The College-Student Image of the Scientist

Scientists are seen as intelligent and hard-working but also as uncultured and not interested in people.

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The image of the scientist among high school students has been studied in detail in recent years. Remmers and Radler (*1*) have reported on some beliefs of teen-agers about scientists, and Mead and Metraux (*2*) have summarized the image of the scientist revealed in essays produced by a large sample of high school students.

The beliefs of college students about the scientist are also of interest. Many students entering college seriously consider careers in science, and college students will eventually constitute an influential segment of the citizens whose views make up the public response to science.

Exploration of the college-student image of the scientist was initiated in a series of unstructured interviews with college undergraduates at Wesleyan University (*3*). In these interviews, students described the scientist as being dedicated to his work and carrying it out with heroic devotion at the expense of concern with public affairs and even family responsibilities. The scientist was described as unsociable, introverted, and possessing few, if any, friends. Some students referred spontaneously to his high intelligence; others were more impressed by the precision of his thinking and the objectivity (that is, lack of emotional involvement) with which he handles most personal and professional problems. Two telling comments represent the common response of undergraduate men to the scientist. One student volunteered, "I wouldn't care to double-date with a scientist," and another student commented, "maybe it's not a good idea for him [the scientist] to be married." A number of students were impressed by the scientist's apparent need to proceed in his work regardless of other demands on his time. In general, the college students revealed in these interviews beliefs similar to those found among high school students. The scientist, to use the student phrase, "is not well rounded."

In order to pursue further the subject of the student image of the scientist, a series of three successive questionnaires was designed and used in testing. A fourth version of the questionnaire was selected as the main instrument for an empirical study. It contained materials derived from the interviews and from standard questionnaires and scales developed in the earlier versions. In the questionnaire students were asked to indicate the appropriateness of a series of terms to each of 15 occupations, including that of scientist (*4*). The terms were arranged in two-ended, seven-point rating scales of the following form (*5*):

1. wealthy —:—:—:—:—:—:— not well-to-do
2. optimistic —:—:—:—:—:—:— pessimistic
3. excitable —:—:—:—:—:—:— calm

This design makes it possible not only to determine absolute values for characteristics attributed to the scientist but also to obtain an estimate of the standing of the scientist relative to individuals in other occupations.

The questionnaire was given to undergraduate men and women in four colleges in the northeastern United States: Wesleyan University, a second small and highly selective men's liberal arts college, a highly selective private women's college, and the college of arts and sciences of a state university (*6*). At each college, probability samples of freshmen and seniors were chosen. Over 90 percent of the students selected at three of the four colleges returned completed questionnaires. At the second men's liberal arts college, all of the freshmen but only two-thirds of the seniors completed the questionnaire. Data from these seniors were not used in many of the following analyses. In all, about 1200 students were included in this phase of the study (*7*).

Image of the Scientist

It is possible to present a composite picture of the scientist from the responses obtained. Students from all of the colleges, both men and women, freshmen and seniors, were in sufficient agreement to justify a summary of the characteristics attributed to the scientist by all groups. There is clearly a well-defined stereotype of the scientist among college students as well as among high school students. In the following summary, the rating of the scientist relative to individuals in other occupations is considered.

The scientist, according to college students, is outstanding in several respects. Students see him most prominently as a highly intelligent person with a strong tendency to be both individualistic and radical in personal and social outlook. At the same time, the scientist is seen as socially withdrawn; he is indifferent to people, retiring, and somewhat depressed, and he rates low in social popularity. In overall sociability the scientist rates lowest among individuals in the 15 high-level occupations. It is therefore not surprising that he is believed to have a relatively unhappy home life and a wife who is not pretty. There is an air of strangeness about him; he is hard to like and comprehend. He is respected for his great contribution to society, but he is not the kind of person one can easily get to know.

The scientist is believed to be highly intelligent but not interested in art. He is both self-sufficient and persevering. He focuses his powers in a rational and sensitive pursuit of answers to nature's mysteries. He is rated as reasonably successful and as having ample opportunity to advance in his field. At the

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same time he is seen as having only modest wealth. It appears that the scientist could exploit his situation to secure wealth and status, but he is so devoted to his work that he is satisfied with a modest income.

The scientist is moderately confident, optimistic, and realistic in his approach to life. He has power in public affairs yet is given only a moderately high score on responsibility. When combined with his radicalism, this finding suggests that there are grounds for an anxious public to become suspicious of his loyalty. After all, he has few friends, great determination, and an unusual set of values.

Rather surprisingly, the scientist is scored relatively low on stability, caution, and calmness. It appears that he has difficulty controlling his impulses. This is consistent with the picture of his radicalism. He is coldly intellectual in some spheres of his life—mainly in his work—and he is emotional in his response to social and political appeals.

The complexity of the scientist's nature must account for his being considered mildly interesting and colorful. He is thought to be very valuable to society and to derive very great personal satisfaction from his work. If one were to study his recreational habits one would find him most frequently at chess, rarely playing bridge, and never playing poker.

In summary, there emerges a picture of the scientist as a highly intelligent individual devoted to his studies and research at the expense of interest in art, friends, and even family. The scientist derives great personal satisfaction, a sense of success, reasonably high status in the community, and a modest income from his work. He serves mankind in a selfless way, almost unaware that he is doing so; he serves others by serving himself.

In public matters the scientist is influential, but he may be somewhat naive. He is extreme in his views on social matters, and he tends to become emotionally involved with issues outside his realm of professional competence. The scientist is coldly intellectual in his professional area but excitable in the public political sphere. He is clearly an intellectual, but unlike "eggheads" in the humanities, he is characterized by a vigorous and directed use of his intelligence. The image conveys a sense of strength of personality, but it is a little extreme, a little strange, somewhat contradictory, and, therefore, hard to comprehend.

Comparison with Images of the Nonscientist

An estimate of the similarity of the scientist image with the images of individuals in 14 other occupations was obtained by correlating the mean scores obtained on 48 scales for the scientist and for people in these other occupations. The data from a subsample of the students tested were used to obtain the correlations presented in Table 1.

These data reveal that the scientist is believed to have much in common with the college professor. The similarity of ratings for the scientist and engineer was predictable, but the correlation with ratings for artist and school teacher had not been clearly foreseen. This correlation stems primarily from the students' grouping of all these roles as intellectual roles. It is clear that the students believe that scientists do not share many attributes with individuals in any of the business and industrial occupations.

Comparison of the image of the scientist with that of the college professor reveals some interesting differences between these roles that are often filled by the same person. Both occupations are entered by men of high intelligence with personality characteristics represented by high scores on *self-sufficient* and *persevering*, middle values on *strong, active, confident*, and *self-assertive*, and low scores on *stable* and *adaptable in habits*. Both professions are believed to attract men who are, to a high degree, radical and individualistic. Members of the two professions differ in that the scientist is thought to lack the artistic interest, good taste, and sensitivity of the college professor. The scientist is not a cultured intellectual, while the college professor attains the highest score in this dimension. Moreover, the scientist is, to a striking degree, less interested in people and less sociable and popular than the college professor. The professor is interested in people and quite successful with them. The scientist is neither drawn to people nor socially attractive. Finally, the scientist is less interesting and colorful than the college professor. The scientist is scored above the college professor on two components of what might be called "material opportunity"—that is, wealth and the opportunity for advancement. The scientist has a more markedly active, persevering, and rational approach to life and work than the professor. In summary, the scientist has greater wealth and opportunity than the professor and a more forceful approach to intellectual problems. However, in the very important areas of social sophistication and esthetic interests the college professor leads the scientist by a wide margin.

Table 1. Correlation of the profile of the scientist with profiles of individuals in other occupations.

Occupation	Correlation
College professor	+.77
Engineer	+.53
Artist	+.51
School teacher	+.49
Doctor	+.44
Lawyer	+.41
Social worker	+.30
Accountant	−.03
Business executive	−.03
Industrial manager	−.03
Personnel director	−.18
Sales manager	−.25
Office supervisor	−.29
Retail store manager	−.29

When the full range of occupation profiles is considered, the scientist and the engineer have a good deal in common. In terms of strength and competence, as indicated by middle values on such items as *active, confident, strong, hard, self-assertive*, and *realistic about life*, they have very similar scores. Competence in either field connotes a reasonable degree of success, social status, and power in public affairs. The scientist differs from the engineer in that he is believed to be more intellectual and less conformist in personal behavior and political viewpoint. The scientist also is rated higher than the engineer in concern with esthetic matters, in spite of the relatively low rating of the scientist in the realm of cultural interests. The scientist is considered more persevering, self-sacrificing, and valuable to society, as well as more interesting and colorful. On the other hand, the engineer has two clear advantages over the scientist. First, the engineer is more concerned with people. He is a sociable, popular fellow as compared with the scientist. Secondly, the engineer is considerably wealthier, and he is a more "regular guy" than the scientist. This latter characteristic is indicated by the higher scores for the engineer on *clean cut, plays poker*, and *has good taste* (taste in clothes, house, car, and so on), and the engineer is believed more likely to have a pretty wife. In conclusion, then, the engineer is thought to be less of an "egghead" than the scientist. He is less intelligent, less nonconforming, less sensitive esthetically, and less valuable to society. At the same time, the engineer

is a more normal, healthy American male, with somewhat the same traits of character as the scientist but with little of the scientist's tendency to go to extremes in behavior or emotional commitment. To summarize, engineers are "Simonized scientists," to bend a phrase recently reported in a national magazine.

Relation of Experience to Image

The student responses were analyzed to determine whether the life experiences and current status of the students were associated with different beliefs about occupations. It was found in comparing the scientist image held by men with that held by women and the image held by students in private as against public colleges, by freshmen as against seniors, by students from different socioeconomic backgrounds, by students from professional as against business families, and by students from different types of communities, that these groups do not differ in their beliefs about the scientist. This is clearly a stable image that is shared widely among college students with varied histories and experience.

In a study parallel to the one under consideration, 41 entering Wesleyan freshmen who indicated an intention to become scientists were compared with all the freshmen who planned to be active in other careers (*8*). Those who intended to be scientists had a more favorable image of both the scientist and the engineer than the remainder of the newly arrived freshmen. The would-be scientists, as compared to the other freshmen, viewed the scientist as more colorful and interesting, of higher social status, more successful, more sensitive to art, and of a more sociable temperament. In absolute terms, the men wishing to enter the field of science rated the scientist quite high in material and social success and in esthetic interests, while they considered him moderately concerned with people. The scientist, as seen by these students, is interesting and colorful. Moreover, as compared with the non-science students, the science students had an image of the engineer that was closer to their image of the scientist. They viewed the engineer as more individualistic, persevering, and capable of deriving satisfaction from his work than did non-science students. In general, the engineer was seen as being more a man of parts by the pre-science students.

There is also evidence in the data that students on entering college have a more favorable view of the scientist than students who have already spent a semester in college. The new students have a more favorable view than second-semester freshmen of the intellectual ability, artistic concern, and success of the scientist.

Faculty Members' View

A group of 27 college teachers of science at Wesleyan University were asked to respond to the same questionnaire that was given to the students. These men were a random sample of the science faculty. It is quite clear that the word *scientist* has similar connotations for them and for students. There was a correlation of +.91 between the average values attributed to the scientist by the Wesleyan students and by members of the science faculty on a group of 21 scales to which responses were made by both groups. The main differences between the two groups were, first, that the students attributed much more influence in public affairs to the scientist than the science teachers did, and, second, that members of the science faculty saw the scientist as more interested in art. Otherwise, the two groups were in close agreement.

Within the ranks of college teachers at Wesleyan, members of science and of social-science faculties are in almost complete agreement on the scientist image. On the other hand, faculty members in the humanities are more complimentary to the scientist than are the teachers of science or social science. A random sample of 23 teachers of the humanities rated the scientist quite high in material and social success and considered him more calm and more sociable than the science teachers did. The worldly success of the scientist seemed more impressive to teachers of the humanities than it did to teachers of the sciences.

Occupational Preferences

Students participating in the main study were asked to indicate the degree to which they would like to enter each of the 15 occupational fields if barriers related to expense, length of training, and native ability were removed. In other words, a male student was directed: "rate each occupational position in terms of how much you would like to be in it if you could be in any occupation you wanted." The data revealed that a group of four occupations —those of college professor, lawyer, doctor, and business executive—were considered most desirable, in that order. The occupations of scientist and school teacher came next in order in a second grouping, at some distance from the first. A rather large gap appeared between this and the next grouping, the occupations of engineer and personnel director. When women were asked to estimate the attractiveness of these occupations for men, they also ranked the scientist in the fifth position. However, when college women were asked to name the single occupation for a future husband that would be most pleasing to them, only 3 percent indicated scientist. Approximately 20 percent of the women wished their husbands would be doctors, and another 20 percent selected the profession of lawyer.

Stereotypes of Specialized Scientists

In studies of the ranking in prestige of professions and occupations, the ranking of the term *scientist* differs from that of terms such as *chemist* or *biologist*, which describe scientists in specific fields (*9*). In view of this finding, an exploratory study was designed to elicit the images of biologist, chemist, and physicist (*10*). A small number of Wesleyan students were asked, in an interview, for their impressions of the personality, family life, status, social life, and motivations of men in each scientific field. Although the sample was small and unsystematically chosen, the agreement among students was so great as to suggest that the findings are of general significance. The stereotype of the specialized scientist in each case was more favorable than the image of scientist that was revealed in other interviews. According to these stereotypes the scientists in designated fields are more wealthy and successful, have richer social lives and more rewarding family lives, and are more pleasant and outgoing people than the "scientist" considered apart from his field. The biologist is the most normal of the scientists in the sense that he approaches most closely the American ideal, and to the physicist are attributed many of the negative qualities that emerged in the interviews concerned with the generalized "scientist." The chemist falls between the two extremes.

Conclusions

These data suggest that there exists among college students a readiness to respond to the word *scientist* in a complex and differentiated manner. There is wide agreement concerning the image of the scientist among various classifications of men and women students in the Northeast. Members of one college faculty share this image with their students. The image is the same for freshmen as for seniors. It is safe to assume that the outlines of the image are the same for students at many colleges and for many college-educated adults. It is quite likely that the image is shifted somewhat in the first few months of a student's college career, but it is obviously not markedly changed. The image of the scientist among college students resembles in many ways the image held by high school students, as reported by Mead and Metraux (*2*).

The specific features of the scientist image are important for several reasons. First, the image reveals the students' beliefs about the personality of the scientist and the style of life associated with a career in science. It means to the potential recruit that, if he selects science, he should have a certain set of personal qualities and can expect a particular kind of social life and certain types of personal associates, and it implies that the kind of life he will live is greatly limited by his work. If these features of the life of the scientist do not fit with the student's beliefs about himself or his hopes for the future, he is likely to be wary of committing himself to a career in science. At the same time, of course, the image influences the behavior of the student who has chosen science and leads him to develop those aspects of his character most in keeping with the stereotype of the scientist.

In short, the image has the effect of recruiting a certain type of person and discouraging others. This limits the range of people likely to consider the field, and it restricts the variety of basic talents available to science. Second, the public reaction to science, scientists, and the contributions of scientific research is likely to be colored by this image. This is particularly true in areas where arguments center around the generalized role of science. For example, the role of scientists in government or the advisability of admitting scientists to positions of high responsibility are issues frequently discussed in general terms. It may even be that the negative reaction of college students to courses in "general science" is attributable in part to the attitudes tapped by the word *science*.

The strong features of the image of the scientist are his high intelligence and his driving concern to extend knowledge and to discover truth. His work is of great value to mankind, and it brings him both a sense of satisfaction and a fair measure of success. The weaknesses in the image are many and disturbing. The scientist is seen as basically uninterested in people and unsuccessful with them. To the contemporary student, a person who does not care for people is suspiciously out of touch with life. The scientist is not interested in art—he has eschewed the life of the spirit that gives breadth and vitality to the life of the mind. Further, the scientist is a nonconformist and a radical, as well as a person with only moderate control of his impulses. These features suggest that college students possess beliefs that can easily be played upon to indict the scientist in times when loyalty is an issue of public concern. The undesirable aspects of this picture of the personal and intellectual life of the scientist make the role hard to accept in spite of the attractiveness of the work and the social contributions of the scientist.

The attractiveness of a scientific career in an abstract sense is clearly indicated by the high rank given it by men in statements concerning what they would like to be. Yet, surprisingly, few women wish to marry a scientist. It must be that, for men, the intellectual status, success, and material well-being of the scientist outweigh the many disadvantages of the scientist image. On the other hand, a woman married to a scientist must accept his personal qualities while benefiting very little in a direct way from the nature of his job.

Students clearly prefer the personality, social opportunities, and style of life of the college professor to those of the scientist. The scientist's only asset, by comparison with the professor, lies in the rewards associated with the work, and the differential is not great. The engineer and the scientist offer relatively interesting alternatives. The scientist is seen as an intellectual, with little capacity for social interchange; the engineer is a more normal "organization man," aiming at a nine-to-five existence, with an interest in good fellowship. It would seem that a student of science who could achieve the requisite training would be strongly drawn to college teaching with its richer, more humane connotations. On the other hand, the attractions of science and of engineering would seem to balance, with a person's view of himself playing an important role in his choice of one or the other.

It is interesting that students intending to pursue careers in science should have a more favorable image of the scientist than their colleagues who are planning other careers. It is not known whether commitment to a field changes the image or whether those with a more favorable image are drawn to the field. Probably both of these processes contribute to this difference.

It is comforting to find that scientists who are identified with their particular specialties are perceived as relatively normal people. These findings indicate that monolithic "science" is a source of concern to many sensitive citizens. On the other hand, men with professional specialties are considered more human, loyal, and comprehensible than "the scientist."

Science as a Way of Life

The standard contemporary response to the finding that a product presents a "bad" image to the public is to turn for assistance to a team of public relations men who are instructed to change the image. To change an image as well developed and as widespread as the image of the scientist appears to be a most discouraging undertaking. This image is imbedded in a system of other stereotypes with which people, even highly educated people, structure their social world. To eliminate the unfavorable connotations from *scientist* would require a brilliantly conceived long-term campaign of confrontation through mass media and of educational innovation that is not likely to be undertaken. But is a massive campaign to alter this image appropriate? Scientists themselves, as well as their faculty colleagues, agree upon the essential features of the image. If it does represent, even in a distorted and exaggerated fashion, the characteristics of American scientists, it may be that to use publicity techniques would not only fail to hide the reality that lies behind the image but might also be dishonest.

Our studies give no data as to the actual (as distinguished from the perceived) characteristics of scientists. Yet C. P. Snow (*11*) has argued that indeed

scientists *are* less interested than most educated men in esthetic matters and social affairs. Perhaps "the discipline" of science *does* narrow a man's interests, does create a group who do not meet the cultural ideal of the broadly educated man. If so, the "solution" is not to be found in an aping of Madison Avenue but, as Snow has also argued, in a more general appreciation on the part of the intellectual community of the demands the scientific mode of thought makes upon anyone, professional scientist or not, who seeks an objective understanding of the world around him. Perhaps, also, scientists have "over-conformed" to their own image of what a scientist is, and perhaps the reality can change as more of them develop the broader interests and cultural appreciation constantly called for by liberal educators.

A final stance for the scientist consists in recognition of the possibility that to be a scientist is indeed to be different. The studies of Roe (*12*) and of Thorndike and Hagen (*13*) have shown that scientists tend to have characteristic developmental histories and personality structures. It may be that in order to do their work, recruits to scientific careers require some of the qualities which, in extreme form, appear in the stereotype of the scientist. If so, cannot the scientist accept this and get on with his work?

References and Notes

1. H. H. Remmers and D. H. Radler, *The American Teenager* (Bobbs-Merrill, Indianapolis, 1957).
2. M. Mead and R. Metraux, *Science* **126**, 384 (1957).
3. E. W. Harbinger and A. LaCava, Wesleyan undergraduates, assisted us in this study. The research was carried out under a contract with the U.S. Office of Education, Department of Health, Education, and Welfare. Additional support was provided by the Faculty Research Committee of Wesleyan University.
4. The occupations that were studied are listed in Table 1.
5. The form of the questionnaire and some of the scales are taken from the work of C. E. Osgood [for example, C. E. Osgood, G. J. Suci, P. H. Tannenbaum, *The Measurement of Meaning* (Univ. of Illinois Press, Urbana, 1957)].
6. The data were collected during 1958 and 1959.
7. A summary of the entire study appears in "College Student Images of a Selected Group of Professions and Occupations," *Final Report, Cooperative Research Project No. 562, U.S. Office of Education* (Wesleyan University, Middletown, Conn., 1960).
8. This study was made by D. H. Bogart, a Wesleyan student.
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11. C. P. Snow, *The Two Cultures and the Scientific Revolution* (Cambridge Univ. Press, New York, 1959).
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Science in the News

The Budget: Kennedy Asks for Science Increases beyond the Increases Ike Recommended

The Kennedy budget recommendations include substantial increases for scientific research, which come on top of the already substantial increases provided in the final Eisenhower budget. In both cases, on a percentage basis, the increases are sharpest for basic research.

Eisenhower recommended an increase of nearly $800 million for overall research and development. This was an increase of about 9 percent, and about 4 times as great a percentage increase as he recommended for federal spending in general. Of the science increase, about $200 million was for basic research, which is a 25 percent increase over the $810 million being spent in the current year and, of course, about 12 times as great a percentage increase as he recommended in overall federal spending.

The details of the Kennedy budget are not all available at the time of this writing. But the over-all increase, exclusive of that for defense research and development, where figures were not available, amounted to around $150 million, with the largest gains for space, oceanography, the National Institutes of Health, and the National Science Foundation.

The National Science Foundation increase, almost all of it for basic research, is $29 million, which comes on top of a $39 million increase already recommended by the Eisenhower budget. This is about a 65 percent increase for the agency, whose research budget last year was just under $90 million. How much of this increase survives the Congressional budget review will offer a fair test of the new Administration's effectiveness in selling Congress on the idea of more support for basic research.

Basic Research and Congress

The difficulty of arousing Congressional enthusiasm for basic research showed up in what happened to Eisenhower's budget requests last year. The following figures, unlike others in this report, are for new obligational authority rather than actual spending. (Congress might, for example, appropriate $100 million in the fiscal 1962 budget for a project that will take 3 years to complete: actual spending in fiscal 1962 might be only $35 million; the rest would be spent in fiscal 1963 and 1964. The figures are for obligations, that is, they include such things as orders placed which will not be filled and paid for until a later year. Actual spending is somewhat less.)

Eisenhower last year requested just under $8 billion for research and development for fiscal 1961, which ends this June. This was a slight decrease from the previous year. Although Congress, as it always does, cut the overall budget requests of the President, it did the opposite with research and development. It gave the President $554 million more than he had asked for. But this increase did nothing for basic research: here Congress cut Eisenhower's requests back from $880 million to $850 million.

In the Defense Department, basic research was not cut, but it received no share in the increase (nearly $500 million) Congress added to the budget for research and development. In the National Institutes of Health, where basic research makes up about a quarter of the research budget, Congress added $4 million for basic research,