ing political climate demands conformity. The recent history of Germany and Russia shows how quickly science is fettered, once totalitarianism gains control.

The scientist may have "wages, fame, (and) fortune" but if these become his major goals, it may not be long before society begins to ask whether he is entitled to any of them, and even his scientific achievement may suffer. It is a noteworthy fact that the majority of scientists listed in *American Men of Science* had rather humble origins and received their training in a selected group of the smaller liberal arts colleges. They were apparently motivated there by teachers of ability and idealism—men and women who were dedicated less to science than to students, and to human welfare broadly conceived. Let us have more of them, and more scientists who dare to be different, since acceptance of present conditions and values may mean the rather speedy extinction of civilization itself, and science too may disappear as learning did for so many centuries after the fall of the Roman Empire.

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Received June 26, 1953.

On the Nuclear Envelope

IN N. G. ANDERSON'S recent discussion of the nuclear envelope (*1*), some investigations conducted in our laboratory were referred to so briefly and in such a manner that our views concerning the permeability of the nuclear membrane may possibly be misconstrued. For this reason, and because of the fundamental importance of establishing definitively the physical nature of the nuclear membrane, we feel that a comment on Dr. Anderson's paper is in order.

The hypothesis (*1*) that "The nuclear envelope is a porous structure, generally permeable to macromolecules, yet containing within itself a mechanism for markedly altering its own permeability" is attractive in that it is capable of reconciling many conflicting, observations. Yet from the standpoint of cytochemistry, the crucial question is whether or not the membrane of the nucleus of a resting cell (e.g., the mammalian liver cell) is sufficiently permeable to permit the escape of enzymes and other proteins when the nuclei are isolated under conditions that leave the membrane unaltered.

The evidence mustered by Dr. Anderson to indicate that the nuclear membrane is a porous structure does not withstand critical examination. Many of the experiments mentioned were, for example, carried out on isolated nuclei and under conditions that may well have led to alteration of the membranes. Whether the apparent migration of antigens into nuclei has a bearing on the problem is also questionable. In one of the investigations (*2*) cited by Dr. Anderson, most of the antigen was, in fact recovered in mitochondria, which almost certainly have a protein-impermeable membrane. Furthermore, although it is generally accepted that the nucleus plays a role in the synthesis of ribose-nucleic acid, which is then transferred to the cytoplasm, we are not aware of data indicating that the RNA is in a "macromolecular" state during its transfer. The statement by Jeener and Szafarz (*3*) that the RNA is in the form of molecules (not macromolecules) that remain unsedimented at $60{,}000 \times g$ is not based on published data and, in any case, cannot be accepted as positive evidence for Dr. Anderson's conclusions.

With respect to our own work, we should like to point out that we are well aware of the possibility that the nuclear membrane may be a permeable structure and have so stated on several occasions, most recently in a discussion of the $CaCl_2$-sucrose method of isolation of nuclei (*4*). In general, this and other studies of the distribution of enzymes among fractions isolated from mammalian liver have indicated the absence, rather than the presence of enzymes in the nucleus (*4–7*), a situation that in itself might be interpreted as resulting from a porous nuclear membrane. Evidence that the membrane may be impermeable to proteins has arisen, however, from the more recent finding that the water-soluble enzyme catalyzing the synthesis of diphosphopyridine nucleotide was recovered almost in its entirety in isolated liver cell nuclei (*8*). This enzyme was released into solution when the nuclei were disrupted by exposure to sonic (not ultrasonic) oscillations for a short time at low temperature (*8*). The fact that about 50% of the DPN-synthesizing activity of a 1 *M* NaCl extract of nuclei was precipitated on dilution of the extract to a NaCl concentration of 0.17 *M* indicated, however, that this enzyme, like many others, is capable of combining with nucleic acid (*8*). Although the latter finding may not have any bearing on the state of the enzyme in the living cell, the implication, namely, that the enzyme may be combined with nucleic acid within the nucleus, was so obvious that further comment was considered unnecessary. As far as we are concerned, therefore, the degree of permeability of the nuclear membrane is still an open question. The situation with respect to DPN synthesis, however, can hardly be ignored as evidence in favor of a membrane impermeable to proteins.

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Received June 25, 1953.