Book Reviews

The Senior Bragg

William Henry Bragg, 1862–1942. Man and Scientist. G. M. CAROE. Cambridge University Press, New York, 1978. xii, 212 pp. + plates. $16.95.

Caroe planned this book together with her brother, the late Sir Lawrence Bragg, as an expansion of their charming sketch of their father published on the centenary of his birth (*1*). Much of the book was written by its subject: its greatest strengths are the generous quotations from William Bragg's unpublished autobiography, his correspondence, and his speeches. He wrote and spoke with exemplary lucidity, the result of a lifelong struggle to make his ideas clear to himself as well as to people ignorant of physics. He was a fine gentleman, wise, self-contained, religious but not observant, self-sacrificing, reflective. He so disliked scenes that when his opinion was required on a controversial matter, even within his family, he would retire to his study and respond in writing.

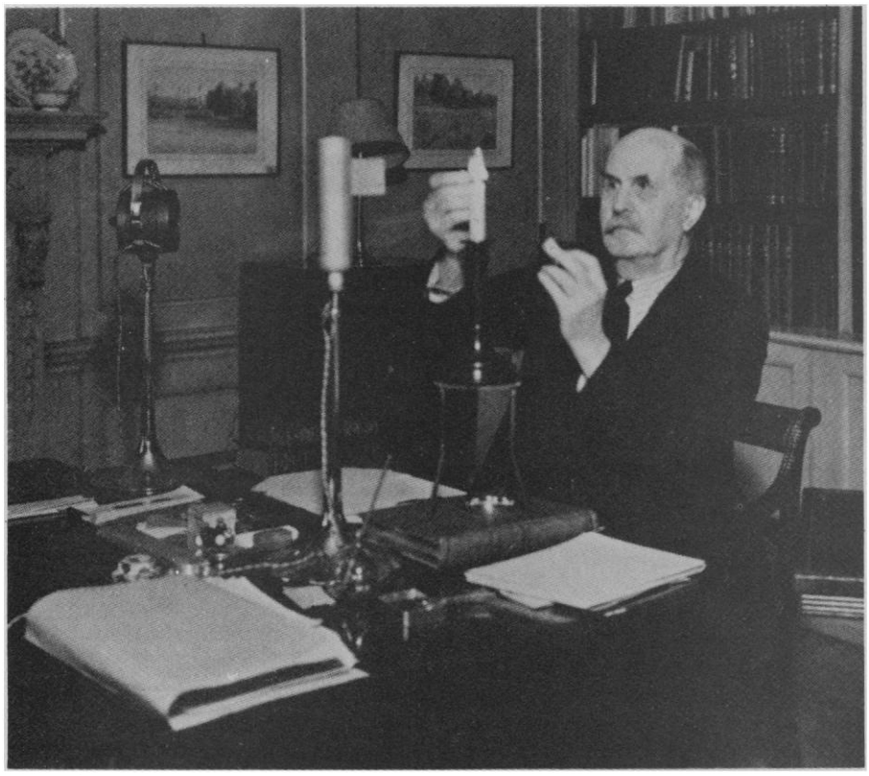
This retiring gentleman became a Nobel laureate, president of the Royal Society, director of the Royal Institution, a tireless banquet speaker, and, as the voice of science on the BBC, a well-known public figure. The career that led to these distinctions could not be reproduced in our time.

Bragg began as professor of mathematics and physics at the University of Adelaide. He was called there on the strength of his showing on the Cambridge mathematical tripos, then regarded as appropriate preparation for any job in the Empire. He had not studied physics. He worked it up leisurely, and otherwise relaxed in the comfortable colonial society into which he married. "It never occurred to me to do research." He entered upon that stony path in his early 40's, when the obligation to write a speech for the Australasian Association for the Advancement of Science caused him to review the latest findings in radioactivity. He saw that the dominant theory of the nature of the rays from radioactive substances could not be reduced to clear pictures. He supplied some, and tried them by experiment. The resultant discovery of the fixed ranges of alpha particles brought him the Cavendish professorship of physics at the University of Leeds.

One of Bragg's clear pictures was of a particulate x-ray. A controversy with C. G. Barkla, who aggressively asserted the common impulse-wave picture, gave Bragg much uneasiness and an intimate acquaintance with the temperamental apparatus then used to produce the rays. Thus prepared he was able rapidly to follow up Laue's experiment in the form devised by Lawrence Bragg, then a student at Cambridge, and to establish with him the basis of x-ray crystallography. That brought father and son the Nobel prize and a little family strain. According to Caroe, her brother occasionally felt that credit had been apportioned too evenly between himself and his father.

After World War I, Bragg moved to the Royal Institution, where he established a research school that included W. T. Astbury, J. D. Bernal, and Kathleen Lonsdale. There he gave lectures in the style of Faraday, which proved very popular and were published in many languages. He also educated industrialists to the usefulness of x-ray analysis. He spoke to civil, electrical, mechanical, and ventilating engineers; to opticians and physicians; to ceramicists, glass technologists, dyers, and colorists; to the Boot and Shoe Research Association (*2*). From these pedagogical labors he was called to the presidency of the Royal Society, which he led into World War II. Despite his great age, the government, recalling his important service during the first war, found ways to employ him in the second. Among other jobs he headed a committee in charge of what he called "the propaganda of science abroad." Bragg died a few days after a radio interview with Bernal on "the problem of the origin of life."

Caroe presents a sensitive portrait of her father as she saw him. Since her vision does not encompass physics, she does not make good the promise of her subtitle, "man and scientist." When physics is unavoidable, she quotes accounts of Bragg's work from obituary notices. These accounts are necessarily partial and episodic, and do not serve to set the correspondence, especially that with Rutherford, in context. Here refer-



William Henry Bragg "in Faraday's (and his own) study at the Royal Institution. By lighting a candle (in Faraday's candlestick) he turned on rows of lights in the Museum of Science and Technology at the Rockefeller Centre, New York, during the opening on 11 February 1936." [From *William Henry Bragg, 1862–1942*]

ence to the work of historians of science, who have published and interpreted much of this and other relevant correspondence, would have been useful (*3*). Since historians customarily smother in their own literature what light they produce, Caroe may be pardoned for not knowing their results; but it is dispiriting to think that no one at the Cambridge University Press or among those it consulted could advise her where to look.

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References and Notes

1. "Sir William Bragg, F.R.S. (1862-1942)," *Royal Society of London Notes and Records* **17**, 169 (1962).
2. A printed bibliography of the nontechnical writings of both Braggs may be obtained for $3, prepaid, from the Office for History of Science and Technology, 470 Stephens Hall, University of California, Berkeley 94720.
3. This literature may be recovered through my *H. G. J. Moseley: The Life and Letters of an English Physicist, 1887-1915* (Univ. of California Press, Berkeley, 1974).

Effect of the Cytochalasins

Cytochalasins. Biochemical and Cell Biological Aspects. S. W. TANENBAUM, Ed. North-Holland, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). xvi, 564 pp., illus. $95. Frontiers of Biology, vol. 46.

The earliest reports describing the effects of the cytochalasins on animal cells were published by S. B. Carter, of Imperial Chemical Industries, Ltd., a little more than ten years ago. Since then the number of studies that have appeared on the actions of these drugs, particularly cytochalasin B, is almost mind-boggling. *Cytochalasins* is a collection of 17 papers that review much of this research.

Many of the effects of the cytochalasins on animal cells are truly dramatic, especially those that are visible under the microscope, such as the rapidly produced reversible effects of cytochalasin B on various types of cell motility, on cell contractility, and on the properties of the cell surface. These effects include the cessation of cell locomotion and the inhibition of cytokinesis, of the extension and movement of lamellipodia and microspikes, of membrane ruffling, and of peristaltic wave motions. Especially curious is the ability of cytochalasin B to cause nuclei of mammalian cells to become displaced toward the periphery of the cells. Often the nuclei protrude from the cytoplasmic surfaces of the cells, remaining attached to the cell bodies through thin stalks of membrane-bounded cytoplasm. In several types of cells the protruded nuclei spontaneously detach, producing anucleate cells.

A powerful influence on the development of cytochalasin B research was the idea espoused by a few early workers that all its biological effects could be explained by an action on microfilaments. This premature notion soon became fixed in the minds of many investigators and led unfortunately to the widespread uncritical use of cytochalasin B as a diagnostic tool for microfilament function in cells. The current view, which is expounded at great length by a number of authors in this book, is that cytochalasin B has multiple sites of action and that we really know very little in molecular terms about the various ways in which cytochalasin B and the other cytochalasins produce their effects.

I think the most valuable aspect of the book is that it describes almost all the known actions of the cytochalasins on cells. The authors review their subjects in depth, and each chapter provides a thorough literature survey. This is the first such review of the cytochalasin literature, and it will be invaluable for investigators using these drugs or contemplating working with them. The many conflicting results concerning the different actions of the cytochalasins are reviewed, often with no attempt to resolve the issues raised but on occasion with considerable insight into possible explanations for the disparate results.

All but a few of the chapters are of high quality. Especially noteworthy are chapters by G. C. Godman and A. F. Miranda on the visible effects of cytochalasin in cells, P. G. W. Plagemann *et al.* on the inhibition of transport by the cytochalasins, G. Poste and N. C. Lyon on the enucleation of cultured animal cells by cytochalasin B, and S. Lin on the interaction of the cytochalasins with the red blood cell membrane and its associated proteins. Studies of the binding of [^{3}H]cytochalasin B have revealed that at least two high-affinity receptors exist for this drug. One of these is most certainly associated with the ability of cytochalasin B to inhibit hexose transport in mammalian cells, and the other seems to be related to the effects of cytochalasin B on cell motility and cell shape determination. Of novel value are chapters by S. W. Tanenbaum on the production of cytochalasins by fungi and by Ch. Tamm on the chemistry and biosynthesis of the cytochalasins. On the negative side there is some redundancy in that the same effects of the cytochalasins on mammalian cells are described by several authors.

It is unusual that a drug whose actions are so poorly understood on a molecular level be used so extensively as an experimental probe. Most certainly this is because the cytochalasins profoundly influence cell functions that a great many biologists are now studying. These drugs and their actions will continue to attract the attention of biologists for years to come. The hope is that, with the aid of this book, the research will progress in a more rational and cautious manner and the cytochalasins will turn out to be the valuable experimental tools that we initially hoped they would be.

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Cellular Phases

Cell Cycle Regulation. JAMES R. JETER, JR., IVAN L. CAMERON, GEORGE M. PADILLA, and ARTHUR M. ZIMMERMAN, Eds. Academic Press, New York, 1978. xviii, 258 pp., illus. $23. Cell Biology.

This is one of a series of multiauthor books on the cell cycle produced over the last ten years as a result of meetings. Reasonably enough, it cannot fulfill the promise of its compendious title with only 11 papers, but it should definitely be on the reading lists of those working on the cell cycle and cell proliferation.

Some of the papers are novel either in siting or in ideas. It is a pleasure to find Harris developing a theory about the control of mitosis by calcium, for this process is very much the culmination of the cell cycle but is normally ignored by the cyclists. Gerson's chapter raises the intriguing problem of intracellular *p*H. Even if the relations of *p*H to cancer can be taken with a grain of salt (or Ca^{++}), I was surprised to learn of the marked changes in *p*H during the cycle of *Physarum*.

Many of the other articles are in the current mainstream of cycle research. Three of them (McCarty and McCarty, Gurley and seven colleagues, Krause) are concerned with chromatin and histones. There are technical arguments here, but also some major biological questions that can only partially be answered. For example, are histone modifications such as phosphorylation and acetylation the cause or the effect of the changes during mitosis or the S period? Do these modifications have effects on transcription and are the effects general or specific? Two other papers are relevant to another important question—are