

A chatty survey of a prominent scientific institution

The Royal Institution: An Informal History

Gwendy Caroe

180 pp. John Murray, London, 1985.
ISBN 0-7195-4245-6. £13.95

Reviewed by Lawrence Badash

The Royal Institution of Great Britain is an unusual scientific enterprise. Not part of any industry, nor of government, nor of a university, it is privately owned and run. It is unique in its multifaceted character as research laboratory, educational center, and social club. Situated in the heart of London, in a mansion often modified for its changing needs, the Royal Institution for nearly two centuries has been prominent in Britain's scientific life.

The idea for such an institution arose in the fertile mind of Count Rumford, well known for his experiments on heat. Its original function was to apply science for the improvement of the poor: to investigate and demonstrate fuel-efficient stoves, cottage fireplaces, methods of preserving food, and so on. This was not selfless philanthropy, however, for the aristocratic land-

owners who supported the scheme hoped to make the lower classes more content with their lot and not be tempted into the sort of mob action so recently seen in the French Revolution.

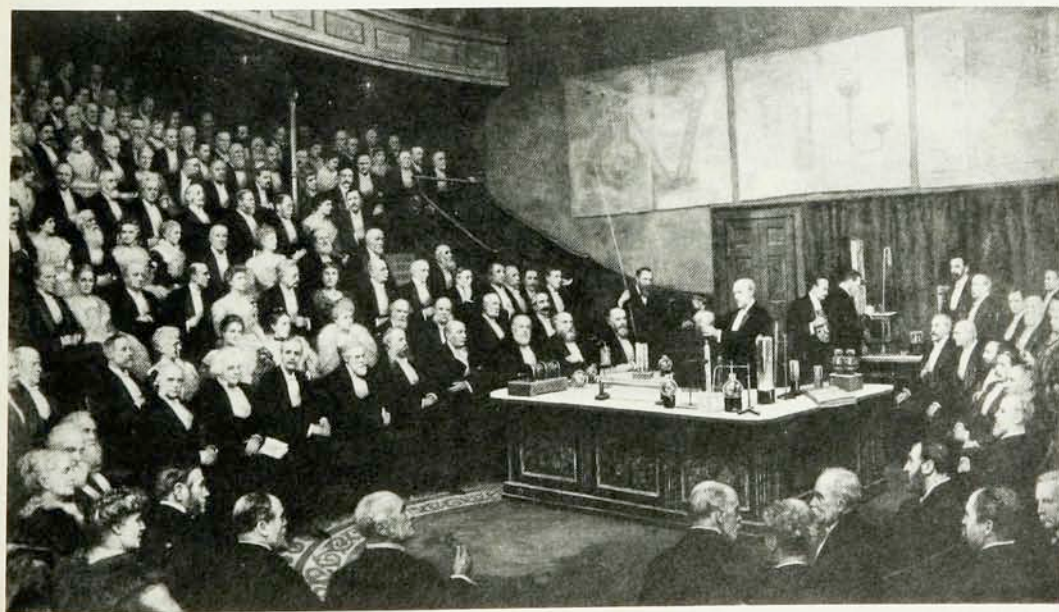
Yet, within a few years of its founding in 1800, the Royal Institution changed directions: classes for workers were unsuccessful, the landowners lost interest, and the institution's finances fell into a dismal condition. Emphasis was then placed on services to industry, such as improvements of optical glass and steel alloys, performance of water quality tests, and Humphry Davy's invention of the miner's safety lamp. Davy was also responsible for another trend, that of aiming Royal Institution lectures at fashionable society. This of course fit in well with the sponsors' continuing desire that the Royal Institution be "the most elegant social and philosophic club in London."

Although the founders had considered only the goal of "useful" knowledge, Davy's great success in basic electrochemical research, followed by Michael Faraday's even greater accom-

plishments in electrochemistry and electricity, gave the Royal Institution such a reputation that by mid-nineteenth century its governing body raised fundamental research to the highest priority. Faraday charted a new direction as well, when he gave a series of science lectures at Christmas-time to children that proved so successful that the tradition continues to this day. Another tradition from the same date is the "Friday evening discourse," generally a lecture on a topic of current scientific interest, handsomely presented with many demonstration experiments, to a fashionable audience of Royal Institution members in evening dress.

Faraday was followed as director of the Royal Institution laboratory and resident professor (there were also nonresident professors, usually from the universities, who gave a series of

Lawrence Badash is professor of history of science at the University of California at Santa Barbara. He specializes in the physical sciences of the past century.



James Dewar giving a lecture in 1904 at the Royal Institution. This illustration comes from the book under review; it is reproduced here by permission of George Porter of the Royal Institution.

lectures each year) by John Tyndall, James Dewar, W. H. Bragg, Henry Dale, Eric Rideal, E. N. da C. Andrade, W. L. Bragg, and (at present) George Porter. Each professor is given a chapter in the book, except that the chain from Bragg to Bragg is treated in a single chapter. This is particularly unfortunate, since the author was the daughter of the first Bragg and sister of the second, and herself lived in the Royal Institution for many years. Not only would far more knowledge about twentieth-century developments be desirable, for the nineteenth century has already been given more attention by historians, but we have lost a chance for a greater amount of information from one who observed keenly, from a privileged position. Beyond this, a more extensive discussion of the governing body's role over the centuries, and especially an elaboration of the major crisis when a resident professor (Andrade) was dismissed, would illuminate the Royal Institution's domestic politics as well as the social structure of science. The author died before the final chapter was written, and it is possible that she might have expanded the twentieth-century material, but it does not appear that she had this intention.

Nonetheless, the book is a highly interesting, charming, and chatty survey of the Royal Institution's history, including a few worthwhile efforts to explain the way it was affected by the larger social and economic currents in Britain. Also of note are chapters on the Royal Institution's high standard of lecturing and its numerous efforts in the field of education. The content of the science pursued in the Royal Institution is treated superficially, but this book makes no claim to being a scholarly analysis of the Royal Institution's activities and influence. On its own terms as a popularization, it is very successful.

Nuclear Energy: A Sensible Alternative

Edited by Karl O. Ott and Bernard I. Spinrad

386 pp. Plenum, New York, 1985.
ISBN 0-306-41441-4. \$25.00

This book analyzes the key issues surrounding nuclear power, largely in an unapologetic spirit of pronuclear advocacy. It is divided into four main sections, corresponding to different facets of the nuclear debate: society's need for energy, the economic status of nuclear power, issues of nuclear proliferation, and environmental risks. A fifth section is described in a foreword by Bernard Spinrad as "devoted to the

destruction of a large number of myths and misconceptions."

The participating authors constitute an eminent group and one might expect to find a definitive presentation of the case for nuclear power. However, although it has many strong sections, the book as a whole falls short of fulfilling such a hope, largely because much of it appears to have been written in the late 1970s. Some of the issues have changed little in character over the past ten years, but—Chernobyl aside—there remain areas where the book is weakened by a failure to address recent developments.

Much of the argument for nuclear power, for example, depends on the absence of better alternatives. However, one author more or less dismisses a crucial objection to coal, namely the global temperature rise associated with carbon dioxide production, by citing a reassuring, "current," 1978 study. The issue of timeliness also arises in the area of energy demand. The book stresses the link between GNP and energy consumption as it existed until 1973. But one of the surprises since 1973 has been the near constancy of energy consumption in the US while the GNP has risen substantially. Good arguments can still be made that nuclear power is needed, but the discussion should reflect recent trends in energy use.

The economics of nuclear power are considered by A. David Rossin, now the DOE Assistant Secretary for Nuclear Energy. This is a more up-to-date chapter than many of the others, with statistics on nuclear reactor performance through 1982. He concludes that "the economics are not merely bad, they do not even exist," due to delays in plant completions arising from political pressures and attendant regulatory difficulties.

Proliferation questions are lucidly and informatively discussed by Spinrad and E. L. Zebroski. They argue that countries seeking weapons have better routes than the utilization of power reactors. They also describe obstacles facing terrorists and clever college students. Although some of the discussions presume a fuel reprocessing program (at present nonexistent in the US), the analysis remains relevant.

Gerald Lellouche provides a helpful introduction to the methodology of probabilistic risk assessment, and T. G. Theofanous and Richard Wilson give a very good, but perforce not fully current, summary of specific technical issues involved in the analysis of reactor accidents. Three chapters by Bernard Cohen cover, in succession, the risks of nuclear waste disposal, radon problems, and comparisons among

risks. Cohen has written extensively on these issues, and the reader who wants a fuller exposition of Cohen's analyses would do well to turn to his own book *Before It's Too Late: A Scientist's Case for Nuclear Energy* (Plenum, New York, 1983).

The present book also contains a nicely written overview by T. J. Connolly, helpful section introductions by Spinrad, and a very unhelpful index. The book offers readers of widely differing technical backgrounds a valuable introduction to the issues of nuclear power, as seen from a pronuclear perspective. The analyses are authoritative, the convictions of individual authors are not disguised, and most of the discussions remain pertinent to current concerns. Overall, it makes a strong case that nuclear power is both needed and safe. Nonetheless, the reader will often regret that the authors are not writing today—rather than five to ten years ago.

DAVID BODANSKY

University of Washington

Electro-Optics

Lewis J. Pinson

265 pp. Wiley, New York, 1985.
ISBN 0-471-88142-2. \$42.00

Electro-Optics is a textbook designed to introduce the fundamental physical principles of the related areas of optoelectronics to advanced undergraduate and first-year graduate students. Pinson has almost reached his objective.

In general the material covered in this book is well selected with a reasonable balance between theoretical and practical aspects of optoelectronics. The level of presentation is fairly consistent with the exception of a few isolated sections, for example, Chapter 3, on geometric and physical optics, and Chapter 4, on lasers and optoelectronic modulation.

Pinson's writing style is good. He usually begins with a qualitative description of the topics and definition of all pertinent physical quantities involved in the chapter with concise statements thereby making the book very easy to read. Fundamental material is presented in the first six chapters, leaving the more specialized applications in the last five chapters. The introductory chapter brings out the fundamental concepts of optoelectronics and gives a good overview. Chapter 2, on optical radiation, contains primarily a detailed discussion of black-body radiation. Only a brief description is given to discrete radiation sources such as lasers.

Pinson gives a good review of Fermat's principle and ray-tracing tech-