Journal of the Minnesota Academy of Science

Volume 25
Number 1 *Vol. 25/26*

Article 59

1957

Social Values and the Scientist-to-be, or Not-to-be

George Helling
St. Olaf College

GEORGE HELLING
St Olaf College, Northfield

SCIENCE AND SOCIETY

Social Values and the Scientist-to-be, or Not-to-be

The problems raised in the preliminary report of the American Association for the Advancement of Science Interim Committee (1957) are of such scope and complexity that I should rather bury what I have to contribute in the joint conclusions of a seminar than attempt to pontificate on them here without classroom immunity. The sphere of social values does, however, seem to fall to the sociologist in the academic division of labor and social values seem paramount in an issue raised on the second page of the report. The committee writes (1957: 144).

> *Public interest in science.* There are indications that the public interest in science is not commensurate with the important role of science in society.
>
> 1) *Shortage of scientific personnel:* We face a major crisis with respect to present and future shortages of scientific personnel. In effect, this means that the social environment in the United States does not elicit a maximum interest in scenes on the part of those individuals who have the capability of doing scientific work, or that our social organization does not permit them to receive the necessary training.

Whatever the future may turn out to be, this problem seems likely to be in the foreground. Newspapers are likely to cast it in a conflict frame with statistics to show that the U.S.S.R. is training engineers and scientific technicians at about twice the rate of the United States, a disparity of incalculable import for modern war. The Committee report, on the other hand, stresses the failure to provide trained personnel sufficient to keep up with the expanding needs of the economy. The forty thousand or so physicists, metallurgists, mathematicians, and engineers that will graduate this June will fall short of replacement and expansion needs in the U. S. by nearly 10,000. Certainly one requires

no further evidence that the disparity between need and supply of men and women trained in science has already reached very serious proportions. The question for our earnest consideration as social scientists and educators is why this has happened.

Obviously the physical and biological sciences, to limit consideration to them for the purposes of this discussion,[1] are not the only fields where need for trained personnel has outrun the supply. One hears frequently of the many unfilled positions in teaching, social work, medicine in rural areas, and even domestic labor, and complaints of such shortages are almost always coupled with a common sense and reasonable—if untested hypothesis that better pay would attract better people and thus erase the problem. The assumption that lack of money is the root of all other lacks is so widespread that we must take a quick close look at it in relation to the shortage we are discussing.

On the cover of *Time* for April 19, 1957 we see the faces of two fairly young physicists, men who in 1953 had indeed their skill and reputations for it but neither capital nor business experience. Today they are number one and number two in Wooldridge Ramo, an electronic equipment manufacturing company whose sales grossed 28.9 million last year and netted a "healthy", says *Time* $2,716,000. Phenomenal? Exceptional? Yes, of course, but accomplished and therefore possible.

At a more familiar level salaries for newly graduated engineers fall most frequently in the $5000 to $6000 bracket while salaries of $7000 are becoming common for the outstanding graduate. Some of us are perhaps painfully aware that the persons who teach them start at a considerably lower level of remuneration. Salaries like these for engineers are not won in stiff competition, evidently. Graduation alone

[1]The AAAS committee uses the term "scientist" with these connotations and we will relate our discussion to theirs by keeping within the frame of reference of the report. As social scientists we can hardly keep from expressing our disappointment, however, that no social scientist was included on the committee and that social science did not play a larger part in its concerns. The immediate personnel situation in social science is, if anything, more acute than in the physical and biological sciences while in regard to the long term implications of training it might be tenably held that even more than we need trained personnel to create our technology and keep it in repair, we need an understanding of the social and individual problems involved in life in such a drastically new milieu as technology has created, an understanding which social science training is best equipped to give.

is sufficient. In fact Dr. R. Buckminster Fuller, the Hill Family Foundation lecturer at St. Olaf this last year, an architect and designer who does most of his work at technical schools, reported that company representatives who visit such campuses are no longer tapping just the top graduates for good jobs, nor even just the graduates. Recruiters now are lining up promising freshmen. The rewards available, especially to the young scientist of marked ability, are not limited to cash. He may in many cases have independence as well. The phenomenal growth of industrial research discussed in the Committee's report, as well as the growing governmental and foundation aid to universities, has opened up hundreds of new positions in research and this in turn has begun to make itself felt in more attractive situations in teaching.

In other words, although the classic relationship between demand and price level clearly seems operative with employers in this country offering unprecedentedly high payment for the service of men trained in science, as well as numerous perquisities that I have not taken time to describe, the supply of young people ready to embark on careers in science and technology paradoxically continues to lag. Perhaps the availability of these opportunities is not known among young people—or perhaps there is more to the question.

The place to look for answers to such questions is in the perceptions, the view of the world, held by young people who are potential candidates for careers in science. Let us turn from the question of fact—for it seems that strong economic inducements do exist—to a somewhat less obvious phase of the question. Clearly, as the training of the scientist is long, arduous, and quite sharply specialized, the original decision to start in science and the reinforcing decisions to stay with it must occur within the educational process at a point far removed in time from the moment that one signs up to work as a scientist or technician. In school, of course, "science" is not a career but a certain grouping of courses of study among many possible groupings.

I am in daily contact with young people in college, young people in the process of making or avoiding the crucial decisions about courses of study that lay the groundwork for careers and for life, after graduation. How do they feel about the rewards and the disadvantages of

science as an area of study in comparison to the alternatives available to them? To go beyond my own inferences as their values I have made a point of sampling student opinion on this subject. Specifically, I asked 21 men and 37 women, all juniors and seniors, my students in a course called Marriage and the Family. I can't claim, of course, that these students represent a random sample of the upper classmen attending St. Olaf, but due to the fact that the course is offered to students from all departments without prerequisites and that evidently a good many sign up for it under the wishful illusion that it will prepare them for their own marriages, this course probably has as hetergeneous a collection of enrollees as can be found in any classroom at our school. These students were asked on the basis of their own best judgment—judgment to be tied as closely as possible to their own experience—to rank from most to least difficult these four areas of study: the natural sciences, the social sciences, literature and the arts, and a practical or vocational training course outside of the liberal arts curriculum, for example, business administration as taught in a commercial school or animal husbandry as taught in an agricultural school. Papers were unsigned and reading them over gave no reason to doubt that they were candid. "Difficulty" was defined as the degree of intelligence and effort required to earn a given grade.

After this first ranking, the respondents went back and ranked the same four areas of study in regard to career opportunities available to the graduate who majors in each, and again for value of the field of study in terms of fullest personal development of the student.

TABLE 1—*Frequency distribution of rankings* of four academic fields of study from most to least difficult.*

Sequential Occupance of St. Cloud, Minnesota

	Nat. Sci.	Soc. Sci.	Lit. & Arts	Voc.	N
Most Difficult	45	7	6	0	58
2nd	8	26	20	4	58
3rd	2	21	23	12	58
Least Difficult	3	4	9	42	58
Mean rank	1.36	2.38	2.60	3.65	

*Observations are significant beyond the .001 level by Chi square test.

TABLE 2—*Frequency distribution of rankings* of four academic fields of study from the best opportunities for career employment on graduation to the poorest.*

	Nat. Sci.	Soc. Sci.	Lit. & Arts	Voc.	N
Best Opportunities	30	11	5	14	58
2nd	16	10	14	16	58
3rd	6	32	4	12	58
Poorest Opportunities	6	5	35	7	58
Mean rank	1.79	2.53	3.19	1.89	

*Observations are significant beyond the .02 level by Chi square test.

TABLE 3—*Frequency distribution of rankings of four academic fields of study from the greatest educational value for the individual to the least.*

	Nat. Sci.	Soc. Sci.	Lit. & Arts	Voc.	N
Greatest Ed. Value	17	13	23	6	58
2nd	14	18	13	12	58
3rd	16	19	13	10	58
Least Ed. Value	11	8	9	30	58
Mean rank	2.36	2.38	2.13	3.10	

As to difficulty, the natural sciences led the field. Social science was next, literature and the arts third, and the vocational course was considered by far the least difficult. In regard to career opportunities, the students also put natural science at the top of the list, followed quite closely this time by the vocational training course, with social science considerably below and the arts well below that. Literature and the arts, however, led the others in regard to educational value as the students saw it, followed closely by natural and social science while vocational training not surprisingly was ranked lowest in this quality by nearly all.

There is nothing in these results dramatically unexpected. Cultural subjects, literature and the arts, still have highest prestige as the real educators though there is a strong sex difference, with girls much more likely to appreciate these courses than boys, and as a matter

of fact exerting a sufficiently strong differential influence to give them first place. Courses in this area are not seen by either sex as producing much in the way of marketable skills. Vocational training, on the other hand, is seen by liberal arts students as both easy and marketable but very little else. Thus it would appear that the real value of a college course as perceived by college students and reflected in their academic programs is not measured in the dollars and cents of earning capacity that it provides. If money really is the measure of all things outside the ivory tower the students live in an unreal world—but it is real to them and that is what counts in the question we are now examining.

Even more directly in line with out interest is the clear and unambiguous student selection of the natural sciences as meaning both harder work in college and the best career opportunities on graduation. Thus we may answer the question we raised when discussing the opportunities for well paid careers that do in fact exist for graduates in science. It is not ignorance of these opportunities that keeps students out of the sciences. They are aware of them. Let us then look at the other attribute of science as a field of study so universally recognized by the students, its difficulty. Is it then the threat of hard work that is keeping students out of science courses?

To answer this let us consider a group of students that work considerably harder than science majors, the athletes. I am perfectly serious. Part of the reason for the difficulties athletes have all too frequently in the classroom stems directly from the fact that they have so little energy left to give it. Football players, after hours of grueling practice and physical punishment, fall into bed too tired even to think. They give up cigarettes, strong drink, feminine companionship and other recreational interests, if not completely, then at least to a degree that we never expect of even our most dedicated "A" students. They work this way eagerly and voluntarily for not so much as a single academic credit—at least at the schools represented here.

The idea that the easy is popular and the difficult is not received an experimental test by U. S. Army units shortly after World War II. At one camp the army gave its new draftees a late reveille, very good food, and sponge rubber mattresses on their bunks. It allowed private radios and regular passes and even instructed the drill sergeants to be gentle and persuasive. In contrast to this the Marines continued

their brutal, debasing, and extremely rugged course of training which built the kind of morale for which this branch of the service is famous. After a trial period, the army discontinued the soft easy training period as ineffectual in providing either good soldiers or *esprit de corps*. The sociological principle involved here is discussed in detail by Rose (1956). Social case work provides many examples of rehabilitation of a discouraged or delinquent individual through the accomplishment of hard but meaningful work.

Exhaustive exploration of this phenomenon is presently impossible but perhaps enough has been said to point to a conclusion namely, that hard work, sacrifice, and achievement through the overcoming of difficulty can take on a strong positive valence for youth. It follows from this that the hard work of the science course is in itself an inadequate deterrent to account for the unfilled need for science majors in our schools.

It has been my purpose merely to lay open an issue for discussion, delineating some of the elements as they appear to a sociologist. This is not a research paper and thus far we certainly have kept our approach to a common sense level. But it is beginning to appear that common sense, far from resolving our dilemmas, is only adding to the confusion. We have taken seriously what are probably the two most frequent complaints about a line of work, "The pay is not enough" and "The work is too hard," but when we applied them to our problem we found that they could not be taken at face value.

We are thus forced to consider the possibility that there is something the matter with these common ideas of how people are motivated. Especially are we led to doubt the efficiency of empathy in bridging the cultural barrier between an adult to whom the workaday world is present reality and the student to whom it is an abstract idea. Many profess to find it a hopeless riddle that students will sacrifice their studies and their preparation for life work to worry, labor, plot and plan for such ephemeral achievements as a place on the team, a campus office, or a date with the homecoming queen. While it is true that the glory of the 80-yard run may vanish after college, the queen may date another tomorrow or next week. Campus political victories may be but the ghost of a ghost of real political power; their lack of importance and durability outside of the student world is quite

beside the point. In the campus world these things win recognition that is as real as a welcoming smile and an admiring comment. Appreciation by people that count with one is real reward, of course, and perhaps more important one does not have to wait until graduation to get it.

Criminologists must be realists about human motivation and they have long since shown that threat of possible horrible punishment in the far future does not deter people from crime. The drawing and quartering of a convicted pickpocket didn't even keep pickpockets from working the crowd gathered to watch. As a deterrent it is not the degree of punishment but its immediacy and inescapability that count. It would be grossly oversimplifying to say that rewards too are effective merely in so far as they are immediate and inescapable, that is to say dependable, but according to many reputable social psychologists, even those far from the orthodox behaviorist point of view, this is a most important set of components in the total motivational complex. See for example O. Hobart Mowrer (1950). Perhaps if, instead of piling up treasurers for graduation, which the poor sinner may never reach, we scattered more of them along the way we would have more success in winning and keeping students in the sciences. This is, of course, speculation, as it is so far from the set of assumptions that seem to be operating in our schools and colleges at present that it is hard to find evidence that will allow us to check theory against reality. Of course there is an occasional teacher whose personality has sufficient impact so that his word of praise is real reward and who also has the time and incentive to appraise and praise student work. But there are too many other factors in the effectiveness of the good teacher to allow this to be an adequate test.

On the other side of the Iron Curtain the approach is getting a trial under less than optimum circumstances but still with an appreciable degree of success as we have seen. In Russia, there is enormous personal prestige connected with engineering training, for example, for appointment to such a school is *prima facie* evidence of superiority in ability as shown on tests. Under a communist system, of course, the student is paid for attending school. While there his only routes to personal prestige are superiority in studies and devotion to the party, so everyone may show either his talent or his loyalty. Every-

one knows that his future hangs directly upon these two pegs. What this really means is that the student competes within a student world that is an extension of the real world rather than an alternative to it.

One is reminded again of the Marines whose rugged training results in high morale by being linked to a definition of the situation and the self that enhances the self image when one is able to say, "I'm tough; I can take it. I'm a real Marine." Unlike the experimental army groups but like the Russian school for engineers, Marine training takes its stated goals seriously. The Marine boot cannot emotionally stand apart from it—"existing" until the 5 o'clock whistle blows when he can start "living" for himself again, for it takes up all his time and all his energy. It establishes the value context in which symbolic rewards and interpersonal relationships take their meaning. It is from this and not his punitive discipline (which, of course, prisons can also exercise) that the Marine drill instructor gains his enormous power over his charges. His word of censure or acknowledgment of a task well done speaks volumes to one who has come to accept himself not as an individual but as a good or a faulty approximation of a real Marine.

Should this be our goal for training in science? I doubt it. The need for the educated "whole man" and for creative capacity and breadth of vision among our scientists militates against such a program even if it were otherwise possible. But we are faced with a serious problem and we must not be too proud to learn—to take what we can and apply it.

In summary, we need scientists, both for the possibility of war and for the possibility of peace, and to get them we must induce students to embark relatively early in their school careers on a course of study that they themselves describe as the most difficult of any. Though our society is ready to reward the graduate with a handsome livelihood, reward so long deferred has small effect in motivating college students. To be effective the rewards must be real and they must come regularly as he progresses in his training. Most effective of all would be the lifting of the status of scientific training in the eyes of the people who "count" with the student to such a degree that his academic achievements would bring immediate rewards in prestige and appreciation among them and a consequent enhancement of his view of himself. This, as can be seen, goes somewhat beyond the once

a year Honors Day ceremony customarily ignored by those students not receiving honors. If we really do value trained people more than old grads who had a lot of fun in college, we should act like it. We cannot and need not make hard work easier, but we can make it meaningful and challenging. We can indicate to the serious student in the sciences that the rest of us need and appreciate his efforts. It is, after all, no more than the truth.

LITERATURE CITED

AAAS INTERIM COMMITTEE ON THE SOCIAL ASPECTS OF SCIENCE. 1957. Social aspects of science, a preliminary report of the interim committee. *Science* 125: 143-147.

MOWRER, HOBART O. 1950. Learning theory and personality dynamics. New York, Ronald Press Co.

ROSE, ARNOLD. 1956. *Sociology: the study of human relations.* New York, A. A. Knopf.

TIME. 1957: 69: No. 17.