The Federal Scientist-Administrator

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A number of interesting questions can be asked about the scientist who is employed as an administrator by the federal government (*1*). Some of these are very practical questions. Others have relevance for theoretical concerns in the social sciences. For instance, exactly what is the professional distribution of scientists in government who hold supervisory and administrative positions? From what backgrounds do they come? What sorts of careers have they had, in and out of government? What is the correlation between the rank of the scientists and their fields of research? How does the scientific elite in government compare with other elite groups? Can any significant conclusions concerning the civil-service and the social function of scientists be drawn from this information?

To answer some of these questions, we have started to gather and analyze data for a random sample of natural scientists who were in the federal government in 1959 in administrative and supervisory positions. Our method was simple, though tedious and time-consuming. We began by taking a 1-in-10 sample from the alphabetical index of names in the *Official Register of the United States* (*2*). The *Register* is a virtually complete list of administrative personnel compiled by the United States Civil Service Commission from data supplied by the departments and agencies of the government. There are approximately 31,000 officials listed in the *Register*; we therefore secured some 3100 names by taking a 1-in-10 sample.

Each of the names in our sample was then checked against the listings in the tenth edition of *American Men of Science: the Physical and Biological Sciences* (*3*). Our study thus does not include social scientists. If the individual was listed in *American Men of Science*, we categorized him as a government scientist with administrative responsibilities (*4*). In our sample of 3100 administrators, we found 170 scientists (*5*).

The first question we raised was, What kinds of scientists are to be found in our sample? The kinds found are listed in Table 1. The largest group—over a third—received their formal training in the agricultural and life sciences. The physical sciences were nearly as well represented. Though the great majority of engineers and physicians had been excluded from our sample, representatives of these two disciplines comprised slightly over 25 percent of the sample. This distribution contrasts sharply with that for scientists in general.

As Table 2 indicates, physical scientists and mathematicians make up 72.1 percent of all scientists on the *National Register* of the National Science Foundation, but only 39.9 percent of all scientists in the federal government. The long-standing interest of the government in agricultural research no doubt accounts for this disparity. At the same time, if we consider only those scientists in the federal government who are engaged in research and development, the percentage distributions of different kinds of scientists are almost exactly those of the NSF *Register*. The federal government has three research and development people in the physical sciences for every one in the life sciences. Scientist-administrators are divided equally between the two main areas of natural science.

With regard to the scientist-administrators, two interesting conclusions emerge from the data. We found, as expected, that scientists tend to be better paid than most nonscientist administrators. We also found that although the agricultural and life science group is numerically larger, there is a higher proportion of physical scientists in the higher echelons.

In order to make comparisons within our sample, we divided it into three salary groups, as shown in Table 3. Group 1, made up of individuals who earn $13,970 or more, includes the highest-ranking scientist-administrators—bureau chiefs and those in supergrades. Groups 2 and 3 are, respectively, in the middle and at the bottom of the federal scientist-administrator hierarchy. The first cutting point was chosen after inspection of the data. A number of scientist-administrators earned $13,970 in 1959; there was a considerable gap below that salary figure. We did not attempt to ascertain the significance, if any, of the gap; by choosing that point, we isolated roughly one-third of our sample for further study. The $11,000 cutoff between groups 2 and 3 was chosen because it is approximately half way between the top of group 2 ($13,969) and the bottom of group 3 (about $8000). This choice gave us a lowest group of about the same size as the top group.

For purposes of comparison we checked the salaries for a 1-percent sample of *all* administrators in the *Official Register* and found (Table 3) that the percentages both for administrators in general and for scientist-administrators were higher for group 2 ($11,000 to $13,969) than for groups 1 or 3, and also that scientists tended to earn more than nonscientists. We also found (Table 4) that the distribution of scientists according to salary definitely favors the physical scientist.

We compared the three groups in other respects. We found (Table 5) that group 1 scientists apparently reach these positions at a fairly young age. Group 2 may include a number of scientists who will move to group 1, as well as many who have reached their highest position. We suspect that many of the scientists in group 3 (at least those to age 54) are likely to move up.

We also considered geographical origins and found that the sample as a whole was distributed as follows: north-

Table 1. Professional affiliation of scientist-administrators ($N = 170$).

Field	%
Agricultural and life sciences	38.2
Physical sciences	35.9
Engineering	14.7
Medicine	11.2

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Table 2. Professional affiliation of selected groups of scientists (*20*).

Category	Scientists on the *National Register* (*1956–58*) ($N = 124,036$) (%)	All scientists in federal government ($N = 56,888$) (%)	Government scientists in R&D ($N = 20,324$) (%)	Scientist-administrators ($N = 170$) (%)
Physical scientists*	72.1	39.9	74.1	50.6
Biological and medical scientists†	27.9	60.1	25.9	49.4

* Includes mathematicians. † Includes agricultural scientists.

eastern United States, 29.9 percent; north central United States, 31.6 percent; the South, 19.9 percent; the West, 11.7 percent; and foreign, 7.0 percent. Group 1 has the highest proportion (15.1 percent) of scientists who are foreign-born (*6*).

We found the region of the undergraduate college for the three groups to be quite similar to the overall pattern for region of birth. In this respect there are no striking differences among the groups. But when we examine the type of undergraduate college (Table 6), we find some points worth noting. Group 1 has the highest percentage of individuals who attended private colleges, or universities. Of the total sample the majority attended a public college or university—a finding indicative perhaps of the social origins of most scientists—but the number decreases from group 3 to group 1. In effect, education at a private college or university seems to be associated, or to have been associated in the recent past, with later achievement of elite government-scientist status. There are no striking differences among the three groups so far as highest degrees are concerned. Of the sample, 24.1 percent have just the B.A. or B.S. degree, 16.5 percent have the M.S. or M.A., 41.8 percent have the Ph.D., 10.6 percent have just the M.D., and 2.4 percent have both the Ph.D. and the M.D. One person (in group 2) had not finished college. As a whole, then, this is a group of administrators with an unusual formal education.

Table 3. Salary levels of scientist-administrators, and of all administrators, in the federal government, 1959. Number of scientist-administrators, 170; of all administrators in the study, 310.

Group and salary	Scientist-administrators (%)	All administrators (%)
1 ($13,970 or higher)	31.2	13.9
2 (11,000–$13,969)	40.0	47.1
3 ($10,999 or less)	28.8	39.0

Table 4. Professional affiliation of scientist-administrators by salary level. Number in group 1, 53; in group 2, 68; in group 3, 49.

Field	Group 1 (%)	Group 2 (%)	Group 3 (%)	Total (%)
Agricultural and life sciences	9.4	36.8	71.4	38.2
Physical sciences	47.2	44.1	12.2	35.9
Engineering	26.4	13.2	4.0	14.7
Medicine	17.0	5.9	12.2	11.2

Table 5. Age of scientist-administrators. Number in group 1, 53; in group 2, 68; in group 3, 49.

Age (yr)	Group 1 (%)	Group 2 (%)	Group 3 (%)	Total (%)
44 or less	28.3	23.5	24.5	25.3
45–54	54.7	38.2	49.0	46.5
55 and over	17.0	38.2	26.5	28.2

The scientist-administrator also has an unusual degree of career-mobility. As Table 7 shows, almost two-thirds of the scientist-administrators had pursued a nongovernment career prior to joining the federal service. Of these, the largest percentage (19.4 percent for the three groups) had been employed in academic teaching before entering government service. In addition to this 19.4 percent, almost two-thirds of those with multiple positions (two or more positions outside of government) had held, or held concurrently, some academic position. More than 10 percent of the sample had come from industry; the proportions in this category decreased from groups 1 through 3.

Of the total sample, 8.2 percent had been previously employed in state or local government or had engaged in academic research or private nonprofit research. Thus, it may be concluded that the scientist-administrator is drawn overwhelmingly from the nonbusiness sector of society.

Once in government service, the vast majority of scientists remain within a single department or agency. The percentages of such single-agency careers are 62.3, 75.5, and 91.8 percent, respectively, for groups 1, 2, and 3, and 76.5 percent for the total sample. Within the department and agencies (Table 8), scientist-administrators are to be found in large numbers in three departments (Agriculture, Interior, and Health, Education, and Welfare), in substantial numbers in three other organizational units, and scattered widely in the remainder. We were surprised to find the Army and the Navy so low on the list. A partial explanation lies in the reliance these agencies have placed, since World War II, on contract arrangements with private corporations and quasi-public agencies such as the Rand Corporation. But we know that the defense agencies employ thousands of scientists directly. The explanation of the low rating in our sample lies in the fact that, in the Army and the Navy, military career officers have, nominally, practically all of the administrative roles. Many of these men have received some engineering training by virtue of attending one of the Service academies but have

Table 6. Type of undergraduate institution, by salary group. Number in group 1, 52; in group 2, 68; in group 3, 47.

Type of institution	Group 1 (%)	Group 2 (%)	Group 3 (%)	Total (%)
Private college or university	42.3	25.0	31.9	32.3
Public college or university	32.7	63.2	66.0	54.5
Technical; service academies	15.4	2.9		6.0
Catholic institutions	1.9	4.4		2.4
Foreign	7.7	4.4	2.1	4.8

Table 7. Types of nongovernmental positions held in the past or concurrently by scientist-administrators. Number in group 1, 53; in group 2, 68; in group 3, 49.

Position	Group 1 (%)	Group 2 (%)	Group 3 (%)	Total (%)
None	28.3	26.5	55.1	35.3
Academic, teaching	20.8	19.1	18.4	19.4
Multiple positions (various)	15.1	19.1	12.2	15.9
Cyclical positions (various)	7.5	14.7	6.1	10.0
Industry	11.3	4.4	2.0	5.9
Industry research	9.4	4.4		4.7
State and local government		7.4	4.1	4.1
Private nonprofit research	5.7	1.5		2.3
Academic research		2.9	2.0	1.8
Miscellaneous	1.9			0.6

not earned sufficient scientific status to be included in *American Men of Science*. Actual administrative responsibility may well be in the hands of a civilian scientist who reports to whichever career officer has been brought to the project through the circumstance of a change in station (*7*).

The career data permit us to make some generalizations.

1) Scientists occupy a considerable number of positions in the federal bureaucracy, including positions at the top of the various hierarchies. [In a recent study (*8*) it was ascertained that of 63 bureau chiefs in the federal government in 1958, nine had advanced degrees in the natural sciences and 17 others had come from an engineering or technical background.]

2) A higher proportion of scientist-administrators than of administrators as a whole receive high salaries.

3) The scientist-administrators come from a wide variety of geographical backgrounds, but the southern and north-central states are under-represented in relation to population.

4) The American administrative system is an open one at all levels, differing from the English and Continental pattern of entrance into government service only at the beginning of one's career (*9*). Almost two-thirds of the scientist-administrators of our sample had worked elsewhere prior to federal employment (20.2 percent in academic teaching and research, 2.3 percent with foundations), and 25.9 percent of the sample had multiple or cyclical careers.

5) Interdepartmental mobility was not common in our sample of scientist-administrators. Some students of public administration, in particular Leonard D. White, have argued the case for mobility, particularly at the higher levels. The vast majority of scientists, however, have worked for only one agency. On the other hand, interdepartmental mobility is much greater for group 1 than for groups 2 and 3. Thirty-eight percent of group 1, 24 percent of group 2, and 8 percent of group 3 have served in more than one department.

We can make a few tentative observations about the elite scientist-administrator. We recognize that the category of group 1 scientist-administrator is not synonymous with that of scientific elite. This latter category is broader; it includes advisers, part-time consultants, and nongovernment scientists. But there is some justification for considering the group 1 scientist-administrator part of an administrative elite. Comparison of the scientific-administrative elite with other administrative elite groups in our society—for instance, with business leaders, presidents of corporations, and flag officers in the traditional military services—is thus in order. It is a characteristic of members of these administrative elite groups that they have reached their top positions through performance and skills which have been rewarded by their superiors in the same fields. There are also political elite groups—congressmen, senators, governors, and so on. Such individuals are elected by a constituency, not by their colleagues or superiors. In Tables 9 and 10, data are given for a number of administrative elite groups and for one political elite group—U.S. senators.

Table 8. Distribution of scientists and scientist-administrators by department and agency, 1958–59 (see Table 2). Number of all scientists in study, 56,888; of scientists in research and development, 20,640; of scientist-administrators, 170.

Department or agency	Scientists		
	All (%)	In R&D (%)	Administrators (%)
Agriculture	34.2	19.6	31.2
Veterans	15.5	2.0	1.8
Navy	10.0	21.4	2.4
Army	9.9	16.1	0.6
Interior	8.3	13.4	21.2
HEW	7.7	11.4	14.1
Commerce	6.3	6.3	7.6
Air Force	3.6	6.3	4.7
AEC	0.8	0.9	4.1
NASA	.6	1.3	1.8
All others	3.1	1.3	10.6

The business leaders studied by Warner and Abegglen (*10*) include chairmen of the board, presidents, vice presidents, secretaries, treasurers, and controllers, from small companies as well as large. Hacker's group (*11*) deals only with the presidents of the 100 corporations that had the highest sales in 1958 (*12*). The group 1 scientists resemble the business leaders of the Warner and Abegglen study in geographic origin.

The group 1 scientist-administrators are the most highly educated of the various elite groups. There is not a single group 1 scientist-administrator who does not have at least an undergraduate degree. Of the three elite groups for whom we have data—U.S. senators, presidents of corporations, and scientist-administrators—the latter group has the smallest percentage of members who attended Ivy League colleges. The percentage is not much lower, however, than that for U.S. senators. The real difference seems to lie between these two groups and the presidents of corporations; the latter had almost twice the percentage of graduates of Ivy League colleges that either of the other two groups had. The percentages for undergraduate education entirely at private colleges (Ivy League or other) are highest for the scientist-administrators, next-highest for presidents of corporations, and lowest for U.S. senators. We noted earlier that of all the scientists in our sample the group 1 scientists had the highest percentage of members with private-college backgrounds (Ivy League and other). The finding suggests that this educational milieu is an important source of members of the administrative elite groups in our society. It is interesting to note that this also seems to be an important source of U.S. senators, inasmuch as 51 percent of the senators in 1949–51 had attended private colleges and universities (see *13* and Table 10). It should be noted, in qualification, that state universities also provide large percentages of elite personnel, especially in the case of scientists and U.S. senators. As for presidents of corporations, almost one-third received their undergraduate education at state universities.

A number of studies have indicated a fairly sharp distinction in social origin between military leaders, corporation presidents, and U.S. senators, on the one hand, and business executives in general on the other. The scientific-administrator elite is clearly closer in this respect to the business executives.

The military elite, according to Janowitz (*14*), "has been drawn from an old-family, Anglo-Saxon, Protestant, rural upper middle-class professional

Table 9. Region of birth of several administrative elite groups (*10, 11, 14*).

Region	Business leaders ($N = 7102$) (%)	Presidents of corporations ($N = 47$) (%)	Senators ($N = 95$) (%)	Army ($N = 166$) (%)	Navy ($N = 204$) (%)	Air Force ($N = 105$) (%)	Group 1 scientists ($N = 44$) (%)
Northeast	38	36	30	23	27	25	38
Northcentral	40	35	27	37	30	43	35
South	16	13	27	34	31	25	18
West	6	15	16	6	12	7	9

background." Even though the base has broadened somewhat in the years since World War II, he says, "a strong emphasis on second- and third-generation, native-born, nonindustrial background still persists." The data for U.S. senators in 1949–51 suggest that these individuals are drawn from the upper levels of the society (*13*). And Hacker (*11*) suggests that the presidents of corporations, like the U.S. senators, are "grandsons of 'old American' families." In addition, his data on religion make it clear that 60 percent of the presidents of corporations belong to "high-status" Protestant churches.

Warner's data suggest that mobility among business leaders was greater in 1952 than it was in 1928, as reported by Taussig and Joslyn (*15*). Warner summarizes his data by stating (*10*) that "there has been not only an increase in the proportion of men who come from the lower ranks, but an accompanying decrease in the proportions of sons of highly placed men, particularly businessmen." We know from the Knapp and Goodrich study (*16*), as well as from the National Opinion Research Center (NORC) study of 1961 college graduates (*17*), that physical and biological scientists (except for physicists) tend to be drawn, to a disproportionate degree, from the middle and lower middle class. Thus, the business leaders and the group 1 scientist-administrators are drawn proportionately more from the lower middle class than the other members of elite groups are. It certainly seems that the occupational fields in our society which are most permeable, or in which social mobility is highest, are business leadership and science (*18*).

What, then, can we conclude about the federal scientist-administrator? It is important to emphasize again that our sample includes only natural scientists. The career of scientist-administrator is an open one in two senses. First, this is one of the sectors of our society in which social mobility is possible for individuals from a number of diverse backgrounds. The career of scientist-administrator is comparable to that of federal administrator in general, though probably the scientist-administrator has a higher level of education than the nonscientist administrator (*19*). Second, it is open in the sense that almost two-thirds of federal scientist-administrators have worked for another organization prior to joining the government.

As a group, the scientist-administrator elite contains people of diverse social backgrounds and bears interesting similarities to the business-leader and the nonscientist-administrator groups. Our data do not explain why the scientists become administrators. There is some evidence that money rewards for federal scientific-administrators are higher than for federal administrators in general. But these individuals were scientists before they became administrators, and a crucial question is, What induces scientists to move from scientific work to administration?

The role of government in science is still expanding, and it may well be that some other changes are in the offing—for instance, changes in the proportion of physical scientists, the entry of greater numbers of social and behavioral scientists, and changes in the proportion of scientific-administrators in the government.

Table 10. Kind of undergraduate college attended by members of various elite groups (*11*).

College or university	Senators ($N = 100$) (%)	Presidents of corporations ($N = 95$) (%)	Group 1 scientists ($N = 45$) (%)
Ivy League	15	29	13
Other private	36	27	44
State university	40	31	42
No college	9	13	

References and Notes

1. The dramatic changes that have occurred in the relations between government and science since World War II are coming in for much study. See D. K. Price, *Government and Science: Their Dynamic Relation in American Democracy* (New York Univ. Press, New York, 1954); J. S. Dupré and S. A. Lakoff, *Science and the Nation: Policy and Politics* (Prentice-Hall, Englewood Cliffs, N.J., 1962); R. Gilpin, "Civil-science relations in the United States," a paper presented before the American Political Science Association, Sept. 1961; J. C. Honey, *Ann. Am. Acad. Polit. Soc. Sci.* **327**, 1 (1960); E. Ashby, *Daedalus* **91**, 264 (1962); E. W. Lindveit, *Scientists in Government* (Public Affairs Press, Washington, D.C., 1960); W. S. Sayre, *Science* **133**, 859 (1961); D. N. Michael *et al.*, *Proposed Studies on the Implications of Peaceful Space Activities in Human Affairs* (Brookings Institution, Washington, D.C., 1960); C. F. Stover, *The Government of Science* (Center for the Study of Democratic Institutions, Santa Barbara, Calif., 1962); E. P. Herring, in *Some Perspecives on Political Science and Science* (National Institute of Social and Behavorial Science, Washington, D.C., 1961), pp. 1–6. A. H. Dupree, *Science in the Federal Government* (Belknap, Cambridge, Mass., 1957) provides the most detailed historical survey; B. Barber, *Science and the Social Order* (Free Press, Glencoe, Ill., 1952) and R. C. Davis, *The Public Impact of Science in Mass Media* (Survey Research Center, Ann Arbor, Mich., 1958), deal with the broader fields of science and society.
2. *Official Register of the United States* (Government Printing Office, Washington, D.C., 1959).
3. J. Cattell, Ed., *American Men of Science: The Physical and Biological Sciences* (Cattell Press, Tempe, Ariz., ed. 10, 1960–61).
4. We made, of course, a number of arbitrary decisions in choosing our sample. The 31,000 administrators listed in the *Register* probably do not include all officials who might appropriately be so categorized. However, with one important exception, discussed in the article, it seems safe to assume that the *Register* includes most federal administrators. Similarly, it might be argued that *American Men of Science* does not have data on all individuals in the United States who could be called natural scientists. The first four volumes include data on about 96,000 people, but there were doubtless some who did not reply to the questionnaires sent out by the editors. On the other hand, *American Men of Science* explicitly excludes most engineers and physicians. Roughly speaking, it includes engineers and physicians who have earned a Ph.D. degree or who have achieved comparable status in research or administration. For purposes of this article, engineers and physicians listed in *American Men of Science* were designated scientists.
5. Two "science writers" also turned up in the sample; we decided not to include them in our analysis.
6. Of the eight foreign-born scientists in group 1, four could be classified as directly engaged in some kind of defense work. Two more were employed in some capacity by the military departments.
7. A former Navy personnel officer told us of one scientist who was asked why he remained in the Navy. The civilian scientist replied that he knew he could always look forward to having a new boss in 2 or 3 years. An idea which could not be sold to one of the regulars could be put on the shelf and brought out again when a new officer came to the project. Admiral Rickover, on the other hand, has criticized the system strongly. "A constantly moving assembly line of officers is entering and . . . they automatically take charge. . . . The civilians have become dispirited" ["Organization and Management of Missile Programs," *Hearings Before a Subcommittee of the House Committee on Government Operations, 86th Congress, 1st Session* (Government Printing Office, Washington, D.C., 1959), p. 607].
8. M. E. Smith, in *Public Policy* **10**, 62 (1959).
9. D. K. Price, *Government and Science: Their Dynamic Relation in American Democracy* (New York Univ. Press, New York, 1954); *Science* **134**, 1099 (1962).
10. W. L. Warner and J. C. Abegglen, *Occupational Mobility in American Business and Industry* (Univ. of Minnesota Press, Minneapolis, 1955).
11. A. Hacker, *Am. Polit. Sci. Rev.* **55**, 539 (1961).
12. The corporations were taken from *The* Fortune *Directory* (Aug. 1959).
13. D. R. Matthews, *The Social Background of Political Decision Makers* (Doubleday, Garden City, N.Y., 1954), p. 25.
14. M. Janowitz, *The Professional Soldier* (Free Press, Glencoe, Ill., 1960), p. 100.
15. F. W. Taussig and C. S. Joslyn, *American Business Leaders* (Macmillan, New York, 1932).
16. R. H. Knapp and H. B. Goodrich, *Origins of American Scientists* (Univ. of Chicago Press, Chicago, 1952), p. 278.
17. J. A. Davis *et al.*, "Great Aspirations: Career Plans of America's June 1961 College Graduates," *Natl. Opinion Res. Center Rept. No. 82* (1961), pp. 56–59.
18. We have evidence from a number of studies that there are some personality characteristics associated with occupational choices. It has been suggested [M. Rosenberg *et al.*, *Occupations and Values* (Free Press, Glencoe, Ill., 1957)] that natural scientists stress self-expression to a greater extent than individuals in business occupations, and that the latter place more emphasis on extrinsic reward than natural scientists do. Davis (see *17*) suggests that individuals who go into the sciences and engineering tend to be "low on extroversion and sophistication," whereas business attracts those who rate themselves "high on extroversion but neither high nor low on sophistication."
19. R. Bendix, thesis, University of Chicago (1947).
20. *American Science Manpower, 1956–58* (Government Printing Office, Washington, D.C., 1961), p. 3; *Scientists and Engineers in the Federal Government* (Government Printing Office, Washington, D.C., 1958), pp. 5, 8.