

# **BLACK SCIENTISTS, WHITE SOCIETY, AND COLORLESS SCIENCE:**

**A Study of Universalism in American Science**

**Willie Pearson, Jr.**

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## **Chapter 1 Toward a Sociology of Black American Scientists**

Since the 1950s, there has been a growing body of literature in sociology on the relationship between science and society. Robert K. Merton's (1973) work is probably the most important in the area and, without question, has had a strong and enduring influence on both early and contemporary themes in the sociology of science (Mahoney, 1976). Merton's description of the normative structure of science laid the groundwork for research on the reward system of science. For Merton, the principal institutional goal of science is the extension or advancement of certified knowledge.

There are, however, certain rules regarding how this knowledge should be advanced in science. While some social institutions, such as the polity, economy, and the family, have these rules codified into law, science does not. As a consequence, the behavior of scientists in the performance of their roles as scientists is guided by a socialization process under the direction of science teachers. Science recruits learn their potential roles as scientists through this socialization process and these role expectations are transmitted through the teachings and personal examples of their mentors and teachers. Technical norms, such as those governing the research process, in contrast, are learned through the multifaceted process of lectures, experimentation, problem sets, and exercises. Because behavioral norms are learned through precept and personal examples and not in the manner in which technical norms are, it is doubtful that most scientists would be able to discuss such norms directly. Nevertheless, while it could be argued that this is so, it does not, in any way, diminish the influence of these norms on the behavior of individuals in the performance of their roles as scientists (Gaston, 1973).

Merton suggests that four basic norms contributing to the "ethos" of science guide the behavior of scientists. These are: universalism, organized skepticism, communality, and disinterestedness. These norms define a significant part of the ideal culture of science, not necessarily how science functions.

*Universalism* is based on the principle that all scientific contributions are to be evaluated strictly in a purely impersonal—objective—fashion. Thus, a given contribution should not be accepted or rejected merely on the basis of some particular trait of its contributor such as race, ethnicity, sex, religion, nationality, or social origin. It is in this sense, too, that science is believed to transcend all political boundaries. This norm orients the scientist to recognize scientific talent irrespective of any personal characteristic of that scientist. If scientists were to behave otherwise, science would not operate at its optimum level of efficiency. Obviously discrimination, be it racial, sexual or otherwise, would not be in the best interest of the goal of science (i.e., extending knowledge). Moreover, Merton believes that science, as a social institution, probably operates most efficiently in a political environment that is democratic and liberal—relatively free of political control or interference. History has demonstrated that when science has fallen under the control of a political system it has not operated at its optimum level of efficiency (see, for example, Merton's [1973] and Barber's [1952] discussions of the purge of so-called non-Aryan scientists in Nazi Germany and Russia's choice of Lysenkoism over neo-Mendelian genetics). Given these historical incidents, we would expect black Americans in the U.S. to work in one of the more favorable scientific environments.

*Organized skepticism* directs scientists to scrutinize carefully the findings of other scientists including those on which they are basing their own work. Indeed, it is the responsibility of scientists not only to make public their criticism of any scientific publication but also to subject their own work to critical evaluation by publishing in professional journals. All scientists—regardless of their position in the prestige hierarchy—must have their work subjected to critical evaluation before being accepted. This is not to say, however, that all scientific work is to be replicated in order to determine its accuracy. Rather, it suggests that scientists are held accountable for the accuracy of the data they publish or cite. This self-regulation seems to work very well in view of the limited amount of fraud that apparently occurs in science. In fact, the mere identification of fraud lends further support for the norm.

*Communality* is based on the principle that all empirical knowledge is the property of the scientific community and not of individual contribu-

tors. Thus, scientific knowledge is not only public knowledge but is to be shared equally with all members of the scientific community. Scientists are expected to share their scientific knowledge with their peers primarily in the form of published articles in scientific journals. As a consequence, secrecy would be counterproductive to the institutional goal of science. In short, a given scientist's claim to intellectual property (i.e., published research) is limited to the recognition and esteem by scientific peers. Ideally, recognition is commensurate with the significance of the published work to the advancement of knowledge. Therefore, given scientists may expect, in terms of rewards, to get what they deserve.

*Disinterestedness* encourages the pursuit of science for the sake of science and not for personal recognition or economic gain. In essence, scientists ought not to be concerned with furthering their own personal reputation. Rather, they are supposed to be driven by the desire to advance knowledge for the sake of knowledge. Therefore, the most desired reward for such behavior is to be held in high esteem by peers—to be recognized for contributing original ideas. This should not be interpreted to mean that scientists are not concerned with obtaining the maximum salary for their job performance but, rather, to indicate that scientists are motivated foremost by their desire to advance the state of knowledge in their respective fields. This norm is expressed most clearly in the fact that scientists *generally do not have their discoveries patented*.

The norms constituting the "ethos" of science are legitimized in terms of its institutional values. Through a process of "anticipatory socialization," norms are transmitted to the prospective scientists by both precept and example. Prospective science recruits develop an identity as scientists by internalizing the norms of science, a process which is facilitated through constant reinforcement.

To the extent that Merton's views are correct, one would expect a high degree of conformity to these norms by most members of the scientific community. Implicit in the Mertonian model of science is the assumption that scientists are motivated to subscribe to the norms of science primarily because of the importance of these norms for the continued and adequate flow of the commodity (i.e., certified knowledge) in which they have a vested interest. As mentioned earlier, not all scientists are necessarily aware of this particular process. However, through the multifaceted process of seeing the general necessity for such patterned behavior, of training and reinforcement, and through close and congenial relationships with other scientists, the norms comprising the "ethos" of science become institutionalized and internalized. These norms are important to scientists not so much because they are beneficial for science over the long run but,

rather, because they are something in which scientists have a vested interest. Thus, scientists not only support the norms of science but also believe that the norms are essential if the exchange system of science is to operate at an efficient level (Storer, 1966).

These norms are germane to the examination of the influence of race on scientific careers. They provide an excellent base for the study of conditions under which the norms are observed and what the possible consequences are for conformity to or deviance from them. More important, these norms provide a unique perspective for examining the internal operations of the social institution of science (Gaston, 1973).

Let us return to the norm "universalism" for a moment. Recall that this norm finds its most immediate expression in the principle that scientific contributions should be evaluated irrespective of the functionally irrelevant statuses of the contributors. In short, ascribed statuses such as sex, social origin, or race are not supposed to be used in the evaluation of the contribution of a given scientist. Furthermore, one would expect, in light of the tenets that guide the reward system of science, that scientists would be rewarded for the quality of their work and not because of some criterion such as race.

However, given the position of black Americans in various other social institutions, why should we expect science to be any different when it comes to racism and discrimination? This question is especially important when one considers the argument that, as a "set," the norms that comprise the scientific ethos seem to be peculiar to the social institution of science.

This brings us to the point that if science is truly governed by an ethos which includes the norm of universalism, we should expect racial discrimination to be absent or, at the very most, minimal. The term discrimination here means that functionally irrelevant statuses are used in the evaluation of individuals in the performance of their role as scientists. In short, equals are treated unequally. Obviously, in an ideal social system, a scientist's role performance would be evaluated solely on universal criteria. Thus, an individual's position or rank in the stratification system of science would be determined by the quality of the performance of the role as scientist. Among the varied roles that a scientist would perform would be those as researcher, teacher, and administrator. Role performance would be evaluated and rewarded in accordance with level of performance. And this would be reflected in the scientist's position in the stratification system of science. Thus, in the evaluation process, a scientist's racial identity should not take precedence over ability. If, however, a functionally irrelevant status such as race is involved in role performance

evaluation, then there is discrimination in the system (Cole and Cole, 1973).

Naturally, there are many critics of the Mertonian model of science who argue that science, like all social institutions, exists in an interdependent state (i.e., it interacts with other social institutions by exchanging its own "outputs" in receipt for the "inputs" of others) and does not approach its ideal state any more than the institution of sport which makes similar claims about being a purely rational and universalistic system. Moreover, it is argued that science does not operate in a vacuum and therefore cannot escape the racism and sexism that pervades society in general. For example, critics of the Mertonian model of science often point to the fact that black Americans and women are grossly underrepresented in science (particularly at the doctoral level) in comparison with their proportion in the general population as evidence in support of the fact that race and sex do influence scientific careers (Cole and Cole, 1973).

Because these norms are "ideal," they are not adhered to at all times by all scientists. Even so, sociologists of science have found considerable support for Merton's perspective. The relevant literature in the sociology of science provides some excellent clues for the study of the influence of ascriptive status on the scientific careers. Science is believed to approach its meritocratic goal more than any other social institution (Cole and Cole, 1973; Gaston, 1978). This is due, primarily, to the nature of the reward system of science which specifies that scientists be rewarded (recognized) on the quality of their role performance which is measured in terms of both quality and quantity of publications. It appears that in science most rewards, whether honorific awards, appointment to distinguished academic departments, receipt of prestigious prizes or various other forms of recognition, are related in some way to the quality of the scientist's role performance (Cole, 1979). This is not to say that science is without its share of deviant cases (see, for example Klein, 1971; Zuckerman, 1967; Cole, 1979).

Perhaps the most important contribution of the sociology of science for this study is its identification and description of the reward system. Its appeal lies, however, in the fact that it has amassed a considerable amount of evidence indicating that "there is a high degree of fairness in the distribution of scientific rewards" (Cole, 1979:5). If this is the case, as some have argued (see Gaston, 1978; Cole and Cole, 1973), one would expect that black American scientists are similarly treated. This conclusion remains purely speculative, for black Americans have been conspicuously absent in sociological studies of the reward system of science.<sup>1</sup> But

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sociologists of science do provide us with some evidence of the effects of ascriptive status (e.g., gender and ethnicity) on scientific careers. No evidence could be found of behavioral discrimination against Jews in American science as a group (Cole and Cole, 1973). Data show, however, that women scientists do face discrimination, particularly in academic promotion (Cole, 1979; Cole and Cole, 1973). It is most interesting, but not surprising, that black American scientists have been, for the most part, objects of scholarly neglect.

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## **Chapter 6 The Effects of Ascriptive Status on Scientific Careers**

It has been suggested that future studies of scientists should consider the possible role of ascription (race) in career patterns (see, for example, Wanner, Lewis, and Gregorio, 1981; Clemente, 1974; Cole and Cole, 1973). In this chapter I examine the role of ascription—race—in scientific career patterns. To this end, I will first review relevant studies of the reward system in American science and the implications of the findings for black scientists. Then, I will examine differences in the career opportunities of three cohorts of black American scientists. (For an explanation of the cohorts, see Chapter 3.) Both qualitative (i.e., personal interviews, biographies, etc.) and quantitative data will be used to assess the degree to which the American scientific community operates in a universalistic fashion. In addition, the career patterns of a matched sample of 43 black and 43 white scientists will be examined.

### **Relevant Studies of the Reward System**

Probably the most important theoretical work on science as a social institution was written by Robert K. Merton. Even his most ardent critics acknowledge his contributions to the sociology of science. In fact, his ideas on the reward system of science have served, and continue to serve, as a springboard for many systematic studies in the sociology of science. Merton (1957) posits that when the institution of science operates at its optimum level of efficiency, recognition and esteem will accrue to those individuals who have best fulfilled their roles as scientists. Recognition by one's peers is perceived by Merton to be at the heart of this reward system.

Cole and Cole (1973) assert that science, more than any other social institution, approximates the ideal of universalism in its assignment of individuals to scientific positions. Reskin (1976:597) stresses that "implicit in the norm of universalism is the dominance of achievement rather than ascription in the distribution of scientific rewards." If this is the case, rewards received by black scientists should be a function of their role performance, not racial status. Yet, several researchers have called into question the degree to which the norm of universalism is dominant in American science (see, for example, Julian, 1969; Young and Young, 1976; Green and Driver, 1976; Mitroff, 1974; Rothman, 1972).

Crane's (1965) study of American biologists, psychologists, and political scientists showed a general lack of congruence between scientific productivity and recognition. It also showed that there were advantages to be gained by being in a research environment at a major university. She conducted personal interviews with 150 scientists at three universities categorized according to varying degrees of prestige: (1) institutions with a history of prestigious research; (2) institutions with some prestigious departments; and (3) those with serious research efforts coming only after World War II. Crane concluded that scientists receiving their doctoral training among Berelson's (1960) twelve top-ranked universities (category one) were more productive than those trained in the universities in categories two and three. Scientists at the major university were more likely than those trained at a non-prestigious university (as classified by Berelson) and now located at the major university to be productive (41 percent versus 36 percent were highly productive). Productivity was measured by counting books or a series of articles on a particular research problem as a major publication. Only postdoctoral publications were counted.

Recognition was measured by counting the number of honorific awards the scientists had received with the honors dichotomized as either high or low in terms of prestige. As a control, Crane took into account age at receipt of Ph.D. Scientists at the major universities held the highest recognition (58 percent), followed, in descending order, by those at category two universities (35 percent), and finally, those in category three (17 percent). Regardless of institution of Ph.D. origin, more scientists at the major universities enjoyed high recognition. However, scientists having their doctoral origins in a non-top twelve university and later appointed to such a university had achieved more recognition than those having their origins in a top twelve university and later appointed to a university in categories two and three.

Although Crane found recognition and scientific productivity to be

positively correlated, this correlation was not perfect. For example, although the high producers generally won the highest recognition (honors), institutional affiliation appeared to be of some influence in that recognition process because high producers at the major university enjoyed a recognition advantage over their peers in less prestigious universities. In fact, Crane states that high producers at lesser universities were no more likely to have won recognition than unproductive scientists at major universities. This finding suggests that some particularistic criterion may be operating.

Using a sub-sample of 576 American physical and biological scientists, selected from a larger sample of 4,440 graduate faculty members of American graduate institutions, Hargens and Hagstrom (1967) investigated the effects of graduate school and research productivity on a scientist's academic affiliation. Their data indicate that, of the scientists with high productivity, a greater proportion of those earning Ph.D.s in high prestige institutions (51 percent) than those having Ph.D. origins in other institutions (24 percent) held appointments at an institution in the highest prestige category. Among the low producers, however, slightly more than one-fifth (22 percent) with doctorates from high prestige institutions were affiliated with a top-ranked institution. Thus, in terms of implications, Hargens and Hagstrom's findings are similar to Crane's. Even after controlling for the effects of productivity, prestige of institution of Ph.D. origin is related to prestige of current institution of affiliation.

The purpose of Cole and Cole's (1967) study was to determine whether the reward system in American science operated to recognize quality of role performance irrespective of the scientist's social-educational background or origins. Their sample consisted of 120 American physicists, many of whom were eminent. The Coles examined data concerning number of publications, quality of publications (assessed by number of citations), number and prestige of honorific awards, prestige ranking of departments of affiliation, and the extent to which the respondents were known by their peers in the physics community. They concluded that quality of research, rather than quantity, was the single most important determinant of recognition. Like Crane (1965), and Hargens and Hagstrom (1967), the Coles report that high quality research by scientists in top-ranked departments is more often recognized than comparable research by scientists affiliated with less prestigious departments.

In another effort to understand the social factors which impact on postdoctoral career appointments, Long (1978:902) reports that "neither the number of publications a biochemist has produced nor the number of

citations he has received significantly affects the prestige of his initial academic appointment." According to Long, the factors which are most related to initial academic placement are graduate institution, sponsorship, and postdoctoral study. He believes that the first appointment is based more on particularistic than universalistic factors. Long also contends that even if subsequent career success (after first appointment) is based more on objective criteria of productivity, the initial appointment (which is independent of earlier productivity) has a significant impact on subsequent productivity and therefore the prestige of second institutional location. Long concludes that a scientist's initial postdoctoral appointment plays a significant role in the chances of that scientist becoming a successful researcher. Because recruiters have incomplete evidence, they may tend to recruit on the basis of the reputation of the mentor and the quality of the postdoctoral department. At any rate, Long believes that the initial decision has a significant effect on the career of the scientist.

In a related study, Long and his associates (1979) examined the initial placement of 239 male Ph.D. biochemists and also found that prestige of the first postdoctoral appointment is most influenced by ascriptive factors. In a more recent study, Long and McGinnis (1981) examined the relationship between scholarly productivity and the organizational context where 557 male biochemists were employed. Their analyses led them to conclude that:

...recruitment operates independently of productivity suggesting that, to the degree that publications and citations are reflective of a scientist's contribution to scientific knowledge, the stratification system in science is far from universalistic (p. 441).

In another recent study, Hargens and Hagstrom (1982) suggested variations among fields in the degree to which status attainment is determined by adherence to universalistic criteria of evaluation. They believe that in fields (e.g., physics, chemistry, etc.) characterized by consensus on research goals and means, academics will usually evaluate individuals more on the basis of scholarly accomplishments than on the basis of ascriptive characteristics. Hargens and Hagstrom conclude that in fields with high consensus and codification, it is easier for skilled or talented academic scientists to experience various kinds of success in their careers. The reverse holds true for fields characterized by low consensus. Scientists in fields not characterized by high consensus and codification are more open to evaluation on the basis of particularistic criteria.

Both Reskin (1976) and Cole (1979, 1981) have located sources of

discrimination against women in science. Comparing gender differences in the status attainment process for a sample of 450 Ph.D. chemists, Reskin's analysis showed significant differences between males and females. This finding led her to conclude that males were able to accumulate advantages over their careers. For male sample members, expected patterns of relationships emerged. Thus, quality of professional training and graduate school performance were associated with receipt of a prestigious award which was, in turn, associated with high status postdoctoral positions and scholarly output (i.e., publications). This was not the case for females. They appeared not to accumulate such advantages. Her statistical analyses derived gender interactions for the determinants and the occupational consequences of postdoctoral awards. In fact, these interactions failed to emerge only with regard to the impact of the postdoctoral fellowship experience on productivity. These findings led Reskin to question the degree to which achievement norms are operative in the status attainment process in science, particularly in relation to the careers of women. In short, she calls into question the notion that status attainment in science is based primarily on universalistic criteria.

Cole's study of women in science also shows evidence of the presence of some sex discrimination in the American scientific community. After taking into account several important factors, such as career interruptions and quality and quantity of research output, Cole found that female scientists were less likely than their male counterparts to be promoted to senior academic ranks. In those instances in which they were promoted, their ascension was usually not as rapid. However, Cole believes that overall status inequality between the sexes in science has been reduced rather sharply over the last fifty or more years.

In Cole's opinion, the biggest obstacle for women in science occurs in informal activities such as laboratory discussions and debates and social networks where ideas are exchanged. In essence, female scientists appear to be excluded from the good-ole-boy network.

Addressing some of the shortcomings of his own study, Cole admits that his analysis has focused only on the survivors and therefore neglects important questions about the filtering process which affects women before they enter science. Furthermore, as he points out, far too little is known about the occupational decisionmaking process of adolescents and youths in general, and women in particular.

Among the areas suggested by Cole for further study is that of accumulative disadvantage. Cole points out that we have little information about the process of accumulating disadvantages, especially as it relates to possible restrictions on the careers of female scientists. Finally,

our measures of discrimination continue to be unsophisticated and in need of substantial improvement. In the next section, I examine the scientific careers of the black and white respondents in order to determine the extent to which race affects career patterns.

### CAREER PATTERNS OF BLACK SCIENTISTS: A COHORT ANALYSIS

#### First Position

##### *Cohort I: Pre-1955 Ph.D. Recipients*

Black respondents earning their Ph.D.s during this earlier period were more likely to report having their first positions in historically black colleges (see Table 6.1). In fact, more than six in ten began their first postdoctoral positions in these institutions, while about one-fourth found employment in predominantly white colleges. However, more than one-tenth (14 percent) secured positions in industry and government. In contrast, whites earning their doctorates during this period generally found employment in predominantly white colleges at the same rates as blacks in historically black colleges (61.9 percent versus 62.4 percent). Less than two in one hundred took their first position at historically black colleges; however, more than one-third entered industry and government. These differences were statistically significant at the .0001 level. Further inspection of the data shows that white scientists are more likely to be concentrated first in predominantly white colleges and second, in industry. Black respondents, on the other hand, were noticeably absent from industry. I expected this variation to be explained by differences in field distribution. However, when the data are examined by field, the same pattern prevails (table not shown).

Another possible explanation may be related to quality of Ph.D. department of origin. Generally, a student's chances of embarking upon a research and teaching career in a major university are greatly enhanced if the student has obtained a doctorate from one of the top-ranked graduate schools (Caplow and McGee, 1965). Brown (1967) argues that a student earning a Ph.D. in a top-ranked department has about a sixteen percent chance of being offered employment in a similarly ranked institution, but a student earning a doctorate from a department outside of the top-ranked has only a two percent chance of receiving such an offer.

**Table 6.1**  
**Type of Employing Institution for**  
**First Postdoctoral Appointment**  
**by Race and Cohort**

Employing Institution	Cohort I (a) (Before 1955)		Cohort II (b) (1955-1964)		Cohort III (c) (1965-1974)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Historically Black College	62.4	1.7	46.0	3.9	36.6	5.6
Predominantly White College	23.5	61.9	35.0	67.6	46.9	74.4
Industry	8.2	28.1	11.0	23.4	16.6	14.4
Government	5.9	8.2	8.0	5.1	6.1	5.6
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	( 85)	(231)	(163)	(256)	(314)	(195)

Note: Total may not sum to 100 percent due to rounding.

(a)  $\chi^2 = 155.58$ ,  $p < .0001$

(b)  $\chi^2 = 115.89$ ,  $p < .0001$

(c)  $\chi^2 = 75.92$ ,  $p < .0001$

An examination of the quality of Ph.D. department of origin of black respondents showed no significant differences in terms of first position (see Table 6.2-A). In short, having a Ph.D. from a prestigious department did not, for the most part, give black scientists any advantage in the job market. Regardless of Ph.D. origin, black respondents were more likely to start their careers in historically black colleges. However, graduates of distinguished departments were more likely to enter jobs in the non-academic sector. Although graduates of unranked departments are more highly represented among those black respondents starting their careers in predominantly white institutions, this is more a function of their small numbers.

Table 6.2-A  
First Job by Race, Quality of Ph.D.-Granting Department  
Cohort I (Before 1955)

Employing Institution	Unranked (a)		Adequate/ Adequate + (b)		Strong/ Distinguished (c)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Historically						
Black College	45.5	0.0	70.0	4.2	61.4	1.1
Predominantly						
White College	45.5	53.6	20.0	66.7	20.5	61.9
Industry	9.1	35.7	6.7	22.9	9.1	28.4
Government	0.0	10.7	3.3	6.3	9.1	8.4
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	( 11)	( 28)	( 30)	( 48)	( 44)	(155)

Note: Total may not sum to 100 percent due to rounding.

(a)  $\chi^2 = 15.99, p < .001$

(b)  $\chi^2 = 38.61, p < .0001$

(c)  $\chi^2 = 101.35, p < .0001$

Further analyses of the data on academic appointments for Cohort I indicate significant differences between black and white respondents in the level of prestige of their first position ( $p < .0001$ ). About nine in ten blacks, as compared to five in ten whites, began their academic careers in unranked departments. White respondents were slightly more than five times as likely as their black colleagues to begin their careers in departments rated adequate or adequate plus (16.3 percent versus 2.8 percent). In regard to departments rated strong or distinguished, three in ten white respondents but only one in ten black respondents started out in such departments. Again, having a doctorate from a prestigious or distinguished department *did not* provide much advantage for black respondents in terms of their initial placement in the academic stratification system.

One of the most candid statements on the employment opportunities of black science doctorates during the first half of the twentieth century was written by the eminent industrial chemist, Percy Julian (1969:148-149) who stated:

[U]p to just a few years ago, the ghetto was his total life abode; he lived there and he worked there. . . . Moreover, apartheid exclusion from the society of his peers (*since no outstanding college or university of the majority race even in the North dared or even desired to offer him a post*) made his doctor's degree much of a farce. . . . of course, *industry excluded him almost completely* from an exploitation of his latent scientific talent. (Author's emphasis.)

Most of the black interviewees earning Ph.D.s prior to 1955 felt that their career opportunities were extremely limited in the initial entry into the labor force. Some comments are illustrative. One of my black respondents from this cohort had this to say: "When I was in graduate school, blacks had no future to look forward to unless they were going to teach in some black college." He explains, "There were two people in my graduating class who were never asked to have an interview with any industrial recruiters who visited the campus—myself and a Jew."

At a recent meeting of the American Association for the Advancement of Science (AAAS), six black American scientists who earned their Ph.D.s during the 1930s and 1940s reflected on their careers. While each of the six scholars reported having a full and successful career in science, each related stories or incidents of unfairness and discrimination. Specifically, one scientist stated that his graduate school advisors instructed him not to apply for positions at predominantly white institutions in that state (*American Association for the Advancement of Science News*, 1983).

### Cohort II: 1955-1964 Ph.D. Recipients

Changes in the distribution of scientists in the labor force for the first postdoctoral position were beginning to manifest themselves during this period (see Table 6.1). This was especially true for blacks. The proportion of blacks taking their first jobs in historically black colleges declined by 16 percent relative to Cohort I. Likewise, the proportion of blacks in predominantly white colleges, industry, and government increased by 11.5, 2.8, and 2.1 percent respectively. Therefore, most of the decline at historically black colleges resulted in increased black representation at predominantly white colleges. The greatest changes for whites occurred in the shift from non-academic employment to academic employment, particularly in predominantly white colleges and universities. Despite the noticeable decline in the proportion of black respondents starting their careers in historically black colleges, significant differences between black and white respondents, with respect to initial appointment remain ( $p <$

.0001); and these differences persisted regardless of discipline.

As was the case for black respondents in Cohort I, having a Ph.D. from one of the two top-rated departments *did not* provide any advantage in terms of initial placement in the job market (see Table 6.2-B). It was true, however, that in this cohort black graduates of top-rated departments exhibited entry patterns which were more diverse than those reported by their peers in the previous cohort.

**Table 6.2-B**  
**First Job by Race, Quality of Ph.D.-Granting Department**  
**Cohort II (1955-1964)**

Employing Institution	Unranked (d)		Adequate/ Adequate + (e)		Strong/ Distinguished (f)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Historically Black College	32.2	9.8	58.5	4.3	49.0	1.5
Predominantly White College	42.4	66.7	28.3	67.1	33.3	67.6
Industry	10.2	17.6	9.4	24.3	13.7	25.0
Government	15.3	5.9	3.8	4.3	3.9	5.8
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	( 59)	( 51)	( 53)	( 70)	( 51)	(136)

Note: Total may not sum to 100 percent due to rounding.

(d)  $\chi^2 = 12.62$ , n.s.

(e)  $\chi^2 = 44.82$ ,  $p < .0001$ .

(f)  $\chi^2 = 68.21$ ,  $p < .0001$ .

Among those scientists beginning their careers in academia, white respondents were considerably more likely to have had their initial placement in higher rated departments. For example, while nearly six in ten (56.5 percent) white respondents began their careers in unranked departments, almost nine in ten (88.1 percent) black respondents began in these departments. Moreover, whites were three times as likely as blacks to have started their careers in departments rated adequate or adequate plus (19 percent versus 5.9 percent). An even greater advantage for whites existed among those scientists starting their careers in "strong or distin-

guished" departments. Approximately one-fourth (24.5 percent) of the white respondents and slightly more than one-twentieth of the black respondents began their careers in such departments.

In this cohort, responses of the black interviewees regarding career opportunities were more mixed than in the previous one. In general, respondents earning their Ph.D.s in the early years of the cohort were more likely than those earning their doctorates toward the end of the cohort to report restrictive career opportunities. Some comments are illustrative. One black respondent who earned a Ph.D. in the early years of the cohort felt that, at the time she was looking for her first position, academic employment opportunities outside of historically black colleges were virtually "nil." She explains:

At the time I finished my Ph.D. I thought I was great. So I sent letters to universities all over the country. All I received from white schools was "we regret that there are no vacancies." I sent more letters to white than black colleges. Many white administrators apologized for not hiring me. In fact, one guy told me that they could hire a black man before they could hire any kind of woman.

I thought that I had a chance at \_\_\_\_\_, a college in Oregon, but, then they found out that I was black and they didn't want me. So, I went to \_\_\_\_\_ (a black college).

While these comments suggest that the opportunity structure for black scientists was somewhat restrictive, they also provide some clue as to the effects of race and sex on careers. Several of the black males who earned their doctorates in the early years of this cohort indicated that career opportunities outside of historically black colleges were somewhat limited. However, responses from some of the interviewees earning their Ph.D.s in the middle and latter years of the cohort are far more mixed.

One physical scientist, who took his first position outside of academia during the early 1960s, felt that his academic job opportunities were restrictive for two reasons: his race and the prestige of his Ph.D.-granting department (which was ranked better-than-average but not strong or distinguished). This interviewee felt that the opportunities for blacks in science at that time were somewhat ambiguous. He explains: "There was prejudice in scientific fields...it [job opportunities] would have just depended on some special circumstances."

A biochemist who took his first postdoctoral position in industry (near the end of the cohort) listed three firm offers from major companies while searching for his first job. He reported that a former alumnus who had

preceded him in graduate school was the individual most helpful to him in securing his job. (He eventually left this position to return to his Ph.D. department of origin for postdoctoral study.) Commenting about why he changed positions, he cited two reasons: (1) limited opportunities to do his type of research and (2) *the company wanted him only for window dressing* (i.e., as a showcase black). Another interviewee, a microbiologist, cited a similar situation in his decision to select one industrial position over another. When asked why he selected his first position he remarked: "Between the two of them (job offers) I felt that \_\_\_\_\_ wasn't offering me a position simply because I was black. If they were offering me a position because of that they were very discreet about it and I couldn't detect it. So, I respected that." Several of the black respondents earning their degrees during this cohort responded in a similar manner. Obviously, the presence of affirmative action programs had now begun to affect the recruitment process. This is even more evident in the next cohort.

### Cohort III: 1965-1974 Ph.D. Recipients

As can be seen in Table 6.1, black respondents earning their Ph.D.s during this period were better represented in the scientific labor force than their peers in previous cohorts. The most noticeable differences for blacks were found in the historically black colleges where their proportions declined by 25.8 percent relative to Cohort I. Correspondingly, the proportion of black respondents in predominantly white colleges increased by 23.4 percent over that period. As a consequence, among those black respondents taking their initial positions in academia, most did so outside of historically black colleges, thus breaking the tradition established in the previous cohorts. Furthermore, the proportion of black respondents in industry actually doubled between Cohort I and Cohort III while their status in government employment remained essentially unchanged.

In contrast, the greatest changes for whites over the three cohorts were in two areas: predominantly white colleges and industry. The proportion of white respondents in industry declined 12.5 percent from Cohort I, while the proportion of white respondents in predominantly white colleges increased by 12.5 percent. Although the proportion of whites beginning their careers in historically black colleges more than doubled over the three cohorts, this increase represented only about one-twentieth of the white total. Also, there was nearly a three percent decline over the cohorts of those who began their careers in government. As was the case

in the previous cohorts, significant differences between black and white respondents continued to exist in terms of type of initial entry into the labor force ( $p < .0001$ ). However, in this cohort, significant race differences were found only among graduates of departments rated "strong" or "distinguished" and those "unranked" (see Table 6.2-C). Significant differences also were found among social scientists ( $p < .01$ ) where black respondents continued the trend observed in Cohort II.

Table 6.2-C  
First Job by Race, Quality of Ph.D.-Granting Department  
Cohort III (1965-1974)

Employing Institution	Unranked (g)		Adequate/ Adequate + (h)		Strong/ Distinguished (i)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Historically						
Black College	44.5	5.6	32.4	4.3	29.2	6.5
Predominantly						
White College	29.9	70.8	46.5	80.4	50.9	74.0
Industry	17.5	15.3	16.9	8.7	15.1	16.9
Government	8.0	8.3	4.2	6.5	4.7	2.6
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	(137)	( 72)	( 71)	( 46)	(106)	( 77)

Note: Total may not sum to 100 percent due to rounding.

(g)  $\chi^2 = 45.09, p < .0001$

(h)  $\chi^2 = 17.31, n.s.$

(i)  $\chi^2 = 16.26, p < .001$

Perhaps the most striking find is that about six in ten black respondents began their careers outside of historically black colleges. The majority of the black respondents earning their doctorates during this cohort reporting having job interviews and opportunities outside of historically black colleges and universities.

### Second Position

Data in Table 6.3 show the distribution of scientists by type of second position. As before, data are presented for three cohorts.

Table 6.3  
Type of Employing Institution for Second Position  
by Race and Cohort

Second Position	Cohort I (a) (Before 1955)		Cohort II (b) (1955-1964)		Cohort III (c) (1965-1974)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Remained at first job	33.3	42.1	38.4	42.6	58.1	66.8
Left black college for white college	4.8	0.4	7.5	0.4	4.5	0.0
Left white college for black college	1.2	0.0	6.3	0.8	3.5	0.5
Left black college for another black college	26.2	0.4	20.1	0.8	4.2	1.0
Left white college for another white college	9.5	25.4	10.7	32.8	10.3	17.6
Left black college for non-academic job	4.8	1.3	1.3	0.0	3.5	0.5
Left white college for non-academic job	8.3	12.7	3.8	8.2	3.5	7.3
Left non-academic job for white college	3.6	3.9	5.0	6.6	3.9	3.1
Left non-academic job for black college	2.4	0.0	3.1	0.0	3.5	0.5
Left non-academic job for another non-academic job	6.0	13.6	3.8	7.8	4.8	2.6
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	( 84)	(228)	(159)	(256)	(310)	(193)

Note: Total may not sum to 100 percent due to rounding.

(a)  $\chi^2 = 86.46$ ,  $p < .0001$

(b)  $\chi^2 = 108.47$ ,  $p < .0001$

(c)  $\chi^2 = 37.73$ ,  $p < .0001$

### Cohort I: Pre-1955 Ph.D. Recipients

As in the case of the first position, significant interracial differences emerged (see Table 6.3). More respondents, regardless of race, remained in their first positions. Blacks were far more likely to move from one historically black institution to another than to any other sector of the labor market while, in like manner, whites were likely to move from one predominantly white institution to another rather than leave academia. Of interest, too, is the fact that more black respondents left historically black colleges for predominantly white colleges than vice versa. Blacks in academia, in comparison to whites, continued to be concentrated in unranked institutions (82.1 percent versus 55.6 percent). Conversely, white respondents were considerably more likely to be located in the top-rated departments (30.6 percent versus 5.3 percent). The differences between the two groups in quality of departmental location approached, but did not reach, statistical significance.

### Cohort II: 1955-1964 Ph.D. Recipients

As in the case of Cohort I, regardless of race, most of the respondents in Cohort II reported that they continued in their first positions (see Table 6.3). Again, the movement in academia continued along racial lines with respondents moving from one institution where they were in the racial majority to another. The proportion of blacks moving from historically black colleges to predominantly white colleges was about the same as those moving from predominantly white to historically black colleges. This may have been due to the recruitment of productive blacks by predominantly white colleges in the beginning of affirmative action programs. It is also possible that a number of younger blacks who had their starts in predominantly white colleges either did not achieve tenure or simply felt moved enough by the "black experience" movement of the time to take positions in schools with large black enrollments. This was in sharp contrast to the pattern which prevailed in Cohort I, where most of the movement was from historically black to predominantly white colleges. Overall, the pattern was similar to that exhibited in the previous cohort. Although the differential between black and white respondents located in the two top-rated categories (of departments) had narrowed considerably in this cohort, whites continued to hold a two-to-one advantage over their black peers (20.9 percent versus 9.4 percent). Blacks continued to be concentrated in unranked departments in about the same proportions as their peers in Cohort I. Again, the differences between the

two groups approached, but did not reach, statistical significance.

### **Cohort III: 1965-1974 Ph.D. Recipients**

Most respondents in this cohort were still in their first positions. The differences between the racial categories, in terms of their distribution in the labor market, continued to be significant (see Table 6.3). One minor exception was among those individuals moving from one non-academic position to another. In the previous cohorts, white respondents were about twice as likely as their black peers to have made such a move. No statistically significant racial differences were found with respect to quality or prestige of departmental affiliation in this cohort.

### **Present Position**

Data on the distribution of scientists by type of current employing institution are presented in Table 6.4.

### **Cohort I: Pre-1955 Ph.D. Recipients**

Perhaps the most striking find for this cohort is the extent to which the black and white respondents developed sharply contrasting career patterns (see Table 6.4). Less than one percent of the white respondents had held positions outside predominantly white job settings. Black respondents, on the other hand, exhibited somewhat less racially segregated career patterns. For instance, about four in ten black respondents reported some employment outside of historically black colleges. In comparison with their white peers, blacks tended to be more concentrated in academia, which suggests some restrictiveness in career opportunities in industry and government for black scientists.

In regard to quality of departmental affiliation, significant race differences ( $p < .001$ ) emerged only for graduates of departments in the top two prestige categories. Among graduates of the "adequate" and "adequate plus" departments, nine in ten blacks, as compared to only two in five whites, were currently employed in unranked departments. Furthermore, black and white respondents were equally as likely to be employed in "strong" or "distinguished" departments (4.8 percent versus 4.2 percent respectively). Approximately nine in ten black graduates (as compared to six in ten whites) of the top ten prestige departmental categories were employed in unranked departments. White respondents were about nine times more likely than their black counterparts to be employed in the

**Table 6.4**  
**Present Employing Institution by Race and Cohort**

Present Position	Cohort I (a) (Before 1955)		Cohort II (b) (1955-1964)		Cohort III (c) (1965-1974)	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
Remained at first:						
Black college	25.0	0.4	18.5	1.6	23.8	2.6
White college	7.1	18.8	11.1	22.7	16.1	41.5
Non-academic job	1.2	14.0	8.0	12.9	9.3	11.3
Remained at second:						
Black college	14.3	0.0	11.7	0.8	9.0	1.0
White college	4.8	14.0	11.7	14.8	10.0	11.8
Non-academic job	2.4	6.1	0.6	4.3	4.2	5.1
Remained at third:						
Black college	2.4	0.4	2.5	0.0	1.0	0.5
White college	1.2	5.7	3.1	6.6	1.9	2.6
Non-academic job	1.2	4.8	0.0	1.6	1.9	1.5
Left black college for present:						
Black college	6.0	0.0	4.9	0.4	1.6	0.5
White college	7.1	0.0	4.9	0.0	1.3	0.0
Non-academic job	1.2	0.0	1.2	0.0	0.3	0.5
Left white college for present:						
Black college	3.6	0.0	2.5	0.0	4.5	0.0
White college	6.0	10.9	8.0	18.0	5.8	12.8
Non-academic job	1.2	6.1	1.2	5.9	2.6	1.5
Left non-academic job for present:						
Black college	4.8	0.0	0.6	0.0	1.9	0.0
White college	3.6	9.6	6.2	5.5	2.6	2.1
Non-academic job	7.1	9.2	3.1	4.7	1.9	3.6
Unemployed	0.0	0.0	0.0	0.4	0.3	1.0
Total percent	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	( 84)	(229)	(162)	(256)	(311)	(195)

Note: Total may not sum to 100 percent due to rounding.

(a)  $\chi^2 = 173.38$ ,  $p < .0001$

(b)  $\chi^2 = 131.50$ ,  $p < .0001$

(c)  $\chi^2 = 105.53$ ,  $p < .0001$

most prestigious departments. There were no major differences among the various disciplines with respect to these career patterns.

### ***Cohort II: 1955-1964 Ph.D. Recipients***

The careers of black and white respondents in this cohort followed significantly different paths (see Table 6.4). However, there was more variation than in the previous cohort. While the proportion of whites reporting some experience in black employment settings was about three times the rate of their peers in previous cohorts, the proportion continued to be less than three percent. The pattern for black respondents in this cohort was almost the reverse of that of their peers in the previous cohort. For example, only two in five black respondents in this cohort reported having some employment experience in a black employment. Thus, three in five blacks had employment experience in predominantly white sectors such as industry, government, and predominantly white colleges. Again, blacks were more likely than whites to be concentrated in academia. Moreover, the only significant ( $p < .01$ ) race differences found for this cohort pertained to graduates of departments rated adequate or adequate plus (see Table 5.5). Nearly nine-tenths of all black respondents were concentrated in unranked departments in comparison to less than two-thirds of white respondents, nearly one in twenty blacks and approximately three in twenty whites were located in strong or distinguished departments.

### ***Cohort III: 1965-1974 Ph.D. Recipients***

Although the career patterns of this cohort closely paralleled those of the second cohort, proportionately more blacks reported some employment experience in non-academic settings (see Table 6.4).

Among respondents currently employed in academia, statistically significant race differences were obtained only for social science graduates of unranked departments. All of the white graduates were currently employed in unranked departments in comparison to about 87 percent of the blacks. For the first time, black graduates of strong or distinguished departments held an advantage over their white peers in terms of positions in those departments (one in four versus one in five).

When the number of career moves was examined by cohort, several interesting patterns emerged but none was statistically significant. For example, in regard to non-academics in Cohort I, about 68 percent of white and 70 percent of black respondents had either moved only once or

remained in their first position. The pattern was similar in the second cohort (64.8 percent for whites and 60.5 percent for blacks). In the third cohort, 85.5 percent of whites and 72 percent of blacks moved only once or remained in their first jobs. In this cohort, blacks were somewhat more likely to have moved two or three times (28 percent versus 14.5 percent).

The pattern among academics was very similar to that of their peers in the non-academic sector. Most white (58.5 percent) and black (57.2 percent) respondents in the first cohort either remained in their first job or moved only once. The pattern was much the same in Cohorts II and III. In essence, no significant differences emerged in patterns of mobility for the two groups.

Likewise, when asked how long they planned to remain in their present position, no significant racial differences were found in the first two cohorts, although blacks were more likely than whites to report they did not plan to remain in their present positions until retirement. However, in Cohort III there were significant racial differences ( $p < .0001$ ) in career plans. Although the two groups were equally likely to report that they planned to remain in their current positions at least one year, black respondents were far more likely than their white counterparts to report that they planned to remain in their positions between two and ten years (75 percent versus 33.7 percent). Slightly less than one-fourth of black respondents in comparison with a little less than two-thirds of whites planned to remain in the jobs until retirement.

An examination of respondents concerning interest in new job opportunities showed no significant racial differences except in Cohort III ( $p < .0001$ ). About two-fifths of whites, as compared with approximately one-fifth of blacks, stated that they were unwilling to change positions. Two-thirds of blacks and slightly more than one-half of whites reported that they were happy in their jobs but would consider new job opportunities. Nonetheless, black respondents were nearly twice (11.7 percent versus 6.8 percent) as likely to report that they were actively seeking new employment. When asked what level position they would consider, the responses for the various cohorts were mixed. For example, in Cohorts I and II there were no statistically significant black-white differences in whether scientists would accept a position on the same or a different level. Once again, the pattern was different in the third cohort ( $p < .001$ ). Overall, black respondents were considerably more likely than their white counterparts to state that they would prefer only higher level positions (36.9 percent versus 17.6 percent).

No significant black-white differences among academic scientists emerged when asked what salary range they would consider in a position

change. The median monthly salary for black academics was \$2,322 as compared with \$2,667 for whites. Overall, academic social scientists of both races had the highest median monthly salaries; among blacks, academic biologists had the lowest salaries; and among whites, academic physical scientists reported the lowest monthly salaries. The greatest monthly black-white salary differential occurred among social scientists. In fact, black social scientists in Cohorts I and II held a slight advantage over their white peers (a difference of \$26 and \$19 respectively). Further, even in Cohort I, whites held only a one dollar advantage. (These data do not control for professional age [i.e., numbers of years holding the Ph.D.] per se nor do they take into consideration differences in type of institution and professional rank.)

#### SCIENTISTS HAVING THEIR PH.D. ORIGINS IN HISTORICALLY BLACK GRADUATE SCHOOLS

Fifty-four percent of the black respondents receiving the Ph.D. from historically black universities reported firm offers from non-black employing institutions or agencies for their first postdoctoral positions. According to the data in Table 6.5, 45.7 percent of these black scientists began their careers outside of historically black academic institutions. A substantial proportion took governmental positions, which is understandable given the proximity of Howard University (Washington, DC) to the headquarters of most federal agencies. However, the vast majority (seven in ten) of all the scientists ended up in academia. Over one-half had their beginnings in historically black institutions where they spent most of their time engaged in teaching.

With respect to current or last position, the number of black respondents reporting employment in historically black colleges and universities represents an increase of about ten percent over the corresponding figure for first postdoctoral position. Nearly two-thirds of the respondents were located in historically black colleges and universities. In contrast, the proportion of black respondents located in predominantly white colleges declined by almost ten percent from that indicated for the first position. Three times as many respondents were currently in industrial employment, while the proportion employed in government declined from about one-fifth to slightly more than one-tenth. Overall, the respondents continued to be concentrated in academia (particularly in historically black colleges).

**Table 6.5**  
**First and Current Positions of Black Scientists—**  
**Their Ph.D. Origins in Historically Black Universities**

Employing Institution	Career Position	
	First	Current or Last
Historically black college	54.3	65.2
Predominantly white college	15.2	6.5
Industry	4.3	13.2
Government	21.7	13.0
Other	4.3	2.1
Total: percent	100.0	100.0
Number of cases	( 46)	( 46)

Note: Totals may not sum to 100 percent due to rounding.

#### The Career Patterns of the Matched Sample

An examination of the career patterns of scientists (all males) in the matched sample revealed interesting patterns (see Table 6.6). For example, slightly more than one-half (51.2 percent) of the black respondents as compared to less than one-fifth (18.6 percent) of the white respondents, began their careers in historically black academic institutions. Forty percent of the black respondents reported employment opportunities in other than historically black colleges or universities. Just over one-third (34.9 percent) of the blacks reported that they began their careers in predominantly white colleges. However, more than three in five (62.8 percent) whites had their beginnings in these institutions in which they were in the racial majority. It is clear, then, that the paths to academic careers were traced largely along racial lines. Although both black and white respondents were equally likely to have begun their careers in government (2.3 percent), this was not the case for industry where 16.3 percent of white and 11.6 percent of black respondents began their careers. These differences (in type of first postdoctoral appointment) remained even when predoctoral publications were controlled. Moreover, white respondents were slightly more likely than their black peers to have had some postdoctoral training prior to their first full-time postdoctoral appointment (41.9 percent versus 34.9 percent).

**Table 6.6**  
**Distribution of Matched Sample of Scientists**  
**by First Postdoctoral Appointment**

<u>Employing Institution</u>	<u>Blacks</u>	<u>Whites</u>
Historically black college	51.2	18.6
Predominantly white college	34.9	62.8
Industry	11.6	16.3
Government	2.3	2.3
Total percent	100.0	100.0
Number of cases	( 43)	( 43)

Note: Total may not sum to 100 percent due to rounding

$\chi^2 = 10.29, p < .01$

Seventy-two of eighty-six respondents began their careers in academia. There was a negative, though negligible, correlation ( $r = -.08$ ) between prestige of departmental affiliation and first position (when the effects of race were controlled). Nonetheless, black respondents (83.8 percent) were more likely than their white peers (71.4 percent) to have had their beginnings in unranked departments. On the other hand, blacks were about as likely as their white peers to have had initial appointments in departments rated strong (8.1 percent versus 8.6 percent) or distinguished (5.4 percent versus 5.7 percent). Further, black respondents reported somewhat heavier (median) teaching loads than their white peers (3.7 hours versus 2.6 hours per semester). To a larger extent, this reflects the academic settings in which the two groups began their careers. For example, a greater proportion of white (17.1 percent) than black (7.1 percent) respondents began their careers in departments with thirty-one or more faculty members. Specifically, white respondents, in comparison to black respondents (61.1 percent versus 32.5 percent), were more likely to have had initial appointments in departments offering doctoral degrees. Approximately forty percent of the black respondents but only 16.7 percent of the white respondents, reported initial academic placement in departments offering the bachelor's or a lower degree. To some extent, these departmental affiliations account for the distribution of time the respondents reported engaged in activities such as teaching and research. For example, while 60 percent of the white respondents

reported that they were granted research time, only 48.8 percent of blacks were in this category. On the average, black respondents indicated that they spent a greater proportion of their time engaged in teaching (67.6 percent versus 56.4 percent). In contrast, whites reported higher percentages of time engaged in research activities (42.9 percent versus 31 percent). These findings were consistent with the criteria for promotion reported by the two groups. That is, black respondents were more likely to have had their beginnings in academic departments emphasizing teaching as the major criterion for promotion (26.3 percent versus 14.6 percent).

The correlations between race and second ( $r = .05$ ), third ( $r = .14$ ), and present or last ( $r = .12$ ) career positions for all respondents were not statistically significant. The initial effects of racial status, which emerged upon entry into the scientific community appear to decline for subsequent appointments. However, the correlation between current position and race remained after controls were entered for performance variables such as quantity and quality of scholarly productivity. Nevertheless, the two groups did take different paths to arrive at their present stations. Approximately 46.5 percent of white respondents and 42.9 percent of black respondents remained in their first positions which were typically racially segregated. While none of the whites reported leaving a historically black college for a predominantly white college, seven blacks (or 16.7 percent) did. White respondents were about three times more likely than blacks to have departed one predominantly white school for another (30.2 percent versus 9.5 percent). Blacks were somewhat more likely than whites to have departed non-academic employment for academic employment (7.1 percent versus 2.3 percent).

Few respondents reported more than two moves. About eight in ten whites and slightly less than two-thirds of blacks remained in their second positions. The greatest movement for blacks was from one historically black college to another; for whites the shift was from one predominantly white college to another.

More than one-third of the black scientists (34.9 percent) and 46.5 percent of white respondents never left their first jobs. Of those respondents acting out their total careers in historically black colleges or universities, 14 percent were white and 18.6 percent were black. About 23.3 percent of whites as compared to 11.6 percent of blacks never left their first job in predominantly white institutions. And, 9.3 percent of white respondents as compared to 7 percent of black respondents remained in their first non-academic position.

Among blacks, 4.7 percent and 20.9 percent remained in the second

positions in historically black and predominantly white colleges respectively. None remained in a second position in non-academic employment. Among whites who remained in their second positions, most were in predominantly white institutions (16.3 percent), and the remainder were distributed equally in historically black institutions (7 percent) and the non-academic sector (7 percent). In general, black respondents were considerably more likely than their white peers to have moved three or more times over their careers (18.6 percent versus 4.7 percent), but the correlation between race and number of moves was not statistically significant.

Correlations between race and second, third, and current positions were not statistically significant; however, the first position was significantly related to the current position when controlling for the effects of race ( $r = .17$ ,  $p < .05$ ). Among academicians, a significant correlation was found between race and first position ( $r = .26$ ,  $p < .01$ ) and this correlation approached significance for the third ( $r = .18$ ,  $p < .06$ ) and current ( $r = .18$ ,  $p < .06$ ) positions. The correlations between race and prestige of first and current positions were not statistically significant. Controlling for race, the correlation between prestige of first and current positions was statistically significant ( $p < .0001$ ).

An examination of several performance variables produced a number of interesting finds. For example, a negative but negligible correlation ( $r = -.04$ ) was found between race and career article productivity. Black respondents (12.5 percent) were slightly more likely than white respondents (7.1 percent) to report that they had never published an article. White respondents, on the other hand, were only slightly more likely to have published twenty or more articles during their career (40.3 percent versus 37.5 percent). On the average, black and white respondents had published 17.7 and 20.1 career articles respectively. There were no major differences between the two groups with regard to the number of articles published during the last five years of the survey. Whites averaged about 6 articles over the five-year period, while blacks averaged about 6.8 articles. Significant race differences ( $r = .26$ ,  $p < .01$ ) did emerge with regard to the proportion of articles co-authored over the career. White respondents were far more likely than their black peers to have produced collaborative articles. For instance, only 23.7 percent of whites but 45.2 percent of blacks reported that less than one-fourth of their articles had been the result of collaboration. At the other end of the spectrum, one-half of the white respondents but only about one-third of the black respondents reported that all or nearly all of their articles had been co-authored.

Only a negligible correlation ( $r = .04$ ) was found between race and career book productivity. About seven in ten whites as compared to six in ten blacks did not have a book to their credit. Forty-one percent of black and 31.7 percent of white respondents published one or more books. White respondents, on the average, published about 0.82 books over the career, while black respondents averaged about 0.94 books.

A negligible correlation ( $r = .09$ ) was found between the number of grants received over the career and the racial status of academic scientists. Black respondents had been awarded, on average, about 2.5 grants as compared to 2.1 grants for whites.

The correlation between race and papers presented at conferences over the careers approached but did not reach statistical significance ( $r = -.17$ ,  $p < .06$ ). Approximately 12.8 percent of the white and 8.6 percent of the black respondents reported that they had never presented a paper at a professional meeting. On the average, blacks produced 6.3 career conference papers, while whites produced 9.1 papers. Black scientists were more than twice as likely as whites to have served as elected officials in professional organizations (31.7 percent versus 13.5 percent). Black respondents were also twice as likely as their white peers to have served as grant proposal reviewers (60 percent versus 29.3 percent).

### Summary

In summary, the data clearly indicate black-white differences in career patterns over the three cohorts. To a large extent, changes in the social status of blacks in the scientific community closely paralleled those of blacks in the general population. Few black respondents receiving degrees prior to the implementation of the U.S. Supreme Court decision of 1954, *Brown vs. Board of Education* (Cohort I), reported opportunities to work in other than racially segregated academic institutions. (This ruling declared the "separate but equal" doctrine unconstitutional.) At that time, black scientists were virtually excluded from full-time appointments in industry. Furthermore, having a Ph.D. from a prestigious department did not provide blacks with the kinds of career opportunities which were available to their white peers. Thus, the evidence strongly suggests the presence of particularism in American science during this period. In short, the institution of science was not immune from the vestiges of particularism that were so visible in other social institutions. (The careers of Ernest E. Just as well as others [discussed in Chapter 2] attest to this fact.)

The opportunity structure for blacks in science began to open up after

1955 with the advent of major civil rights movements. This was evident in a noticeable decline in the proportion of black scientists in Cohort II who reported that their first postdoctoral positions were in predominantly black settings. Yet, despite this change, significant race differences in initial employment patterns persisted. While black scientists were entering their first positions in predominantly white academic institutions, industry, and government in greater numbers, white scientists were shifting their initial entries from the non-academic to the academic sector (particularly in predominantly white institutions). Blacks entering academic employment continued to be concentrated in unranked departments, but the number beginning their careers in departments rated strong or distinguished began to rise. Nevertheless, a number of black respondents reported that a number of employers or prospective employers recruited blacks merely to achieve quotas (because of the pressures of affirmative action legislation). Opportunities for blacks in the scientific labor force improved considerably after the introduction and passage of major federal civil rights legislation in the mid-1960s. As a consequence, respondents earning their Ph.D.s after 1964 reported a more diverse pattern of entry into the labor force. It was during this period that most black respondents entering academia did so outside of historically black institutions while the proportion beginning their careers in industry had doubled from the first cohort. This period also showed a continuing decline in the proportion of white respondents whose first positions were in industry.

When respondents in Cohort I left their first positions, most moved from one academic institution to another (usually of the same or similar racial composition). Further, more blacks departed historically black schools for predominantly white schools than vice versa. Once again, black respondents were usually concentrated in unranked departments. This may also be attributed to the recruitment efforts of many predominantly white institutions which were, according to many black respondents, influenced by federal affirmative action legislation. The situation for the second cohort was much the same with perhaps two major exceptions: (1) black respondents were equally as likely to have departed an historically black college for a predominantly white college as the reverse and (2) the differential between black and white respondents, in terms of representation in the two most highly rated departments, actually narrowed (though whites maintained a two-to-one advantage). The majority of the respondents in the third cohort were still in their first positions.

Overall, few white scientists reported job experiences in a predomi-

nantly black setting, but the number of those who had increased over the three cohorts. Most black respondents had spent at least some of their careers in other than predominantly black settings. The major overall finding was that black and white scientists arrived at their present stations in the scientific community through significantly different paths, paths generally pursued along racially segregated lines. By the beginning of the third cohort, the opportunity structure had opened up considerably for blacks, becoming, at least in theory, more universalistic.

Most blacks receiving Ph.D.s from historically black universities began their careers in historically black colleges or in government employment. This is understandable given the fact that many had been employed in historically black colleges before returning to graduate school and Howard University's close proximity to the headquarters of many federal agencies. The proportion of these respondents presently located in predominantly white colleges had declined from the proportion who had initial appointments in such institutions; the proportion in industry nearly tripled; but the majority remained in historically black colleges and universities.

Findings from the matched sampled were essentially consistent with these patterns. Once again, blacks tended to be more heavily concentrated in historically black colleges and universities, at least in their first postdoctoral positions. Among those scientists who entered academia, no statistically significant differences were found between the two groups in regard to the prestige of first departmental affiliation. In fact, although black respondents were likely to have begun their careers in unranked departments, they were equally likely to have begun in departments rated strong or distinguished. Nevertheless, blacks were generally more likely to have begun their careers in departments which were smaller (less than thirty-one faculty members), did not offer the Ph.D. degree or much research time, and required heavier teaching loads.

There were statistically significant racial differences with regard to the type of first position. The correlation between prestige of first academic appointment and current academic department (controlling for race), was also statistically significant. In essence, where a respondent started out in academia had much to do with where he or she ended up in academia.

An examination of the performance variables produced few variations. Overall, white respondents produced slightly more career articles and they were more likely to have had co-authored articles. Black respondents produced, on the average, slightly more books (including textbooks) over their careers and had received slightly more research grants with higher levels of funding. White respondents had presented more research papers at professional meetings.

The pattern was similar with respect to honorific awards. Black and white respondents were equally likely to have served as editors of professional journals and to have been recipients of prizes for scientific contributions. However, blacks were more likely to have held a position in a professional organization.

# BLACK SCIENTISTS, WHITE SOCIETY, AND COLORLESS SCIENCE:

**A Study of Universalism in American Science**

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## UNIVERSALISM IN AMERICAN SCIENCE

One of the major foci of this study has been the extent to which blacks are treated in a universalistic fashion in American science. According to one of Merton's (1973) propositions, if science is to operate at its optimum level of efficiency, it must adhere to the norm of universalism in its evaluation and rewarding of scientific talent. Thus, according to the ideal, functionally irrelevant characteristics, such as race or ethnicity, ought not enter into the evaluation of a scientist's worth. Mitroff (1974), on the other hand, argues that such an image of science is no more than a storybook image which exists in the minds of laypersons (and perhaps some social scientists). Mitroff questions the ability of scientists to suspend their personal biases in the evaluation of other scientists and their scientific contributions.

The results of the present study call into question the degree to which the American scientific community adheres to the norm of universalism. The examination of the cohorts clearly show differences in the opportunity structure for blacks and whites entering science, especially prior to the civil rights protests of the 1960s. The careers of Charles Drew, E. Franklin Frazier, W.E.B. DuBois, William Hinton, Charles H. Turner,

Ernest E. Just, Ralph Bunche, and Percy Julian (to name only a few) serve as classic examples of black individuals of exceptional talent but whose scientific careers were limited to some extent because of their racial status. The biographies of these early scholars reveal that, despite their many scientific accomplishments, most of their careers and the careers of a great many of their black peers were developed outside of major research universities or research laboratories. In fact, Turner spent much of his scientific career teaching in high schools. While it may be difficult to infer from these few case histories that scientists are not adhering to the norm of universalism in American science, it is less difficult to make that argument if evidence is available to identify some systematic pattern of race discrimination in American science.

Prior to 1954, only a handful of black American scholars were employed outside of predominantly black colleges and universities. That particularism was prevalent during this period is consistent with the fact that more blacks in the earliest cohort than in any other report that they did not have opportunities to work in non-black employment settings. The vast majority of the black scientists in Cohort I declare that they were categorically denied employment opportunities in predominantly white colleges and universities, government, and industry. Even when black American scientists were employed in major research institutions, conditions were often strained. The career of Harvard syphilologist William Hinton serves as a classic illustration of this point. Despite being recognized as one of this country's top syphilologists, he reportedly held a non-teaching position for most of his career at Harvard University Medical School.

An examination of the initial entry patterns of black and white respondents in the pre-1955 cohort revealed significant black-white differences. For example, more than six in ten blacks (compared to less than two in one hundred whites) began their first postdoctoral positions in historically black colleges and universities; one-fourth of black respondents but 61.9 percent of white respondents had their beginnings in predominantly white institutions; and 14 percent of blacks, as compared to one-third of whites, began their careers in industry and government. I might add that some black respondents reported preferences for employment in historically black colleges. Most of the black respondents who earned their doctorates in the early part of the cohort were virtually excluded from employment outside of historically black colleges and universities, and were especially excluded from industry. These findings are also substantiated by personal interviews. One of my black respondents who earned his degree in the 1930s stated that opportunities for

black scientists were limited at the time he earned his degree. He explained that the employing institutions (predominantly black colleges) of his time needed everything which meant "we sacrificed personal development for institutional development." This respondent's allegations are supported by one of his contemporaries who reported having spent his entire career at one historically black college where his administrative responsibilities were so great that he never had time for research. Another scientist of this period stated: "Because of the insecurity of teaching during my time and because of poor pay, I left university teaching and went to medical school." This respondent subsequently began his own medical practice and never returned to academia. One of the respondents who earned his Ph.D. in the early 1950s believes that his career opportunities were restricted because of his racial status and believes that "racism is still rampant" in American science. Most black respondents, regardless of discipline, feel that they were restricted in the kinds of employment opportunities available during this period.

Several scholars (Crane, 1965; Caplow and McGee, 1965) report a positive correlation between prestige of Ph.D. and first postdoctoral appointment. This did not hold true for the black respondents in the first cohort. It is clear that having a Ph.D. from a prestigious department did not provide any placement advantages for black respondents in Cohort I (prior to 1955). Nevertheless, over the cohorts the situation changed considerably to the extent that the effects of race on career placement became statistically insignificant. It must be emphasized that these changes closely parallel those of blacks in the general population. In other words, the gains of the civil rights movement (i.e., affirmative action) provided blacks with more latitude with respect to place of employment in science. This study suggests that recent career opportunities for blacks who enter science (especially in academia) are similar to those of whites. In short, it now appears that the initial job placement for young black scientists are better than at any other time in history. This is not to say that race discrimination has been completely eliminated from the scientific community. Rather, it implies that the opportunity structure is more open today for those who are well trained.

Regardless of cohort, most black respondents feel that their career mobility has, in some or all instances, been limited by their racial status. However, it must be emphasized that the proportion of black respondents who believe that their career mobility has been restricted declined over the cohorts from 74.2 percent (Cohort I) to 59.7 percent (Cohort III). As one might expect, the proportion reporting no effects increased from 9.1 percent in Cohort I to 21.4 percent by the final cohort. The proportion

who viewed their race as an asset climbed from a low of 4.5 percent in Cohort I, peaked at 6.8 percent in the second cohort, and declined to 6.0 in the final cohort. On average, about twelve percent gave a neutral response. These findings suggest significant changes in the respondents' perceptions of the opportunity structures of American science. Thus, we observe a trend toward the view that race is becoming less of a barrier to career mobility in American science. These patterns generally prevailed regardless of Ph.D. origin. Most graduates at each departmental prestige level report that their careers have been limited by their racial status but graduates of the distinguished departments (58.8 percent) are least likely to respond in this manner. Graduates of the most prestigious departments are more likely than graduates of the other departments to state that race has had no impact on their career mobility. More graduates of unranked departments than of any other category feel that their racial status has actually been an asset.

The majority of blacks also feel that they have been hampered in their level of participation in science in comparison with non-blacks. This is true irrespective of cohort or Ph.D. institution. In fact, the proportion who believes that, relative to non-blacks, their participation levels in science have been hampered increased over the cohorts from 65 percent in Cohort I to 81 percent in Cohort III. When the data are analyzed by prestige of Ph.D.-granting department, the results show that respondents who received their Ph.D.s in distinguished departments are only slightly less likely to feel that their careers have been hampered. Responding to the question of how their careers have been hampered, two major categories of responses emerged. The largest single group (one-half) feels that some form of discrimination (especially exclusion from the communications network) is responsible for restricting their participation levels. The next most cited reasons (26.8 percent) are difficulty in obtaining research funds, lack of facilities, and time.

When asked if they believe research funds are distributed on an equitable basis without regard to race, the majority (79 percent) of black respondents tended to give a negative response. There are some differences between the cohorts. For example, six in ten respondents in Cohort I disagree as compared to eight in ten respondents in the remaining two cohorts. An examination of the data by prestige of Ph.D.-granting department reveals very little variation between the scientists. It is the case, however, that scientists having Ph.D.s from "strong" (71.1 percent) or "distinguished" (73.8 percent) departments are less likely to perceive discrimination in comparison with scientists with Ph.D.s from "unranked" (78 percent) and "adequate" (85.4 percent) departments.

Three primary explanations are given for the responses: (1) institutional racism, (2) discrimination directed especially toward scientists at historically black colleges and universities and lack of power to distribute funds, and (3) lack of a true peer review system. The explanation cited most often by graduates of prestigious departments is institutional racism. In contrast, graduates of unranked departments most often (36.6 percent) cite race discrimination directed toward scientists located in historically black colleges where, incidentally, many of them are located.

### REDRESSING THE CURRENT STATUS OF BLACKS IN AMERICAN SCIENCE

Several conclusions may be drawn from this study. First, while these black scientists have their origins in families that are economically more advantaged than the general black populace, they come from less privileged backgrounds than their white counterparts. Although the fathers of black and white respondents often have similar levels of education, black fathers are not as successful as their white counterparts in obtaining employment in positions commensurate with their education. In other words, highly educated black males have, at least historically, been the objects of systematic discrimination in the labor market. Wilson (1978) argues that this situation has all but vanished because access to the means of production is now based primarily on educational criteria. As a consequence, talented and educated blacks (who were once severely underemployed) are now experiencing what Wilson refers to as unprecedented job opportunities in the labor market. These opportunities, he argues, lend strong support to the view that economic class is clearly more important than race in predetermining job placement and ultimately occupation mobility.

By implication, Wilson's conclusions suggest that, as more black parents move into the middle classes, one might expect similarities to emerge in the kinds of career choices made by their offsprings and those of comparable whites. In short, increased occupational mobility for blacks may ultimately lead to increases in the proportion of black youths who enter scientific professions. An increase in the general socioeconomic status of the black population will do much toward establishing the kind of tradition of intellectual pursuits among blacks which historically has eluded the group. It is precisely this subcultural tradition which has been used to explain the status of Jews in American science. It is a well established fact that both blacks and Jews have been the objects of

intense discrimination in American society. Yet, while studies consistently reveal that blacks are underrepresented in science, Jews, in the words of Blalock (1967:99-100), "are if anything 'overrepresented' in academic and scientific circles" (see also Cole and Cole, 1973). Blalock believes that the emphasis on learning and developing independent thinking within the Jewish subculture has provided them with what he calls a "compensatory competitive resource." Blacks have generally lacked this intellectual tradition. And, because training for academic and scientific careers is both prolonged and expensive, blacks simply have not been economically able to support this kind of training for their children (Blalock, 1967). These facts, taken together with race discrimination, account for this underrepresentation in science.

Black respondents (95 percent) in this study believe unequivocally that blacks are severely underrepresented in science. The major reasons given for the underrepresentation of blacks in science are (in decreasing order): (1) lack of early encouragement and motivation (24.4 percent); (2) lack of financial support and limited opportunities (15.1 percent); (3) limited recruitment (11.2 percent) and institutional racism (11.2 percent); (4) lack of tradition (8.7 percent); and (5) science perceived as too difficult and unrewarding and lack of role models (8.3 percent each). If black scientific talent is to be fostered, it must be encouraged in the early years. Early encouragement will provide the kind of confidence that will serve as a motivating force in developing a keen interest in science. It is precisely this kind of motivation which leads itself to the survival skills necessary for the successful completion of a science program. Surprisingly, only in the case of black respondents earning the Ph.D.s in Cohort I (prior to 1955) do a majority (51.6 percent) agree that desegregation contributes to an increase in the proportion of black Americans in science. In fact, the majority of the black interviewees believe that "integration" has probably done more harm than good in increasing the proportion of blacks in American science. One black respondent pointed out the situation at the top high school in his city where (at time of the interview) not a single black youth was enrolled in the physics courses. This respondent also suggests that few black youths are enrolled in the other science or math courses. He believes that many black youths are tracked or counseled away from science and math courses. Several other interviewees report similar accounts in their cities.

While several black respondents feel that black youths are purposely counseled out of science, many believe that many counselors (especially non-blacks) are not aware of the career opportunities for blacks in science. As a consequence, this information is not communicated to black

youths in secondary schools. The results of a recent National Science Foundation and Department of Education (1980) study confirm the suspicions of the black respondents. The study states that minority group members, who are already grossly underrepresented in science, tend to believe that the only individuals in scientific fields are top academic students with advanced degrees. The report recommends that the National Science Foundation (NSF) and the Department of Education (DE) expand existing programs to provide adequate career information to minority youths beginning in the early adolescent years (a time, as my study shows, when most black respondents made the decision to pursue science as a career).

The findings of my study also suggest that, in addition to parents, teachers have a tremendously important influence on the career choice of young people. Thus, primary and secondary teachers have a pivotal role to play in the increased production of minority scientists. The NSF and DE (1980) study points out that during the post-Sputnik era curriculum development programs sponsored by the federal government were a key strategy for improving science and mathematics teaching. According to the study, there is substantial evidence that the programs had a long-term effect. Presently there is a need for new and innovative science curricula which would stimulate the interest of a broad spectrum of students. This could be especially directed toward minority students. Ideally, these new curricula would be offered during the middle and junior high school years.

At the post-secondary level, more federal support should be directed toward those undergraduate institutions with proven records (both historically and presently) of producing black scientific talent. This is particularly true for historically black institutions where there is a critical need for more funding to strengthen existing programs and to maintain and recruit additional competent scholars. Because black students are now equally (if not more) likely to attend four-year, predominantly white colleges as historically black colleges, it would be most efficient to provide greater support to those predominantly white colleges which are most successful in producing black scientific talent. With the incentive of additional government funding, perhaps predominantly white colleges and universities would put forth more than a token effort to recruit and retain black students with vocational interests in science. The growth of the pool of professional black scientists will depend largely on the increased productivity of the undergraduate schools. These institutions will serve as feeders to graduate departments.

American graduate education in the sciences is highly dependent on

private and governmental funding. In recent years, federal and private support to graduate departments has been declining. One reason often given for this trend is the overproduction of Ph.D.s, which may apply to whites but obviously does not apply to blacks. According to Watson (1977), it is critically important that federal policy be directed toward encouraging and financially supporting the achievement of equal production of minority Ph.D.s in scientific fields. He argues that, without such a policy, any goal of an equitable distribution of minorities in the sciences is probably unachievable by century's end. Watson proposes two possible solutions to the problem: (1) the initiation of programs of graduate fellowships and/or traineeships for the financial support of minority graduate students and (2) providing grants and contracts to departments and institutions with proven track records of recruiting and training minority group members for scientific careers.

Opportunities for highly educated and talented blacks appear to be at an all-time high (Wilson, 1978; Freeman, 1976). In a recent study, Blalock (1982) reports that his review of pertinent studies showed no evidence of any slackening of the gains blacks derived from the civil rights protests of the 1960s. He cautioned that these studies do not provide any support for the belief that inequality between blacks and whites will be eliminated within the near future. Blalock points out that various projections indicate that at least fifty to a hundred years will be required before black-white differentials will become insignificant.

For Blalock, existing positions must be filled in an equitable fashion. He argues that, although affirmative action programs have been criticized on the grounds that they discriminate against white males, what must be remembered is that the programs were instituted precisely because it is extremely easy for employers, educational institutions, or labor unions to discriminate against minorities by claiming that few "qualified" minorities ever apply or by protesting that only they can assess who is competent or qualified for employment. What affirmative action requirements have done, in Blalock's opinion, is to exert pressure on the "gate keepers" by instructing them to play an active role in identifying the best qualified minority applicants, then they—rather than the minorities—will have to pay a price. He emphasizes that, unless minorities possess genuine competitive resources, affirmative action programs alone cannot have more than a token impact on their overall career opportunities. Young and Young (1976) support this position when they state that past history suggests that business and industry (and educational institutions) will respond only to affirmative action programs because of the threat of removal of government contracts if equal opportunity requirements are

not met. These scholars suggest also that governmental agencies strengthen their own affirmative action policies.

In summary, the present underrepresentation of blacks in American science presents a tremendous societal cost in the form of untapped scientific and technological resources. It is difficult for this writer to discern the extent to which the scientific community was either behind or ahead of other social institutions in the allocation of positions to its citizens in a universalistic fashion. It may be worthwhile to examine the social responsibilities of scientists. What is the responsibility of the scientific community to support, in various ways, the development of the potential found in black scientific talent? In short, the discovery and dissemination of scientific truths (i.e., the extension of certified knowledge) should obviously be one of the ultimate values of the scientific community. Toward that end, and for other humanitarian reasons, scientists should also be concerned with human welfare, including the development of human potential. If this country is to maintain its present top status in the world of science, it can ill afford to waste any creative talent. The purge of Jewish scientists in Nazi Germany serves as a reminder to any society not utilizing all of its resources. Only through well-planned, comprehensive, and dedicated efforts involving government, industry, and educational institutions will the serious underrepresentation of blacks in American science be fully redressed.

Science and technology are playing increasing roles throughout American society, particularly in the economic sector (e.g., involving business, government, the military, etc.). Scientific and technical training are becoming the key elements for success in many professions. Even in a number of non-scientific and non-technical occupations and professions, workers must have a greater understanding of science and especially technology than at any other time in American history (National Science Foundation and the Department of Education, 1980). Thus, if for no other reason, blacks will have to acquire scientific and technical skills in order to be competitive in the labor force. Without these skills, black Americans will see the segment of its population Wilson (1978) identifies as the "underclass" swell to enormous proportions. To reiterate one of the main conclusions of this study and others: because of the general neglect of black Americans in the sociology of science much remains to be known about this group, and it is imperative that future studies compensate for this gap in our knowledge. I hope this study is a good start toward this end. Out of this study come several suggestions for future research.

First, there is a tremendous need to investigate the career development

of black Americans earning their doctorates after 1974. Such an analysis would provide a test for the notion that labor market opportunities for highly educated black Americans have not slackened (in comparison to similarly trained whites) because of the recession and the rise of conservative political policy (particularly as it relates to affirmative action programs). An analysis of the post-1974 cohort of black American scientists could also provide useful data regarding any changes in (1) racial composition of the undergraduate colleges attended; (2) geographic and social origins; (3) prestige and geographic location of the Ph.D.-granting department; and (4) evidence (positive or negative) on universalism in American science.

Second, a more detailed and systematic comparative study should focus on blacks and whites who have had careers in non-academic settings such as industry and government. Special attention should be given to engineers, including data on their social origins.

Third, our knowledge of the effects of gender and race (i.e., black females) on scientific careers continues to be limited and, therefore, in need of further investigation. Ideally, such a study would include a national sample employing both qualitative and quantitative data.

Fourth, because the present study deals with individuals who have survived the rigorous training process of science, it fails to provide much in the way of information regarding those factors contributing to attrition among black Americans with early vocational interests in science. Such inhibiting factors need to be identified so that corrective measures may be taken. Thus, longitudinal studies beginning at the middle school years, and even earlier, would provide valuable information (including how career choices are influenced).

Fifth, while I am not fully familiar with the number of white graduates of historically black Ph.D. programs in science, it would appear that if the numbers are sufficient, it would be worthwhile to examine the career patterns of these graduates to see if they differ from those of their black counterparts.

Finally, this study represents only the beginning of research on the communication patterns of black American scientists. This area along with research on interracial collaborative patterns may provide some insightful information regarding the interworkings of the American scientific community.