

# THE CALTECH ALUMNI

## IV. Occupation and Income

by JOHN R. WEIR

IN PREVIOUS ARTICLES we have discussed certain aspects of the survey relating to the occupations of our alumni. We have pointed out that the great majority have followed the specific field in which they got their training, have been in it ever since they left school, and intend to continue in it for the rest of their working careers. If they were to leave it, it would be only for another specialty within the fields of science or engineering. They are in positions of importance and influence, and have the responsibility of directing and controlling other people as project leaders, supervisors, administrators, and executives. They consider themselves more successful than the average, and if they had it all to do over again, would go back to the same school and major in the same field.

In this article we will complete the vocational picture of our Caltech alumni with a discussion of fields of employment and income medians and distributions.

<i>Occupational Fields</i>	<i>% PhDs</i>	<i>% Es</i>	<i>% MSs</i>	<i>% BSs</i>	<i>% Caltech</i>
Research and Development	40	38	34	20	30
Administration	6	6	13	19	15
Design	1	9	11	14	11
Teaching	36	2	7	2	9
Production and Operation		4	5	7	5
Military	2	31	7	3	5
Construction and Maintenance		1	3	8	5
Other	15	9	20	27	20

As the table shows, our Bachelors are about evenly distributed among Research and Development, Administration, and Design. Only 2 percent are in Teaching. This distribution also holds for alumni with Master's degrees. Among the PhD's, 40 percent are in Research and Development, and 36 percent are in Teaching.

About three times as many Bachelors as PhD's are in the field of Administration. Other occupational fields in which the number of alumni were so small as to be not significant were: student, selling and advertising, field work, consulting, laboratory, law, insurance, medicine, statistics.

From another standpoint, almost all of our alumni are in positions requiring leadership and administrative skill. A quarter of the alumni have from 1 to 5 people responsible to them, a quarter 6 through 19, a quarter 20 through 199, and 7 percent have over 200 responsible to them. Approximately 80 percent thus have one or more people responsible to them. This figure points to the need for executive and administrative training as an essential component in the education and training of the young scientist or engineer.

### Earned income

The median earned income for the Caltech alumni as reported in the fall of 1952 was \$7,000 per year. Havemann and West report median earnings for three different groups which permit significant comparisons with this figure. They give the median earnings for U. S. college graduates as \$5,345, the median earnings for professional men (construction, engineering, architecture) as \$5,472, and the median earnings for the graduates of seventeen technical schools as \$6,135.\*

\* The actual figures given by Havemann and West are, respectively, \$4,689, \$4,800, and \$5,382. The data for the Havemann and West survey, however, were gathered in 1948, and a correction must be made for the inflation that has occurred between that time and the fall of 1952, when our data were gathered. A comparison was made between the annual surveys of professional scientific salaries by the Los Alamos Scientific Laboratory and the index of the cost of living of the United States Bureau of Labor Statistics. In each case the averages had risen 14 percent from 1948 to 1952, so it was considered safe to assume that a correction of 14 percent for the Havemann and West figures would make them comparable to our 1952 data. This correction has been made in every case where we compare our data with Havemann and West.

# ALUMNI SURVEY . . . CONTINUED

It is also possible to estimate an approximate median earnings figure for all scientists and engineers in the United States by combining figures from the Los Alamos Scientific Laboratory Survey of Professional Scientific Salaries for 1952 and from the National Society of Professional Engineers' Report for 1952-53. This estimated median, based on reports from 30,000 scientists and 12,000 engineers, comes to \$6,946 per year.

The chart below shows earned income by age for Caltech alumni, U. S. college graduates, and U. S. males. The advantage of a college education is obvious. Also, the advantage of a Caltech education in science and engineering is clear, and these differences become even more impressive if we recall the extreme youthfulness of the Caltech alumni. For example, of the 12,000 engineers mentioned above, only 13 percent got their degrees after 1946, whereas 50 percent of the Caltech alumni got their degrees after this date. As our alumni grow older, the tendency for earnings to increase with age will have the effect of raising the Caltech median considerably above where it is now. (The down curve beginning at age 50 can probably best be understood as

reflecting the changes initiated at the California Institute in the middle twenties under the influence of Drs. Hale, Noyes, and Millikan.)

## Income from consulting activities

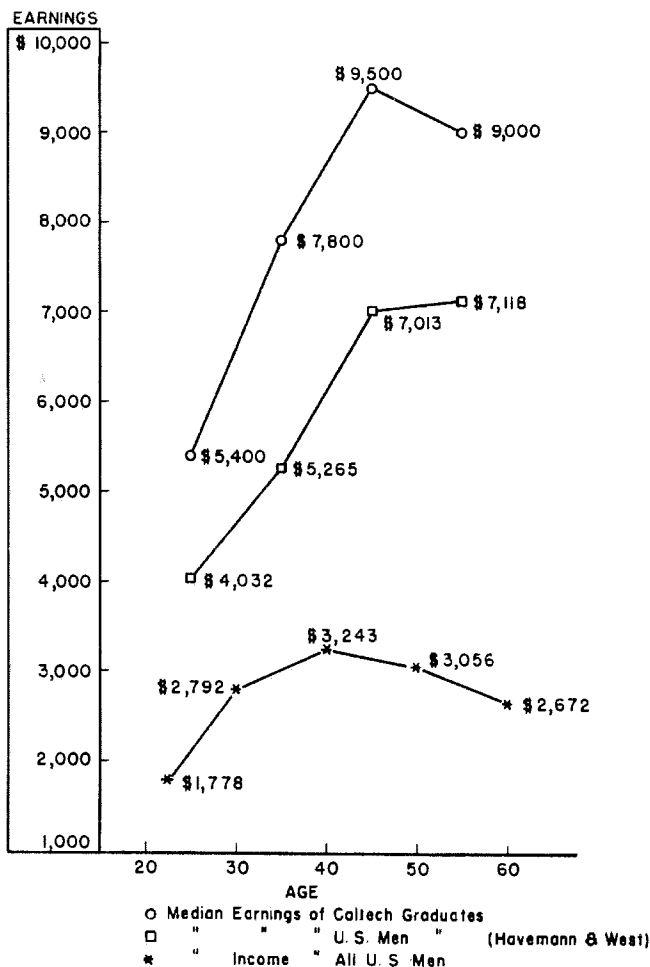
Our Caltech graduates do not get much income from consulting fees. Only 7 percent earn more than \$1,000 a year from this activity—and this 7 percent includes those whose sole earned income is from consulting practice. What consulting income there is, is mainly concentrated in the PhD group. Twenty-three percent of them report some income here, contrasted with only 8 percent of the BS's and MS's. This lack of consulting activity is probably largely determined by the youthfulness of our alumni, as consulting activities tend to increase with age and experience in the field, and with the development of a professional reputation.

### Consulting Income

None	88.7%
\$100 to \$500	2.6
\$500 to \$800	1.8
\$1,000 to \$5,000	5.0
\$5,000 to \$100,000	1.9

It is equally true that few of our alumni have income from inherited wealth or large investments. Only 12 percent receive more than \$1,000 per year from sources other than occupational and consulting activities.

## A DEGREE PAYS OFF AT ANY AGE



## Total income

If all sources of income are combined, we get a total income median of \$7,900 for Caltech alumni. Havemann and West give the median total income for U. S. graduates as \$6,140, indicating a \$1,700 advantage for the Caltech grad. The Caltech distribution runs as follows:

### Total Income

Under \$5,000	12.4%
\$5,000 to \$8,000	37.2
\$8,000 to \$11,000	29.1
\$11,000 to \$40,000	20.4
\$40,000 and over	.9

If grouped by years out of BS, and according to highest degree earned, the following medians obtain:

### Median Total Income

#### By Years Out of BS, by Highest Degree Earned

	BS	MS	PhD
1 through 10 years	5,700	6,000	6,900
11 through 20 years	9,000	9,000	8,400
21 through 30 years	10,100	10,500	11,000
Over 30 years	10,800	*	11,500

\* insufficient sample

And here again as our alumni get older as a group, all of these medians will be higher, and the gap between the Caltech alumni and the other groups noted for comparison will widen considerably.

**Do advanced degrees help?**

One would expect that the extra effort and expense entailed in obtaining an advanced degree would reflect itself in an increase in income; that is, a PhD ought to have a considerably larger income than a Bachelor. However, a comparison of earned income for various degrees reveals that such is not the case. The chart below shows the median earned income for PhD's, MS's and BS's by years since they obtained their BS degree. The line for the PhD's is mostly on the bottom. Only during the first few years of employment do they earn more than the Bachelors. From then on they are considerably lower.

The median earned income for all Bachelors and Masters is \$7,000. For PhD's it is \$7,500. Do these figures contradict the chart below, as well as the comments made in the preceding paragraph? Actually they do not. There is a disproportionately large number of BS's and MS's in the early year (low income) age groups which depresses their medians. We could make more

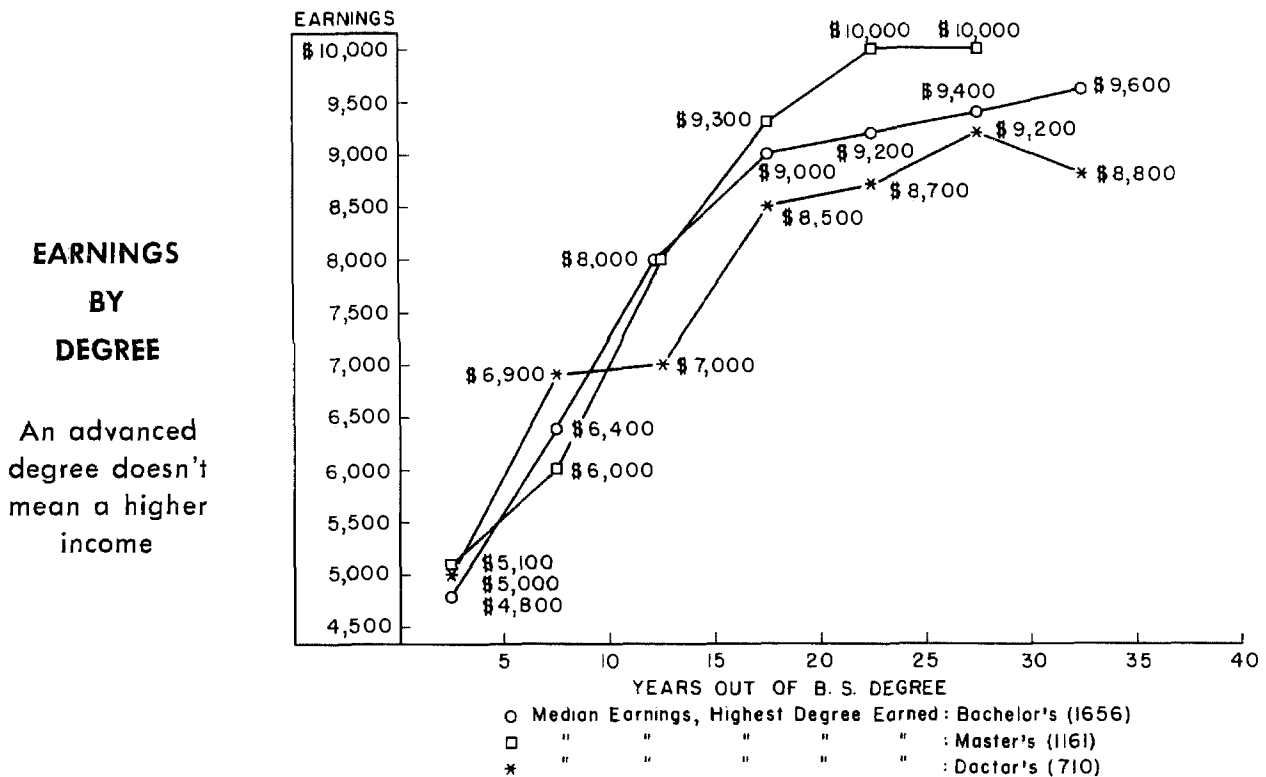
valid comparisons and draw more meaningful conclusions if this depressive effect were removed. Doing this gives an "adjusted" median earned income for Bachelors and Masters of \$7,980.\*

Our PhD's earn an average \$500 a year *less* than our BS's, although they have had four additional years of advanced education! Is there a penalty for knowing too much? Yes, in a sense, there is. Thirty-six percent of our PhD's go into teaching, and the earned income of these teachers is relatively so low that it drags the median for all PhD's down below that for the BS's. It's the same old story—society doesn't reward knowledge and scholarship for itself alone.

**Teaching or industry?**

Only 9 percent of our alumni are in teaching—2 percent of the BS's, and 36 percent of the PhD's. Nevertheless, the relative earnings available in "teaching versus industry" are an ever-present concern of many of our alumni; so some comparisons may be quite welcome.

\* This adjustment was made by equalizing the number of BS's or MS's with the number of PhD's in each group. Over-all medians for BS's or MS's were then estimated from these now-equalized groups.



# ALUMNI SURVEY . . . CONTINUED

In order to avoid complications, comparisons will be limited to the PhD's.

One thing is certain. The PhD's certainly represent a high degree of scholastic ability. Almost the entire group reports A and B grades—and within this group, more of the A students tend to go into teaching.

### Grades of Teaching and Non-Teaching PhD's

	Teaching	Non-teaching
Mostly As	58%	14%
Mostly Bs	36	45
Mostly Cs	6	11

The median earned income for the teaching PhD's (7 percent of the Caltech sample) is \$6,500. For the non-teaching PhD's (12 percent of the sample) it is \$8,200—a difference of \$1,700 a year. If additional income from consulting, books, lectures, etc. is included, the teachers report \$7,600 total income versus \$9,000 for the non-teachers—a difference of \$1,400.

While a person making \$7,600 a year could hardly be called poverty-stricken, even in these times of inflation, there certainly is a significant financial sacrifice entailed if one enters the academic field. It would indeed be interesting to identify the true motivations leading to the decision to accept such a sacrifice.

### Politics

As most studies show, there is a relationship between the amount of money one has and his political affiliation: The higher the income the greater the affiliation with the Republican party. The Caltech alumni are no exception. They show a definite, though minor, correlation between income and Republicanism.

### FAMILY INCOME AND POLITICAL PARTY

FAMILY INCOME	REPUBLICANS	DEMOCRATS	INDEPENDENTS
\$7,500 & OVER	63%	12%	25%
\$3,000 TO \$7,500	55%	15%	30%
LESS THAN \$3,000	50%	14%	36%

### Religion

Havemann and West found that the Jewish members of their sample reported earning more money than the Protestants and Catholics. This is not true for the Caltech alumni. The Caltech Protestant graduates tend to have the higher incomes. This difference might be explained by the fact that Caltech has had very few Jewish graduates until recently; thus, they are relatively young and as yet have not realized their potentialities to a degree comparable with the rest of the Caltech alumni.

### College finances

Havemann and West reported that, in general, the students who had their parents' financial support in college cashed in later on the security and prestige which this seemed to give them. The median income for those who worked their way through school was about 10 percent below the median for those whose families had put them through. The opposite is true for our alumni. Those who earned the majority of their expenses at Caltech report a median total income \$300 greater than do those who earned a quarter or less of their college expenses. Apparently our alumni are more likely to get their jobs and income by determination and hard work than through family position and influence.

### Median Total Income of Self-Help and Family-Supported Men

	CIT	U.S.
Earned none to 1/4 of college expenses	\$7,700	\$6,014
Earned 1/4 to 1/2 of college expenses	8,000	5,694
Earned 1/2 to all of college expenses	8,000	5,507

### Extra-curricular activities

An item of considerable importance and interest to the Caltech student is the matter of the relative importance of grades versus extra-curricular activities in their contribution to success in later life. Would it be better for him to forego all extra-curricular activities, student body offices, clubs, etc., and concentrate on his books, becoming a 100 percent dyed-in-the-wool snake? Or should he study just enough to get by, and spend most of his time on extra-curricular activities, learning how to win friends and influence people?

This is a constant problem, and up to the present time we have had no adequate empirical data on which to base conclusions. However, the results of our survey now permit us to draw some tentative conclusions on this matter.

The median total income for our graduates who report getting mostly As is \$8,100 a year. The median total income for those who report getting mostly Cs is \$7,500—or \$600 less a year, and hardly what one would call a profound difference. If we look at those of our alumni who report participation in four or more activities, we find that their median total income is \$8,800 a year. But those who report no extra-curricular activities while in school have a median of \$7,200—a difference of \$1,600, and almost three times the difference between high and low grades!

If these two items are combined, even more interesting relationships are revealed. Let's divide the alumni into four groups: All-Around Students—those who report getting mostly As and indulging in four or more extra-curricular activities; Big Men on Campus—those who get mostly Cs, but who were in four or more extra-curricular activities; Snakes—those who report getting mostly As but who did not take part in any extra-curricular activities; and Those Who Just Sat There—graduates who report getting mostly Cs and who were not in any extra-curricular activities.

**Grades, activities and income**

The median earnings of these four groups are shown in the chart below. The All-Around Students have the highest income. Those Who Just Sat There the lowest. If we compare the Big Man on Campus with the Snake, it appears that if you have to take your choice between grades and activities, you'd better take the activities. But an even better solution is to combine good grades with at least a few activities.

This is quite different from the way it is among the U. S. college graduates as reported by Havemann and West. While extra-curricular activities appear to be very important in relation to the later success of the Caltech graduate, they make little difference for the U. S. graduate. On the other hand, while grades seem to make relatively little difference for the Caltech graduate, they are very important for the U. S. graduate.

Grades probably make more difference among the U. S. college graduates because there are large differences in scholastic ability within this group. Grades don't make much difference at Caltech, because all of our students are A students when compared with the U. S. college group.

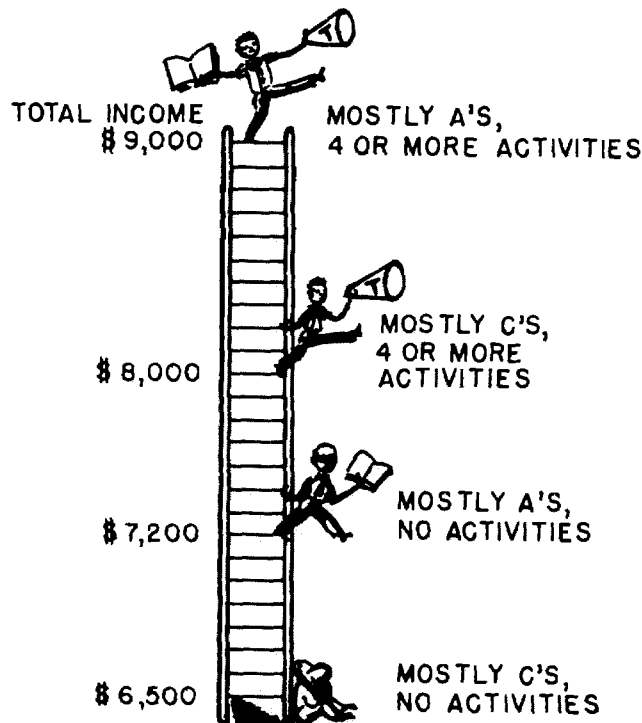
The factor that seems to differentiate significantly among Caltech graduates is their participation in extra-curricular activities—that is, their capacity and willingness to assume group leadership, participate in group activities, and find fun and relaxation in social and cultural pursuits in addition to their academic work. To obtain material rewards in life, it is not only important to know something, but it is even more important to be able to communicate this knowledge to others, and to cooperate with them in its application and development. It seems reasonable to assume that participation in extra-curricular activities might be a rough measure of such communication ability and social facility.

**GPA and vocational success**

These facts indicate that while our system of grades and grade point averages may be valuable for our own administrative purposes, it has little value as a measure for predicting subsequent vocational success. If we want a method of making such predictions we might do better to base our grading system on extra-curricular activity. It would seem to be only a mild exaggeration to say that anyone able to get a degree from Caltech will

**THE CALTECH  
LADDER  
OF SUCCESS**

The All-Around Student  
gets to the top,  
but Those Who Just  
Sat There still sit  
there — on the bottom



find his earnings directly related to his capacity to establish adequate interpersonal relationships, assume leadership responsibility and understand and enjoy activities outside of his field of specialization.

**Civic activities**

The median earned income for all Caltech alumni reporting no participation in civic activities is \$5,000; for those participating in five or more, it is \$8,200—a difference of \$3,200!

<i>Earnings</i>	<i>Civic activities engaged in</i>		
	<i>None</i>	<i>1 through 4</i>	<i>5 or more</i>
Less than \$3,000	23%	9%	5%
\$3,000 to \$5,000	19	12	5
\$5,000 to \$7,500	30	36	29
\$7,500 and over	28	54	61

The difference in medians mentioned above is twice the difference between no extra-curricular activities and four or more, five times that between C grades and A grades, and seven times the difference between BS's and PhD's.

How can we account for this difference—the largest we have found? The most plausible explanation would be to assume a close relationship between civic activities and extra-curricular activities. That is, a person with the interest and capacity to participate in extra-curricular activities as a student would also tend to be active in civic affairs as an alumnus. The following figures support this hypothesis.

<i>Civic Activities</i>	<i>Extra-curricular activities</i>		
	<i>None</i>	<i>1 through 3</i>	<i>4 or more</i>
None	4%	2%	1%
1 through 4	66	62	50
5 or more	30	36	49

The earlier comments made concerning the hows and whys for the contribution of extra-curricular activities to high earnings is even more relevant here. The Caltech alumnus who accepts the social and cultural responsi-

bilities, the obligation to assume leadership, and the obligation to contribute to his community and state—all in proportion to his training and capacity—is also an alumnus with a relatively high income. It is an oft-stated assumption that the person who has the awareness and willingness to assume civic and social responsibility will be a happier and more productive person. This is certainly the reasoning behind the Humanities program at Caltech. Apparently it also leads to higher income—a very persuasive testimonial for breadth of interest and activity.

Putting the income differences we have been discussing into a rank order table highlights some of the interesting results of this part of our survey.

*Advantage of:*

Five or more civic affairs over no civic affairs	\$3,200
A grades and 4 extra-curricular activities over C grades and no extra-curricular activities	2,500
Non-teaching PhD over teaching PhD	1,700
Caltech graduates over U. S. college graduates	1,655
Four extra-curricular activities over no activities	1,600
Caltech graduates over U. S. professionals (Construction, engineering, architecture)	1,528
B.S. (adjusted*) over teaching PhD	1,480
Caltech graduates over graduates of 17 technical schools	865
A grades over C grades	600
B.S. (adjusted*) over PhD's	500
Self-help over family supported	300
Non-teaching PhD's over BS (adjusted*)	220
Caltech graduates over scientists and engineers according to Los Alamos and National Society of Professional Engineers surveys	54

\* see footnote on p. 26

Perhaps the most dramatic relationships revealed are the large differences for civic and extra-curricular activities, and the small differences for grades and degrees. At least for Caltech graduates, it isn't how much you know that counts—it's how well you use what you know.

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*This is the fourth in a series of articles on the alumni survey. Next month Dr. Weir, the man responsible for the survey, will compare the alumni who majored in science with those who majored in engineering.*