ACADEMIC SPONSORSHIP AND SCIENTISTS' CAREERS*

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Scientists' academic sponsors might influence their students' careers through the quality of training they provide and through their ability to transmit to their students a professional status and other ascriptive advantages. Using data for a probability sample of doctoral chemists, this study explores the effects of scientists' Ph.D. departments and several characteristics of their doctoral sponsors on their scientific productivity and positions over their first postdoctoral decade. Sponsorship appears to play a vital role in the chemists' careers. Their sponsors' productivity affected sample members' predoctoral productivity, and the calibre of their Ph.D. department affected their postdoctoral productivity. Although measures of the quality of their training did not affect the setting (university versus other employer) of the chemists' jobs, two measures of their sponsors' professional stature were consequential. These results suggest ascriptive effects of doctoral sponsorship, independent of the effects of sponsors' performance, the calibre of the Ph.D. department, and the chemists' own productivity.

Analyses of the normative structure of science (Merton, 1957, 1965; Storer, 1966) suggest that ideally performance should determine the allocation of scientific rewards. Nevertheless, departures from the normative ideal may occur for several reasons. First, scientists work in organizations in which nonscientific considerations sometimes favor ascription over performance (Mayhew, 1968). Second, the unmitigated pressures of a pure achievement orientation can be dysfunctional for individuals (Parsons, 1951:185). Third, a reward structure completely based on achievement is impossible when organizations or disciplines lack widely shared standards of performance (Gaston, 1975) or when scientists' accomplishments do not differ enough to permit rewards to be based solely on achievements. Some deviations from the ideal may increase the efficiency with which resources are allocated to scientists most able to exploit them (Storer, 1963:134; Merton, 1968; Cole and Cole, 1973:245–47). However, substantial reliance on ascription rather than achievement[1] in the

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[1] Studies of the normative structure of the scientific reward system have sometimes confused Parsons' pattern variable denoting achievement–ascription with his universalism–particularism pattern variable. Because I focus exclusively on the former, it is useful to distinguish the two at the outset. Achievement–ascription refers to the extent to which actors are evaluated (and hence assigned positions or status) on the basis of their ascribed characteristics as opposed to their performance. In contrast, universalism–particularism refers to the extent to which the relationship between evaluators' and evaluatees' status attributes (and these may be either achieved or ascribed) influences the formers' evaluations (Parsons and Shils, 1951:82–83). If evaluators' actions are independent of their characteristics and those of evaluatees, the reward system is universalistic with respect to the particular evaluation. If, on the other hand, their responses typically depend on the relationship between their own status characteristics and those of the actors whom they are judging, the reward system can be described as particularistic. Thus, assessing the extent to which ascription or achievement prevails requires measures of scientists' ascribed characteristics, their performance, and their professional outcomes. Assessing universalism–particularism is more difficult. Because universalism–particularism refers to the consistency with which a set of evaluative criteria are applied, assessment requires data for both evaluators and evaluatees. This study does not assess the consistency with which status judges (employers,

allocation of scientific positions or professional status can demoralize under–rewarded scientists and hamper the incentives of the acriptively favored, thereby undermining the motivational structure upon which scientific progress rests.

Several characteristics of scientists may serve as bases for ascription: their personal traits (sex, race, age, class, regional background), academic origins (baccalaureate institution or Ph.D. department, doctoral or postdoctoral sponsor), or job histories (prestige of academic employers, non–academic employment, etc.). Although research has generated some evidence for the existence of ascription in the scientific reward structure (Crane, 1969; Reskin and Hargens, 1977), most claims are based on the effects of scientists' Ph.D. departments on their later careers (Caplow and McGee, 1965; Crane, 1965, 1967; Hargens and Hagstrom, 1967; Blume and Sinclair, 1973; Stehr, 1974; Pfeffer, Leong, and Strehl, 1977). However, in order to demonstrate that such effects result from ascription, researchers must rule out the possibility that the association between an ascribed characteristic and the outcome in question is a spurious one in which achievements that are correlated with the ascribed characteristic are the true causal agent. In the case of ascription apparently resulting from scientists' academic origins, two alternatives are possible. First, such effects could result from a selection process that matches students' ability with the quality of their Ph.D. departments and, in some instances, accumulates advantages for more gifted students in elite departments (Merton, 1977:89). I present evidence below that casts doubt on this alternative. Second, the effects could be due to graduate training and thus would support the claim that achievement norms govern scientific status attainment. Because prestige ratings of graduate departments correlate almost perfectly with ratings of the effectiveness of their graduate programs (Cartter, 1966; Roose and Anderson, 1970), a department's reputation—the primary basis for ascriptive advantage—is confounded with the quality of its training. Hence what has been taken as status ascription might actually reflect status achievement. Indeed, at least one researcher (Crane, 1965) interpreted the effect of departmental calibre on graduates' professional rewards as evidence that achievement governs status attainment in science. Unfortunately, independent measures of the calibre of Ph.D. departments and the effectiveness of their graduate programs do not exist (the two dimensions are measured with separate scales based on reputational ratings by the same respondents; Cartter, 1966; Roose and Anderson, 1970), so disentangling the effects of ascription and achievement (as indexed by the calibre of training) is impossible. Controlling for postdoctoral publications and citations would weaken but not eliminate the training interpretation of Ph.D. department effects, insofar as they imperfectly measure scientists' performance. Although suggestive, then, the evidence for ascription is inconclusive.

Researchers have tended to neglect the role of another potential basis of ascription in scientists' careers—that of their doctoral sponsors. Yet participants in higher education agree on the importance of sponsorship (see, for example, National Academy of Sciences, 1974:15), and anecdotal evidence suggests that doctoral sponsors transmit substantial ascriptive advantages. Nobel laureates, for example, have credited their own eminent mentors with giving them a sharpened sense of "what matters" in research, but also with enhancing their visibility to the scientists who distribute opportunities and rewards (Zuckerman, 1970:244). Former Nobel laureates may nominate candidates for the prize and thus can, and apparently do, call their own students to the selection committee's attention (Zuckerman, 1977). In the first study to examine simultaneously the effects of both sponsorship and the Ph.D. department, Crane (1965) found that sponsors' eminence was associated with their students' later productivity, recognition, and current position. Despite her provocative results and the persistent

editors, etc.) evaluate or reward scientists' performance, or the extent to which the former's characteristics influence their evaluations. It deals only with the extent to which the reward system appears to involve ascription.

general interest in processes by which scientific rewards are allocated, researchers have failed to pursue these findings with the more complete data sets now available. Long's (1978) recent study of academic biochemists is an exception. He found that both the prestige of their Ph.D. departments and citations to their sponsors' work influenced the prestige of sample members' first academic appointments. Sponsors' citations also affected their students' number of publications and citations three years after beginning their first tenure–track job, and calibre of the Ph.D. department affected their number of publications after an additional three years.

In view of these results, reported effects of the Ph.D. department may reflect in part the impact of sponsorship. Furthermore, because faculty in the same departments vary in their academic origins, professional status and productivity, and because faculty calibre varies substantially within departments,[2] measures of sponsors' characteristics should explain some of the variation in scientists' careers that is unexplained by the prestige of their Ph.D. departments.

Like the impact of the prestige of the Ph.D. department, sponsors' influence on their students' careers may reflect both achievement and ascription. In training students, sponsors transmit to them professional skills that will enhance their scientific performance and hence their job prospects. But in assuming responsibility for students, sponsors also ascribe to them an origin status in the scientific stratification system.[3] Sponsors may provide other rather substantial ascriptive advantages as well, including introductions, nominations, and recommendations and accordingly may increase their students' visibility to employers and other status judges (Merton, 1977). However, the ascriptive potential of sponsorship is not limited to sponsors' deliberate efforts on behalf of their students; much of it ensues from others' assigning to new Ph.D.'s a status based on the status of their primary socializing agent—their sponsor.

Certain characteristics of sponsors can be distinguished that correspond approximately to the achievement and ascriptive aspects of sponsorship. Because sponsors transmit to their students scientific knowledge, technical skills, and professional values that should influence the kinds of positions they attain, the quality of sponsors' scientific performance and the closeness with which they work with their students reflect their potential influence on their students' scientific achievements. In contrast, the effect of sponsors' professional stature *net* of their scientific achievements provides an estimate of the ascriptive potential of sponsorship. Decomposing the effects of sponsorship into those suggesting each of the two processes would be impossible, of course, were sponsors' scientific performance and their professional stature perfectly correlated. They are not. While eminence is usually acquired through performance (Zuckerman and Merton, 1971:81), imperfections in the scientific reward structure stemming from normal delays between scientific achievements and recognition, the Matthew effect (Merton, 1968), and the tendency for eminence to be ascribed for an indeterminant duration and hence to persist after a scientist has withdrawn from active research (Zuckerman and Merton, 1972:325), reduce the association between performance and eminence. Thus, it is possible to gauge the independent effects of scientific performance and professional stature which, I argue, reflect achievement and ascription, respectively.

Figure 1 presents a model of the mechanisms by which sponsors are expected to affect their students' professional careers. Most of the direct paths from sponsors'

[2] Long (1977a), for example, reported a correlation of $r = .4$ between the prestige of the Ph.D. departments of his sample of academic biochemists and the number of citations to sponsors' publications at the time sample members received their degrees.

[3] Of course, graduate students usually pick their sponsors (although they may not get their first choice), so any effects of their sponsors' professional stature on the jobs they obtain could be said to accrue ultimately to the judgment they exercised in choosing a sponsor. Nevertheless, to the extent that potential employers act on information about students' sponsors *instead of* information on the students' own performance, the new doctorates are ascribed a status based on their sponsors' characteristics.

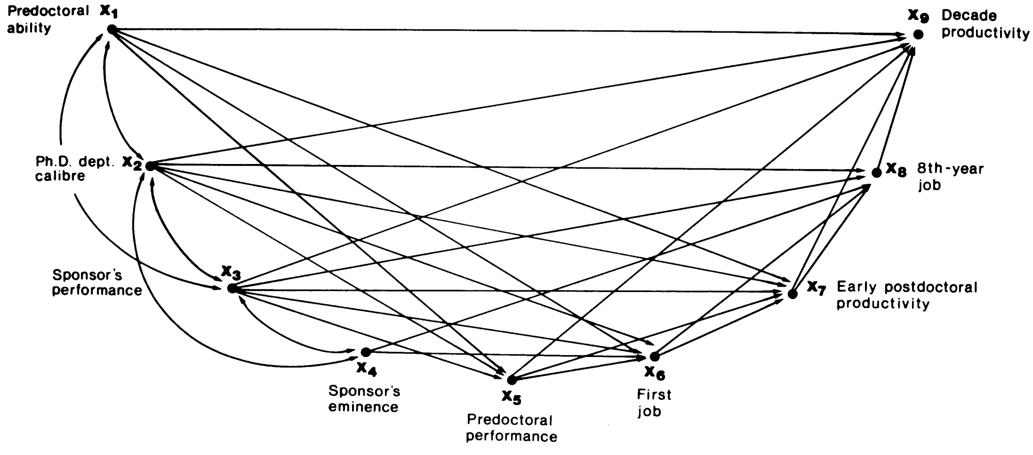

Figure 1. Theoretical model of impact of academic sponsorship on scientists' professional outcomes.

characteristics to their students' occupational outcomes, I contend, reflect the operation of either achievement or ascription processes. The indirect paths, although they cannot always be categorized as neatly, represent the accumulation of sponsorship-based advantages in the status-attainment process of scientists.

Ideally, evidence for the operation of achievement norms in the job-allocation process depends on showing an impact of measures of scientists' ability or performance on the jobs they attain, predoctoral ability (X_1) or performance (X_5) on their first job (X_6), early postdoctoral performance (X_7) on subsequent jobs (X_8). However, such effects are difficult to substantiate (Long, 1978), especially among new Ph.D.'s who vary only slightly on their measurable performance. Lacking objective evidence of candidates' scientific promise, employers must rely on other predictors of performance, including their sponsors' reputed ability to train good scientists. Thus, sponsors' scientific achievements serve as a proxy for new doctorates' scientific potential both for employers and in the present study. According to this reasoning, any direct effects of sponsors' scientific performance (X_3) on their students' first job (X_6) might be interpreted as evidence for an achievement effect of sponsorship. One could argue, however, that if employers are ascribing to new scientists characteristics of their sponsors, then such effects of sponsors' performance—net of measures of students' predoctoral performance—actually represent ascription. Whether effects of sponsors' academic performance signal ascription or achievement cannot be determined without research on how employers make hiring decisions. Classifying any link between sponsors' performance and their students' jobs as reflecting achievement rather than ascription will yield a conservative estimate of the total amount of sponsorship-based ascription in the job-attainment process. (Any direct effects of sponsors' performance on their students' occupational positions that persist several years after the Ph.D. probably reflect ascription, because employers would have had ample opportunity to assess the scientists' performance.) Indirect effects of sponsors' performance—and thus, I presume, training—on their students' occupational outcomes that are mediated through the students' predoctoral performance would constitute less equivocal evidence for achievement.

In contrast, any independent effects of sponsors' professional eminence (X_4) on their students' occupational outcomes (X_6, X_8,) *net* of sponsors' and students' performance suggest ascriptive advantages associated with sponsorship. One might object that sponsors' professional stature, itself a function of their earlier performance, reflects the quality of training they provide their students. If this is so, sponsors' eminence should directly affect both students' postdoctoral performance and their jobs. If no such effects on students' performance can be identified, any observed net effects of sponsors' eminence on their students' occupational outcomes might plausibly be taken as evidence for ascription.

Distinguishing between the Effects of Academic Sponsorship and Selection

In discussing the effects of the Ph.D. department, I noted that selection processes that match students' predoctoral ability, and hence professional promise, with the quality of their doctoral departments could account for apparent departmental effects. Selection or matching could also account for any effects of scientists' academic sponsors. In fact, there is almost no evidence for this hypothesis with respect to the Ph.D. department. Because many nonacademic factors enter into students' selection of graduate schools (Caplow and McGee, 1965:225; Berelson, 1960:143) or sponsors (Merz, 1961), student–department and student–sponsor matches are far from perfect. Estimates of the correlation between graduate department prestige and doctorates' I.Q.s range from .18 (Bayer and Folger, 1966:338) to .30 (Cole, 1974:43). In addition, previous research suggests that controlling for scientists' I.Q. does not destroy the relationship between the rank of scientists' doctoral department and the prestige of their jobs (Bayer and Folger, 1966:389; Cole, 1974:67,69). Thus, despite its plausibility, selection—at least on the basis of I.Q. scores—does not account for observed effects of the Ph.D. department. Unfortunately, no comparable data exist on the extent that selection processes match graduate students and faculty on their respective abilities, reputations, or performance, so we cannot exclude the possibility that any association between sponsorship and positions could be spurious, with scientists' calibre the true causal factor. The model in Figure 1 permits this possibility: scientists' predoctoral ability (X_1) and their sponsors' performance (X_3) are correlated, with the former directly affecting both their predoctoral performance (X_5) and their first postdoctoral position (X_6). But including indicators of students' predoctoral ability and performance in analyses of the effect of sponsors' performance reduces the likelihood that any independent effects of the latter are attributable to selection or matching.

The Present Study

Guided by a model of the impact of academic sponsorship on scientists' careers, the analyses address the following questions: (1) Do previously reported effects of the Ph.D. department persist when sponsors' characteristics are also taken into account? (2) Do characteristics of sponsors exert independent effects on students' postdoctoral performance and positional attainments? (3) Does sponsors' eminence influence their students' occupational outcomes net of performance measures, thereby suggesting the presence of ascription? (4) Does sponsors' performance influence their students' postdoctoral positions, presumably through its impact on their scientific ability, consistent with the existence of achievement effects of sponsorship? Using multiple regression, I explore these questions. Because the effects of sponsorship should decrease over time, I assess them both at the beginning and end of the scientists' first postdoctoral decade. Following Long (1978), who has demonstrated the causal priority of jobs in the job–productivity association, jobs precede the productivity measures in the model underlying the analyses. Hence, first job (X_6) is employed as a predictor of early postdoctoral productivity (X_7), and eighth–year job (X_8) as a predictor of productivity during the last two years of the first post–Ph.D. decade (X_9). (Because of its obvious temporal priority, early postdoctoral productivity—X_7—is permitted to affect the job held toward the end of the decade—X_8—although the causal order may be violated for scientists who remained with their first employer through this entire period.)

After describing the sample and measures, I report the results for this model.

DATA AND MEASURES

Sample Members

The sample members are chemists who obtained their doctoral degrees from U.S. universities between 1955 and 1961. I chose chemistry because biennial listings of the names of new graduates and their doctoral sponsors were in the American Chemical Society's *Directory of Graduate Research (DGR;* 1957, 1959, 1961). From that source I drew a systematic random sample of 238 chemists. I obtained educational and employment histories for 95 percent of the sample[4] from the 11th and 12th editions of *American Men and Women of Science (AMWS)* and from mailed questionnaires. Variables include selectivity of the bachelor's degree institution (Astin, 1971); rank of the Ph.D. department (Cartter, 1966); duration of doctoral study (elapsed time between the B.S. and Ph.D. degrees); specialty (measured by a dummy variable that distinguishes organic chemistry from other specialties); an index denoting the number and prestige of postdoctoral fellowships (the measure of prestige was taken from Cole and Cole, 1973:270–74); whether the first job was a tenure–track university position;[5] and whether the job held eight years after the Ph.D. was in a university as opposed to any other type of organization.

Productivity measures. The chemists' productivity is observed at three times: before the receipt of the Ph.D., shortly after sample members began their first postdoctoral job, and at the end of their first decade. The measure of predoctoral publications is based on the number of articles published through the Ph.D. year. Early productivity is measured by (1) the number of articles published during the third, fourth, and fifth years after the Ph.D., and (2) the number of citations to sample members' early work,[6] which reflects both the quantity and quality of early publications (Cole and Cole, 1973:27–28). Productivity at the end of the first decade is measured by (1) the number of articles published in the chemists' ninth and tenth years after the Ph.D. and (2) the number of citations to first–authored works received during the same two years.[7]

Transformation of productivity measures. All productivity measures were standardized by sample members' Ph.D. year to adjust for variation in *CA* and *SCI* coverage across the seven degree cohorts. Because relationships between the productivity measures might not be linear

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[4] Reskin (1977) gives details on sampling and measurement. The ten chemists whose career histories were unavailable did not differ significantly from other sample members on measures of early postdoctoral publications. In view of these results and the high response rate, the findings reported should not be biased by nonresponse.

[5] Because I sampled all new doctorates, sample members have pursued both academic and nonacademic careers. University positions are more highly regarded and preferred by many new Ph.D.'s (Davis, 1962:20 and Table 2.18, p. 158; Klaw, 1968:62–63; National Academy of Sciences, 1969:69). Because lecturers, instructors and research associates cannot claim the status or resources that professorial appointments confer, I assume the former positions are less desirable and less likely to facilitate incumbents' scientific productivity. Hence, university tenure–track appointments are distinguished from all others. I coded as universities all academic institutions listed in the *DGR* as granting advanced degrees in chemistry or biochemistry. All professorial appointments (i.e., appointments at the assistant–professor level or higher) are classified as tenure track. Although this categorization may occasionally be incorrect for lecturers or instructors, the effects of the small amount of measurement error this is likely to produce should be negligible.

[6] For 1955 to 1958 Ph.D.'s, I took citations from the 1961 edition of *SCI*; for 1959 to 1961 Ph.D.'s, I used the 1964 *SCI*.

[7] Except where noted, article counts were made without regard to the order in which authors' names appeared or the number of authors. Citation counts exclude self–citations and were tabulated only for articles on which the chemists were first authors. Thus, citation counts are underestimated for chemists who were disproportionately junior authors. This does not bias early citations because sample members' sponsors usually were first authors of articles on which sample members themselves were not senior authors, and citations to those papers should be omitted in an analysis of the effects of sponsorship. Presumably, sponsors were less frequently first authors on articles cited during the ninth and tenth years after sample members' Ph.D. on which sample members were junior authors, and I would have preferred to have citation counts for junior–authored papers. But the lack of these counts probably does not cause a severe bias. Long (1977b) found a .8 correlation between total number of citations and citations to first–authored publications for a sample of biochemists at about the same career stage.

(Long, 1977a), I compared the regression results for natural–logarithm and square–root transformations (also standardized by Ph.D. year). The results were essentially the same for all three representations; because the measures that were only standardized by the Ph.D. year yielded a slightly better fit, they are reported here.

Sponsor's Eminence

Because sponsors' eminence depends partly on their backgrounds, I measured events in their professional careers that occurred both before and during the period in which sample members studied under them. Potential measures of eminence included (1) the prestige of their Ph.D. departments;[8] (2) the number of postdoctoral fellowships they held and their prestige (per rankings in Cole and Cole, 1973:270–74); (3) the number of awards they received and their prestige (prestige ratings also taken from Cole and Cole, 1973:270–74); (4) number of honorary degrees; (5) professional age and (6) academic rank during their student's Ph.D. year; and (7) the number of federal science advisory committees on which they served through their student's Ph.D. year (data are from Mullins, 1978). Lacking any strong *a priori* case for any given subset of these indicators, I experimented with various combinations and with two indexes constructed from factor scores. The two indicators that showed the most consistent effect—number of honorary degrees and number of science advisory committees—are used in the analyses reported below. Their correlations with the other five sponsorship measures shown in Table 1 support their validity. The number of sponsors' honorary degrees is positively correlated with the calibre of their Ph.D. departments, their number of scientific awards, the prestige of their most prestigious award and their academic rank, and, with one exception, these cor-

Table 1. Means, Standard Deviations and Intercorrelations for Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Mean	S.D.	N
1. Pre-PhD publications																							1.36	2.17	237
2. Elapsed time BS–PhD	.23																						6.41	3.78	224
3. Organic specialty	−.02	.03																					.42	.50	232
4. PhD calibre	−.02	−.24	.05																				3.07	1.02	237
5. Spons. PhD calibre	−.02	−.19	.02	.36																			3.80	.79	224
6. Sponsor's rank	−.05	.05	−.02	.09	.07																		5.63	.73	236
7. Spons. postdocs.	−.03	−.15	.05	.23	.19	−.05																	.86	1.00	237
8. Spons. postdoc. pres.	−.02	−.15	−.06	.30	.25	−.08	.79																6.68	2.94	237
9. Spons. honorary degree	−.07	−.01	.03	.12	.14	.22	.01	−.04															.32	1.53	237
10. Spons. awards	.03	−.11	.00	.36	.21	.31	.09	.09	.47														1.73	2.36	237
11. Spons. award prestige	.08	−.13	−.04	.39	.25	.19	.14	.20	.32	.72													22.13	34.91	237
12. Spons. adv. comms.	−.04	−.10	−.11	.14	.03	.15	.05	.03	.14	.26	.24												.78	3.35	237
13. Spons. publications	.23	−.15	.21	.20	.19	.19	−.02	.00	.16	.48	.42	.04											15.62	16.39	237
14. Spons. 1961 citations	.18	−.15	.22	.35	.24	.19	.09	.10	.27	.57	.56	.05	.73										46.92	74.56	237
15. Spons. decade cits.	.10	−.13	.20	.29	.26	.02	.19	.16	.22	.49	.44	.03	.59	.74									100.80	172.35	237
16. Spon.-chem. collab.	.46	−.07	.07	.08	.08	−.04	.06	.03	−.06	.06	.12	−.07	.45	.30	.21								.41	.86	237
17. Postdoc. fel. pres.	.04	−.04	−.04	.11	.08	.14	.13	.13	.21	.18	.07	.05	.05	.14	.07	−.08							.78	2.78	227
18. Job 1 univ. ten-trk.	.05	−.01	−.14	.00	−.05	.01	.03	.05	.11	.20	.13	.27	.03	.10	.05	.00	.32						.05	.22	227
19. 3–5 year pubs.	.20	−.20	−.13	.22	.17	−.06	.10	.12	.12	.09	.20	.11	.09	.13	.05	.04	.28	.20					.00	.99	237
20. Early citations	.17	−.19	−.20	.22	.14	.05	.17	.19	.07	.06	.20	.16	.04	.10	.03	.06	.20	.11	.42				−.01	.97	237
21. 8-year univ. job	.05	−.11	−.11	.18	.03	.02	.16	.16	.19	.24	.26	.26	.03	.09	.09	−.04	.26	.39	.38	.40			.15	.36	226
22. Decade publications	.08	−.17	−.15	.23	.16	−.01	.19	.15	.08	.13	.15	.03	−.01	.09	.01	.03	.18	.08	.54	.38	.40		−.00	.99	237
23. Decade citations	.14	−.20	−.14	.23	.19	−.04	.20	.19	.04	.16	.21	.02	.06	.12	.06	.08	.34	.21	.63	.56	.39	.68	−.01	.97	237

[8] The sponsors received their Ph.D. degrees between 1903 and 1957; their mean degree year was 1940. Because Ph.D. department prestige rankings have been quite stable (Roose and Anderson, 1970), I used Cartter's (1966) ratings to measure the calibre of sponsors' Ph.D. departments rather than Keniston's (1959) earlier ratings for 25 universities.

relations are larger than the correlation with the number of articles they authored. Sponsors' membership on federal advisory committees also apparently reflects eminence rather than performance. It is positively related to the prestige of sponsors' current academic department, their academic rank, their numbers of honorary degrees and awards, and award prestige, but is unrelated to their number of articles or citations during their students' training. These results are consistent with Blume's (1974:195) claim that scientists' selection for federal advisory committees often depends more on their professional and political status than on their scientific performance, and support using advisory–committee membership to measure sponsors' ability to confer ascriptive advantages.

Sponsors' Performance and Students' Training

Particularly in laboratory sciences, students learn from observing their sponsors at work (Zuckerman and Merton, 1972:315). Presumably sponsors' research performance also reflects the overall quality of the training they provide their research students and consequently their students' research potential. Thus, I measured sponsors' number of publications during the four–year period preceding their students' Ph.D. year.[9] Because students often acquire professional skills by collaborating with their sponsors, the number of articles that sample members coauthored with their sponsors through their Ph.D. year provided a second measure of training.[10] Of course, coauthored articles do not always reflect true collaboration; sponsors may claim coauthorship in exchange for suggesting a problem, making data available, helping to write results, or simply as a prerogative of their status. However, even by contributing only their names and institutional affiliations, sponsors may facilitate publication (Crane, 1967; Merton, 1968), which in turn should orient newly trained scientists to publishing in the future.

Some measures are particularly difficult to interpret as reflecting either eminence or performance. Citations are a case in point. They reflect both performance—the quality of scientific contributions—and eminence—the recognition these contributions elicit from the scientific community. Thus, while Long (1978) found that sponsors' citations at the time their students were completing their training affected students' performance and institutional prestige, such effects do not unambiguously denote either ascription or achievement. For this reason, I chose sponsors' publications to measure performance. They are highly correlated with the sponsors' number of citations in the 1961 edition of *SCI* ($r=.73$), and most of the regression results using publications differed only slightly from those using citations. Except where noted, data for sponsors were taken from *AMWS* (which included all of the sponsors), *DGR* and *Chemical Abstracts*.

Analyses

Primary analyses utilize ordinary least–squares regression procedures. For the two dichotomous dependent variables that indicate whether the first and eighth–year jobs were in universities, OLS assumptions of homoscedasticity and normality are violated (Goldberger, 1964:248–55), and the estimated standard errors and statistical tests are biased. Moreover, the use of a technique that assumes a linear model is questionable because predicted values of the dependent variable can be less than zero and greater than one. In view of these problems, shortly before this paper went to press I re–estimated the equations for the two dichotomous dependent variables using the logit technique, which does not as-

[9] The data do not indicate how long sample members were enrolled in graduate school, but they averaged 6.4 years between their B.S. and Ph.D. degrees. Out of that period most of the students probably were enrolled between 4 and 4.5 years (National Academy of Sciences, 1967:69; Folger et al., 1970:192).

[10] Because students also learn from observing their professors train others, I also examined the effect of the number of other doctoral recipients trained by sponsors during the biennium in which the sample members completed their degrees. However, this variable was unrelated to the dependent variables, so it is not included in the results reported.

sume a linear model (Hanushek and Jackson, 1977:187–89). The results from the logit analyses replicated those obtained with OLS regression which are reported here.

Table 1 shows the means, standard deviations, and intercorrelations for the variables.

RESULTS

Selection Processes

Before considering the regression results, let us consider the possibility that selection processes might account for any apparent department or sponsorship effects. The data include four potential, although imperfect, measures of the chemists' ability: selectivity of the B.S. institution, whether the chemists bypassed the master's degree, number of pre-Ph.D. publications and amount of elapsed time between the B.S. and Ph.D. degrees; all four measures are modestly related to four measures of their academic origins (see Table 2). These results are consistent with the broader literature on the relationship between ability and Ph.D. departments or sponsors. If these measures reflect sample members' ability, then holding them constant in the regression analyses would reduce the likelihood that any effects of academic origins are spurious. In fact, the four measures rarely showed significant partial effects on the dependent variables, so they are usually omitted from the equations reported.

Predoctoral Publications

The number of papers that students publish before receiving the Ph.D. should be influenced both by their scientific ability and the quality of their training. But few measures of predoctoral ability are available, so distinguishing between the effects of these factors is difficult and drawing inferences about the impact of the quality of training sponsors provide on their students' predoctoral publications is risky. Nevertheless, analyzing the determinants of the chemists' predoctoral publications is desirable, because—as we shall see below—insofar as sponsors' performance and student–sponsor collaboration affect sample members' postdoctoral performance, they operate indirectly, through their effects on predoctoral publication.

In order to assess the impact of training on predoctoral publication, I regressed the number of articles the chemists published through their Ph.D. year on two indicators of their predoctoral promise (B.S. selectivity score and whether they bypassed the master's degree), the calibre of their Ph.D. department, the number of articles their sponsors published during the four–year period prior to sample members' Ph.D. year, any student–sponsor collaboration during graduate school and, to control for the amount of time during which predoctoral publication could occur, their length of doctoral study. Equation 1 in Table 3 shows the best–fitting equation, which accounted for 27 percent of the variance in predoctoral publication. Apart from the expected positive effect of the duration of doctoral study, only two variables had significant partial coefficients: sponsors' productivity and sponsor–student collaboration. Students of prolific sponsors published more articles by the time they had finished their

Table 2. Correlations between Sample Members' Academic Origins and Measures of Ability

Academic Orgins	Measures of Ability: BS Selectivity	Bypassed MS degree	Predoctoral publications	Elapsed time, BS to PhD
Ph.D. calibre	.168*	.272*	−.045	−.239*
Sponsors' pubs.	.187*	.132*	.215*	−.231*
Sponsors' 1961 cits.	.152*	−.001	.138*	−.154*
Sponsors' eminence[a]	.181*	−.011	.124*	−.163*

* Statistically significant at .05 level.
[a] This measure is a factor score based on several indicators of sponsors' eminence, including sponsors' 1961 citations, honorific awards and award prestige.

Table 3. Regressions for Chemists' Predoctoral Publications, First Job, and Early Postdoctoral Productivity (coefficients in standardized form).

	Predoctoral Publications (Eq. 1)	Job 1 Univ. Tenure Track (Eq. 2)	Publications Years 3 to 5 (Eq. 3)	Early Citations (Eq. 4)
Organic specialty		−.109**	−.094	−.045
Elapsed time BS–Ph.D.	.321*	.006	−.212*	−.172
Ph.D. department calibre	.012	−.067	.161*	.120*
Sponsors' publications	.181*	.042	−.013	−.052
Pre-Ph.D. collaboration	.407*	−.045	−.045	.030
Predoctoral publications		.054	.263*	b
Sponsors' advisory committees		.245*	a	a
Sponsors' honorary degrees		.010	a	a
Postdoc. fellowship prestige		.306*	.181*	.105**
First job university			.245*	.053
Early 1st-authored pubs.				.434*
$\bar{R}^2$	.279*	.149*	.235*	.278*

[a] No theoretical basis for inclusion; coefficient not statistically significant.
[b] First-authored predoctoral publications included in early first–authored publications.
* Statistically significant at .05 level.
** Statistically significant at .1 level.

doctoral degrees (the regression coefficient dropped to .15 when the measure of sponsors' productivity excluded articles coauthored with their students, but the other coefficients remained stable), and students who coauthored any papers with their sponsors through their Ph.D. year had more predoctoral publications than did those who, for whatever reason, did not do so. Independent of these factors the calibre of the Ph.D. department failed to affect sample members' predoctoral productivity. This may constitute additional evidence against department–student selection or it may indicate that overall departmental calibre is not that important for graduate students' predoctoral performance beyond the effect of their sponsors.

Despite the failure of the controls for sample members' predoctoral ability (and hence for matching) to significantly affect the dependent variable, concluding that working with a prolific sponsor or collaborating with one's sponsor enhanced the chemists' predoctoral productivity is still risky. However, the data clearly show that students of productive sponsors tended to leave graduate school with more impressive vitae, and, even assuming superior ability, it seems likely that their sponsors' encouragement and advice also figured in their performance.

First Job

Any ascriptive effects of new doctorates' academic background should be particularly important for their first job because (1) relatively little objective evidence exists as to new Ph.D.s' merit, and (2) new doctorates vary only slightly on one of the few available measures of performance: predoctoral publications. Equation 2 in Table 3 shows the results of regressing a dummy variable indicating whether the first job was a tenure–track university position (coded 1, all other jobs coded 0) on the calibre of the Ph.D. department and sponsors' characteristics. In view of the demonstrated impact of postdoctoral training on academic employment (Folger, Astin, and Bayer, 1970), the prestige of any postdoctoral fellowships is also included.

Although previous studies have reported an effect of the calibre of the Ph.D department, in these data neither the Ph.D. department nor either measure of training significantly affected sample members' type of first job. Moreover, omitting all three sponsorship measures from the equation did not affect the coefficient for the Ph.D. department, so their inclusion does not explain the absence of an effect of the doctoral department. The discrepancy between these and earlier findings probably results from the different representations of the measure of first job.

As expected, having held a prestigious postdoctoral fellowship enhanced the chemists' chances of obtaining a university tenure–track position, probably because recipients of prestigious rewards are highly selected (at least males are; Reskin, 1976) and benefit from the visibility and contacts that fellowships provide.[11] However, sponsors' participation in the federal advisory system was almost as important. Federal science advisors are presumably more eminent. Perhaps prospective employers who are concerned with hiring individuals who will be good colleagues as well as good scientists assume that qualities of these eminent scientists such as collegiality or conformity to professional norms will be shared by their students (either through socialization or selection). Federal science advisors are also more favorably situated in communication networks than most other scientists and thus presumably better able to place their students. Regardless of which of these explanations holds, this result signals ascription if sponsors' characteristics were attributed by others to their students or if, by virtue of their positions, sponsors enhanced their students' job opportunities.

This ascriptive effect of sponsorship is noteworthy for two reasons. First, it is independent of the two measures of training (sponsors' publications or collaborative publications, which were not statistically significant). Second, many scientists remain with their first employers for much of their careers (National Academy of Sciences, 1965:47–48; Long, 1977a:143–44), and—for both mobile and stationary scientists—the type of first job dictates access to resources essential for future performance (Allison and Stewart, 1974; Long, 1978).

[11] The dummy variable that indicated only whether chemists had any post-doctoral fellowships was not significant, nor was sponsors' nonacademic work experience which might signal nonacademic ties or an orientation toward nonacademic employment opportunities. Presumably few new Ph.D.'s who had offers from universities turned them down (Davis, 1962), regardless of their sponsors' employment background.

Early Productivity

Early publications. Equation 3 in Table 3 presents the results of regressing the number of articles the chemists published during their third through fifth years after the Ph.D. on measures of the quality of their training, controlling for their predoctoral publications, specialty and first job setting. (The effects of the indicators of predoctoral ability—the selectivity of the B.S. institution, the duration of doctoral study, and bypassing the master's degree—were all insignificant, so they were omitted from equation 3.) Net of the significant effects of predoctoral publication, university employment and specialty, the calibre of sample members' Ph.D. department significantly affected their productivity a few years after beginning their careers; however, neither collaborating with their sponsors nor their sponsors' scientific productivity during the period the chemists were in graduate school directly affected their early postdoctoral productivity. As we have seen, these two measures of training were associated with the chemists' *pre*doctoral productivity, so we cannot discount the importance of the training that sponsors provided, but the results in equation 3 suggest that the direct effects of sponsorship on sample members' performance were short–lived. After examining the impact of sample members' academic origins on the number of citations to their early publications, I consider the implications of both sets of findings together.

Citations to early work. Equation 4 (Table 3) presents the results of regressing sample members' early citations on measures of their academic origins, controlling for their number of first–authored pre– or postdoctoral publications (i.e., those to which *SCI* citation counts applied), measures of their predoctoral ability, their specialty, any postdoctoral fellowship experience, and the setting of their first post–Ph.D. job. Only two of the variables showed significant partial effects: the calibre of the Ph.D. department and having held a prestigious postdoctoral fellowship. Although the latter result may reflect selection, it is often interpreted as a consequence of postdoctoral training

(Folger et al., 1970:365), because the additional training involved in many postdoctoral fellowships presumably leads former fellows to publish higher quality or more important work. However, a third interpretation is possible. Receiving a prestigious fellowship probably heightens the visibility of new doctorates, either by increasing their ties with other active researchers in their area or through the deliberate efforts of their postdoctoral sponsors. Thus, the effect of the fellowship identified in equation 4 may also reflect ascriptive aspects of sponsorship.

Turning to the results for the three measures of the sample members' doctoral origins—the prestige of their Ph.D. departments, their sponsors' productivity, and collaboration with their sponsors—only the first showed a significant independent effect. Neither measure of the training sponsors provide discernibly affected the number of citations sample members received to their early work.

It would be rash to conclude from these results and those for early publications that the quality of training that sponsors offer is unimportant for their students' postdoctoral performance. Both measures of training probably did affect the chemists' predoctoral publications, which in turn showed a modest effect on their article productivity five years later and, indirectly, on their early citations as well. Also, their validity as measures of training—especially that of sponsors' publications—is questionable. Teaching effectiveness is notoriously resistant to measurement, and the quality of the less structured training that sponsors provide their doctoral students cannot be measured directly. Perhaps if we could adequately measure the quality of training sponsors provide, we would observe less transitory effects on their students' postdoctoral performance. Nevertheless, it is puzzling that the influence of sponsors' productivity, not to mention the experience of jointly authoring articles, should be entirely indirect. Part of the explanation may lie in the direct effects of the calibre of the Ph.D. department on sample members' early publications and citations. Although sponsors may assume primary responsibility for training their own students, other faculty participate as well in courses, colloquia, and by serving on thesis committees. Apparently students' sponsors, who work quite closely with them during the final stage of their training, are important in whether their students publish before completing their degrees. Since getting students off to an early start in publishing can help establish orientation toward publishing, this sponsorship effect has long run consequences. However, the efforts of other faculty members and the context in which training occurs apparently directly influences scientists' scholarly achievements in a more enduring way.

Later Job

The persistence of ascriptive effects of the Ph.D. department has engendered debate among sociologists of science. Caplow and McGee (1965:193) claimed that the Ph.D. department "indelibly" marked academics and that the "handicap of initial identification with a department of low prestige is hardly ever overcome." Others have disagreed. Hargens and Hagstrom (1967) suggested that these ascriptive effects should decline over time as evidence of performance becomes available, because employers consider what more advanced scientists have done since the doctorate and not who trained them. However, Stehr (1974:207) contends that equally strong ascriptive effects from the prestige of the first academic job may replace that of the Ph.D. department. The analysis of the effects of the chemists' academic origins on whether they held a university position eight years after the doctorate bears on this debate.

Equation 1 (Table 4) reveals no significant impact by the Ph.D. department but does suggest ascriptive effects of sponsorship. Except for Crane (1965:706), previous researchers who have reported an effect of the Ph.D. department have failed to control for sponsors' professional eminence. When I omitted the two measures of sponsors' eminence from the equation, the coefficient for the Ph.D. department increased slightly. Although the analysis should be replicated with other represen-

Table 4. Regressions for Chemists' Eighth-Year Jobs and Decade Productivity (coefficients in standardized form).

	8th-Year Job University (Total Sample) (Eq. 1)	8th-Year Job University (Movers, N=133) (Eq. 2)	Decade Publications (Eq. 3)	Decade Citations (Eq. 4)
Ph.D. department calibre	.070	.144**	.155*	.050
Sponsors' publications	−.036	−.055	−.084	−.016
Pre-Ph.D. collaboration	−.002	−.044	.040	−.022
Sponsors' honorary degrees	.118*	.131	[a]	[a]
Sponsors' advisory committees	.102	.144**	[a]	[a]
First job university	.393*	.230*	.123*	.125*
3–5 year publications	.101	.133	.383*	[b]
Early citations	.279*	.270*	.124*	.351*
8th-year job university			.129**	−.018
Predecade publications[c]				.449*
$\overline{R}^2$	.377*	.267*	.354*	.503*

[a] No theoretical basis for inclusion; impact statistically insignificant.
[b] Omitted in favor of total number of predecade publications.
[c] Total number of publications through eighth year after the Ph.D.
* Statistically significant at .05 level.
** Statistically significant at .1 level.

tations of the dependent variable, they are consistent with Cole and Cole's (1973:98) claim regarding earlier findings that the doctoral department served as a proxy for sponsors' ability to place their students.

Net of the expected effects of type of first job and intervening performance, sponsors' eminence—as measured by number of honorary degrees—enhanced sample members' likelihood of working in a university. Furthermore, this effect is in addition to the ascriptive aspects of sponsorship that influenced the chemists' type of first job. However, almost half of the chemists remained with their first employer for at least eight years, so these sponsorship effects may mean only that students of eminent sponsors were more likely to succeed in universities—perhaps because of superior performance—rather than necessarily implying recurring ascription in subsequent moves. To test this possibility, I repeated the analysis for the 133 chemists who had changed jobs at least once during the eight-year period (see equation 2, Table 4). Although the variables were less effective in combination in explaining the mobile chemists' type of job because of the reduced impact of initial university employment, both indicators of sponsorship became more important. The strength of the effect of sponsors' honorary degrees increased slightly, and the effect of membership on federal advisory committees (though it failed to attain significance with this reduced number of cases) was positive. Of course, sponsors' eminence may have been more important for those job changes that occurred earlier in scientists' careers (starting dates for subsequent jobs were not available), but about one-quarter of the chemists changed jobs more than once during the eight years, and moves occurred throughout the entire period; thus the ascriptive effects of sponsorship appear to have persisted well into the decade. A larger sample and more detailed occupational coding would permit more definitive conclusions about changes in the impact of sponsors' characteristics as scientists' careers progress.

Although small, the effects of sponsors' eminence in equations 1 and 2 of Table 4 are theoretically important. They suggest ascriptive effects of sponsorship that are independent of the effects of sponsors' performance, the calibre of the Ph.D. department, and their own productivity, almost a decade after the sample members began their careers. Because the measures of training showed no direct effects on the chemists' positions, to the extent that sponsors' accomplishments and eminence are not perfectly correlated, students of highly eminent but less productive (and less frequently cited) sponsors got better jobs than did students of less eminent but more productive faculty members.

Decade Productivity

Decade publications. We saw above that sponsors' productivity and collaborating with one's sponsor enhanced sample members' predoctoral publication rate but had no direct effect on their early postdoctoral publications. Thus, these variables are not likely to directly affect the number of articles published five years later. In contrast, the effect of the Ph.D. department on early productivity, regardless of whether it results from selection or socialization, might well persist for ten years after scientists finished graduate school. The results in equation 3 of Table 4 show just this. Net of early publications, citations, and university employment, none of the sponsorship variables showed a significant direct effect (although they indirectly affected decade publications through their direct effects on predoctoral publications and university employment). The calibre of the Ph.D. department, however, had a positive direct effect. This result strengthens earlier findings (Folger et al., 1970) by ruling out the possibility that they spuriously attributed to the Ph.D. department the effects of sponsors.

Decade citations. Equation 4 of Table 4 shows that after employment and number of publications had been taken into account, sample members' academic origins had no effect on the number of citations they received in the ninth and tenth years of their career. Only when the strongest predictor of decade citations—number of previous publications—is omitted does the coefficient for the Ph.D. department attain significance. Hence, rank of the Ph.D. department influences decade citations only indirectly through its effect on the number of publications; it has no enduring direct effect on the quality or visibility of these articles.

Although the significant effects of university employment and early productivity on decade articles and citations are not our primary interest here, they deserve mention. Whether scientists continue to publish depends in part on material factors, as indexed by their employment settings and access to resources, and their major work activity (Folger et al., 1970:263–64; Long, 1978). Hence, the effects of first and eighth–year job are not surprising.

Honorific Awards

One final result merits discussion. When I regressed a measure of the sample members' own professional stature, the number of honorific awards they received during the first ten years of their careers, on all available measures of their origins and performance, only number of citations to their early work had a significant effect ($\beta = .15$; equation not shown). The absence of evidence for ascription here is especially noteworthy in view of the results for jobs. Perhaps, as Cole (1974:52) suggests, there is more particularism in the structure of appointments and promotions than in the distribution of other rewards.

CONCLUSIONS

Summary and Discussion

Training and scientific performance. Being trained by a productive sponsor and collaborating with one's sponsor during graduate school were both associated with greater predoctoral productivity by sample members. Although these effects may reflect the tendency for brighter students to work with more productive faculty, it seems likely that the association stems at least in part from the superior training and professional orientation more productive sponsors provide. If so, these associations constitute the only evidence I found that the two measures of training by sponsors directly affected their students' professional achievements. Neither measure significantly affected sample members' article productivity during their third through fifth or ninth and tenth years after the doctorate or the number of citations they received at the beginning or the end of their first postdoctoral decade.

The effects of the calibre of the doctoral department on the chemists' productivity showed the opposite pattern. While the prestige of sample members' Ph.D. departments had no impact on the number of articles they published through their Ph.D. year, it was important for their productivity at the middle and end of their first postdoctoral decade and for the number of citations they received to early first-authored work. Three factors probably contribute to its effects. First, besides differing in faculty quality, departments differ in their rigor, commitment to high-quality training, and availability of research facilities that students need to acquire technical skills. Second, other faculty members besides students' sponsors contribute to their training. Data on the achievements and eminence of all members of students' Ph.D. committees or references on their first vitae would be useful in interpreting the effect of the Ph.D. department. Intellectual debts also might be reflected in joint publication or acknowledgments to other faculty in early articles. Third, we cannot discount the possibility that more talented students graduate from more highly ranked departments. Even if we could categorically reject the possibility that selection processes operate prior to matriculation, selective attrition could lead to some matching at the time of graduation. The evidence for stronger apparent effects of sponsors on their students' professional achievements prior to leaving graduate school and for more enduring effects of their Ph.D. departments suggests that sponsors may be especially important in getting their students started publishing, either through the significance of the work they assign them, the quality demanded, assistance in preparing results for publication, or coauthorship, but that initial experience along with overall strong training that superior departments provide is necessary for students to continue to publish well past the Ph.D.

Sponsors' eminence and ascription. Out of many potential indicators of sponsors' eminence, only two consistently affected sample members' jobs: sponsor's participation in the federal science advisory system and their number of honorary degrees. Working under an eminent sponsor both increased the chemists' chance of beginning their careers in university tenure-track jobs and helped them to succeed in such positions. Because the scientific reward structure accumulates advantages for young scientists initially favored on the basis of their academic origins, ascriptive advantages of sponsorship may indirectly yield a variety of later rewards. In his analysis of Thomas Kuhn's career, Merton (1977) contends that such benefits are forthcoming only as long as a scientist's achievements justify the sponsor's good opinion, but analyses of the careers of ascriptively favored scientists whose accomplishments did not vindicate their sponsors' efforts are needed to test his claim.

In contrast to previous findings, the calibre of the Ph.D. department exerted no independent effect on either the first or the eighth-year job. This inconsistency may be explained by the different measures of the job used. The ascriptive effect of the calibre of the Ph.D. department probably influences the prestige of scientists' academic jobs but apparently does not help chemists get academic positions beyond any indirect effects through the prestige of their postdoctoral fellowships and their sponsors' eminence.

Implications and Limitations

Generalizing beyond the research population is risky, but the results permit at least the claim that sponsorship is vital for scientists' careers. Both their departments and sponsors affect graduate students' later performance as well as how they fare professionally. While evidence for the importance of training and hence achievement is heartening, the implications of evidence for ascription are more complex. If (1) the most capable faculty are also the most eminent and (2) students and sponsors are perfectly matched, then ascription will exact no price from either the institution of science or individual scientists. Indeed, it may be beneficial (Merton, 1968; 1977). Storer (1966:134), for example, argued that intergenerational ties maintain a discipline's universe of discourse. But when matching is not perfect—and this must be the rule—ascription will impede the maximum utilization of talent, and both individuals and the scientific enterprise will suffer from the contradictions between the normative ideal of universalism–achievement and the reality that talented scientists from humble academic origins encounter.

Future research should extend this study in several ways. First, additional measures of performance that are more appropriate for scientists in nonacademic careers should be employed. Second, given the increasing importance of postdoctoral education in science (National Academy of Sciences, 1974:29–30), researchers should give high priority to examining the relative effects of pre– and postdoctoral sponsorship. That former fellowship recipients outperform other scientists has been documented repeatedly. We need to separate the effects of selection and the postdoctoral mentor, and particularly the effect of training that the mentor provides from any ascriptive effects of sponsors or of the award itself. If fellows and their postdoctoral sponsors—being mutually better informed—are better matched, fewer undeserved advantages should accrue.

Third, future research should explore whether the relationships observed for chemistry hold across other disciplines or scientific specialties. The degree of consensus within a field on important questions and appropriate research strategies may affect the impact of sponsors' achievements on their students' performance, the ascriptive effects of sponsorship on students' jobs, and the impact of the calibre of the Ph.D. department. High consensus in a field facilitates training; because sponsors can transmit scientific skills to their students more easily, the impact of their performance should be enhanced. The effect of Ph.D.–department calibre also may vary with the level of consensus. In low–consensus fields, departments often include competing specialties, and students working exclusively with their sponsors' research group may be isolated from much of the department; in high–consensus fields, training may be more standardized across the department, so the effect of quality of the department should be greater.

Regarding sponsors' ascriptive effects, they might vary either directly or inversely with the level of consensus in a field. In low–consensus fields that lack standards for evaluating scientific work and workers, sponsors' reputations may be less important; but, on the other hand, sponsors' eminence could matter more in such fields, because potential employers might find it more difficult to evaluate the work of new Ph.D.'s than the professional stature of their sponsors.

Finally, the effect of market conditions on the extent of ascription needs study. In tighter job markets, ascriptive aspects of the allocation process may predominate, and for this reason conclusions about ascription among chemists who began their careers in the late 1950s and early 1960s may not hold for disciplines with different market structures, or even for chemists in the 1970s. General questions on how market structures affect ascription have resisted study (beyond identifying the effects of race and sex) because indicators of ascription are hard to find. Research in this area might follow the present example by seeking other institutional sectors in which the effects of ascription can be distinguished from those of training or performance. Within science comparative research is clearly needed across disciplines, with particular attention to secular changes in job markets. The effects of ascription identified here illustrate the value of future research to determine the limits of ascription within science.

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CURRICULUM PLACEMENT AND EDUCATIONAL STRATIFICATION IN FRANCE*

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Curriculum placement is the keystone of educational stratification in France. Curricular boundaries are firmer than in the United States, and previous research has shown the effect of curriculum placement on subsequent educational attainment to be stronger in France. In this paper we report findings of strong effects of father's occupation, academic performance, parents' expectations, and teachers' expectations on curriculum placement upon the completion of primary school. Furthermore, we report significantly stronger effects for the socializing influences of parents' and teachers' expectations among the young women in our sample. We conclude that curriculum tracking in France (1) increases the variance of educational outcomes, (2) assists in the transmission of socioeconomic advantage from one generation to the next, and (3) is only tangentially involved in sexual stratification in France despite sexual segregation in the schools.

Curriculum differentiation regulates students' access to school resources. The students who occupy the advantaged position in the social structure of the school are the ones enrolled in curricula that lead to higher education. College prep students spend more time in the libraries and laboratories of schools, they spend more time with and receive more encouragement from school counselors (Heyns, 1974), they are more likely to apply to college and more likely to be accepted (Alexander, Cook, and McDill, 1978), and they perform better on standardized tests (Rosenbaum, 1975).[1] What social factors are important in the assignment of students to curricula?

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[1] Rosenbaum (1975:52) reports a positive net effect of college preparatory track on tenth grade IQ, controlling for eighth grade IQ.