Earnings of Physicists, 1951

This is the first of two articles on physicists which have been prepared in the Bureau of Labor Statistics of the U. S. Department of Labor, in connection with its continuing program of studies of scientific manpower.

By Laure M. Sharp and Helen Wood

IN PHYSICS, as in professional occupations in general, there has been up to the present time very little information as to the incomes which members of the profession can expect to earn during their working lives, and the influence on their earnings of such factors as educational background, experience, and type of employment.

A considerable body of data is now available on this subject from a survey of physicists conducted in mid-1951 by the National Scientific Register of the U. S. Office of Education, Federal Security Agency, with the cooperation of the American Institute of Physics. This questionnaire survey covered approximately 6600 physicists and 1300 graduate students, almost all of whom were members of the Institute and one or more of its five founder societies. The main purpose of the survey was to develop a source file of qualified scientists, but it has also yielded information on such matters as physicists' age, educational background, military status, and employment, as well as detailed data on the factors affecting their income.[1]

Another source of information on the earnings of a large group of physicists—those working for the Federal Government—is a recent survey of Federal employees carried out by the U. S. Civil Service Commission. This survey shows in which agencies and at what grades Government physicists are employed, and their average salary in June 1951.

Together, these two surveys supply information on the earnings of a very substantial segment of the physics profession. The total number of professionally active physicists in the country in 1951 has been estimated at approximately 15,000. The Civil Service Commission survey provided salary information for the approximately 3000 Federal scientists classified as physicists in June 1951. A total of 4875 working physicists supplied income information in the Scientific Register Survey, of whom 821 were Federal employees; the remainder were employed chiefly in educational institutions and, to a lesser extent, in private industry. It can thus be seen that earnings figures are available for approximately 4000 physicists in nongovernment jobs and that, alto-

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Median and Quartile Annual Professional Incomes of Physicists, by Type of Employer, 1951

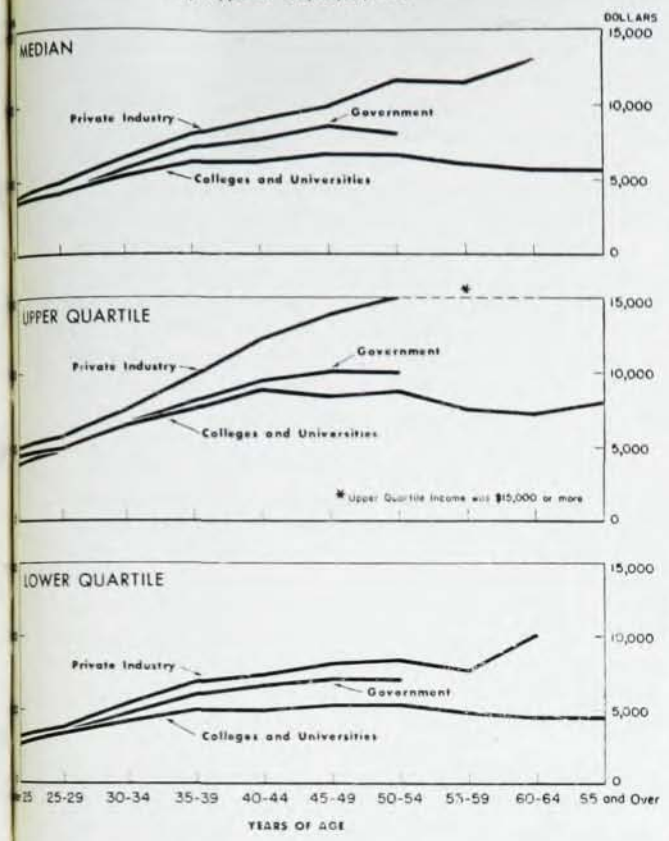

Chart 1. Salary levels of physicists are highest in private industry.

gether, the information presented here covers nearly half of all physicists professionally active in 1951.

THE MEDIAN ANNUAL INCOME of all physicists in the National Scientific Register survey was $6200 in early 1951. Three-fourths earned over $4300 (the lower quartile), and the best-paid fourth all earned at least $8000 (the upper quartile). These figures represent total yearly professional income, including salaries and also supplementary earnings from part-time teaching, consulting, royalties, patents, and other sources. The figures apply only to persons who were working in physics at the time of the study; they do not include the small group of physicists (8 percent of all those in the survey) who reported that they were currently employed in chemistry, engineering, or other fields outside physics.

The physicists in this survey of AIP members probably had a somewhat higher average income than all physicists in the country. The survey had a disproportionately high coverage of scientists with graduate degrees, especially of those with doctorates,[2] and men with PhD's tend to have higher incomes than those with less academic training. When the earnings of physicists at each level of education are considered separately, the findings for PhD's and masters can be regarded as generally indicative of the income levels of all such physicists. But there is reason to believe that the bachelors in the survey had higher average earnings than all of the nation's physicists with that level of education. The members of the profession with only bachelor's degrees who held relatively low-paid junior positions in government and private industry were underrepresented in the study—probably because many of them did not belong to the American Institute of Physics. These points should be borne in mind in interpreting the following median and quartile income figures for the surveyed PhD's, masters, and bachelors:

Income	*PhD*	*Master*	*Bachelor*
Median	$7 100	$5 300	$5 100
Lower quartile	5 700	4 200	3 800
Upper quartile	9 100	6 700	6 900

In part, the differences in median earnings shown by these figures were due to age differences among scientists at the various levels of education. Experience, as measured by age, is important for achievement in the sciences, as it is in other fields of work. Though not every individual enjoys progressive gains in earnings with the passage of years spent in professional work, the majority of scientists can look forward to some growth in their professional incomes from the time they enter a profession up to the period when they are mature and experienced workers. Table 1 shows that, as a group, experienced physicists tend to earn considerably more than their younger colleagues. Peak earnings were found, however, in the 45 to 49-year age group; beyond that point, the median income figures declined gradually from one age group to the next. However, it would be erroneous to conclude from these data that the individual physicist is likely to experience a decline in salary after he reaches the age of 50 or 55. The relatively low income figures of the oldest groups of physicists in the survey were due to the interplay of a variety of factors. Comparatively few men in these age groups are in the newer and better-paid specialties,

Table 1.—**Median and quartile incomes of physicists, according to age, 1951**

Age groups	Annual income		
	Median	Lower quartile	Upper quartile
All ages	$6 100	$4 600	$ 8 000
Under 25 years	3 700	3 200	4 600
25–29 "	4 300	3 600	5 300
30–34 "	5 800	4 700	6 900
35–39 "	7 100	5 800	8 800
40–44 "	7 600	5 800	9 900
45–49 "	8 000	6 200	10 500
50–54 "	7 600	5 800	10 600
55–59 "	6 700	5 200	9 400
60–64 "	6 700	4 800	9 400
65 years and over	6 300	4 800	9 300

particularly nuclear physics and electronics; most of them work for educational institutions, where salaries are lower than in industry; and with advancing years, there may well be a decline in additional earnings from such sources as summer teaching or consulting.

Another point evident in Table 1 is that the variation in individual earnings is much smaller among young men than among experienced physicists who are at the height of their careers. Of the physicists under 25, three out of four earned at least $3200 a year, and only one out of four made as much as $4600. The difference between these figures (the interquartile range) was only $1400. Among physicists between the ages of 50 and 55, on the other hand, the corresponding range was $4800; the lowest-paid fourth earned no more than $5800 and the highest-paid fourth all made at least $10,000.

Physicists' incomes are greatly influenced by the type of employer for whom they work as well as by their education, age, and other, often imponderable, factors. Of the physicists in the survey, almost half (47 percent) were working for colleges and universities, 31 percent for manufacturing industries, 15 percent for government agencies, and the remaining 10 percent for other employers such as research and consulting services and the communications industry. In every age group and at every level of education, physicists employed in private industry had considerably higher median earnings than those working for government agencies, and the educators had the lowest median earnings of all (see Charts 1 and 2).

The differences in median earnings as between physicists in different types of employment were especially marked in the older age groups. Furthermore, there was a greater differential among fields of employment at the upper income levels than in the middle of the income scale, as shown by Chart 1. No doubt this situation is largely a result of the fairly rigid salary ceilings in effect in government and educational institutions, where annual salaries in excess of $10,000 or $12,000 are exceptional. It should also be noted that the scientists in private industry included both salaried employees and those working as self-employed consultants.

Within each field of employment, earnings varied directly with the level of the scientists' academic training. The PhD's were the highest-paid group on the campus, in government, and in private industry. Furthermore, masters were usually somewhat better off than the bachelors, though the income difference was not nearly as wide as in the case of PhD's and MS's. In fact, among men between forty and forty-five working for government agencies and private industry, the bachelors in the survey had higher incomes than the masters, as shown in Table 2.

It should be remembered, however, that the physicists in the survey who held no more than a bachelor's degree probably had incomes above the average for all physicists at this educational level. Studies of other professions carried out by the Bureau of Labor Statistics have shown that, in general, masters tend to have somewhat higher incomes than bachelors, though these studies confirm the finding that differences in earnings between masters and bachelors are usually less than those between PhD's and masters.

INFORMATION on physicists' salaries available from a recent Civil Service Commission survey of Federal employees cannot be compared directly with the findings for Government employees from the National Scientific Register survey. As indicated above, the data from the latter study relate to total annual professional income, whereas the Civil Service Commission survey

Table 2. **Median annual income of physicists in each age group, according to level of education, for the principal types of employers, 1951**

Type of employer	All age groups	Under 25 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	50–54 years	55–59 years	60–64 years	65 years and over
All levels of education*											
All types of employers	$6 100	$3 700	$4 300	$5 800	$7 100	$7 600	$8 000	$7 600	$6 700	$6 700	$6 300
Colleges and universities	5 600	3 600	4 100	5 200	6 100	6 200	6 700	6 700	6 000	5 700	5 700
Government	6 300	3 600	4 000	5 700	7 100	7 700	8 600	8 100	‡	‡	‡
Private industry§	7 000	3 900	4 800	6 400	8 000	9 000	9 900	11 700	11 500	13 000	‡
PhD											
All types of employers	7 100	‡	5 300	6 400	7 500	8 400	8 500	8 300	7 100	7 400	6 800
Colleges and universities	6 400	‡	4 700	5 800	6 600	7 700	7 300	7 500	6 500	6 500	6 000
Government	8 000	‡	‡	6 700	8 300	8 100	9 300	8 600	‡	‡	‡
Private industry§	8 000	‡	5 900	6 900	8 600	9 300	11 100	12 200	‡	‡	‡
Master's degree											
All types of employers	5 300	3 700	4 100	5 300	6 500	6 000	6 100	5 800	5 600	4 800	‡
Colleges and universities	4 500	‡	3 600	4 300	4 800	4 900	5 300	5 400	5 200	4 500	‡
Government	6 000	‡	4 400	5 700	6 800	7 000	‡	‡	‡	‡	‡
Private industry§	6 400	‡	4 800	6 000	7 700	7 900	8 500	‡	‡	‡	‡
Bachelor's degree											
All types of employers	5 100	3 600	3 900	5 400	6 800	8 000	8 700	8 200	‡	‡	‡
Colleges and universities	4 000	‡	3 600	4 500	‡	‡	‡	‡	‡	‡	‡
Government	5 000	3 600	3 800	5 300	6 400	7 400	‡	‡	‡	‡	‡
Private industry§	5 800	3 700	4 200	5 900	7 500	9 200	9 400	‡	‡	‡	‡

* Includes a small group of physicists who do not hold a college degree.
‡ Insufficient number to compute median.
§ Includes employees of business firms, independent consultants, and self-employed physicists.

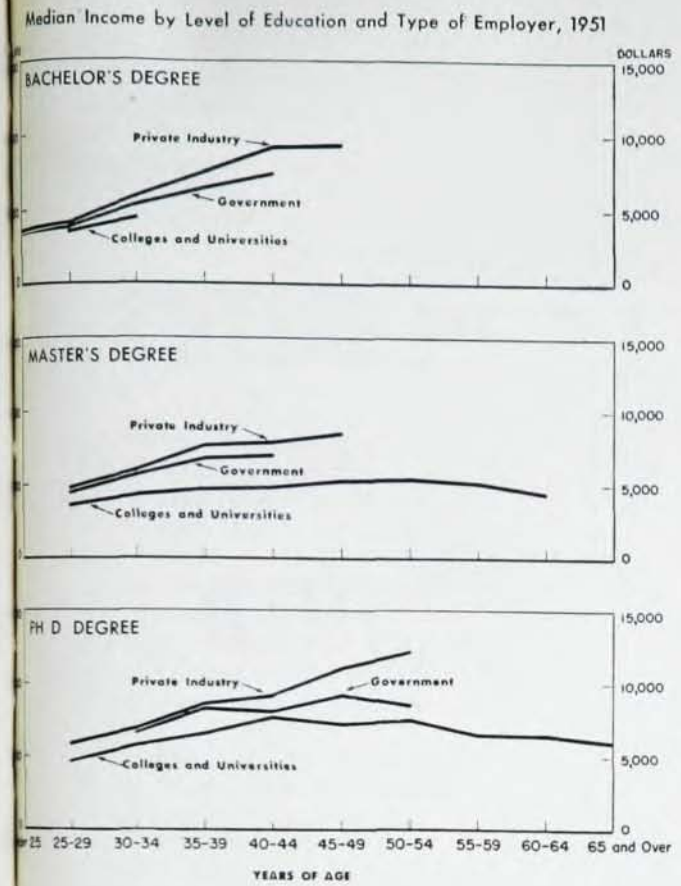

Chart 2. PhD, MS, and BS physicists all have higher incomes in private industry than in other types of employment.

collected only salary information. Furthermore, the Register survey included only 821 reports on income from Government workers, although, according to the Civil Service Commission, there were in June 1951 3067 Federal employees classified as physicists. The 1901 Government scientists and engineers employed in electronics research, development, and testing work also included some physicists, as did the 517 "physical science administrators" on Federal payrolls in June 1951. However, the exact number of physicists in these categories is not known.

The Government physicists who were classified as such had an average annual salary of $5300 in mid-1951.[3] Information on the salaries received by individual scientists is provided by data on the numbers in positions of different grades. These grades, which are uniform throughout the Federal Service, reflect the difficulty and responsibility of the work involved in the various positions. Table 3 shows the numbers of physicists in each grade and the minimum and maximum salaries in effect in June 1951. It will be seen that a high proportion of the Government physicists (43 percent) had jobs classified as in grades 5 or 7, the entrance grades respectively for new college graduates with only bachelor's degrees and for those with master's degrees or equivalent experience.

Table 3.—**Distribution by grade of physicists employed in the Federal Government on June 30, 1951**

Civil Service Grade*	Number	Percent	Salary Range
All grades	3 067	100.0	
Grade 5	709	23.1	$ 3 100–$ 3 850
Grade 7	604	19.7	3 825– 4 575
Grade 9	460	15.0	4 600– 5 350
Grade 11	447	14.6	5 400– 6 400
Grade 12	385	12.6	6 400– 7 400
Grade 13	277	9.0	7 600– 8 600
Grade 14	134	4.4	8 800– 9 800
Grade 15	47	1.5	10 000– 11 000
Grade 16	3	.1	11 200– 12 000
Grade 17	1	‡	12 200– 13 000

* One physicist classified in grade 6 is included in the grade 5 category; 3 physicists in grade 8 are included in the grade 7 category; and 5 physicists in grade 10 are included in the grade 9 category.
‡ Less than 0.05 percent.

Although the largest group of government physicists were those in grades 5 and 7, a relatively high proportion (28 percent) were employed at the upper grades (grades 12 and above). In other scientific fields, there are somewhat fewer positions at the upper grades. This is reflected in the average salaries of chemists ($5000), mathematicians ($4700), and geologists ($5100), all of which are somewhat lower than those of physicists ($5300).

However, the difference between the median income of Government employees in the National Scientific Register survey ($6400) and the average annual salary of physicists surveyed by the Civil Service Commission ($5300) was considerable. It is unlikely that this difference in earnings was due wholly to the fact that professional incomes other than salaries were included in the figures from the National Scientific Register survey. As a rule, Government employees do not supplement their salaries to the same extent as other scientists, especially those on college faculties.[4] The differential stems mainly from the fact that among Federal employees, membership in the American Institute of Physics is most frequent in the case of scientists who hold responsible, relatively high-paid positions.

Footnotes

[1] The survey findings were analyzed by the Bureau of Labor Statistics, under contract with the National Scientific Register. The Bureau also prepared the full report on the study, entitled "Manpower Resources in Physics, 1951." This is now in press and will be published as No. 3 in the Register's Scientific Manpower Series.

[2] Among the surveyed physicists, 45 percent held PhD's, 27 percent held master's degrees, 25 percent held no more than a bachelor's degree, and 3 percent had not completed college. It is estimated that in the entire physics profession, the proportion of PhD's was not more than one-third in 1951, and that the proportion of bachelors was much higher than among the surveyed scientists. One reason for the survey's disproportionately high coverage of physicists with graduate training was undoubtedly the fact that the Institute has drawn its membership to a considerable extent from among college faculty members.

[3] Since that time, all Federal salaries have been increased by approximately 10 percent.

[4] See "Employment, Education, and Earnings of American Men of Science," Bulletin No. 1027, U. S. Department of Labor, 1951, p. 34.