seminary was not abandoned until 1891, and for the decade following the close of the seminary Knox awarded a lesser, literary degree, the bachelor of literature.[2] Thus, despite Knox's claims, complete obliteration of the difference in gender expectations did not occur simultaneously with the coming of coeducation.

During the nineteenth century, Granville, Ohio was home to three institutions of higher education. Denison University was founded in 1831 as the Granville Literary and Theological Institution, and throughout the nineteenth century it only accepted male students. Founded about the same time was the Granville Female Seminary (later Granville Female College) and the Granville Female Academy (later the Young Ladies Institute and then Shepardson College). Granville Female College offered two distinct courses, English and Classical, which required for their completion two and four years respectively.

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[1] Catalogue of the Officers and Students of Knox College, (Galesburg, IL: 1933).

2Hermann R. Muelder, Missionaries and Muckrakers: The First Hundred Years of Knox College, (Urbana, IL: University of Illinois Press, 1984), 54.

The college's bulletin stated that "throughout both courses the whole school is divided into sections, in which Spelling, Reading, English Grammar and Composition, English Literature and Bible Study are special features." While not mentioned, students did receive some, although slight, education in the sciences: one semester each of physiology, chemistry, and astronomy.[3] The subjects of study described what was more equivalent to a male's preparatory school than an institute of higher education. If a woman desired an education with an emphasis on the sciences, Granville Female College was not the one for her. The Young Ladies Institute offered both the bachelor of science and bachelor of arts. A prospective woman scientist at the Institute would receive one semester each of physiology, botany, chemistry, geology, and astronomy.[4] During the mid 1880's it was decided that although the resources of the Shepardson College for women were not sufficient to permit a merger with Denison, the two institutions would share Denison's laboratory and scientific facilities as well as Shepardson music and art equipment. Also, women would be allowed to attend Denison classes, but would remain under Shepardson supervision and administration. Even if a Shepardson student completed a Denison degree program, such as the Bachelor of Philosophy, she could not receive the actual piece of parchment from Denison.[5] Because of the long history of dual yet segregated education, women in Granville, Ohio suffered a greater wait for equal access to the rewards of higher education.

Antioch College, Wooster College, and Illinois Wesleyan University had not nurtured such close affiliations with sister schools as had Knox and

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[3]Annual Catalogue of Granville Female College, (Granville, OH, 1886).

[4]Catalog of the Young Ladies Institute, (Granville, OH, 1886).

[5]G. Wallace Chessman and Wyndham M. Southgate, Heritage and Promise: Denison 1831-1981, (Granville, OH: Denison University, 1981), 55.

Denison; transitions to coeducation were smoother, but suppression was still achieved, albeit through very subtle means. Antioch College's attitude toward its female students was displayed in its stated expectations for women's use of their education. By 1881 both courses, Classical and Philosophic, were open to women, and it was believed that "these various Courses will meet all the wants of students, and fully prepare them to enter the many professions or scientific sphere now opening before the youth of America." Yet it was also written that:

> Superior advantages are offered to young women who desire *thorough intellectual culture* and who prefer advanced education to merely artistic social accomplishments. *Those who expect to teach, to engage in Missionary work or to prepare themselves for any womanly sphere of usefulness or of self-support*, may find advantageous training in our Courses of study, which are open *without distinction*, to members of either sex. (italics are theirs)[6]

While all degrees were granted to both sexes equally, women were expected to remain in traditionally accepted feminine occupations while men were to forge ahead into the burgeoning fields of industry.

When women entered the collegiate program of Illinois Wesleyan in 1870, they could choose from the same courses of study as men, that of the classical or scientific. At Illinois Wesleyan, however, along with the admission of women came the creation of a new school within the university--the school of music. As would a guilty child, the faculty minutes announcing the addition of a music program attempted to dispel prematurely any notion that the school of music was designed with a lesser education for women in mind.

> To meet a clearly recognized want in the Institution, more especially realized since the admission of ladies to its halls, Professor F. A. Parker of the Bloomington Conservatory of Music has been elected Professor of Vocal and Instrumental Music in the University, thus offering to its students in that important department facilities that are unsurpassed in any institution in the land. The University does not

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[6]Antioch College Bulletin, (Yellow Springs, OH, 1880).

> propose to substitute music for other and severer studies, but it does propose to add the grace, the sweetness and the moral power of music to the graver duties of mental discipline.[7]

While on the surface the education at Illinois Wesleyan was equal because men and women achieved identical degrees, a subtle gender stereotyping can by seen through the faculty minutes. Women, it was assumed, were greatly interested in the field of music because music is "graceful, sweet, and possesses moral power"--attributes which could have been copied from a definition of femininity. "The graver duties of mental discipline" were considered masculine; when Illinois Wesleyan only admitted male students, it had no school of music and, therefore, offered only mental pursuits.

Another veiled expectation of coeducation during this period was that women were admitted to colleges to socially adjust and develop the morality of men. Ronald W. Hogeland of the history department at the University of Wisconsin contended that "the introduction of coeducation at Oberlin was not equally directed toward men and women but was conceived of and implemented with masculine priorities in mind." He noted that women were believed to aid men, many of whom were studying to be ministers, to be more than "purely literary men" who knew more about books and "theological halls" than they did about human nature. It was also believed at Oberlin that men could better choose a worthy wife from the natural female associations in the controlled environment of a college campus. It was the founders' belief that "An unmarried minister is a peculiar temptation to the other sex," which explained why the founders believed that "ministers need a wife more than other men." Oberlin founders wanted women to be useful in society and to acquire the "indispensable" qualities of a good minister's wife: discretion, conversational

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[7]WHERE.

powers, prayerfulness, economy and good housekeeping skills. Female students were required to wash and repair the clothes of "the leading sex," care for male students' rooms and take charge of the dining hall tasks. Oberlin founders also argued that men in a community without women fell prey to a "fallacious image of the opposite sex." The explanation of this reflected the general public's concern about the moral and physical "disasters of masturbation."[8] Oberlin, often celebrated for its supposed liberal attitude toward women, was, in fact, plagued by blatant stereotypes and sexual discrimination.

Similar to women at Oberlin, as an undergraduate at Cornell University, Martha Carey Thomas, later president of Bryn Mawr College, found herself up against a mentality that proclaimed the women's role at an institution of higher education was determined by their relations to men. Andrew D. White, Cornell's president from 1866 to 1895, favored coeducation, but his vision was still androcentric.

> Strong men, in adversity and perplexity, have often found that the "partners of their joys and sorrows" give no more real strength than would Nuremberg dolls. Under this theory, as thus worked out, the aid and counsel and solace fail just when they are most needed. In their stead the man is likely to find some scraps of philosophy begun in boarding-schools and developed in kitchens and drawing rooms.[9]

Thomas, however, was an exceptional woman who rose above the constricting attitude and eventually became a trustee of her alma mater.[10]

While the administrations and faculties of the six colleges of this study were not as boldly discriminatory as Oberlin's and Cornell's , the midwestern colleges' practices and rhetoric displayed the belief that women were at college

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[8]Ronald W. Hogeland, "Coeducation of the Sexes at Oberlin College: A Study of Social Ideas in Mid-Nineteenth-Century America," Journal of Social History 6 (Winter 1972), 160-176.

[9]Quoted in Roberta Frankfort, Collegiate Women: Domesticity and Career in Turn-of-the-Century America (New York: New York University Press, 1977),31.

[10]Ibid., 31.

for the benefit of their male counterparts. An article in the Bloomington newspaper shortly after the admission of women into Illinois Wesleyan University read:

> . . . quartette selections accompanied the organ by Miss Ross, one of the students. The gentlemen in the quartette show much improvement. This may be attributed in part, at least, to the fact that a [sic] effort has been put forth by the members from night to night to secure the presence of young ladies.[11]

The faculty had recently stated that the school of music had not been developed for women, but the presence of female students had miraculously inspired men's musical performances. At the College of Wooster similar gender stereotyping was displayed by the Wooster Women's Education Association that had been created "to advance the interests and increase the advantages of young women pursuing their studies in the University." Part of the appeal to the Presbyterian women of Ohio for donations to go to a women's dormitory included their definition of the purpose of women's collegiate education.

> All who have given the subject thoughtful attention now acknowledge that, whatever her sphere in life may be, a woman is better fitted to discharge her duties to others, and happier herself, for having enjoyed the advantages of thorough intellectual training. . . . Of these young women [who have enjoyed the advantages of Wooster College] several have graduated, some with honors, and many are filling nobly positions as missionaries and teachers.[12]

Ironically, while women received such definite opinions as to the limitations of the use of their education, the president of Wooster, Dr. Willis Lord, stated that "Within these walls, the young woman on the same terms and with the same means as the young man, may strive with him for the highest training and the noblest honors." Apparently women were only expected to receive an

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[11] Daily Pantagraph, 5 June 1872.

[12] Lucy Lilian Notestein, Wooster of the Middle West, 1866-1944, (New Have, CT: Yale University Press, 1937; reprint, KY: The Kent State University Press, 1971), Vol. I,82.

education and perform admirably in their studies, but not to put their education to equal use with men.

Knox's expectations of women mirrored those of Wooster. The following excerpt from the circular and plan for Knox College, that was approved in 1837, continued to be printed in the bulletins until the first world war.

> It is beginning to be believed, and not without good reason, that females are to act a much more important part in the conversion of the world than has been generally supposed; not as preachers of the gospel, but as help-mates of those who are, and as instructors and guides of the rising generation, not only in the nursery but in the public school. It should, therefore, be an object of special aim with all who pray and labor for the conversion of the world to provide for the thorough and well directed education of females.[13]

The definition of coeducation at Wooster and at Illinois Wesleyan was women and men working side by side, but they were not to not achieve equal career goals. This equality of education was to serve distinctly separate ends.

Another symptom of women's dubious welcome into the school was the manner in which they were housed. In all of the schools they were boarded separate from men and dined only with their fellow females. While no school was as severe as Oberlin, there was a definite difference in the treatment of the sexes. At Wooster female students were lodged in the homes of the townspeople who could then house no male students. This arrangement, it was believed, placed women "under faithful matronly care, where their habits of study and of conduct are affectionately regarded [and] special attention is given to their education interests."[14] Women at Wooster boarded off campus until 1895. Similarly, women at Illinois Wesleyan University were boarded in private homes until 1878 at which time the Major's College building was purchased by

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[13] Catalogue of the Officers and Students of Knox College, (Galesburg, IL: Knox College, 1896), 6.

[14] Annual Catalogue of the University of Wooster, (Wooster, OH: University of Wooster, 1880), 36.

the Women's Educational Association. It was shortly thereafter renamed Henrietta Hall in honor of Henrietta and Charles Cramp who gave $4000 to renovate the property. Sue M. D. Fry, professor of *belles lettres* and the only female faculty member, was matron of the dormitory.[15] At Antioch College women were not only separated in housing and dining but they could not even attend social occasions with members of the opposite sex. It was also determined that women could visit the glen only every other day; men could explore the glen on odd days of each month, and women on even. Curiously, the catalog also proclaimed that any student who married would "by that act, dissolve his or her connection with the institution."[16] At Knox and Denison/Shepardson College/Granville Female Institute women were housed separately at the seminary or female schools.

The vague messages given to women concerning the practicality of their education, along with the general public conception of what constituted a female's sphere, did not affect their choices of curricula of study as might be expected. Two explanations can be offered for this perplexity. First of all, it may be alarming to notice that in 1882 and 1885 at Illinois Wesleyan University 100% of the women were in the scientific course, yet between those years in 1884, 0% were science students. Rather than supposing that women flocked into this traditionally male course *en masse* for support and protection, it should be explained that in those years of diverse percentages, there were relatively few women at the university at all, and in these cases, 100% represents a single student! For this reason percentages of women who received science degrees were graphed with data combined from all the colleges.

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[15]Elmo Scott Watson, The Illinois Wesleyan Story 1850-1950, (Bloomington, IL: Illinois Wesleyan University Press, 1950), 118.

[16]Antioch College Bulletin, (Yellow Springs, OH: Antioch College, 1880).

The professionalization and institutionalization of science began in the latter part of the nineteenth and early twentieth centuries, and was manifested through greater demand for specialized classes, the expansion of scientific laboratories to be more than mere collections of specimens, and the division of the field of natural science into subjects such as geology, astronomy, chemistry, and biology. In addition, science was beginning to become experimental, rather than observational in focus. This change demanded the expansion of departments to include faculty who were more specialized in their fields. For example, in 1892 the department of natural science at Monmouth College divided into the departments of biology and of physical science. Chemistry and physics fell into the category of physical science while that of biology also included botany. Similarly, before 1886 Wooster had only one faculty position in science. In that year departments of chemistry, physics, geology and zoology were created. The 1880's also saw the expansion of the science department at Denison through a new professorship in chemistry and physics. The program of classes leading to the bachelor of science was lengthened to four years, and scientific laboratories were instituted. That interest in science increased among the students is evident by the creation of the Bulletin of the Scientific Laboratories of Denison University, which was first published in 1885. Only one paper in these bulletins, however, was written by a woman, and her topic of study was in geology.[17] At Knox College Albert Hurd began lecturing in the natural sciences during 1852, and in 1870 he became professor of chemistry and natural science. An additional professor taught mathematics, astronomy, and natural philosophy. In 1881 Hurd published a chemistry textbook derived from his many years of classroom teaching. "It comprised 265 pages of

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[17]Chessman, Heritage and Promise, 47-49.

exposition, definitions, and equations, with no problems or exercises such as would today be tried in a laboratory."[18] The lack of laboratory experiments could be explained by the lack of such facilities at Knox due to the emphasis on observational science during this period. Hurd could merely demonstrate simple experiments while the class observed. The majority of his executions met with success, but students long remembered when his class once "fired off a combination of oxygen and ethene, the report of which was like that of a young cannon. Those in the halls thought the building was going up. The girls screamed, and the boys were not much behind them in vocal demonstrations."[19] Women in his classes were treated with

> genuine chivalry; he was always deferential and dealt more gently with them than with men. Yet he could be caustic when the occasion seemed to demand it. One student said to me [James G. Needham] that she was 'scared to death of him.'. . . He was more polite with women. He never said 'Mr.' when calling on a man in recitation; he never omitted 'Miss' when calling on a woman.[20]

Women were welcome in Hurd's class since the 1870's when they were permitted to trek from the seminary into the college class, but their treatment was clearly condescending.

By the close of this period, science and the procedures of science education had changed. As the departments were expanding, and the courses in science became more specialized, expectations of students and curricula changed as well. For example, students at Knox during the 1880's demanded the requirements for the bachelor of science be toughened. It had come to be considered by students as the "short cut through college."[21] The program

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[18]Muelder, Missionaries and Muckrakers, 204.

[19]Republican Register, 1 Jan. 1890.

[20]James G. Needham, "How Biology Came to Knox College," Scientific Monthly 60.April (1945), 369.

[21]Coup D'Etat Feb. 1885.

became stricter, however, not by requiring more science courses, but by increasing the number of semesters in German and Latin. These particular foreign languages were required because they would facilitate the reading of articles and deciphering names in science. Aversion to studying Latin was one factor dissuading women from the traditional classics course. Science had been the course of choice for women students, but as the curriculum changed, most of them left (Figure 1).

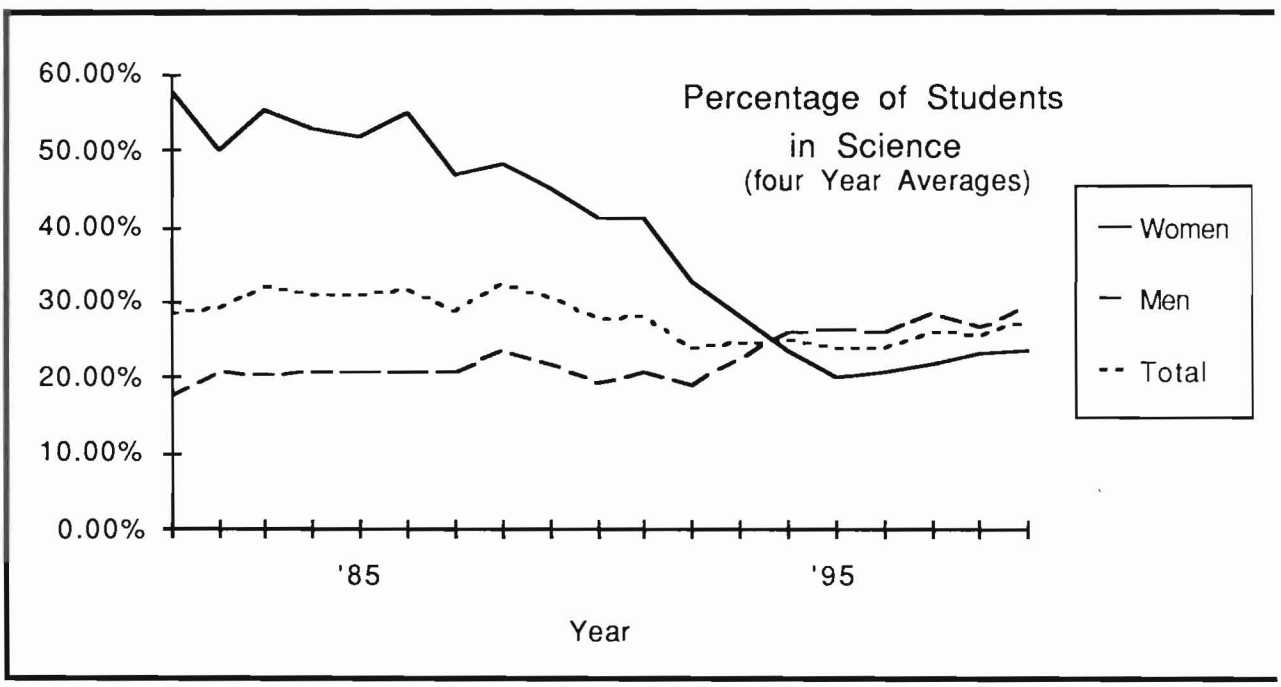

Figure 1

This graph presents data in one year increments of four years each, rather than simple annual totals. Thus, each of the Years on the graph actually represents a four year period beginning with that year. This four year sum is a means of reducing fluctuations in data while preserving the integrity of trends.

Despite the enlargements of the science departments there was no female professor or even assistant professor of science employed by any of the six schools. Female professors outside of the seminaries of Knox and Denison

were few, and none taught science. At Wooster University, which had been coeducational from its founding, only three women had been granted real academic status on the faculty. (Annie B. Irish, professor of German (1880-1886); Eva Correll, professor of German (1886-1893); and from (1893-1920 and 1924-1935), Gertrude Gingrich, also professor of German). Illinois Wesleyan University hired two female professors. (Sue M. D. Fry, professor of *belles lettres*; followed by Luella M. Denman, also professor of *belles lettres*.) At Antioch College there were no female professors between 1880 and 1900 but there had been a few in previous years. (Lucretia Crocker was professor of mathematics and astronomy for one year, 1857-58; Rebecca Rice taught French and mathematics for a year, 1869-1870; Anna Richmond was professor of mathematics and astronomy from 1873 to 1876.) Monmouth College hired seven female professors, but their tenure at the school was short and four of them taught English. (Others were: Agnes Strang, professor of German (1880-1887); Clementine Calvin, professor of German and elocution (1886-89); Oella Patterson, professor of German and English literature (1889-1892). In these midwestern colleges the creation of new professorships in science did not effect women's employment in academia.

Data derived from the midwestern liberal arts colleges of this study need not only be explained in light of the ambiguous messages concerning coeducation women received once members of the academic community, but also with consideration of the national trends in education and science as well as the general public's conception of the women's sphere. The argument within academia concerning the scope of women's higher education continued through the 1880's with increasingly more self-opposing preambles and confounding re-statements of previous resolutions. Before elaborating upon the primary topic for the article, authors would first list reasons why women had

rightfully earned the practice of coeducation. Education journals frequently published essays with titles such as "Mothers as Educators" that hailed women's use of education to train their children.[22] Mary Whitney, student of Maria Mitchell and professor of astronomy at Vassar College, best displayed the convergence of feminine attributes with the study of science. Whitney believed that women should study science because it developed their intellect through laboratory experiments as well as provided hopeful "remunerative labor." She admitted that as of 1882 "of remunerative labor for women, as the outgrowth of scientific preparation, we cannot say the present offers many examples," but she predicted that the field of household economy would provide some. Her stance must be held in question due to her messages of nearly opposite sentiments. On one hand, she despised the fact that "there is still considerable unreadiness to believe that in the higher professions she either can or or will make herself as proficient as a man." Yet she also proclaimed that "She [female students] will know that motherhood is the highest profession the world has to offer; highest in the knowledge it requires, and widest in its influence; and she will not allow a lower profession to trespass upon a higher."[23]

During the last two decades of the nineteenth century women had been granted the right to receive educations equal to men's, but the period did not mark the resolution of the controversy concerning coeducation. The argument merely shifted its emphasis from the debate of whether women were too weak to experience the hardships of the total college experience to the discussions of how to design courses which would be relevant to women's future careers as wives and mothers. And though many received their education in science, they

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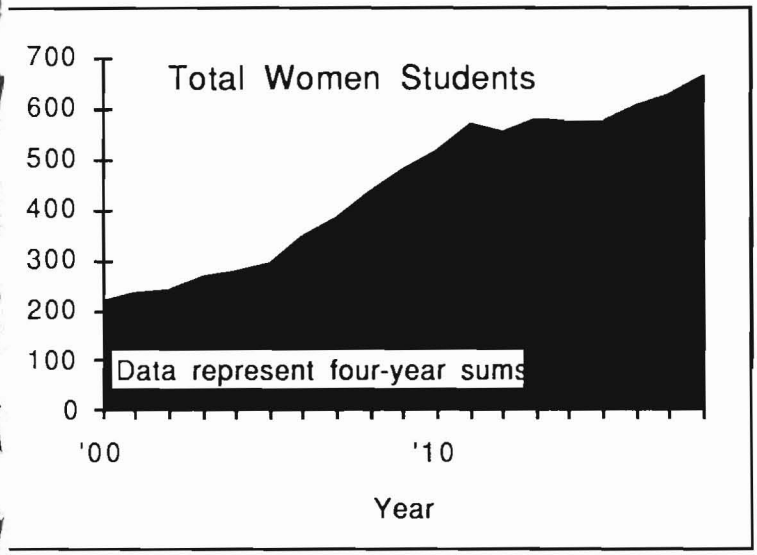
[22]Mrs. D. H. R. Goodale, "Mothers as Educators," Education 3 (May 1882), 483-487.

[23]Miss M. W. Whitney, "Scientific Study and Work for Women," Education 3 (Sept.1882), 58-69.

were not to be "scientists." Changes in the field of science, and how it was taught, resulted in women studying science in much lower numbers than previously. These trends were shown through the expansion of the collegiate science departments and the drop in the ratio of women to men receiving degrees in science. As science in the twentieth century became more actively experimental and enmeshed with industry, scientists also became more esteemed. The feminization of science courses for women, therefore, began.

Period 2: 1900-1919

During the first two decades of the twentieth century science education changed to accommodate its increased role in industry, which was still a male-dominated domain. Women found themselves being led into fields which were suited to the "feminine spirit." The field of home economics was created as means of directing scientifically minded women into the traditionally accepted woman's sphere. The male realm of academia, when assaulted by more and more women who demanded an education, crafted a way to entice women to be good females and only entertain careers which would allow them to fulfill their duties as wife and mother. The impact of this shift resulted in a rise in the number of female students, while the proportion of females in science remained fairly stable, with only a slight increase before 1920 stimulated by the First World War (Figure 2). Although more women joined the ranks of college graduates, they did not break into the "masculine" field of science with any greater frequency than they had during previous years.



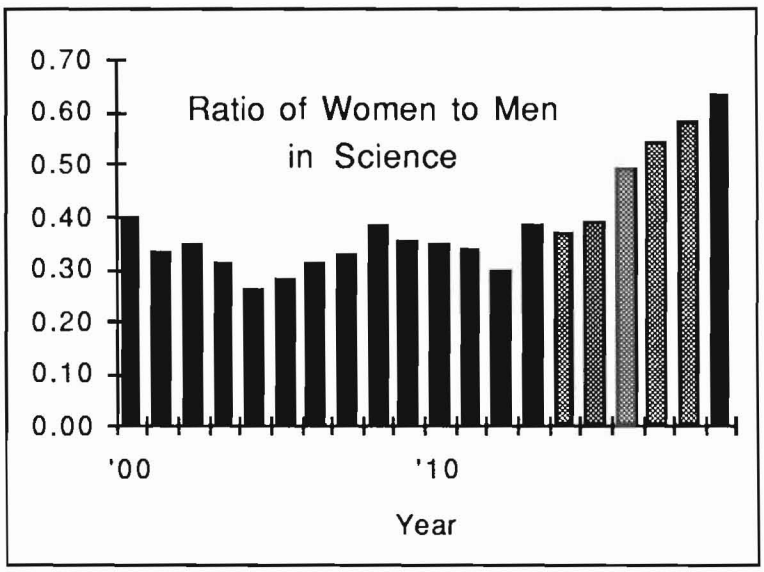


Figure 2
Shaded bars represent WWI

Between 1880 and 1899 there were 757 women students, but in the next two decades the total number of women increased threefold to 2212. The number of male students, however, did not increase with such acceleration; in fact, the male population did not even double in this time, increasing from 1390 to 2590. The ratios of students from these schools correspond with those Mabel Newcomer derived for the entire country using data from Reports of the

Commissioner of Education and the Decennial Census.[24] The midwestern schools favored women slightly more than the average during the first period, but corresponded exactly during the latter. At first glance, this appears as a mere increase in student body size, however, a much more profound demographic change was, in fact, occurring.

From the first period through the second, the ratio of women to men who studied science decreased drastically. Between 1880 and 1899, 289 women studied the scientific course, leading to 38.2% of the female student body in science. Comparatively only 22% of the males received a bachelor of science. Those who chose the scientific program, however, had a closely divided population by sex; the ratio of women to men was .93. While the overall number of female students tripled, the proportion of women to men dropped from equal to roughly 40%. Women in science were not as numerous during the first two decades of the nineteenth century. While women were not entering science, their male counterparts flocked to the discipline, their number more than tripling. This drastic shift led to female scientists accounting for only 8% of the student body while the males for 33%! What caused women of the new century to avoid the scientific programs?

The decrease of women entering science can be explained by several forces working simultaneously and contingently. One factor was science's increasing intimacy with the rising field of industry. Industrial research laboratories were established in the early twentieth century. As Kendall A. Birr observed:

> By the end of the century, many American industrial firms were using scientifically trained men; their inventions were being exploited by industry, scientists were widely employed to analyze and control

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24Mabel Newcomer, A Century of Higher Education for American Women, (New York: Harper & Brothers Publishers, 1959), 46.

> existing processes, and they were frequently called on as consultants. The time was ripe for the introduction of the modern industrial research laboratory.[25]

It is this supplantation of laboratory science for traditional, observational or "classical" science which led to a new system of scientific prestige: "pure research is better than applied research, and any kind of research is better than mere analysis or application."[26] As a science degree became a ticket into an increasingly hierarchic industry, women were electing less harsh fields.

Not only was the bachelor of science becoming more vocational; all degree programs began their transformation into career directed educational programs. Solomon Willis Rudy studied the liberal arts curricula of many colleges throughout the United States and maintained that in 1905, Knox College embarked on a pursuit which evolved "a largely elective curriculum with a minimum of required courses to a program demanding a broad grounding in general education and concentration of upper-division work in some one special field."[27] All first year students at Knox during the turn of the century were required to take mathematics, English, and oratory; those who desired a B.A. degree would also learn Latin while those who earned the B.S. would need laboratory science. The remainder of their program was elected freely. Rudy interpreted The Knox Curriculum as one which "always frankly recognized the ultimate vocational and professional objectives of its students and accepted the obligation to advise them as to programs."[28] The curriculum was therefore expanded to offer electives in business and pedagogy. The field

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25Kendell A. Birr, "Science in American Industry," Science and Society in the United States, eds. David D. Van Tassel and Michael G. Hall (Homewood, IL., 1966), 35-80.

26Carroll Pursell, "Science and Industry," Nineteenth-Century American Science: A Reappraisal, ed. George H. Daniels (Evanston, IL: Northwestern University Press, 1972), 233.

27Willis Rudy, The Evolving Liberal Arts Curriculum: A Historical Review of Basic Themes, (New York: Bureau of Publications, Teachers College, Columbia University, 1960), 70.

28Ibid., 71.

of home economics was soon offered also. The number of science degrees awarded to women actually dropped from what it had been in the nineteenth century and only increased again when the effects of the First World War were felt.

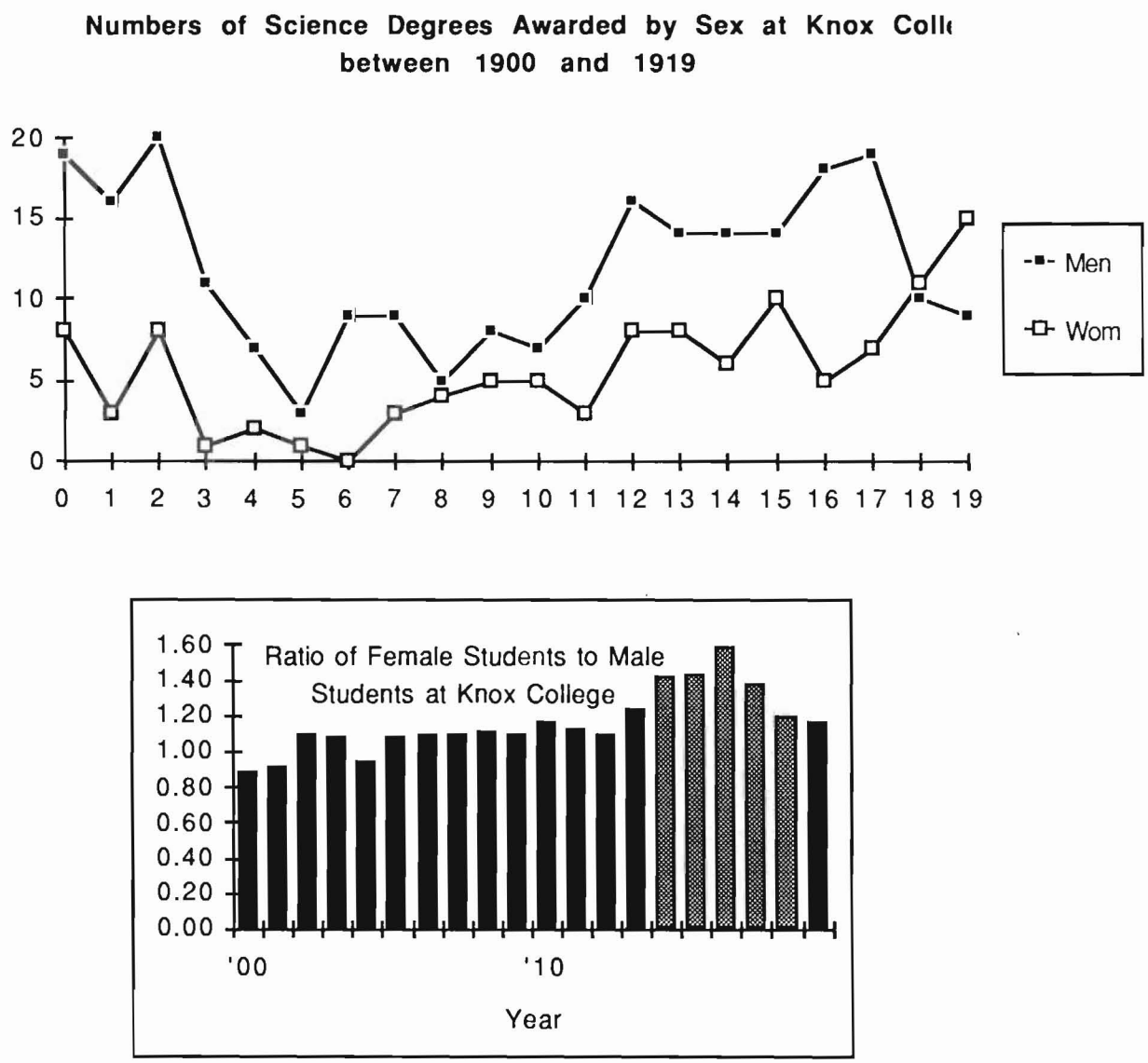

Figure 3
Shaded bars in lower graph represent WWI

The College of Wooster experienced a similar trend in curriculum reform with the brunt of the change occurring between 1910 and 1920. New

professorships were created in most fields of study including biology and domestic science, and most departments were expanded through the use of assistants and creation of new courses. The departments of physics and biology were greatly developed. Previously the department of biology consisted of one professor, who along with a few laboratory assistants taught all of the courses which (since he was a practicing physician) directed students toward further training in medicine. In 1919 an assistant professor was added who developed courses in neurology, personal hygiene, and laboratory physiology. Botany and geology also were taught at Wooster, with "geology [taking] one back to Genesis."[29] The chemistry department also expanded to include more technical courses in quantitative analysis, organic analysis, chemical calculations, physical chemistry, and it branched into home economics. The administration and faculty were sympathetic to the increase in opportunity and interest of their students to attain careers in college teaching as well as research in chemistry, biology, physics, geology, and botany. Thus, in addition to expanding the core course offerings, other aspects of the curriculum were changed as well. For example, since Wooster graduates who eventually desired a Ph. D. would be required to possess reading capabilities in two foreign languages, the French, Spanish and German departments added courses in literature. A class in "scientific French" was offered in 1908. (The department of German language was suspended temporarily during and after the war years, even though Germany was leading the science race.) While the ratio of women students at the College of Wooster showed a steady increase with a more rapid one due to the First World War, the ratio of female science students did not show such a rise. The ratio of female science majors to total

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29Notestein, Wooster of the Middle West, vol. 1, 139.

female population and the ratio of female science majors to the total student body remained similar.

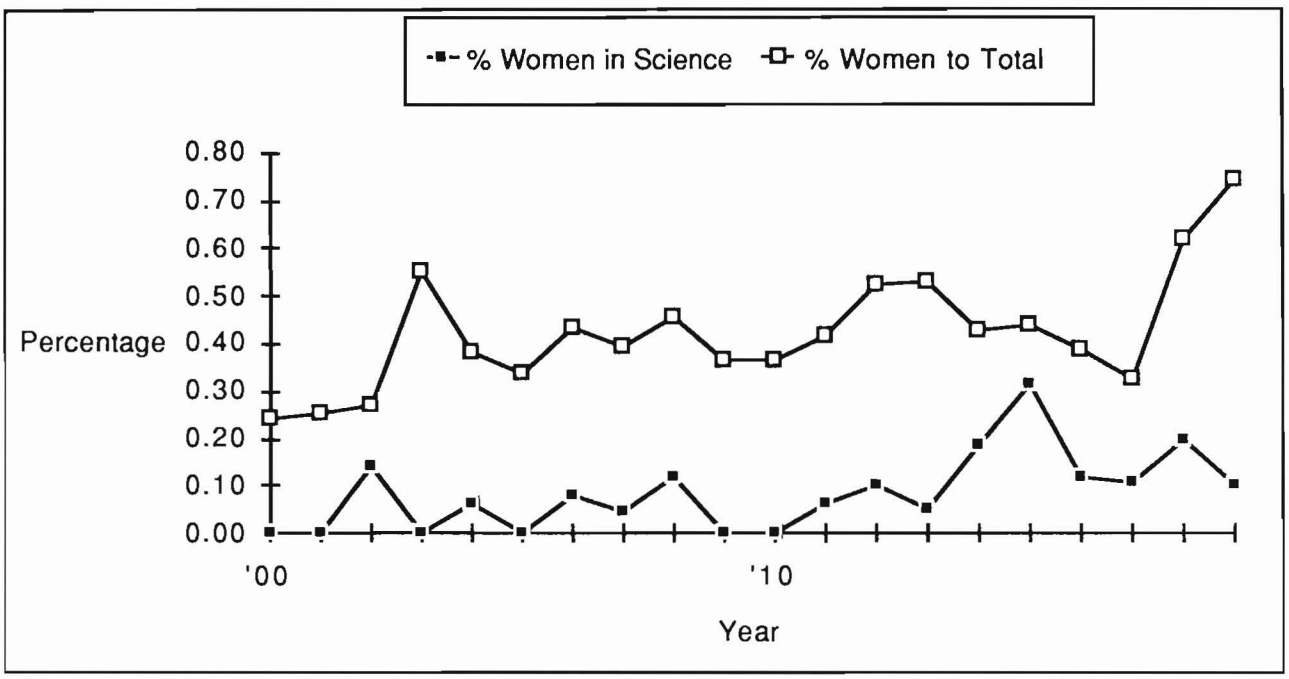

Figure 4

Despite the growth of the science departments, women were not electing them as major fields of study in any greater degree than they had before the curriculum reform. The self-imposed segregation of students by sex was even noted during this period by Charles de Garmo of Cornell University. He noted that "parallel with this rapid increase in the number of women devoting themselves almost exclusively to the humanities we have a correspondingly rapid increase in the number of young men who are devoting themselves to the applied arts and sciences."[30] Not all of the schools of this study were as blatantly segregated as de Garmo suggests, but they did display segregation. The self-imposed division is probably due to the greater emphasis on

30Charles de Garmo, "Differentiation in the Higher Education of Women," Educational Review 25 (1903), 341.

vocational education in science, and women were not planning to pursue careers in science. It would be interesting to compare these figures with the ratio of women who entered the field of home economics, but due to the lack of funding, I was unable to return to the colleges to investigate this.

During the first two decades of the twentieth century while the fields of science in academia were becoming vocationalized due to their increasing role in industry, the question of how to make women's education vocational became a dilemma. Martha Carey Thomas, president of Bryn Mawr College, at the turn of the century advocated women's colleges which would provide "sex solidarity." By this term she meant that career women should make no provisions for men in their lives. They should be strong enough to shoulder loneliness because as Thomas observed: "As I watch their gallant struggles I sometimes think that the very stars in their courses are conspiring against them. Women scholars can assist women students, as men can not, to tide over the first discouragements of a life of intellectual renunciation."[31] As the push for the feminization of college courses took hold, Thomas proclaimed that if a woman's education should prepare her for the role of mother it should "begin by educating their own college men to be husbands."[32] By about 1910 her stance on sex solidarity altered and reflected concessions made to those promoting feminine directed courses at the universities. She had sensed that the era of the woman demanding an education for the sake of learning despite the taboos against it had ended and that these women, who suffered no outcast states for attending college, were not as voracious or adamant in the studies. She wrote: "The students of today are interested in what they believe to be very modern

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31Martha Carey Thomas, "Present Tendencies in Women's College and University Education," Educational Review 25 (1908), 83.

32Quoted in Frankfort, Collegiate Women, 33.

and practical studies, apparently without regard to the relative teaching ability of the professors. Students often say to me that they wish to study these subjects because, as they say, they will help them to deal with life, and it is dealing with life that they are eager for."[33] The progression of Thomas's ideas concerning higher education was reflective of the concern for women's careers after college and the subsequent feminization of the academic curriculum.

The most conspicuous product, or brain-child, of the feminization craze was the field of home economics. There was a plethora of articles from the period which hailed home economics as the solution to the dilemma of the purpose of women's higher education. The possible reasons for such frequent publications of the wonders of home economics and its passionate descriptions are manifold. It is possible that home economics was so welcomed and enjoyed by those who pursued it that they felt it was their duty to encourage others to explore the field. The articles, however, were often not written by domestic engineers, but by other scientists, and the tone was frequently condescending. There were not blatant statements of discrimination, but the field was spoken of with such inflated importance that it smacked of a carnival worker hustling the susceptible prey into believing his "tonic" was real. An example from Charles de Garmo's polemic on the rewards of applied chemistry illustrates this manipulation. He enticed:

> Shall the measure of their possible preparation for such work be the brief and inadequate training afforded even by the best or our secondary schools of commerce? Is her field to be circumscribed to stenography and bookkeeping? Ought not the university to extend to her, and to men also, a professional training in the application of science, language, and economics to this realm of human endeavor?

Then he deposited women right where he wanted them:

33Quoted in Ibid., 35.

> A New England college woman who had studied and taught chemistry concluded to make a business application of her knowledge. She studied the art of bread-making, and when this had been mastered, she set up a scientific bakery in her own town.. . . Almost every domestic art has like possibilities, and awaits alike the transforming hand of applied science.[34]

They were back in the kitchen. While de Garmos's rhetoric displayed the manipulative aspect of the drive toward domestic science, there were consistent tenets upon which the arguments were based.

The rationale of those who advocated domestic science's integration into the college curriculum was grounded in three notions. The first was that women were expected to marry and should, therefore, be trained to manage a home. R.H. Jesse, president of the University of Missouri, wrote:

> All colleges and universities that admit women should recognize the fact that the majority of their pupils will marry and ought to do so. . . . If the primary aim should be to consecrate the pupils to scholarship alone, then the quicker they are turned aside from marriage and housekeeping, the better; but if the primary object be to train the whole woman in her body, her mind, her character, her social nature, and her domestic sympathies, some instruction should be offered in household economics.[35]

It was also promoted that the field of domestic science would elevate the status of women's work in the home.

> [Courses in household economics] are neither "classics" nor "natural sciences" in the sense in which these two groups of studies have been used in the the battle royal for a chief place in the college curriculum, but rather belong among the logical sciences--that is, those which develop observation and reasoning in a natural and logical order. . . . I would advocate, therefore, the study of household economics, not with a view to the making of better cooks, waiters, cleaners, and caretakers--though these will come incidentally--but because such study dignifies and invests with a ten-fold interest the routine and drudgery of household affairs, and also because the subject most naturally lends itself completely to the kind of instruction

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34de Garmo, "Differentiation," 344.

35R. H. Jesse, "The Position of Household Economics in the Academic Curriculum," Association of Collegiate Alumnae Publications Series III, no. 10 (1905), 26.

> which women most need, for the reason that it is not, if one may say so, an inevitable function of their ordinary experiences.[36]

The preceding passage from an article by Edward Devine for the Association of Collegiate Alumnæ incorporated the notion that the natural duty of women was to be mothers with the emphasis on vocational education and the enlarged college curricula. He also believed that the elevation of women's roles as housekeepers would be achieved through a college course of study and subsequent degree in it. The final presupposition of the necessity of domestic/sanitary science in the college curricula is that women could use the knowledge it afforded as social workers. According to Sally Swager, Marion Talbot, founder of the Association of Collegiate Alumnæ and Dean at the University of Chicago, believed that her field of sanitary science was not "intended to teach girls how to run a home; it was designed to equip social science experts with training in chemistry, physics, physiology, political economy, and modern languages in order that they might successfully address the problems of urbanization."[37] Another example of the exaggerated difficulty of homemaking skills is found in an alumni bulletin from Knox College. In it Chloe Owings from the class of 1910 described her work experiences in France during World War I. She wrote that "the problem [studying the quality of hospital food] is tremendously interesting and pregnant with possibilities--possibilities so big in their final effect that it seems too big to be realized. But being born of Irish and Welsh pioneers and having done a bit of pioneering myself, and believing as I do with all my soul that if a thing is for me to do I'll find--or rather be shown--the way . . . ."[38] Not only did the article elevate the significance of domestic

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36Edward T. Devine, "The Economic Place of Woman," Association of Collegiate Alumnae Publications Series III, no. 10 (1905), 16.

37Sally Schwager, "Educating Women in America," Signs:Journal of Women in Culture and Society 4, no. 2 (Winter 1987), 365.

38"Cloe Owings in France," The Knox Alumnus, 1, no. 6 (1918),137.

science to a phenomenal proportion, but her attitude toward the moral crusade to research the "pregnant possibilities" was decidedly feminine. While men on the outside of the field condescended to it, women from the previous generation of coeds, who were now working within academia, had a less stereotypically feminine definition of the scope domestic science.

The Association of Collegiate Alumnæ (later renamed the American Association of University Women) supported the feminization of the college curricula, and because of this stance their influence was increased and the curricular reforms were enforced. The ACA's early purposes were to fund women's undergraduate and graduate education, support the research of noted women scientists (such as donating to the purchase of one gram of radium for Madame Curie), and alleviate the sense of alienation women might experience in academia and science laboratories.[39] At the turn of the century, similar to the change in the nature of women students attending college, they softened their earlier stance of proving the physical and mental ability of women to one which sought the union of intellectuality and femininity. Applied science, the catch phrase for domestic and sanitary science, was believed to combine the intellectual pursuit of chemistry with women's innate interest and concern for domesticity. Science would therefore be used by women to ease the effects of rapid urbanization and immigration which the country was experiencing. Academic men who had previously ridiculed both women's quest for higher education and the ACA, supported the organization once it promoted applied sciences. Roberta Frankfort interpreted men's support for domestic science as a sigh of relief that women were no longer encroaching upon male ground, but simply expanding the definition of "home" to include the whole of the community

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39Marion Talbot and Lois Kimball Mathews Rosenberry, The History of the American Association of University Women, 1881-1931, (Boston, MA: Houghton Mifflin Company, 1931).

and using "science" only after it had been researched by male scientists.[40] Charles Eliot, who in the nineteenth century was adamantly against coeducation, spoke at the 1908 ACA national convention. His speech would have been scorned in earlier years, but the members during this period accepted his discriminatory remarks.

> The one great occupation for women is the most intellectual occupation there is in the world. It calls, and calls loudly, and often calls in vain, for carefully trained mental powers, as well as great moral powers. . . . I look forward therefore to the future of the higher education for women as a great influence in the perfecting of home life, of family life, of household joy and good.[41]

The president of the all women college of Barnard, Laura Drake Gill, went so far as to remark that "the fact that the number of women is not increasing markedly in the older professions of law, medicine, [science,] and theology seems to indicate that other service is better adapted to the exigencies of woman's racial [sic] position and to her taste than are they."[42] The service to which she believed women were suited was that of applying science through social work. The application of the tenets of ACA and the creation of the field of domestic science were displayed in midwestern colleges.

During the first two decades of the twentieth century, home economics departments were created in the colleges of this study. At the College of Wooster, for example, William Zebina Bennet, professor of chemistry, branched his department into the field of home economics. According to Lucy Lillian Notestein:

> [Bennet] had always been happy in the number of college girls who took his courses; he made rather a special bid for them; and in 1912-

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40Frankfort, Collegiate Women, 91-96.

41Charles Eliot, "Women's Education: A Forecast," Association of Collegiate Alumnae Publications Series III, no. 18 (1908).

42Quoted in Frankfort, Collegiate Women, 99.

> 13 he began offering sanitary and household chemistry: 'devoted to the sanitary study of water, food material, the chemistry of cookery, preserving, cleaning, bleaching, dyeing, disinfection, textile fabrics, etc.'[43]

Three additional courses in food and its preparation, textiles, and household administration were offered experimentally during the First World War. They were taught by Amelia Doddridge, acting dean of women, who had experience and training in domestic science. These particular classes were offered only between 1918-1919 during the "confused period of war, fuel shortages, S.A.T.C., Spanish flu, and demobilization."[44] Apparently Bennet believed that women would be especially interested in household science, and while the number of men students dropped due to the war, the feminization of the curriculum took an especially strong stance.

The feminization of science was especially prominent at Illinois Wesleyan University. The department of home economics emerged in 1905; for one year, 1911, there was even a college of home economics. Except for the years surrounding the existence of the college of home economics, the home economics major led to the bachelor of science degree. During the years of the college of home economics, a bachelor of domestic science was granted. While the college of home economics existed there were two courses available to those interested in the field. One was the four-year college course which led to a degree; a non-credit laboratory course in "practical cooking" was also offered "for the benefit of those students who have not had sufficient work to gain college entrance, for housekeepers, and for students enrolled in some other department of the University who wish to devote a small amount of time to

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43Notestein, Wooster, 139.
44Ibid.

Home Economics work . . . ."[45] Three purposes were offered for the College which related to the ideas of the ACA and the arguments of prominent educators previously discussed.

> 1. To give the young women a general college training leading to a college degree, thus fitting them for the highest usefulness in relation to society in general, enabling them to come in contact with the greatest minds of all ages and storing up immeasurable treasures of intellectual power that makes one at home in the best, the most cultured society, that society which is based on mind.
>
> 2. To give the young women such thorough, practical scientific training in all phases of Home Economics work that they may be enabled to do their part in the elevation of the standards governing the administration of the affairs of the home and that they may be home makers in the fullest sense of the word.
>
> 3. To prepare young women to become active workers in some phase of the Home Economics work, as teachers, as hospital dietitians, as directors of Home Economics in Young Women's Christian Associations or Settlement work, as Institute or Short Course workers, or in Lunch Room work.[46]

The first purpose allowed that women could and should develop their intellect; the second displayed the supposed moral drive that women had to serve the expanded home; the final purpose listed the vocations which were proper for women, none of which would fall too far from the traditionally feminine sphere. Also evident in the bulletin was the rhetoric which overly glorified the tasks of a home economist.

> . . . we find it essential that all our work be intensely practical, and that science without practice is insufficient. For example, it is not enough that a young woman should know something of the composition, structure and digestibility of a cut of meat. She must also be able to go to the market and intelligently select and prepare the cheaper as well as the more expensive cuts so that they will be equally palatable and digestible. It is not enough that she be thoroughly informed as to the life history of the yeast plant. She must

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45Illinois Wesleyan University Bulletin: Annual Catalogue, (Bloomington, IL: Illinois Wesleyan University, 1911), 73.

46Ibid., 73-74.

> be able to apply this knowledge to the making of uniformly palatable and nutritive bread.[47]

With such a necessity for a college degree to manage a home, it is a wonder that generations lived at all before the creation of the science of home economics! It is impossible for me, unfortunately, to discern the frequency of home economics majors who receive a B.S. because the commencement programs from this period had not been preserved. It is also interesting to note that within the college of home economics those who taught the home economics classes were female while those who taught and assisted in chemistry, biology, and geology, the disciplines upon which home economics were founded, were all male. The home economics department and college at Illinois Wesleyan University exhibited all of the necessary characteristics for enticement of women to enter the feminine branch of science.

While it is beyond the scope of this study to discern precisely which attitudes or measures shaped each coed's choice of study, a particular female science student from Monmouth College demands attention. Ruth Eliza Okey majored in chemistry and received both a bachelor of science and a master of arts from Monmouth during the 1910's. Her college peers remembered her in their class yearbook of 1914 as someone who reminded herself "of a preserved student" and others "of a spolyto canicularia hypognea instructing a branta canadensis minima as to the structural difference between a pseudatsuga incranata taxifalia and a pinus ponderous scoplorum." Obviously, she was considered a serious student of science. Immediately upon graduation she studied at and received a Master of Science and a Doctor of Philosophy from the University of Illinois. Frequently, Monmouth College hired alumni, but they did not offer Okey a position even though she was more qualified to teach than

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47Ibid., 74.

their professor of chemistry and physics who had received only a B.S. and had studied for one year at Harvard's graduate school. Instead, Okey traveled to Berkeley, California where she was hired as Assistant Professor of Home Economics. At Berkeley, Okey served under Agnes Faye Morgan, a woman whom Margaret Rossiter, noted historian of women in science, referred to as "the battler at Berkeley" because she was known for the high-caliber of professors she attracted into her department and because she was an extremely strong willed person.[48] Rossiter also reported that when Okey was offered an opportunity to do "cooperative research" with Herbert Evans of the biology institute of Berkeley, Morgan refused Okey permission to work with Evans on the chemistry of biological tissues. Morgan based her decision on Evan's notorious habit of not crediting the work of his female assistants as theirs.[49] The experiences of Ruth Eliza Okey displayed the manner in which highly qualified and motivated female scientists were ushered into home economics. Even if they were offered work in more masculine fields, credit for their input would often be usurped by their male colleagues.

By 1920 the feminization of science had succeeded in its establishment of an acceptable branch of science for women, that of home economics. The division of science into feminine and masculine subjects was welcomed because of the continued increase in the number of women who sought a college degree. With women diverted to a specific branch, the more lucrative and prestigious fields were preserved for men. Women, however, were not forced into this separation. In fact, they welcomed it because science was

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48Margaret W. Rossiter, Women Scientists in America: Struggles and Strategies to 1940, (Baltimore, MD: The Johns Hopkins University Press, 1982), 203.

49Ibid., 212-213.

developing at such an accelerated rate that its study was becoming increasingly rigorous and the science degree was becoming decidedly vocational.

Period 3: 1920-1939

After the first world war the prestige of science as a field of specialty rose incredibly. While industry and academia were encouraging male collegians to further their research in science, they did not seek women in their laboratories. The few women in industry and academia were hired in low echelon jobs and did not advance far beyond their entry level positions. During the years between the first and second world war there was an influx of vocational guidance books for women that did include jobs in science. Collegiate women of this period were more interested in the social aspects of college life than their predecessors, who had first barged through the barriers to higher education. Emphases on the colleges' campuses were on social events rather than scientific.

As previously shown, the number of women students enrolled in higher education rose dramatically in the early twentieth century, but the percentage of women students peaked in 1920 at 65%. While the percentage of women dropped between 1920 and 1940 the absolute number of women acquiring higher education continued to increase. These data are in accordance with the results of Mabel Newcomer's study of women students between 1870 and 1957. She plotted the peak percentage of women students as occurring in 1920 at 47.3%, while the absolute number continued to climb.[50] As in the two

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[50]Newcomer, A Century of Higher Education, 46.

decades before World War I, despite the increased number of women students, there was not an increased wave of women in the science programs.

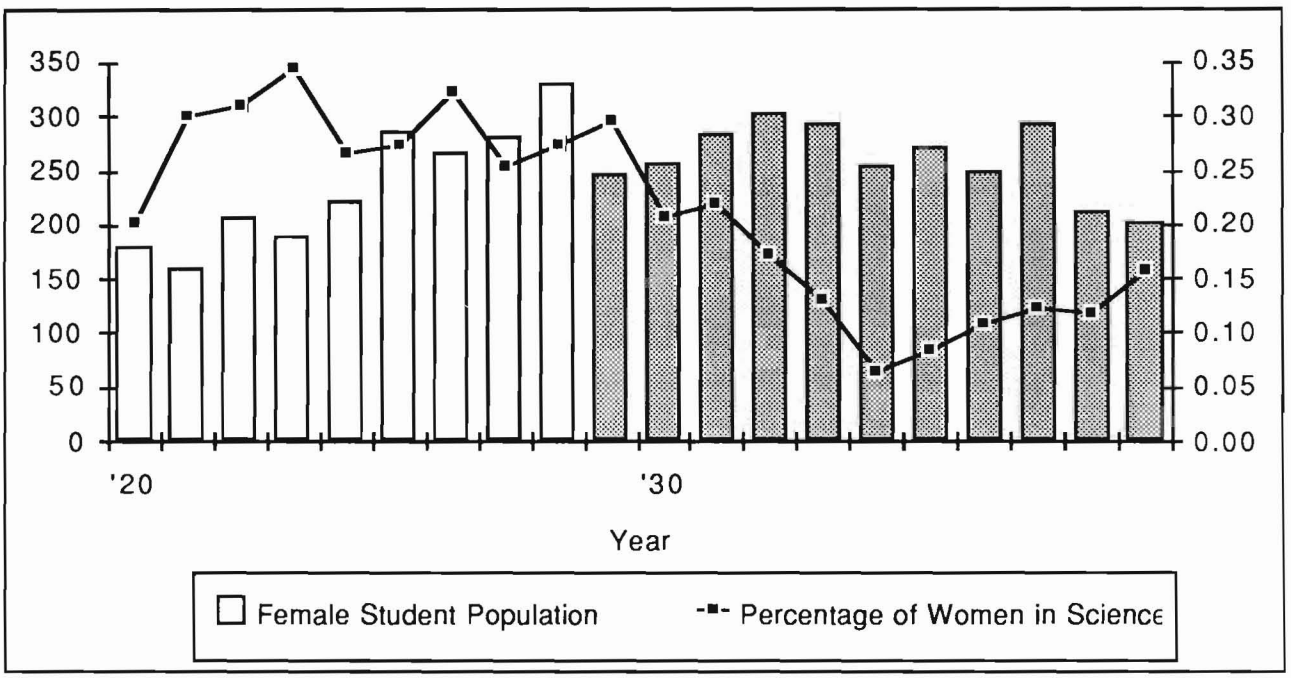

Figure 5
Shaded bars represent years of the Depression

During the 1920's there was an increased fascination with science, chemistry in particular. Collegiate as well as non-collegiate women were introduced to chemistry through its application to the home. Carroll Pursell in his study of science and industry reported that the general public's conception of science hinged on the tenet of "better things for better living through chemistry."[51] His claim is supported by the emergence of scientific discussions in the women's clubs. Women's clubs had existed since the nineteenth century, but they had previously focused, for the most part, on literature. Women in the clubs met regularly, and the meetings were more of a social event than inspired intellectual discourse. In the 1920's and 1930's women's clubs expanded their

[51]Pursell, "Science and Industry," 234.

subjects of interest to embrace science and sometimes received their direction of study from articles in scientific journals. An example is the "Women's Club Study Course in American Chemistry" which was published during 1930 in the Journal of Chemical Education. This particular course consisted of twelve assignments and was created by The Chemical Foundation through the use of scientific books for the general public rather than textbooks. The selection of books covered chemistry in most facets of American life: agriculture, industry, medicine, and the home. Chemistry's role in government, however, was lacking. The study course's stated goal was to be "non-technical, designed to give that newness of vision and awakening of interest which results from a knowledge of what this all-important science is doing and may do for us."[52] Its appeal was directed to women's supposed inclination for romance. One of the books for study was titled The Romance of Chemistry, and the study course contained such ludicrous statements as "no greater romance is to be found in the world of industry today than that of rubber."[53] The bulk of this study course for women, however, discussed chemistry's necessity for the successful management of a home.

Collegiate women were not flooding the science programs despite industry's urgent appeal for trained personnel. The modern warfare of the first world war coupled with the increasing role of science in industry led to strong recruitment of men into science. Margaret Rossiter in Women Scientists in America: Struggles and Strategies to 1940 reported that there was a plethora of "grandiose articles" urging men to further their knowledge of science. The theme of the enticements was the following:

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[52]Harrison Hale, "Women's Club Study Course in American Chemistry," Journal of Chemical Education, 7 (Jan.-June 1930), 325-6.

[53]Quote of J. A. Orb from Scientific American in Ibid., 334.

> . . . the talents of these men were [considered to be] so rare and precious that industry was justified in giving them every incentive and inducement to keep on with their research in an industrial setting--to hire them from the major universities, give them whatever staff and facilities they needed, and reward the successful ones with larger laboratories and staffs, more time for their beloved "pure" research, and permission to publish in professional journals. . . . [However,] even when the phrase "[white] male Christians only" was not printed in the advertisement, everyone knew that they were the only ones wanted. [insertion of "white" was hers][54]

While men in general had a much easier time entering industry than women, through analysis of Rossiter's findings the fact that the leading scientists of the 1920's and 1930's were not graduating from the smaller midwestern liberal arts colleges is discerned. Neither sex at the small, liberal arts colleges intended to become leaders of their fields of science. In general, goals of science students at the liberal arts colleges were different from those at the large universities, and this could explain why women at the midwestern, liberal arts colleges majored in science at a .443 ratio to men when they possessed little chance of finding employment in the field.

During this period guidance books for women's careers became popular. Because of the quantity of recent female college graduates had flooded the employment markets in public schools and libraries, young women located less traditional occupations through vocational guidance books. Catherine Filene's Careers for Women, according to Margaret Rossiter, was the most influential of these books during the 1920's.[55] Filene's publication was a compilation of articles written by female leaders in a wide variety of occupations, such as secretarial, religious, social, and scientific work. The occupations she listed for female scientists were: bacteriology, geology, medical research, paper chemistry, pharmacy, physics, plant pathology, and psychology. The authors

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[54]Rossiter, Women Scientists in America, 256.

[55]Ibid., 263.

were frank in their descriptions of both the advantages and drawbacks to each specific career. For example, Marion Slater Stone wrote of the bacteriologist that "one of the disadvantages of a hospital to a college graduate is its military system. The authorities have not quite been able to decide the social standing of a bacteriologist."[56] While admitting difficulties which would today be referred to as discrimination, these women scientists were optimistic that with luck and much pluck, a young woman could become a respected scientist in the field of her choice. A typical example is found in the article about medical research: "though it is, undoubtedly, more difficult for a woman than for a man of equal ability to attain a position of eminence in this field, if the character of her work is sufficiently distinguished practically no opportunity is closed to her."[57] A more revealing example is Margaret Maltby's description of the field of physics because it was, in fact, one in which women faced particularly severe discrimination:

> The opportunity for advancement in research depends entirely upon the character of the woman herself and her ability. There seems to be no prejudice against a woman, if she could do the work as well as or better than a man. It is difficult to be specific, for such opportunities have been open to women so few years and the cases are individual. A general notion has been prevalent that women have no interest or aptitude in fields requiring mechanical ability. But with the increasing use of automobiles and household mechanical or electrical devices women are acquiring familiarity with their construction and operation. Perhaps the conservative academic world is more imbued with the idea of women's limitations in this direction than industries, for it has been difficult for women to get full professorships in the department of physics.[58]

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[56]Marion Slater Stone, "The Bacteriologist," Careers for Women, ed. Catherine Filene (Boston, MA: Houghton Mifflin Company, 1924), 412.

[57]Katherine R. Drinker, "The Medical Research Worker," Careers for Women, ed. Catherine Filene (Boston: Houghton Mifflin Company, 1924), 422.

[58]Margaret E. Maltby, "The Physicist," Careers for Women, ed. Catherine Filene (Boston, MA: Houghton Mifflin Company, 1920), 432.

Such optimism is surprising coming from a woman who herself had difficulty being promoted at the women's college of Barnard.[59] In the six midwestern colleges of this study, not more than a handful of women majored in physics. Furthermore, only one woman faculty member held a post in physics, and she was only hired for one year. In a book similar to Filene's and published four years later, the field of science was treated in its entirety rather than by its specializations. Women were encouraged to enter science because "infinite patience or 'stick-to-it-ness' is conceded to be an innate possession of woman and the prime qualification that makes for her success in this field" especially since "many of the women in these branches [of science] are employed merely as technicians, doing most of the routine analyses, blood counts, urine analyses, preparation of histological sections, qualitative and quantitative analyses . . . ." That their optimism was not based on actual experiences was nowhere more blatant than in the claim that "from an obscure position in the laboratory, one may be called to a position of honour, the chair of bacteriology or chemistry at one of the large university or medical school." The author claimed, however, that "when competing with men for a position or promotion, especially in the industrial world, the preference will be given to men. In order to overcome the traditional prejudice or favouritism, for it does exist, the writer has always urged that women acquire a superior education and training, the latter being an entering wedge to the field where she can manifest her talent."[60] Women, in the 1920's were urged to use the prejudices against them as inspiration to achieve more degrees and awards to prove their worthiness.

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[59]Rossiter, Women Scientists in America, 264.

[60]Rosa E. Prigosen, "Science," An Outline of Careers for Women: A Practical Guide to Achievement, ed. Doris E. Fleischman (Garden City, NY: Doubleday, Doran and Company, Inc., 1928), 458-461.

By the late 1930's women had accepted sex-classified work within science rather than continuing their quest for equal career opportunities and recognition. Margaret Rossiter claimed that the shift from optimism to resignation occurred because instead of "being praised for their hard work and promoted for their persistence, women scientists in industry, like those elsewhere, found themselves blamed for their lack of initiative and forced to make their careers in low-level and low-paying jobs."[61] Symposiums and articles in journals from the late 1930's through the 1940's support Rossiter's supposition. The "Symposium on Training and Opportunities for Women in Chemistry," which was conducted by the Division of Chemical Education and printed in the Journal of Chemical Education in 1939, was a prime example of this attitude. Rather than encouraging self-discipline and uncompromising work, it was admitted that "there are recognizable ceilings of advancement for women [in industry]." Limitations were believed to exist because women supposedly lacked aggression, took things too personally in the work place, and were unfit for promotion until they were "well across the peak of the age-marriage rate curve."[62] In other words, women were not to be hired in prestigious positions in science because they were feminine and had babies. Collegiate women were instructed as to which fields of science were open to women. College chemistry majors were advised that "in terms of 'subjects' as offered in college or university, engineering is a better bet as a minor for the man chemist; and home economics is a better bet as a minor for a woman chemist," and that women should be taught that "the woman chemist's job may

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[61]Rossiter, Women Scientists in America, 265-66.

[62]W.S. Landis, "Women Chemists in Industry," Journal of Chemical Education, 16 (Dec. 1939), 577-579.

be entitled professor of home economics or expert in nutrition research."[63] Acceptable occupations for women in chemistry included: research bibliography since "temperamentally, women are well equipped to undertake such work and should be superior to men in carrying it out;"[64] control laboratory work because "her proverbial curiosity sustains her interest under conditions which spell boredom for most men;"[65] and merchandise control.[66] Writing about chemistry was promoted especially, for the most part, for women who enjoyed writing. Chemistry writing assistants could use their degree in science, it was suggested, to aid their understanding of the subject while applying their skills of stenography and typing; secretarial skills would increase their opportunities for employment. Women in the lower jobs in chemistry were to be pacified by the notion that they had ". . . just as much right to call themselves chemists as has the man standing behind a laboratory bench." Their ambitions were held in check by the admonition that "a woman is not apt to become the managing or directing editor because such a position requires a combination of business man, editor, and chemist . . . ." A woman was to be a ". . . meek and willing stenographer, one not only willing to work but willing to learn."[67] The feminine attribute of nonaggression, which was blamed for women's lack of promotion into the prestigious jobs in science, was hailed as desirable for women in the lower echelon careers. During the Depression women progressively allowed themselves to be confined within the "women's work" of

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[63]H. C. Sherman, "Training and Opportunities for Women in Chemistry," Journal of Chemical Education, 16 (Dec. 1939), 580.

64F. W. Adams, "Opportunities for Women as Research Bibliographers," Journal of Chemical Education, 16 (Dec. 1939), 581.

[65]Evelyn Hearsey, "The Woman Chemist in the Control Laboratory: Training and Qualifications," Journal of Chemical Education, 16 (Dec. 1939), 587.

[66]Elizabeth S. Weirick, "Experiences in the Field of Merchandise Control," Journal of Chemical Education, 16 (Dec. 1939), 585-587.

[67]Cornelia T. Snell, "Writing about Chemistry," Journal of Chemical Education, 16 (Dec. 1939), 588.

science because their feminine qualities had blocked their acceptance and advancement in the traditional fields of science.

While I was not able to research the occupations held by female science graduates at all six midwestern colleges of this study, certain tabular studies of Antioch College allow a glimpse at the possible data available for further study. Arthur E. Morgan, as president of the college, instituted a policy whereby students received practical experience in the vocations to which they aspired. Students held cooperative jobs which would allow them connection with the people of their chosen professions and finance, at least partially, their educations at Antioch.[68] Because of the emphasis on vocations, Antioch students would likely be more career oriented than those at other colleges. The report in 1932 showed, however, that 25 recent male graduates were actively pursuing science while no women were similarly employed. Even at a midwestern school which stressed vocational concerns, women graduates were not employed in science.

Women in academia did not have any warmer welcome than those in industry. Rossiter reported that between 1920 and 1940 women's faculty positions were limited to appointments in women's colleges or instructorships and jobs in home economics at coeducational institutions. In the midwestern schools of this study there were a few women who were hired in science, but their tenures were extremely short. A not too unusual description of a female science faculty member's qualification and length of tenure is the following from Antioch College:

Amy Louise Hunter
Position: Research associate from 1932-33

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[68]Algo D. Henderson and Dorothy Hall, Antioch College: Its Design for Liberal Education, (New York: Harper & Brothers Publishers, 1946), 1-8.

Degrees: B.A. Vassar College, 1921
M.S. Cornell University, 1922
M.D. Yale University School of Medicine, 1930
Previous experience:
Research assistant Cornell Univ., 192-23
Instructor in Physiology, Wellesley Co., 1923-24
Instructor in Physiology, Vassar Co., 1924-26
Interne, Babie's and Children's Hosp., Cleveland, OH, 1930-31
Resident Physician, Children's Community Center, New Haven, CT
Clinical Instructor in Pediatrics, Yale Univ. School of Medicine, 1931-32[69]

Even though she held her position for only one year, Hunter was more experienced than the more typical female science faculty member. A common description follows:

Mabel Lindsey:
Position: Professor of Chemistry and Physics, 1919-20
Degree: B.A., Ohio State University[70]

Among the six colleges of this study there was only one female faculty member in science who acquired notable tenure of office and advancement. Elizabeth E. Coyle graduated from Wooster College in 1926 with a bachelor of science and major in biology. The year of her graduation marked the retirement of their long-standing professor of biology, Dr. Horace Mateer. Coyle, recently elected into Phi Beta Kappa, was hired as a laboratory assistant and instructor at her alma mater. Coyle had intended to teach high school science to earn enough money to pursue a master's degree in botany and was honestly surprised by Wooster's offer. Her immediate reply to the proposal was, "Does that mean I'll get to sit in the choir loft with the faculty?" When the Depression's effects reached Wooster, after teaching for six years Coyle was dismissed from the

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[69]Rober Shaker, comp., "Directory of Antioch College: 1850-1933, 1933" Special collections, Antioch College Library, Antioch College, Yellow Springs, OH.
[70]Ibid.

department only days before the close of the spring term in 1932. At that time she, in her own words,

> wrote to a professor I knew at Ohio State and asked about going to graduate school there. I was admitted, and when I discovered it was too late to get a lab assistantship at Ohio State, I argued that the College should help me because they had let me go too late to find anything else. I was given $500, which was as much as I would have gotten as a lab assistant. And then they renewed it the second year, so Wooster actually financed my Ph. D. studies.[71]

She was rehired the following year and received her doctorate in 1935. She published twice, both times in the field of botany which was her specialization: "The algal food of Pimephales promelas (Fathead Minnow)," Ohio Journal of Science Vol. 30 (1930): 23-35; and "Algae of some Ohio soils," abstract of doctorate dissertation, The Ohio State University Vol. 17 (1935). When asked to list her research interests and to evaluate herself she responded:

> I must confess I am not an active research person; I have always been more interested in teaching. I did start marine algae research at Wood Hole in 1949 but did not continue it. It was in the field of taxonomy of the Genus Enteromorpha. . . . I have always felt my greatest contribution was in teaching! Endeavoring to make Wooster a good school, preserving the image so to speak.[72]

She was later promoted to chairperson of the biology department at Wooster. Her promotions and the fact that the school financed her graduate education were unique.

The conception of higher education's appropriate role in women's lives continued drifting away from the militant determination advocated decades previously by educators such as M. Carey Thomas. Women in higher education during the 1920's and 1930's did desire further development of their intellects

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[71]Elizabeth E. Coyle, "Does That Mean I'll Get to Sit in the Choir Loft?," Wooster Alumni Magazine, 102 (1988), 7-8.

[72]Elizabeth E. Coyle, "Faculty Information, 1967" Archival collections, College of Wooster Library, College of Wooster, Wooster, OH, 3-5.

and acquisition of vocational skills, but their sights were primarily focused on their future lives as housewives. In a guidance book for college freshwomen (she referred to them as girls) Kate W. Jameson perceived young women as passively expecting college to do things for them rather than actively achieving their rewards.[73] Students of Illinois Wesleyan University supported her supposition when broached by a college newspaper reporter with the question of why they had enrolled in college. A student avowed, "One reason I decided upon college was because all my friends were going and it seemed the popular thing to do. Then, too, I seemed to have a faint idea of the possibilities of development that college life offers to all." Another replied, "The catalogue said, 'a college course is a voyage in self-discovery.' I wanted to find out what I was good for."[74] Their conception of college stemmed from its social opportunities, and their anticipation of college life, rather than diligent study, molding them into complete persons. Gone were women driven to divulge the mysteries of science.

The fear that women did not enter college for intellectual pursuits was held by both university administrators and students. The Illinois Wesleyan University Student Council of 1924, noting a laxity of study compared to the enthusiasm for social occasions of the extra-curricular organizations, enacted a system which limited the hours students could engage in non-intellectual play. Every activity was designated a point value; the maximum number of points a student could accumulate during a single semester was limited to twenty-five. This regulatory measure was designed to aid students in balancing the number of extracurricular clubs with their hours of study. The administration of Illinois

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[73]Kate W. Jameson "Getting Adjusted to the Campus," in The Freshman Girl: A Guide to College Life (Boston.: D. C. Heath and Company, 1925), 8-10.

[74]n. a., "Why Go to College?" The Argus, 22 October 1925.

Wesleyan University supported this enactment and awarded medals to the "students showing the best improvement in scholarship and the best rounded life for that year. . . ."[75] Knox College experienced a similar proliferation of extra-curricular organizations and in the 1930's created means to curb their success at stealing students' attentions. Teachers at Knox became concerned with how the noncurricular activities interfered with the quality of students' scholarly pursuits. If a student became an editor or manager of a school publication, she would have to reduce her academic load unless she possessed an exceptional scholastic record. She was also limited to participation in only two major activities, such as athletics and the theater.[76] Students and administrators at both Wesleyan and Knox alike mourned the loss of the ideal student to the social excitement of extra-curricular activities, yet they encouraged lightheartedness through their adherence to the limitations of femininity for their female students.

In the same breath in which college educators and administrators sighed for the loss of a stimulating, intellectual campus, many continued to assert that a woman's education should reflect her prospective role as helpmate. Their arguments did not focus on the alleged weakness of women's minds and bodies, as had those from previous years. The recently increased emphasis on vocational education suggested that the curricula for the sexes should mirror the conception of gender differentiation. Women were absolutely not expected to entertain notions of invading the masculine fields of study. Virginia C. Gildersleeve's beliefs and actions reflected the conflicting notions. As Dean of Barnard College, she fervently believed that the quality of higher education was

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[75]n. a., Wesleyana: Seventy-fifth Anniversary Edition (Bloomington, IL: Illinois Wesleyan University, 1925), 88.

[76]Muelder, Missionaries and Muckrakers, 332-333.

threatened by the "feminized versions of the sciences and arts," such as domestic science, which would prepare women for their traditional sphere. Yet, in the same article she supported the limitation of women, and her belief was rooted in the same conceptions of gender as were the arguments for domestic science which she had previously condemned. Gildersleeve wrote that the "Broadening of the mind, widening of knowledge, development of the spirit through literature, philosophy, and religion--surely all these things are even more essential to a woman who is creating a home and developing the character and spirit of her children than to a man who is a banker, or a lawyer, or an architect, or a salesman."[77] Gildersleeve even "admitted that she hired men chiefly for the higher positions [at Barnard]--since the women would accept jobs at lower levels, to keep the sexes roughly balanced, she brought men in at the top."[78] Despite the controversies concerning the practicality of women's study of "masculine" subjects at Illinois Wesleyan University, the curriculum offered was identical for women as for men; the only discrepancies appeared in the physical education courses. Women were not instructed in competitive sports, but taught deportment and social flexibility. Men boxed, wrestled, swam, performed calisthenics, practiced track and field, and played basketball. While women, in a separate class, perfected postural exercises, swam, and danced. Women also received periodic lectures concerning health and hygiene throughout the year. When women were allowed to participate in sports, the goal was "to create a democratic spirit of friendship and cooperation among the girls." The extra-curricular activities were also open to both sexes except for

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[77]Virginia C. Gildersleeve, "Present Dangers in the Education of Women," Teacher's College Record 30 (Nov. 1928), 125.

[78]Rossiter, Women Scientists in America, 178.

marching band because it accompanied the athletic teams on away games.[79] This differentiation between physical education courses for the sexes was found throughout the colleges of this study and demonstrated the continuation of gender stereotypes on college campuses.

Even women who majored primarily in the fields of fine arts and the social sciences, saw reason for studying science. Women were encouraged to study science even if they had no intention to pursue a career in it. A female student at another small liberal arts college, Webster College in Webster Groves, Missouri, explained, "the training from biology . . . will have made of the mother, the teacher, the social worker, the friend, the wife only the more womanly woman.'"[80] While women were not encouraged to forge ahead into the male-dominated careers, college education was to provide them with the general culture and development to occupy their leisure hours wisely and to participate in intellectual conversations. These charms, it was supposed, would enable a woman to remain interesting to her husband whether or not she had a career.[81] An example is the following commentary given by a woman graduate of Antioch on her education :

> No one can enter into intelligent conversation these days without some sort of science background, which our required courses helped to provide. I'd be quite outside of my husband's avocational life--radio broadcasting--without the physics Antioch required me to study. (I never would have chosen it.) I'd understand even less than I do of world affairs without social science and the reading interest it started. . . . In short, I feel that the courses required at Antioch gave me background of general information which makes what I read and hear more understandable, and forms a basis for building up a more complete fund of knowledge.[82]

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[79]Illinois Wesleyan University, Illinois Wesleyan Bulletin: Annual Catalogue Vol. 23 (Bloomington, IL: Illinois Wesleyan University, 1924), 66-68.

[80]Harriet Averill, "The Woman and Biology," Lorretine 21 (Feb 1927), 94.

[81]Ibid., 93.

[82]Henderson, Antioch College, 253.

The emphasis on education solely for its uses in relation with others is most disconcerting when feminists asserted that women should be educated for the reason that "by the time [uneducated women] are forty or forty-five they are profoundly uninteresting to their husbands, their children, and themselves."[83] Women were also to achieve a college education to raise good citizens and to be capable of wisely employing their newly acquired right of suffrage.

The idea of college education as a means of developing women's minds, rather than acquiring vocational skills, was reflected in the emphasis on liberal arts. The Illinois Wesleyan University Bulletin explained that "a college course is a voyage in self-discovery. The aim of the modern liberal college is to develop a limited but definite interest in many great subjects and also to focus attention on one or two great fields where the students's chief interest lies."[84] This liberal education, however, was seen by a prominent educator as being "a static thing, as completely finished as a dress she might buy, or a car." She argued that the woman rarely used her knowledge of such subjects as philosophy and science once she entered the work world even though she might have excelled in them during college.[85] This might not have been peculiar to women, but the emphasis on women's education was clearly in preparation for a life of domesticity. The average women's opportunities for entering the job market in the 1920's, however, were only possible due to the lessoning of household chores because of domestic appliances and the decrease in the size of families. Unmarried women especially were little needed in the home, and they required both a target to direct their energies and

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[83]Dorothy Dunbar Bromley, "Feminist--New Style," Harper's Monthly Magazine 155 (June-Nov. 1927), 552.

[84]Illinois Wesleyan University, Illinois Wesleyan University Bulletin: Annual Catalogue Vol. 23 (Bloomington, IL: Illinois Wesleyan University, 1925), 23.

[85]Alice Beal Parsons, Women's Dilemma (New York: Thomas Y. Crowell Company, 1926; reprint, New York: Arno Press, 1974), 117.

a sense of financial independence.[86] During the 1920's and 1930's it was not romantic or novel to be a scholarly woman as it had been in the early years of coeducation, and women of the small, liberal arts colleges, in general, sought excitement from their college years rather than intellectual pursuits.

College education was also expected to provide preparation for women's future lives as wives and mothers. All sources from this period, even the most liberal, show that the conception of a woman's most proper role was as a wife and mother. For example, while encouraging equality of education Virginia Gildersleeve stressed that ". . .all women should look forward to marriage and children, to the creation of a home, and to the rearing of future citizens."[87] As the feminist dogma was revised after its prime goal of women's suffrage had been won, women were encouraged to marry. This new style of feminism "readily concedes that a husband and children are necessary to the average woman's fullest development. . . ."[88] The college education was expected to guide a woman in the social areas which would develop her wifely skills and expand her independence so that she could support herself financially until the right man came along. It was believed that women would work in their "careers" until they had married. Generally, if the couple was in dire need of money, the wife might work temporarily until the financial crisis was alleviated.[89] During the Depression women were less likely to be hired, especially those who were married.[90] The colleges' emphases on women's preparation for their roles as homemakers might have been a reaction to the dire prospects of women's

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[86]Gildersleeve, "Present Dangers," 122.
[87]Gildersleeve, "Present Dangers," 123.
[88]Bromley, "Feminist," 558
[89]Ibid., 123.
[90]William H. Chafe, The American Woman: Her Changing Social, Economic, and Political Role 1920-1970, (London: Oxford University Press, 1972), 91-100.

occupational employment. That much concern in the colleges was placed on women's marriage status is shown in tabulations conducted by the colleges. At Antioch College, in particular, a study was conducted which was devoted entirely to the marriage status of women graduates between 1922 and 1932. While women's occupations were never studied at this time apart from men's, the marriage status of women was noted whenever it was known although men's were not.

Women scientists were not encouraged in small, midwestern colleges between 1920 and 1940 for several reasons. One was that industry and academia were discriminatory against women, so their employment prospects were scarce. Guidance books, while in the early years of this period were optimistic, eventually accepted specific, less prestigious jobs in science as women's work. The feminist stance during this period began its hibernation, and the emphasis for women was placed on serving in their proper role as wife and mother. Under these pressures, although women students between the world wars were greater in number, they were less scholarly and ambitious than their predecessors.

Conclusion

While women flocked to colleges once coeducation was no longer controversial, they chose science as their major field of study with a drastically lessoned frequency, only to enter it once again once the science of domesticity had become included in the field.

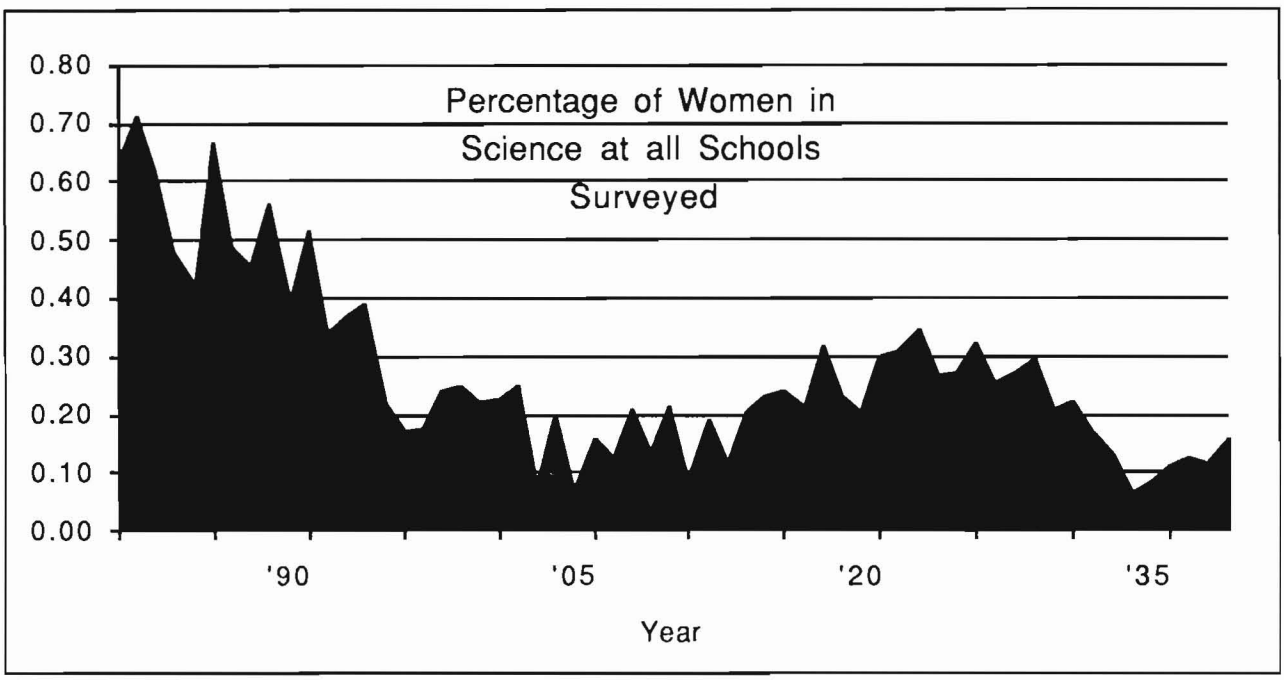

Figure 6

Before the turn of the century the percentage of women majoring in science was quite high. The bachelor of science, however, at this time was considered the easy way through college because it did not require the study of Latin and Greek. At this time, the classical course of study which led to the bachelor of arts degree still carried the prestige associated with the wealthy men of previous years who were trained in the classics as a demonstration of the gentleman status. During the years of high percentages of women in science, the courses were not as rigorous as they were in the years when fewer women studied the field.

During the early part of the twentieth century the percentage of women in science plummeted despite a continued increase in the female population on the campuses.

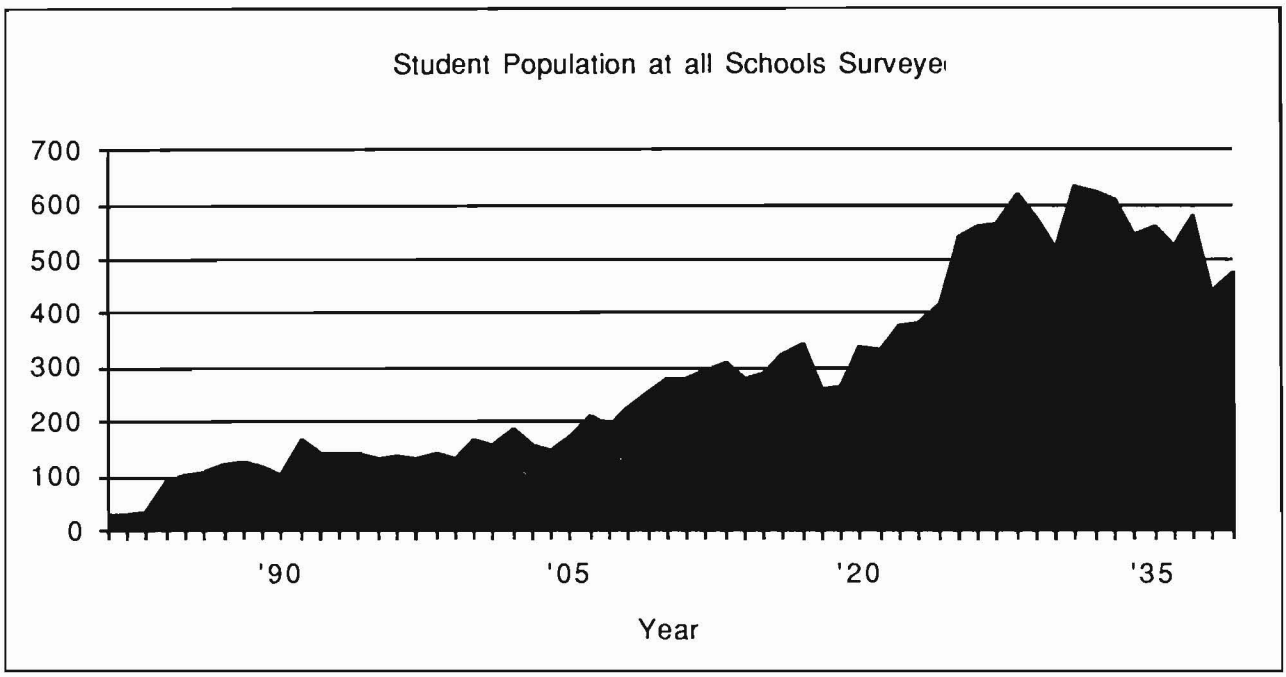

Figure 7

Science at this time was developing its method of testing hypotheses through carefully constructed experiments. It was therefore necessary that experimentation was included in college scientific courses. At the same time, it was taught through Charles Darwin's theory of evolution that the sexes were not only biologically different but possessed distinct sexual temperaments--males being aggressive and creative and females being passive and nurturing. Women were, therefore, restrained from entering the fields which required greater creativity and experimentation and were ushered into the newly created branch of science--home economics. The importance of domestic science was elevated to such a level that it was beginning to be believed that only a housewife with scientific expertise could efficiently manage a home. During the last decades of this study, women merely went through the motions of achieving a college education. They did not have to prove women's abilities to withstand

the rigors of higher education, nor were they bent on becoming professional intellectuals. The knowledge they acquired at college was directed at attracting and keeping their husbands.

There were rare individual women who sought a true education in science which would then be used in their careers. World War I glorified science, and also at the same time, industry become reliant on continued progress in science. This caused the leaders of industry to call for increased numbers of college graduates to become employees. Some women did enter industry, yet they increasingly found that they were only welcome in subservient positions and jobs. With such job prospects it was no wonder that women did not enter science with any greater frequency or take their education more seriously. As the job hierarchy which placed women in low level jobs became solidified, the female to male ratio of science majors in college steadily declined.

Just because women were allowed to study the masculine field of science, it did not alter women's opinion of their sex as a whole. The belief in a gender differentiation which classified women as passive and uncreative limited their effectiveness in the field of science. They were introduced to science during the latter part of the nineteenth century when it was considered a short-cut through college, but instead of persevering in it when the requirements became more rigorous because of the rapid progression of science and its role in industry in the twentieth century, they abandoned "hard science" for its feminine offspring--domestic science. Instead of forging ahead into masculine fields of science, they remained in their safe, domestic sphere and declared that instead of an art, the management of a home was a science. Despite coeducation's acceptance and the growing number of women students in the colleges, women never denied the existence of a distinctly feminine sphere.

Instead of demanding their place in professorships and research chairs, they accepted lower positions in academia and created women's work in industry. In these careers such as the chemistry bibliographer, women served their superiors as had the traditional, subservient wives their husbands. Women's search for acceptable jobs in science limited their awareness of their own creativity and abilities. With few exceptions, women were never fully accepted in the masculine fields of science, because they could not stop clinging to the safety of their feminine sphere.

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