Vitamin K–Induced Prothrombin Formation: Correction

I am indebted to M. J. Smith of the Massachusetts General Hospital for pointing out to me that plasma thromboplastin antecedent (factor XI) is not a vitamin K–dependent clotting protein. In a recent paper [*Science* **145**, 926 (1964)], I had listed it along with plasma thromboplastin component (factor IX), proconvertin (factor VII), and prothrombin as clotting proteins under probable genetic control by vitamin K in the mammal. Instead of PTA, I should have listed Stuart's factor (X), which appears now to be well established as a vitamin K–dependent clotting factor.

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Study of Creative Scientists: Comments on Methodology

Some methodological restrictions on inferences from apparently straightforward data on religion and scientific attainment may not be generally known; preliminary findings in this area previously have been widely and uncritically cited, gathering authority beyond that justified by the nature of the samples and the experimental design. It may therefore be appropriate to consider some limitations on Chambers's conclusion (*1*) that "religious preference is much more strongly associated with choice of science as a career than it is with achievement of highly creative productivity within a specific discipline."

1) An association between religion and choice of science as a career is not demonstrated merely by describing the religious background and current religious preferences of a sample of scientists. At least one problem may be considered. Most scientists are highly educated; the religious preferences of highly educated individuals (98 percent of Chambers's sample were Ph.D.'s) may, for a variety of reasons only indirectly associated with religion, be different from those of a more general population, without any necessary differentiation between scientists and nonscientists. While there are no adequate comparison data, it may be noted that Ament (*2*) has tabulated affiliations listed in *Who's Who* for scientists and men distinguished in other fields. The proportions of Protestants, Catholics, Jews, "others," and "no preferences" (to use Chambers's categories) were not significantly different for scientists and men of arts and letters, although both groups differed markedly from the general population.

2) The same comments apply to the other evidence cited by Chambers (college attended and parental religion). Interpretation of the finding that 1½ percent of all scientists attended Catholic colleges is additionally obscure, since the implicit assumption that only Catholics attend Catholic colleges and no Catholics attend other institutions is patently untenable.

3) Even if Chambers had unequivocally demonstrated a distribution of current preferences unique to scientists, the issue of cause and effect would still remain. The "relation" may be primarily between values developed during a career in science rather than values involved in choosing science as a career. Certainly among individuals currently at the threshold of their careers, there seems to be little relation between religious background and interest in science; Greeley (*3*) has found that the proportions of college seniors planning careers in science, in the social sciences and the humanities, and in engineering were not significantly different for those raised in Jewish, in Catholic, and in Protestant faiths; 8 percent of the students of Jewish origin, 6 percent of those of Catholic origin, and 7 percent of those of Protestant origin intended to become scientists. The distribution of religious preference at a median age of 53 would seem only tenuously related to the differential choice of science as a career three decades earlier.

4) Chambers's conclusion is based on data from a rigorously selected sample of scientists: eminent psychologists and chemists, and controls individually matched for age, discipline, education, sex, and opportunity to do research. As an example of how this may affect conclusions about religious background and choice of career: The median age of the scientists in the sample is 53 years. The median age of the 215,000 persons listed as scientists in the National Register of Scientific Personnel is 38 years, and the median age of the 66,000 registered Ph.D.'s is 41 years (*4*). While, again, there are no adequate comparison data, it should be noted that Clark (*5*) reports a significant difference in the distribution of parental religious affiliation for psychologists who received the Ph.D. in 1930–34 and those who received it in 1940–44; he notes that responses from the 1950 Ph.D.'s show the trend has continued. The other ways in which Chambers's sample may differ from the broader class of scientists could also restrict generalizations about choice of career, creativity, and affiliation to the smaller class of scientists with similar characteristics.

5) This point concerns inferences which can reasonably be drawn from the questionnaire response of a minority of subjects. Approximately 60 percent (438 out of 740) of the originally selected scientists returned the questionnaire. Of the 60 percent, 40 percent (43 out of 110) of the creative psychologists and 16 percent (17 out of 108) of the creative chemists did not indicate any current preference (*6*). The conclusion that creativity and current preference are relatively unrelated is thus based on 39 percent (67 out of 170) of the original sample of creative psychologists and 45.5 percent (91 out of 200) of the original sample of creative chemists. With so small a proportion of known preferences, any statement about Chambers's *sample* is questionable, let alone generalizations about the population of scientists to which the conclusion is directed.

6) In view of the frequency with which certain denominations have been reported to be "overrepresented" and others "underrepresented" among scientists, a cautionary note should be sounded about drawing inferences from essentially descriptive data. Information on family religious background, religious preference during the period of career choice, and current religious affiliation is clearly needed for eminent and noneminent scientists and eminent and noneminent scholars in other disciplines before the nature of the relations among religion, science, and creativity can be meaningfully discussed.

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