

References and Notes

1. O. T. Avery, C. M. MacLeod, M. McCarty, *J. Exptl. Med.* **79**, 137 (1944); R. D. Hotchkiss, in *The Chemical Basis of Heredity*, W. D. McElroy and B. Glass, Eds. (Johns Hopkins Press, Baltimore, 1957), p. 321.
2. A. D. Hershey, *Cold Spring Harbor Symposia Quant. Biol.* **18**, 135 (1953).
3. G. W. Beadle, in *The Chemical Basis of Heredity*, W. D. McElroy and B. Glass, Eds. (Johns Hopkins Press, Baltimore, 1957), p. 3.
4. E. Chargaff, in *Nucleic Acids*, E. Chargaff and J. N. Davidson, Eds. (Academic Press, New York, 1955), vol. 1, pp. 307-371.
5. J. D. Watson and F. H. C. Crick, *Nature* **171**, 737 (1953); *Cold Spring Harbor Symposia Quant. Biol.* **18**, 123 (1953).
6. M. H. F. Wilkins, *Biochem. Soc. Symposia (Cambridge, Engl.)* **14**, 13 (1957).
7. M. Feughelman, R. Langridge, W. E. Seeds, A. R. Stokes, H. R. Wilson, C. W. Hooper, M. H. F. Wilkins, R. K. Barclay, L. D. Hamilton, *Nature* **175**, 834 (1955).
8. A. Kornberg, in *The Chemical Basis of Heredity*, W. D. McElroy and B. Glass, Eds. (Johns Hopkins Press, Baltimore, 1957), p. 579; *Revs. Modern Phys.* **31**, 200 (1959).
9. A. Kornberg, in *Phosphorus Metabolism*, W. D. McElroy and B. Glass, Eds. (Johns Hopkins Press, Baltimore 1951), p. 392; *Advances in Enzymol.* **18**, 191 (1957).
10. D. E. Koshland, Jr., in *The Mechanism of Enzyme Action*, W. D. McElroy and B. Glass, Eds. (Johns Hopkins Press, Baltimore, 1954), p. 608.
11. A. Kornberg, I. R. Lehman, E. S. Simms, *Federation Proc.* **15**, 291 (1956); A. Kornberg, *Harvey Lecture Ser.* **53**, 83 (1957-58).
12. I. R. Lehman, M. J. Bessman, E. S. Simms, A. Kornberg, *J. Biol. Chem.* **233**, 163 (1958).
13. F. J. Bollum and V. R. Potter, *J. Am. Chem. Soc.* **79**, 3603 (1957); C. G. Harford and A. Kornberg, *Federation Proc.* **17**, 515 (1958); F. J. Bollum, *ibid.* **17**, 193 (1958); ———, *ibid.* **18**, 194 (1959).
14. M. J. Bessman, I. R. Lehman, E. S. Simms, A. Kornberg, *J. Biol. Chem.* **233**, 171 (1958).
15. J. Adler, I. R. Lehman, M. J. Bessman, E. S. Simms, A. Kornberg, *Proc. Natl. Acad. Sci. U.S.A.* **44**, 641 (1958).
16. H. K. Schachman, I. R. Lehman, M. J. Bessman, J. Adler, E. S. Simms, A. Kornberg, *Federation Proc.* **17**, 304 (1958).
17. I. R. Lehman, *Ann. N.Y. Acad. Sci.* **81**, 745 (1959).
18. R. L. Sinsheimer, *J. Mol. Biol.* **1**, 43 (1959).
19. I. R. Lehman, R. L. Sinsheimer, A. Kornberg, unpublished observations.
20. F. J. Bollum, *J. Biol. Chem.* **234**, 2733 (1959).
21. F. Weygand, A. Wacker, H. Dellweg, *Z. Naturforsch.* **7b**, 19 (1952); D. B. Dunn and J. D. Smith, *Nature* **174**, 305 (1954); S. Zamenhof and G. Griboff, *ibid.* **174**, 306 (1954).
22. M. R. Heinrich, V. C. Dewey, R. E. Parks, Jr., G. W. Kidder, *J. Biol. Chem.* **197**, 199 (1952).
23. M. J. Bessman, I. R. Lehman, J. Adler, S. B. Zimmerman, E. S. Simms, A. Kornberg, *Proc. Natl. Acad. Sci. U.S.A.* **44**, 633 (1958).
24. G. R. Wyatt and S. S. Cohen, *Biochem. J.* **55**, 774 (1953).
25. R. L. Sinsheimer, *Science* **120**, 551 (1954); E. Volkin, *J. Am. Chem. Soc.* **76**, 5892 (1954); G. Streisinger and J. Weigle, *Proc. Natl. Acad. Sci. U.S.A.* **42**, 504 (1956).
26. R. L. Sinsheimer, *Proc. Natl. Acad. Sci. U.S.A.* **42**, 502 (1956); M. A. Jesaitis, *J. Exptl. Med.* **106**, 233 (1957); *Federation Proc.* **17**, 250 (1958).
27. J. G. Flaks and S. S. Cohen, *J. Biol. Chem.* **234**, 1501 (1959); J. G. Flaks, J. Lichtenstein, S. S. Cohen, *ibid.* **234**, 1507 (1959).
28. A. Kornberg, S. B. Zimmerman, S. R. Kornberg, J. Josse, *Proc. Natl. Acad. Sci. U.S.A.* **45**, 772 (1959).
29. I. R. Lehman, S. B. Zimmerman, J. Adler, M. J. Bessman, E. S. Simms, A. Kornberg, *ibid.* **44**, 1191 (1958).
30. C. M. Radding, J. Adler, H. K. Schachman, *Federation Proc.* **19**, 307 (1960).
31. J. Josse and A. Kornberg, *ibid.* **19**, 305 (1960).
32. Any credit for the work cited here is shared by my colleagues in New York, Bethesda, St. Louis, and Stanford, and by the whole international community of chemists, geneticists, and physiologists, which is truly responsible for the progress in nucleic acid biochemistry.

Science in the News

Scientists in Government: Growing Concern Over Conflicts of Interest

There is considerable and growing concern over the position of scientists with regard to the conflict of interest laws. The subject is talked of a good deal in private but only rarely in public, a situation which reflects the delicacy with which it is felt this potentially explosive issue must be handled.

The relevant laws are a group of seven poorly defined, vaguely interpreted statutes which, in their broadest interpretation, prohibit anyone working for the government from having a financial interest in any group having dealings with the government. They tend to put almost anyone working for the government on less than a career civil service basis in an extremely awkward position. The situation is difficult for administrative and legal personnel,

often preventing the government from obtaining the services of an outstanding man because of the unreasonable financial sacrifices he would have to make in order to protect himself from a possible accusation of violating the law. But nowhere is the situation more touchy than in the case of scientific personnel.

The government today relies on an intricate web of consultancies, contracts, and part-time and temporary employees to provide itself with the scientific and technical assistance it must have. It underwrites more than half the scientific research done in this country. It "employs" in some fashion a very large fraction of the leading scientists in the country, and a question of conflicts of interest could be raised in almost every case. The institution or corporation with which the scientist is associated very probably is receiving a share of the more than \$5 billion the

government spends annually on scientific work. Quite often it is doing work for the government in precisely the area in which the scientist is being asked to advise the government.

Conflicts Unavoidable

The situation is awkward, but it is also absolutely unavoidable. The government clearly needs the best scientific advice it can get, and it can get this advice only from men with the pertinent experience—that is, in most cases, precisely from the men who will find themselves in a conflict-of-interest situation. The problem is complicated further because many of these men will not only be associated with a group doing business with the government in the area in which they are to serve, but they will also be serving, in addition, as consultants to one or more other corporations or institutions which, again, are doing business with the government in the area in which the scientist is asked to advise the government. And to complicate the picture still further, a significant and growing fraction of these scientists own stock, and sometimes large blocks of stock, in the "space age" research corporations that have sprung up in intellectual centers throughout the country.

New York Bar Study

The entire conflict-of-interest problem has been studied by a committee

of the Bar Association of New York, whose detailed report, together with draft legislation for clarifying and updating the statutes, will be published next month by the Harvard University Press. This article reflects the feelings of that committee, confirmed by talks here in Washington, that the touchiest part of this problem relates to the position of scientists. This concern stems from the feeling that not only are scientists caught with other personnel in a badly outdated system of laws, but that, in the case of scientists, to a dangerous extent the laws have simply been ignored and no effort to comply with them has been made. The reason for this is clear: it is simply that in the area of executive or legal talent there are usually enough men qualified for a position that it is possible to find one who is reasonably free of conflict-of-interest problems; in the area of science the talent and experience the government needs tend to be so specialized that the number of men qualified to fill a post is limited to a very few, all of whom will commonly have quite involved conflict-of-interest problems. But the dilemma does not disappear simply because it is recognized as unavoidable.

There has been no real concern over scientists as a class behaving improperly. Indeed the general feeling seems to be that the scientists have done an admirable job of seeing that their conflicts of interest do not effect their decisions. There is a good deal of concern, on the other hand, over the possible Congressional and public reaction to a scandal in this area. There is a fear that among the several thousand scientists advising the government there must be some who not only have made no effort to clear up a clear conflict-of-interests, but have allowed this conflict to influence their decisions. But aside from the concern over the possibility of outright scandal, there is the feeling that even the appearance of scandal, where no wrong-doing had actually taken place, could have extremely unfortunate repercussions. There is concern over the effect that a sensationalist Congressional investigation could have on such matters as the recruitment of scientists for government service, on the system of contracting with government-supported corporations for work which the government cannot handle effectively within its departments, and on the prestige of scientists in general.

Possible Repercussions

No one knows how much the government, and the nation, would suffer if it were cut off from the services of scientists who were unable to comply strictly with the present conflict-of-interest regulations; or how many scientists would avoid government service if it involved the risk of exposure to scandal mongers, no matter how honorably they served, because of an unavoidable conflicts-of-interest. Nor does anyone know what the effect of a series of scandals, real or imagined, would have on the use of corporate devices like the Air Force supported, non-profit Rand Corporation, or the Space Technology Labs Inc., which handles a major share of the work on this country's space program. The use of such corporations for work that might normally be done within the government is usually a device for paying higher salaries than the present civil service scale allows, and sometimes for avoiding close control of projects by the Congressional appropriations committees. It is not hard to find Congressmen who are suspicious of the whole business, nor is it hard to imagine the effect on these suspicions of even a hint of scandal.

The question of scientific prestige is a special one, resting on the fact that although the scientist is an increasingly admired person, he is also sufficiently exotic in the public mind that there is a strong tendency to stereotype him. If a lawyer or business executive is caught with his hand in someone else's pocket, no one is led to question the ethics of lawyers or executives as a class. Whether the same will hold for scientists is open to question, particularly in view of the sharp contrast it will present to the current stereotype of the scientist as a man so engrossed with dissecting atoms that he never concerns himself with such gross things as personal advancement and money.

No one knows the answers to these questions, and perhaps the concern of those who fear the worst is unwarranted. But no one seems to feel that even the New York Bar group's proposal for revising the conflict-of-interest statutes, helpful though these proposals undoubtedly would be, is capable of really solving the dilemma of the scientists. It appears to be unavoidable that risks must be run, and under the present circumstances, when the mere mention of the phrase "conflict

of interests" suggests to the public not merely a questionable situation but a full-blown scandal, it is understandable that there are a good many nervous people in Washington.

The problem is one that cannot be legislated out of existence. Some sort of rules governing conflicts of interest are necessary, and no matter how carefully they are framed there will still be a great many difficult situations, particularly in the case of scientists. The Bar group's draft legislation hopes to help matters by giving the President broad powers to grant exemptions "in the national interest." But an exemption can only make a conflict of interest allowable; it does not make it disappear. What everyone seems to agree is needed, if and when sensational revelations, justified or not, begin to appear, is a clear understanding among the public and on Capitol Hill that the risk of an occasional scientist acting indiscreetly is trivial compared to the risks to the national security if, in order to strictly enforce the conflict of interest laws, the government were forced to cut itself off from the soundest scientific assistance it can get.

U.S. and U.S.S.R. Begin Exchange Visits of Nuclear Scientists: Polio Group Encounters Difficulties

The U.S. Atomic Energy Commission has announced that the United States and the U.S.S.R. have started an exchange of visiting teams of nuclear scientists. Five U.S. scientists left on 12 May for the U.S.S.R., where they will see high-energy physics establishments; five Soviet experts are coming to the U.S. to visit controlled thermonuclear research installations. These visits implement some provisions of the Memorandum on Cooperation in the Peaceful Uses of Atomic Energy, which was signed last November.

A second exchange is scheduled to begin in June, with a U.S. thermonuclear research team visiting Soviet laboratories and a Soviet team visiting high-energy physics installations in the United States. Other reciprocal exchanges in the area of peaceful uses of atomic energy are also being considered.

The U.S. scientists who are touring Russian establishments are Robert F. Bacher, chairman, division of physics,