Comments and Communications

Statement on Atomic Energy Commission Fellowship

From January, 1947, to September, 1948, I was employed at the Oak Ridge National Laboratory by contractors of the Atomic Energy Commission. For this work I was cleared by the FBI and had admittance to the Restricted Area.

In September, 1948, I was awarded an Atomic Energy Commission Predoctoral Fellowship in the Biological Sciences, which I have held until the present time. The fellowship carried no loyalty or security regulations for students doing nonsecret work, and it was not stated that the purpose of such fellowships was to train students to work for the AEC.

In August, 1949, in a rider to the 1950 Independent Offices Appropriations Act, Congress passed a provision that requires loyalty investigations of all persons awarded AEC fellowships, including those doing nonsecret work. The purpose of such legislation in this extended form can no longer be interpreted as the protection of secrets of military importance to the nation, but rather as political motivation in the choice of individuals to receive support.

Because of the implications that such legislation holds for the future of scientists in this country, I feel it necessary to resign from my fellowship and to express publicly what I think are the dangers involved.

The practical results of science are obvious to everyone living in our civilization, and it is frequently assumed that the production of an improved technology is the sole aim of science. The more fundamental aspect of science —as a continuous creative effort through which man attempts to increase his understanding of himself and the universe in which he lives—is less often appreciated. Yet this aspect is the one from which the knowledge necessary for the more obvious technological developments is derived, and the level at which the real advances in our understanding are made. If science is to continue to be an important phase of human activity, then we must maintain an atmosphere in which fundamental research in all fields can continue to develop.

The nature of science is such that the sole criterion for judging the success of scientific efforts lies in the truthfulness of the formulations developed. The methods of testing the validity of these theories are continually being refined, and the scope of the observed facts that the theories must explain is continually increasing, making greater demands upon the abilities of the investigator and the comprehensiveness of his concepts.

Thus the individual scientist must weigh his theories impartially and must continually and rigorously discard those he finds to be inadequate. This requires that he be free from external pressure in his decisions. The frustrating effects of the imposition of criteria other than the one of truthfulness upon the findings of scientists have been tragically apparent to the world in recent years.

It becomes obvious that, since the success of scientific achievement lies in its truthfulness, the method automatically eliminates from the ranks of scientists any investigator who would deliberately falsify his results. The political beliefs that a scientist holds may be affected by his scientific understanding, but his scientific interpretations cannot be influenced by these beliefs or he is no longer acting as a scientist. The results of his work must be incorporated into the total body of scientific knowledge and must harmonize with this knowledge, or it is recognized that something is wrong. Further investigation will then reveal either that the earlier knowledge was incomplete and must be modified in interpretation, or that the later investigator was wrong in fact or in interpretation. Thus it is important to realize that the nature of the method operates as a control on those using it.

Since it is essential that the individual scientist be free from outside influence, and since the scientific method itself serves to maintain the professional integrity of the investigator, I think that a law barring from support for scientific training or research persons with particular political views can serve no purpose favorable to the advancement of science. The basis for the application of the law to scientists does not lie in any inherent danger that the scientific method may be successfully distorted to serve ideological purposes. Thus there is no reason to believe that the individuals who feel such legislation is necessary for scientists will not feel the need to extend it to other phases of activity.

This law indicates that the government is willing to aid only those individuals whose social views correspond to beliefs approved by the agencies conducting the government investigations of loyalty or by those passing on the information thus obtained. A narrow interpretation of this or similar legislation in the hands of uninformed individuals could very easily lead to a situation intolerable to scientific research.

The implications of an extension of such legislation throughout our society are far-reaching and frightening. To institute a criterion of political orthodoxy to sanction the position of individuals in all fields of thought and action could only lead, eventually, to the elimination of the most imaginative intellects in society. In this event, a steady progressive evolution of our society, based upon increased understanding of the nature of man and of the universe, would become impossible.

Since the legislation under question is so well defined and is without precedent in this country, I believe the issue can be fought clearly at this point, and that the time to oppose the possibility of political control of scientific research is at this opening movement. Govern-

ment support of scientific research will become increasingly necessary and important in the future, and the manner in which this support is administered will become increasingly significant.

The firm stand taken by the National Academy of Sciences and groups like the Federation of American Scientists is, in my opinion, excellent. But, unless their position is supported by individual action, I believe it will lose significance. Therefore, I wish this resignation to be recorded as the protest of one student against a ruling that I believe to be directed against the freedom of the individual scientist and the interest of our society as a whole.

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Nomenclature of the Rh-CDE System

In a recent paper by E. F. Ducey and R. I. Modica on the amendment of the nomenclature of the Rh-CDE System (*Science*, 1950, **111**, 466) several errors are to be noted in the use of the Wiener Rh-Hr nomenclature:

1. Table 1 indicates the following under Wiener's antigens: Rh_0, rh′, rh″, Hr_0, rh′, and rh″. The last two antigens should correctly read hr′ and hr″. Likewise, under Wiener's agglutinins, the last three indicated as Anti-Rh_0, Anti-rh′, and Anti-rh″ should correctly read Anti-Hr_0, Anti-hr′, and Anti-hr″.

2. In the sentence "For example, Wiener must use a different set of terms for the genotypes and the phenotypes (Rh_1, Rh_0 and R_1, R_0, etc.)," the order of "genotypes and phenotypes" implies a respective arrangement in the symbols appearing in the parentheses, "(Rh_1, Rh_0 and R_1, R_0, etc.)." Concerning the latter, it is to be noted that symbols Rh_1 and Rh_0 represent phenotypes and not, as implied, genotypes; also, contrary to the implication, symbols R_1 and R_0 represent neither phenotypes nor genotypes. According to the Wiener nomenclature, a genotype consists of two italicized symbols (a symbol for the gene contributed by each parent). Therefore, the possible genotypes falling under phenotypes Rh_1 and Rh_0 would correctly be R^1R^1, R^1r', R^1R^0, R^1r, R^0r', and R^0R^0, R^0r, respectively.

3. It is further stated that the Wiener symbol Rh_1 does not indicate whether the individual is homozygous or heterozygous, and that the corresponding Race symbol CDe/CDe or CDe/cde does. In this case a comparison has been made between a phenotypic symbol (Rh_1) and a genotypic symbol (CDe/CDe or CDe/cde). A valid comparison would have been made had genotypic symbols representing both systems of nomenclature been used, e.g., CDe/CDe = R^1R^1 and CDe/cde = R^1r.

4. For the sake of comparing Wiener's symbols against those of Race, the possible progeny resulting from the mating of an Rh_1 individual with an rh individual is discussed. Here again there exists a situation similar to that mentioned in (3); i.e., Wiener's phenotypes are compared with Race's genotypes. Also, it is stated that in the above-mentioned mating the possible progeny are Rh′, Rh_1, Rh_0, and rh″. The Rh′ is incorrect and should read rh′.

Employing several symbols mentioned above, the following table may serve to depict a more complete comparison between the Wiener and Race nomenclatures.

Phenotypes		Genotypes	
Wiener	Race	Wiener	Race
rh	cde	*rr*	cde/cde
Rh_1	CDe	R^1R^1	CDe/CDe
		R^1r'	CDe/Cde
		R^1R^0	CDe/cDe
		R^1r	CDe/cde
		R^0r'	cDe/Cde

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Ducey and Modica actually recommend the abandonment of the Wiener nomenclature and a modification of the Fisher-Race terminology. The gist of the latter is the substitution of D′, C′, and E′ for d, c, and e, because "the use of the lower case letters c, d, and e, to denote the Hr antigens leads to ambiguity when it is remembered that in the major groups, a and b indicate agglutinins." Therefore, the lower-case letters are to be reserved for agglutinins, the capital letters for antigens. The agglutinins are to be labeled anti-d, anti-c, anti-e, anti-d′, anti-c′, and anti-e′.

I do not wish to enter the controversy on the respective merits of the two main systems of Rh nomenclature, but would like to call attention to one major defect in the recommendation of Ducey and Modica. It is true that a and b denote agglutinins in the ABO blood group system, but many objections have been raised against their use, because it is misleading. The modern tendency followed in most textbooks and scientific papers is to use anti-A and anti-B instead of a and b, as the only clear designations of these two isoagglutinins. Therefore, to be consistent, Ducey and Modica's recommendation for the agglutinins would have to label them as anti-D, anti-C, etc. Otherwise the proposed amendment would, I am afraid, only add to the confusion.

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The recent criticism of current *Rh* terminology by Ducey and Modica correctly points out the comparative simplicity of teaching and understanding the Fisher-Race scheme but misses a far more significant fact, i.e., the possibility that Wiener's hypothesis of a series of multiple alleles at one locus on homologous chromosomes may be correct. The only method apparent at present of coming to any decision concerning relative correctness of