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PROFESSORS' SALARIES[1]

ARE EQUITABLE SALARIES PAID TO PROFESSORS?

By Dr. WILLIAM A. NOYES

PROFESSOR OF CHEMISTRY, UNIVERSITY OF ILLINOIS

THE professors in our colleges and universities are not receiving their fair share of the returns coming to others from the rapidly increasing prosperity of the country. No one will claim that professors were overpaid in 1900. In order that they may retain their economic status in comparison with other men and women their salaries must be increased in the same proportion as the income of the average citizen. Salaries have fallen far below this equitable level.

The volume of "Statistical Abstracts" of the United States published by the government in 1928 gives the following numbers in millions of dollars for the values of farm products, mineral products and the values added to raw materials by manufacture in the years 1900 and 1925:

	1900 Millions of Dollars	1925 Millions of Dollars
Farm products	3,549	13,034
Mineral products	1,110	5,678
Manufacture	5,123	26,778
	9,782	45,490

To avoid an unfair use of the statistics for farm products, it should be stated that the farm population remained stationary during this period, while the total population increased 50 per cent., or from 77.1 millions to 115.4 millions.

[1] A symposium on the salary question arranged by the Committee of One Hundred on Scientific Research, American Association for the Advancement of Science, Shrine Lounge, Des Moines, Iowa, December 31, 1929.

Dividing the values of the products by the population, we have a per capita production of $128 in 1900 and of $394 in 1925. We may put this concretely by saying that where an individual received for his labor and capital, on the average, $100 in 1900, he received, on the average, $300 in 1925.

This gives, however, a very exaggerated idea of the increase in our powers of production. The average of the index numbers for wholesale prices for the years 1898–1902 was 77.7. The similar average for 1923–27 was 152. In other words, a gold dollar was worth just about one half as much in purchasing power in 1925 as it was worth in 1900. Making allowance for this change in the value of the dollar, the increase in the real value of our production was about 50 per cent. instead of 200 per cent.

Salaries and wages are paid, however, in the depreciated money indicated by the index numbers, and it would seem to be a fair conclusion that, if professors in our colleges and universities are to maintain the same economic status relative to other classes of citizens which they held in 1900, their salaries must be increased threefold. A professor of a given rank who received a salary of $2,000 in 1900 should have received $6,000 in 1925. There are doubtless some factors which make this conclusion not wholly accurate, but we may take it as approximately true until some one is able to furnish a statistical analysis which will prove its fallacy.

To determine how closely this equitable basis for salaries has been approached, the presidents of nine universities were asked to furnish a statement of the average salaries paid to executive officers who do no teaching and to professors, associate professors and assistant professors, in 1900 and in 1925. The presidents of Yale, Harvard, Ohio State, Michigan, Illinois, Wisconsin and California furnished the data requested. The other two universities were unable to do this. I wish here to express my appreciation of the courtesy shown in furnishing this information. The averages are given in the table.

AVERAGE SALARIES

	1900	1925	Increases
Executives	$3,115	$6,904	122 per cent.
Professors	2,791	5,318	87 per cent.
Assoc. professors	1,956	3,895	99 per cent.
Asst. professors	1,605	3,004	87 per cent.

MAXIMUM AND MINIMUM AVERAGE SALARIES AND INCREASES

	Max. 1900	Min. 1900	Max. 1925	Min. 1925	Per cent. increase Max.	Min.
Executives	$5,598	$2,050	$8,470	$5,562	208	0
Professors	4,002	1,958	7,008	4,550	161	44
Assoc. prof.	3,950	1,350	5,077	3,665	130	28
Asst. prof.	2,351	1,412	4,000	2,642	199	44

An examination of these statistics makes it clear that the economic position of professors in these universities is not so good in relation to other members of the community as it was in 1900. While the income of citizens, in gold dollars, has increased, on the average, about 200 per cent., that of these professors has increased less than 100 per cent. When we take account of the index numbers, the value of the salaries paid in 1925 was somewhat less than the value of the salaries paid to men of the same rank in 1900.

A report by Dr. W. Hardin Hughes, director of administrative research for the city schools of Pasadena, California, was published in August, 1929. It gives a very careful and exhaustive analysis of salaries paid in the city schools of Pasadena in 1928 in comparison with those paid to wage-earners in other callings. Dr. Hughes reports that in comparison with 1914, taking account of the index numbers, "the average income of all persons gainfully occupied in the United States in 1928 had actually gained 57 per cent. in purchasing power." This is in surprisingly close agreement with the conclusion reached above. It makes it quite clear that it is not fair to professors that their salaries should be increased merely in proportion to the change in the purchasing value of their salaries. The salaries should be increased in proportion to the increased income of the average citizen.

A concrete illustration will help us to see this. Since 1900 a very large proportion of the people of the United States have found it possible to own or use automobiles. This is one direction in which the 57 per cent. increase in the income of the average citizen is being used. We realize what an immense addition to the convenience and richness of our lives this has made. Is it not right that professors should be able to take advantage of these changes, as well as other citizens?

Men and women who take the degree of Ph.D. in chemistry go partly into industrial positions and partly into academic work. A comparison of the salaries paid to the two classes of individuals throws further light on the reasons why many of our most brilliant graduates do not follow academic careers.

During the years 1918 to 1928, inclusive, 146 men and women received the degree of Ph.D. in chemistry at the University of Illinois. In the fall of 1928 a letter was addressed to these graduates asking for a statement of the initial salary received after gradua-

tion and the salary received in 1928. Replies were received from all but three. Sixty-one engaged in academic work soon after graduation and have continued in such work. Fifty-three accepted and have continued in positions in industrial work. Fourteen entered academic work but left it for industrial positions. Two were in industrial work for a time but are now teaching. Thirteen have gone into medicine, hold fellowships, live in foreign countries or for other reasons can not be included in the average.

In academic positions, the average initial salary, including income from summer teaching or other work, was $2,407. For industrial work, the average initial salary was $2,845.

In 1928 the average salary of persons who had taught for four to ten years was $3,472. The average salary of persons who had held industrial positions for four to ten years was $5,619.

The highest initial salaries for academic work were one of $3,500 paid to a woman in a woman's college; $3,056, including summer teaching, paid to a man who returned for graduate work after some years of teaching, and $3,000. Two other incomes exceeding $3,000 included incomes from industrial work.

The highest salary for academic work in 1928 was $4,500, paid to a woman for teaching part time and doing executive work in a high school. The next two were $4,450 and $4,433, each including teaching in a summer school.

The three highest initial salaries paid for industrial work were $4,800, $4,000 and $3,840.

The highest salaries paid for industrial work in 1928 were $15,000, $13,000 and $11,000.

The University of Illinois offers courses in chemistry and in chemical engineering which require the study of chemistry for four years and include a minor amount of research during the senior year. An inquiry was directed to the graduates of these courses for the years 1919 and 1925. The results of this inquiry were not sufficiently extensive to justify a detailed report, but they indicate quite clearly that a man entering academic work with the degree of Ph.D., usually four to six years older than the man who takes a bachelor's degree, will receive, on the average, only about $400 more than the bachelor. Ten years later, the salary of the doctor in an academic position is, on the average, less than that of the bachelor in industrial work.

Chemists who are employed as teachers in our best colleges and universities are receiving far less than their fair share of the threefold producing power gained by the country during the last twenty-five years. Teachers who enter an academic career after receiving the degree of Ph.D. have, on the average, after five to ten years, a much smaller income than those who engage in industrial work.

It seems evident that unless these conditions can be remedied our universities must be content to fill their teaching positions with mediocre men.

The very slow increases in academic salaries are a just reason for complaint. We should seriously question whether the present policy of many universities to employ a much larger number of recently graduated doctors of philosophy than can hope for reasonably rapid promotion to salaries on which they can support a small family and care for their own professional needs for books and for attendance on professional gatherings is justifiable. Shall we not contribute more to the development of high standards by employing fewer people and giving more rapid and adequate promotion to those who are worthy?

During the last twenty years it has been necessary, repeatedly, to fill major positions in the department of chemistry at the University of Illinois. After looking the country over, with the aid of friends, it has often been found that the quest has narrowed down to only two or three who were suitable and possibly available at the salary which could be offered. Even then, it was found, on several occasions, that the men selected would not come. Sometimes the position was left vacant for a year and the search continued. In other cases the position was filled with a young man of unusual promise and he was then given a rather light load of teaching and allowed time and facilities for research which made it possible for him to make for himself a position of importance in the chemical world.

It is an open secret that Harvard University has tried very earnestly but has failed to secure a man of established reputation to fill the place of one who had grown up from the ranks to a position of international fame.

Professor Harper gave to the University of Chicago much of its initial prestige by calling a few men of national and international reputation at salaries of $7,500, which was much above any salary paid at that time in the middle west. To maintain a similar standard, to-day, the university should have a few professorships with salaries of at least $20,000. If some university will have the courage, to-day, to do this and to break away from that lock-step promotion, which is so fatal to the encouragement of men of exceptional ability, it will help to remove the very objectionable differences in rate of promotion in the universities and in the industries.

Dr. A. D. Little, who has built up a very strong organization of chemists working on industrial problems, permits me to quote him as saying that he has "found it advantageous and profitable to pay the

salaries necessary to secure men whose records lead their professors in the institutions they have attended to recommend them as exceptionally capable."

The great leaders in science have been men who were inspired by other great leaders who went before them. Liebig studied with Gay-Lussac, Wöhler with Berzelius, Faraday with Davy, Pupin with Helmholtz, Nef with Baeyer. The necessity of providing great leaders in our universities can not be overemphasized. To do this we must pay such men adequate salaries. It is, perhaps, of even greater importance that we should give young men of promise adequate time and facilities for research and that they should be promoted when they have shown their worth.

In a recent paper published in SCIENCE, the claim was made that salaries are inexorably fixed by the law of supply and demand and that it is useless to try to tamper with a law which the author of that paper seems to think is sacrosanct.

Such an attitude treats human beings as on the same level with the inanimate products of their labor. Sociologists are generally agreed that other factors beside supply and demand should be taken into account in determining wages and salaries.

Foremost among these is the "living wage" which is necessary to maintain the efficiency of the worker and enable him to provide suitably for those dependent on him. Surely the "living wage" for a professor should be on a higher plane than that of a day laborer. No one can do efficient work unless he is freed from the anxiety which comes from the attempt to make an inadequate salary cover the bare necessities of life. He should have a sufficient income to free him from that anxiety and to make it possible for him and his family to form reasonable social contacts with other cultured men and women. In addition to that he should be able to purchase the books which are the tools of his trade and to travel and associate, occasionally, with colleagues in his field, at home and abroad.

Henry Ford has recently stated a principle which he thinks should be considered by employers of labor. By increasing the wages paid to workmen their ability to purchase the products made by other workmen is increased. This is a recognition of the fact that under modern conditions production is limited, not so much by the number of workmen required and by the cost of machinery used, as by the market for the goods produced.

During the few years of the great war the position of the United States was changed from that of a debtor nation, with many of its securities held abroad, to that of the most powerful creditor nation in the world. This happened because we had the ability to speed up mass production and meet the emergencies of the war. The most important material losses of the war were not, as many suppose, the munitions and other materials used and destroyed, for these were almost entirely made during the war. The losses which have caused such a dislocation of economic relations are due to the transfer of wealth from one nation to another and from one class of citizens to another.

One of the lessons of the war which we should all learn and take to heart is that the people of the world are now able to make valuable products far more rapidly than the citizens of the world are able to buy them. If the salaries of professors could be doubled overnight, their scale of living would rise rapidly and they would furnish a market for products in such a manner that their increased receipts would mostly find their way back into the pockets of other citizens. In a sense, this is an illustration of the old saying, "Nothing succeeds like success." Henry Ford's principle is, within limits, essentially sound. In the long run, even on the rather low basis of economic prosperity, the use of the money of the people to increase the salaries of professors would contribute, materially, to the possibility of increased production and to the general prosperity of the country.

Another factor worthy of careful consideration is the value of the services rendered to the community. The increase in salaries which we are asking should not be considered as a charity to underpaid men and women. They should be considered as an attempt to pay a part of the debt which the community owes for the services professors render.

Liebig founded a laboratory which has transformed and democratized the teaching of science, not only in Germany but throughout the world. When Prince Albert wished to establish a scientific institute in London, he called to his aid Professor A. W. Hofmann, one of Liebig's students. The first of the coal-tar dyes was discovered and developed by W. H. Perkin, who studied with Hofmann.

The synthesis of alizarin, or turkey red, was discovered by Graebe and Liebermann, working in a German university. Germans did not, at that time, succeed in manufacturing the dye, but Perkin, with his experience in factory production, succeeded so well that as early as 1881 it was stated that the turkey red manufactured in one year was worth $8,000,000 but that it would have cost $28,000,000 to make the same amount from madder root, formerly used as the source of the dye.

In spite of this initial success in England, the manufacture of dyes was soon transferred almost completely to Germany. This happened because there were in Germany many young men trained in re-

search in laboratories similar to the one founded by Liebig.

Baeyer discovered a synthesis of indigo about 1880, and a manufacturing company worked for twenty years to convert the discovery to a commercial success. The company could not succeed till two other discoveries were added, one made by a professor in Holland and the other by a professor in Switzerland.

Professor Haber, formerly of Karlsruhe, developed the synthesis of ammonia from hydrogen and the nitrogen of the air. This discovery is destined to add greatly to the food resources of the world. Without it Germany would have been defeated in the great war in six months.

Michael Pupin is a graduate of Columbia, and he studied at the University of Cambridge and with Helmholtz in Berlin. He has done much to make long-distance telephony practically possible.

The first electrical manufacture of aluminum was invented by the Cowles brothers, students at the Case School of Applied Science in Cleveland. A second, more important, method was discovered by Hall as the result of a statement made by Professor Jewett in a lecture at Oberlin College.

Such illustrations could be multiplied by the thousand, and it would be easy to show that the wealth added by the work of professors in colleges and universities very far exceeds the cost of the maintenance of all these institutions.

The illustrations have been taken from chemistry and physics, but it would be a mistake to suppose that only scientific faculties are worthy of support. It is not necessary to argue the importance of training in other subjects than science. My own academic career was begun at Grinnell College, then a small western institution. There, Professor John Avery, who taught me Greek and German, was one of those who inspired me to a life of productive scholarship.

In conclusion, I wish to make the following practical suggestions.

(1) The executives of our colleges and universities should redouble their efforts to secure equitable salaries for their professors. They should see clearly that to secure able and efficient men in charge of the various departments and divisions of their work and so to relieve them from routine work that they may continue to be productive scholars as well as efficient teachers is the most important function of the institution.

(2) Positions as instructors should be given only to those young men, to be found anywhere in the country, who have the best training in the subject to be taught and who give most promise of becoming both efficient teachers and productive scholars. These requirements are more severe, in general, than the requirements for men who might succeed in industry, and the salaries should be rather higher than lower than the salaries paid for industrial work. In other words, executives should seek the best, not the cheapest.

(3) Such men after appointment should be given ample opportunities and time for productive scholarship and should also be encouraged to become efficient teachers.

(4) The number of instructors appointed should bear a close relation to the possibility of a rather rapid promotion for those who show exceptional ability.

(5) Lock-step promotion—a regular increase each year, almost irrespective of accomplishment—an easy device of executives to avoid trouble—should not be tolerated. Men of unusual ability should be promoted rapidly, as they are in the industries.

(6) New lines of work should be undertaken only when there are ample funds to support them. The California Institute of Technology set an admirable example when it refused to establish a department of biology before ample funds for its support were available without depleting the money needed for other departments.

ADEQUATE SALARIES FOR COLLEGE AND UNIVERSITY TEACHERS

By EDWARD A. FILENE

PRESIDENT, WILLIAM FILENE'S SONS, BOSTON, MASSACHUSETTS

I HAVE been asked to address this body upon the question of adequate salaries for university and college teachers. I have been asked to speak, however, upon only one phase of the question, that is, the social importance of such salaries. That immediately presents a difficulty, particularly to a business man. I confine my talking, usually, to business groups, and to tell the average business audience that something is socially important is not to tell it very much.

Every business man in America to-day knows that high wages for everybody are socially desirable. Not many of them know, however, just how they, individually, can make wages higher. They suppose that higher wages must be paid out of profits and, with