used in determining who is or is not a "security risk." In addition to such standards as character, discretion, associations and political activities, the Board chose to consider as valid criteria the soundness of Oppenheimer's policy advice and the attitude he displayed toward government directives. From this misbegotten beginning arose the incredible finding that Oppenheimer was to be considered a security risk, because, in addition to defects of character and associations with unreliable people, he might have been more "enthusiastic" about the crash program to develop the hydrogen bomb.

This consideration was rejected when the case went, on appeal, to the AEC Commissioners, who apparently thought better of the inherent inappropriateness of such a standard and of its potentially dangerous consequences. As Stern points out, however, if Oppenheimer's advice regarding the crash program had been ruled irrelevant at the outset, many of the witnesses opposed to him would not have been called to testify, and the case would have turned upon older evidence that had been considered and reconsidered before and had always been found insufficient to warrant removal of clearance.

It might be argued, against Stern's brief for the inherent inadequacies of the security system, that the flexibility of the proceedings and even of the criteria offer a better basis for the protection of the right of the accused than a legal proceeding, where the provisions of statutory law must be strictly enforced. There can be no doubt that if Oppenheimer had confessed in court, as he did in the hearings, to having withheld information from the security officers and having lied to them, he would have been convicted of a felony. By contrast, as Stern points out, the AEC clearance criteria controlling the inquiry specifically left room for the exercise of common sense by those sitting in judgment.

The trouble with this argument is that the security system is more susceptible to political influence than the judicial system. Oppenheimer's clearance would not have been suspended in the first place if the Air Force and its allies had not been anxious to curb Oppenheimer's influence and if the Eisenhower administration had not been anxious to head off an investigation by Senator Joseph McCarthy. It would have been simpler and less risky with respect to relations with other scientists for the AEC not to avail itself of Oppenheimer's services. The Board's decision was obviously influenced by the loyalty-security hysteria of the times, and it was sustained by the AEC largely because the majority of the Commissioners were less liberal in their political attitudes than those who had cleared him before, as well as less willing to ignore his politics on grounds of his importance to national security.

Indeed, this consideration points to the one criticism that can fairly be addressed to Stern's book. As an indictment of the security system, it is certainly powerful and persuasive. In taking the Oppenheimer case, however, as an example of the ordinary workings of the system, it does a certain violence to history. The Oppenheimer affair was hardly a typical security case.

To a significant extent, the Oppenheimer case arose because at this awkward stage in the evolving relationship between science and government, scientists were still peculiarly vulnerable to political attack. In the court of public opinion, they were subject either to adulation or grave suspicion but rarely to understanding. They had as yet no institutional access to the Executive (as they have now through the Office of the Special Assistant for Science and Technology) and no well developed relationship with Congress, except through the Joint Committee on Atomic Energy. The fact that scientific expertise is more important to national security than the protection of scientific "secrets" was scarcely understood by politicians, let alone by their constituents. Nor was it understood that scientific advice would be needed in every area of public policy or that scientists, by venting their disagreements over policy, would actually make an indispensable contribution to responsible and democratic politics. We need not assume that such lessons have been fully learned to recognize that the Oppenheimer case was an expression of the confusion and tension that attend great historical changes. This does not diminish the injustice done to Oppenheimer. Like Socrates and Galileo and lesser men like John T. Scopes, he was very much a martyr to the cause of reason. His trial, like theirs, should make us proud of his humanity and ashamed of the "defects of character" in our own society that could have permitted him to be condemned.

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Molecular Spectroscopy With Neutrons

By Henri Boutin, Sidney Yip
266 pp. MIT Press, Cambridge, Mass., 1969. $10.00

Molecular Spectroscopy With Neutrons is a small book dealing with the applications of neutron scattering to the study of a variety of systems: simple liquids, hydrogen-bonded solids, polymers and others. The authors' stated aim is to correlate neutron spectroscopy with optical spectroscopy, and to use this combination to interpret molecular behavior. In a sense the book, as written, is a mixture of research monograph, extended review article and elementary text.

It is organized so that after an introductory section each of the topics mentioned is later treated separately. Each section has references to the research literature, presumably to guide the reader to more detailed treatments and to identify the sources of ideas, measurements and techniques. Do the authors achieve their goal of providing information to ". . . those who work with neutrons as a tool in molecular research as well as to those spectroscopists and workers in related fields. . ."? Despite the utility inherent in collecting information on a variety of subjects, it is my opinion that they do not succeed.

The basic theory is described in more detail, and with at least equal clarity, in other books (for example, G. Bacon in *Neutron Diffraction*), and although the collected reviews are useful, they do not provide sufficient information to more than indicate some of the literature that should be examined. Also the description of experimental techniques is so abbreviated that it is useless.

It might be argued that a book citing contemporary literature must serve some useful purpose. To this I

would rebut that the authors must then be very careful to systematically cite the literature, including examples of many points of view. I am not familiar with the literature in all of the subjects discussed, but I do know what is relevant to the study of simple liquids. The textual citations and list of references in chapter 3 are in my opinion so incomplete as to be useless and misleading.

The theoretical development in this book does not fulfill a need not now served by existing books, and I can not recommend it to either the novice or the practicing spectroscopist.

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Life of John William Strutt, Third Baron Rayleigh, O.M., F.R.S.

By Robert John Strutt, Fourth Baron Raleigh, F.R.S.
439 pp. U. of Wisconsin Press, Madison, 1968. $10.00

In 1924 Robert John Strutt, the fourth Baron Rayleigh (1875–1942) and a distinguished physicist in his own right, published a biography of his father John William Strutt, the third Baron Rayleigh (1842–1919). This volume came to be recognized as a major source of information for this period of experimental research associated with the establishment of the Cavendish Laboratory.

The present augmented edition is provided with an informative and perceptive foreward by John N. Howard. In its new format the work also includes hitherto unpublished illustrations and, notably, a 34-page appendix of annotations, amplifications and corrections that the author, Rayleigh's son, entered into his personal interleaved copy. Long out of print, this handsome volume now constitutes a major document for the history of modern physics and, as such, should attract the attention of many physicists.

The picture of Rayleigh that emerges from this biography is that of a versatile, independent, extraordinarily gifted and thoroughly dedicated amateur physicist who was equally competent in theory and practice. Although all of physics was his province, Rayleigh tended to limit his experimental investigations to practical problems that required relatively simple and commonly available apparatus—much of it designed and constructed in his own laboratory at Terling Place.

His natural bent toward frugality was severe. Guided by an unaffected mathematical and theoretical approach to physical problems, Rayleigh possessed the patience, perseverance and temperament for chasing after anomalies in a field where everything seemed to others clear and secure. He simply delighted in being able to "tidy up" some obscurity. Exceptionally skilled in mathematics, Rayleigh nevertheless was philosophically unreceptive to letting the mathematics of the situation get in the way of maximal physical insight.

The chapter on the discovery of argon, for which Rayleigh and William Ramsay received the Nobel Prize in 1904, makes exciting reading. It details various spectacular circumstances of the story: the delicacy of the collaborative efforts with Ramsay, the reluctance of scientists to draw the inference of monatomicity from the ratio of heat capacities, the enthusiasm of Lord Kelvin and the antagonistic attitude of James Dewar. Though dramatic, the discovery of argon played a relatively minor role in Rayleigh's scientific career. Thus, the author ably demonstrates that Rayleigh made orig-

LORD RAYLEIGH in the laboratory at Terling in July, 1900.