

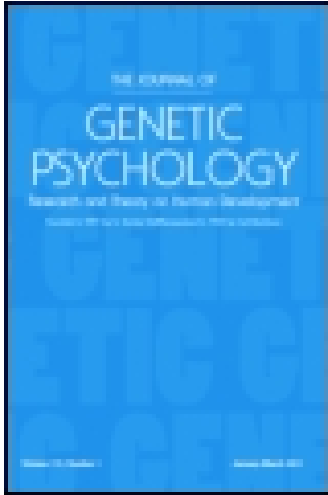
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## SEX SELECTION OF MAJOR SUBJECTS UNDER THE ELECTIVE SYSTEM OF LELAND STANFORD, JR. UNIVERSITY.

By E. I. MILLER, State Normal School, Chico, California.

With the commencement of May, 1901, the tenth yearly session of Leland Stanford, Jr. University came to an end. This ten-year period is long enough to show some of the tendencies of the experiment of free election of studies now being tried at that institution. With the desire to see what tendencies were manifesting themselves this statistical study was begun some years since and is now completed for the decennial period 1891 to 1901.

At Leland Stanford, Jr. University the student has great freedom to choose all his subjects of study; but he is particularly free to choose his major subject or department. Perhaps there are few other universities in America where so much freedom is allowed, and there are no others, certainly, where fewer restrictions in this matter exist. The student just entering the university may say he wishes to make this, that, or the other subject his major work and it is so recorded. If later the student wishes to change his major subject, that is, change from one department to another as from physiology to zoölogy or the reverse, or from history to any language or to any science or the reverse, or in fact to make any change, he may do so subject to the regulations as to quantity and kind of work required for graduation by the department newly chosen. Commonly such change may be made without any loss of time or credits save where the change is made late in the student's course and to a department widely differing in requirement from that in which the student previously worked. The major subject having been chosen the department exercises a certain control over the courses to be taken in that department and in the allied subjects or minors; but this control is frequently only nominal, the student being allowed to suit his own wishes.

So great freedom of choice being possible it is clear that exceptional facilities are afforded at this university for examination of sex selection of studies. What is it that determines the individual student in choosing a major subject? Doubtless there are many things that help decide this matter; among which are previous preparation, influence of friends, reputation

of certain departments, anticipated use for the work after completion of the university career, force of precedents, natural likes and dislikes and so forth; but with the freedom of choice at entrance to the university and the facilities for changing from one department to another it is evident that at the time of graduation students are taking degrees from departments of which they have made selection, and that they have made this selection under influences as little artificial as possible with the existing status of sex relations—entirely inartificial as far as the environment of the university goes. This paper records the results of sex selections as observed at graduation. Such conclusions as may be reached cannot be absolutely, but only approximately, true; but they certainly show tendencies; and it is believed these tendencies suggest educational problems which are worthy of the most careful consideration.

It is the purpose of this paper to show how the graduates of the university are classified as to sex among the different departments, and, if possible, from such data, to suggest some inferences as to sex intellectual preferences and the possible power of such preferences to influence the course of education.

It is believed by many that the intellectual likes and dislikes of men and women are different. Some believe this is due to inherent sex qualities; others attribute it to environment and education. Although the figures accompanying this paper may give some data suitable to an examination of these beliefs it is *not* the purpose of this study to account for such difference if such difference exists, nor to make any comparison as to intellectual superiority. The terms intellectual likes and dislikes and intellectual preferences are used here with no intention of adopting either of the above views, but simply as convenient terms for use.

In pursuing the purpose above indicated over the period stated at the beginning of this paper, it was found desirable to exclude the classes of 1892 and 1893. The reasons for this are first, because these classes were very small; second, as the university did not open until the fall of 1891 the members of these classes entered with advanced standing, on work done in other institutions, many of which did not permit the elective system; therefore those students were not so free to select their major subjects as if they had been at Stanford during the entire course, because the work already accomplished would not prepare them equally well for all departments at Stanford; in order to make the most of the work already done they must take the major best suited to their preparation; third, because as women are less roving than men, there were few women in these classes. For these reasons, then, the first two classes are

excluded from this study. To a certain degree these objections apply to the class of 1894, but because a large majority of the members had three years' work at Stanford this class is not excluded.

Even should their tastes tend toward law, geology, and engineering, few women are likely to enter those departments. The occupations to which those lead after leaving the university are at present such as to make them undesirable, if not impossible, fields of work for most women. And since the subjects are technical and prepare for particular fields only, this would tend to keep women from selecting them as major subjects. Therefore it seems fair to omit these departments from the study.

The following summaries show by departments and by graduating classes, first, the total number taking the Bachelor of Arts degree,<sup>1</sup> second, the per cent. of men and the per cent. of women taking the degree in each department. To illustrate, the class of 1896 has twenty-four graduates in the English department; of these, eight, or  $33\frac{1}{3}\%$ , are men, and sixteen, or  $66\frac{2}{3}\%$  are women. Again, the class of 1901 has six graduates from the department of Sociology and Economics; of these, all, or 100% are men, and no women. At the beginning of each summary is given the whole number in all departments, for that year, also the number and per cent. both men and women, taken separately, bear to the entire class. This is called the class percentage and is to be compared with the percentage in each department.

#### SUMMARIES OF SEPARATE CLASSES.

*Class of '94.*<sup>2</sup> The women constitute 29.26% of the class, the men 70.74%, the numbers being 12 and 29 respectively.

The women are above their class percentage in Latin  $66\frac{2}{3}\%$ , Romance Languages 100%, English  $33\frac{1}{3}\%$ , Education  $33\frac{1}{3}\%$ , History  $33\frac{1}{3}\%$ , Astronomy 100%, Chemistry 50%, and Physiology  $33\frac{1}{3}\%$ .

The women are below their class in Greek 0%, German 0%, Ethics 0%, Economics 0%, Botany 0%, and Zoölogy 0%. To illustrate, the women constitute 29.26% of the whole class, but in Latin they are  $66\frac{2}{3}\%$  of the graduates, and in Greek they are 0%; that is they are above their class percentage in Latin and below in Greek.

The men are above their class percentage in Greek 100%,

<sup>1</sup>The B. A. degree is the only one granted from any department for the first degree. Other higher degrees are granted only on more advanced work.

<sup>2</sup>Little or no stress is put upon the results for this year because of the small size and scattered condition of the class.

German 100%, Ethics, Economics 100%, Botany 100% and Zoölogy 100%.

The men are below their class percentage in Latin  $33\frac{1}{3}\%$ , Romance Languages 0%, English  $66\frac{2}{3}\%$ , Education  $66\frac{2}{3}\%$ , History  $66\frac{2}{3}\%$ , Astronomy 0%, Chemistry 50%, and Physiology  $66\frac{2}{3}\%$ .

In other words the men are above their class percentage of the class in those subjects in which the women are below, and below in those subjects in which the women are above. This last statement is true for all the succeeding classes.

*Class of '95.*<sup>1</sup> The women constituted 36.13% of the class and the men 63.86%, the numbers being 43 and 76 respectively.

The women are above their class percentage in Latin 45.46%, German 37.5%, English 69.23%, Education 50%, Botany 75%, and Drawing and Painting 100%.

The women are below their class percentage in Greek 0%, History 5%, Economics  $16\frac{2}{3}\%$ , Mathematics 28.58%, Chemistry 10%, Physiology  $33\frac{1}{3}\%$ , Zoölogy 20%, and Physics 0%.

The men are above their class percentage in Greek 100%, History 95%, Economics  $83\frac{1}{3}\%$ , Mathematics 71.42%, Chemistry 90%, Physiology  $66\frac{2}{3}\%$ , Zoölogy 80%, and Physics 100%.

The men are below their class percentage in Latin 54.54%, German 62.5%, English 30.77%, Education 50%, Botany 25%, and Drawing and Painting 0%.

*Class of '96.*<sup>2</sup> The women constitute 36% of the class, and the men 64%, the numbers being 45 and 80 respectively.

The women are above their class percentage in Latin 75%, German 50%, Romance Languages  $66\frac{2}{3}\%$ , English  $66\frac{2}{3}\%$ , Ethics 100%, Education  $66\frac{2}{3}\%$ , Mathematics 60%, and Botany 60%.

The women are below their class percentage in Greek  $33\frac{1}{3}\%$ , Psychology 0%, History 14.29%, Economics 12.5%, Astronomy 0%, Physics 0%, Chemistry 22.23%, Entomology 0%, Physiology 15.78%, and Zoölogy 0%.

The men are above their class percentage in Greek  $66\frac{2}{3}\%$ , Psychology 100%, History 85.71%, Economics 87.5%, Astronomy 100%, Physics 100%, Chemistry 77.77%, Entomology 100%, Physiology 84.22%, Zoölogy 100%.

The men are below their class percentage in Latin 25%, German 50%, Romance Languages  $33\frac{1}{3}\%$ , English  $33\frac{1}{3}\%$ , Ethics 0%, Education  $33\frac{1}{3}\%$ , Mathematics 40%, and Botany 40%.

<sup>1</sup> The class of '95 has represented in it the additional departments, Mathematics, Physics, and Drawing and Painting; but it has no graduates in Romance Languages, Ethics, and Astronomy.

<sup>2</sup> Drawing and Painting not represented. Psychology and Entomology are added.

*Class of '97.*<sup>1</sup> The women constitute 45.37% of the class, the men 54.65%, the numbers being 49 and 59 respectively.

The women are above their class percentage in Latin 63.64%, German 83⅓%, Romance Languages 100%, English 77.77%, and Drawing and Painting 100%.

The women are below their class percentage in Greek 0%, Education 37.5%, History 40%, Economics 7.69%, Mathematics 33⅓%, Physics 25%, Chemistry 0%, Entomology 0%, Physiology 28.57%, Zoölogy 0%, and Hygiene and Organic Training 0%.

The men are above their class percentage in Greek 100%, Education 62.5%, History 60%, Economics 92.31%, Mathematics 66⅔%, Physics 75%, Chemistry 100%, Entomology 100%, Physiology 71.43%, Zoölogy 100%, and Hygiene and Organic Training 100%.

The men are below their class percentage in Latin 36.36%, German 16⅔%, Romance Languages 0%, English 22.23%, and Drawing and Painting 0%.

*Class of '98.*<sup>2</sup> The women constitute 52.59%, and the men 47.41% of class, the numbers being 61 and 51 respectively.

The women are above their class percentage in Latin 90%, German 80%, Romance Languages 80%, English 76.19%, Botany 100%, and Entomology 100%.

The women are below their class percentage in Greek 20%, Education 50%, History 35.71%, Economics 0%, Mathematics 33⅓%, Physics 0%, Chemistry 25%, Physiology 41.67%, Zoölogy 50%, and Bionomics 33⅓%.

The men are above their class percentage in Greek 80%, Education 50%, History 64.29%, Economics 100%, Mathematics 66⅔%, Physics 100%, Chemistry 75%, Physiology 58.33%, Zoölogy 50%, and Bionomics 66⅔%.

The men are below their class percentage in Latin 10%, German 20%, Romance Languages 20%, English 23.81%, Botany 0%, Entomology 0%.

*Class of '99.*<sup>3</sup> The women constitute 47.59%, and the men 52.41% of the class, the numbers being 57 and 62 respectively.

The women are above their class percentage in Greek<sup>4</sup> 100%, Latin 75%, German 77.78%, Romance Languages 100%, Eng-

<sup>1</sup>The Astronomy department is discontinued. Psychology, Ethics, and Botany are not represented. Hygiene and Organic Training is added.

<sup>2</sup>Psychology, Ethics, Drawing and Painting, and Hygiene and Organic Training are not represented. Bionomics is added.

<sup>3</sup>Drawing and Painting, and Hygiene, and Organic Training are not represented. Classical Philology is added.

<sup>4</sup>Only one graduate and that a woman. Classical Philology having been added took men from Greek and thus changed sex predominance.

lish 73.92%, Psychology 100%, Education 50%, Mathematics 50%, Physics 50%, and Entomology 50%.

The women are below their class percentage in Classical Philology 0%, Ethics 0%, History 38.88%, Economics 0%, Chemistry 0%, Botany 28.57%, Physiology 46.67%, Zoölogy 0%, and Bionomics 0%.

The men are above their class percentage in Classical Philology 100%, Ethics 100%, History 61.12%, Economics 100%, Chemistry 100%, Botany 71.43%, Physiology 53.33%, Zoölogy 100%, and Bionomics 100%.

The men are below their class percentage in Greek 0%, Latin 25%, German 22.22%, Romance Languages 0%, English 26.08%, Psychology 0%, Education 50%, Mathematics 50%, Physics 50%, and Entomology 50%.

*Class of '00.*<sup>1</sup> The women constitute 46.09% and the men 53.91% of the class, the numbers being 53 and 62 respectively.

The women are above their class percentage in German 81.82%, Romance Languages 100%, English 75%, Education 60%, History 50%, Botany 66⅔%, and Hygiene and Organic Training 100%.

The women are below their class percentage in Greek 0%, Latin 42.86%, Classical Philology 0%, Economics 11.76%, Mathematics 33⅓%, Physics 0%, Chemistry 0%, Physiology 28.57%, and Zoölogy 40%.

The men are above their class percentage in Greek 100%, Latin 57.14%, Classical Philology 100%, Economics 88.24%, Mathematics 66⅔%, Physics 100%, Chemistry 100%, Physiology 71.43%, Zoölogy 60%.

The men are below their class percentage in German 18.18%, Romance Languages 0%, English 25%, Education 40%, History 50%, Botany 33⅓%, and Hygiene and Organic Training 0%.

*Class of '01.*<sup>2</sup> The women constitute 63.58%, and the men 36.42% of the class, the numbers being 96 and 55 respectively.

The women are above their class percentage in Latin

<sup>1</sup> Psychology, Drawing and Painting are not represented. Ethics from this time on is merged with Philosophy. Entomology and Bionomics are both merged into Zoölogy. Hereafter they will not be carried separately, but in conjunction with the departments in which they are now classified. If they had been so classified throughout the study no important change in results would have occurred save that in the years 1898 and 1899 the women would have lost Entomology in which they were above their class percentage, and the men would have lost Bionomics in which they were above their class percentage; by adding these two departments to Zoölogy, the percentage in Zoölogy would be unchanged in '98 and the men largely predominant still in '99.

<sup>2</sup> Greek, Psychology, Drawing and Painting, and Hygiene and Organic Training are not represented.



88.66 $\frac{2}{3}$ %, German 100%, Romance Languages 100%, English 76.47%, History 68.75% and Botany 100%.

The women are below their class percentage in Classical Philology 50%, Education 50%, Economics and Sociology 0%, Mathematics 50%, Physics 0%, Chemistry 14.29%, Physiology 33 $\frac{1}{3}$ % and Zoölogy 25%.

The men are above their class percentage in Classical Philology 50%, Education 50%, Economics and Sociology 100%, Mathematics 50%, Physics 100%, Chemistry 85.71%, Physiology 66 $\frac{2}{3}$ %, Zoölogy 75%.

The men are below their class percentage in Latin 13.33 $\frac{1}{3}$ %, German 0%, Romance Languages 0%, English 23.53%, History 31.25%, and Botany 0%.

*Totals for the Eight Years.* The whole number of graduates in the departments mentioned was 894. Of these 416 or 46.53% were women, and 478 or 53.47% were men.

By reference to the accompanying table it will be seen that the women are above their percentage of the total number of

	Totals for '94, '95, '96, '97.					Totals for whole period.				
	Total.	Men.	Per cent.	Women.	Per cent.	Total.	Men.	Per cent.	Women.	Per cent.
Greek,	9	8	88.88	1	11.12	16	13	81.25	3	18.75
Latin,	32	13	40.62	19	59.38	72	22	30.55	50	69.45
Classical Philology,*						9	6	66 $\frac{2}{3}$	3	33 $\frac{1}{3}$
German,	19	9	47.36	11	52.64	60	15	25	45	75
Romance Language,	5	1	20	4	80	22	2	9.09	20	90.91
English,	80	24	30	56	70	178	48	26.97	130	73.03
Psychology,	2	2	100	—	—	3	2	66 $\frac{2}{3}$	1	33 $\frac{1}{3}$
Ethics and Philos.,	3	2	66 $\frac{2}{3}$	1	33 $\frac{1}{3}$	4	3	75	1	25
Education,	23	12	52.17	11	47.83	52	26	50	26	50
History,	66	54	81.81	12	18.19	148	93	62.84	55	37.16
Economics & Sociol.,	35	32	91.42	3	8.58	74	69	93.24	5	6.76
Mathematics,	15	9	60	6	40	35	21	60	14	40
Astronomy,*	2	1	50	1	50	2	1	50	1	50
Physics,	6	5	83 $\frac{1}{3}$	1	16 $\frac{2}{3}$	11	9	81.82	2	18.18
Chemistry.	26	22	84.61	4	15.39	57	50	87.72	7	12.28
Botany,	10	4	40	6	60	22	10	45.45	12	54.55
Entomology,*	2	2	100	—	—	6	3	50	3	50
Zoölogy,	11	10	90.90	1	9.10	[24	19	79.17	5	20.83] <sup>1</sup>
Bionomics,*						[35	26	74.29	9	25.71] <sup>2</sup>
Physiology,						5	4	80	1	20
Hygiene and Organic	44	33	75	11	25	90	61	67.78	29	32.22
Training,	1	1	100	—	—	2	1	50	1	50
Drawing & Painting,	2	—	—	2	100	2	—	—	2	100
Totals,	393	244	62.08	149	37.92	894	478	53.47	416	46.53

\*Temporary Departments.

<sup>1</sup> Zoölogy alone. <sup>2</sup> Zoölogy with Entomology and Bionomics.

graduates in Latin, German, Romance Languages, English, Education, Astronomy,<sup>1</sup> Botany, Entomology,<sup>2</sup> Drawing and Painting,<sup>3</sup> and Hygiene and Organic Training.<sup>4</sup>

That the women are below their percentage of the total number of graduates in Greek, Classical Philology, Psychology,<sup>5</sup> Ethics and Philosophy,<sup>6</sup> History, Economics and Sociology, Mathematics, Physics, Chemistry, Physiology and Histology, and Zoölogy (either including or excluding Entomology and Bionomics).

The men are above their percentage of the total number of graduates in Greek, Classical Philology, Psychology, Ethics and Philosophy, History, Economics and Sociology, Mathematics,<sup>7</sup> Physics, Chemistry, Physiology and Histology, and Zoölogy.

That the men are below their percentage of the total number of graduates in Latin, German, Romance Languages, English, Education, Astronomy, Botany, Entomology, Drawing and Painting, and Hygiene and Organic Training.

It will be seen that the women are not only above their percentage of the total number of graduates in all the language studies save Greek and Classical Philology, but they constitute from 69.45% to 90.91% of all the graduates of those departments. In Botany, and Drawing and Painting they have 56.55% and 100% respectively; in Education just 50%; in no other subject does the percentage of women nearly reach 50%.

It will also be seen that, whether taken by separate years, by four-year periods, or for the whole time in the total results, the women tend to choose the language studies (except Greek and Classical Philology), Education, Drawing and Painting, and Botany. Men tend to choose Greek, Classical Philology, Philosophy, History, Economics, Mathematics, and the physical and biological sciences (except Botany).<sup>8</sup>

It will be remembered that one of the purposes of this study

<sup>1</sup> There have been but two graduates, one man, one woman.

<sup>2</sup> There have been but six graduates, three men, three women.

<sup>3</sup> There have been but two graduates, both women.

<sup>4</sup> There have been but two graduates, one man, one woman.

<sup>5</sup> There have been but three graduates, two men, one woman.

<sup>6</sup> There have been but four graduates, three men, one woman.

<sup>7</sup> The percentage in mathematics is undoubtedly affected by the fact that many men students who do a great deal of work in mathematics have their majors in the engineering courses and hence mathematics is not credited with the men who really belong to it. History is similarly affected by majors in the law department.

<sup>8</sup> It might be added that a similar study for the four years from 1901 to 1905 showed little important change save that the women have gained in per cent. in Greek, History, Mathematics, and Physiology and Histology, and lost in Education. They even have a majority in some years in all these subjects and during all years since 1901 in History.

was to see if this experiment in electives gave any data regarding the belief that men and women under existing conditions of society have different intellectual preferences where allowed freedom of choice. It is claimed that this study not only furnishes such data, but that it shows in a pronounced manner the direction of these tendencies.

Another purpose of the study was to see what problems in practical education might be suggested when these results were applied to existing educational conditions. If the intellectual preferences of men and women are different will not those preferences be expressed, intentionally or unintentionally, in courses of study made or enforced by either sex alone? As the educational system now stands the sexes are not equally distributed numerically in the various branches of school work, and have not equal opportunity to influence the course of study. At present the great mass of teachers in the elementary schools are women, in the universities and higher schools they are chiefly men, while in the secondary schools there is greater equality in number though the women are still largely in the majority. In city schools men teachers are usually few in number as compared to women teachers, even principalships and superintendencies, formerly almost always filled by men, are now frequently held by women. This is what some call 'femaleization of the schools.' It is certainly true that the lower schools, which are those most vitally touching the great mass of the people, are chiefly under the influence of women; the higher schools chiefly under the influence of men.

These facts, in connection with the results of the above study, suggest several important questions which this paper will raise, but will not attempt to answer.

*First*, if women are to have complete domination over the public schools will the course of study in those schools come to be more and more in harmony with their intellectual likings and tendencies?

*Second*, if the first question is answered in the affirmative will the course of study come to be more suited to girls, and provide less amply for the peculiar and distinctive characteristics of boys?

*Third*, may such lack of proper provision for the boys account in part for the fact that boys tend to drop out of school at an earlier age than girls, and, if so, will it tend to increase under present tendencies?

*Fourth*, is the ideal educational environment, that which brings the child under the influence of men and women about equally, thus balancing the peculiar tendencies of the sexes?

*Fifth*, since many of the colleges and universities make Latin a prerequisite to entrance to all their important courses, and

hence in order that their graduates may enter the college or university the high schools must make Latin an important part of their course of study, and since we have seen at Stanford Latin is pre-eminently a woman's study, does this in part account for the excess of girls in the high schools?

*Sixth*, a study of the figures given above for Stanford University will show the women to have been but 29.26% of the class of '94 and with slight variations to have increased from year to year, until in 1901 the women had 63.58% of the class (though the per cent. dropped nearly 10 points in '02), though the average for the eight years is but 46.53%; the women students of the University of California have increased in like proportion to those at Stanford University. Since the high schools are the principal preparatory schools for the universities are the present conditions of sex of teachers and character of course of study in part responsible for the very great increase in the number of women students at the universities?

As was said above, no attempt is here made to solve the questions asked, but it is believed that the paper furnishes some material for a discussion, and if it does furnish that material it will have fulfilled its purpose.