concretely in his own words what is their significance. This reticence is especially noticeable in the sections devoted to historiography, where the author is too ready to accept the word of someone else that a given historian was "scientific" (which neither Tatishchev nor Karamzin, prominently featured in the book, really were). But one must be grateful to him for having given us a judicious and informative account of a complicated and often obscure story.

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Commemorative Lectures

Clerk Maxwell and Modern Science. Six commemorative lectures. C. Domb, Ed. University of London Press, London, 1963. x + 118 pp. Illus. $4.

James Clerk Maxwell was professor of natural philosophy at King's College, London, from 1860 to 1865, and the six essays in this volume commemorate his tenure there.

Sir John Randall's introductory address, based primarily on the Campbell and Garnett biography and the *Collected Papers*, reviews comprehensively Maxwell's life and work. New to many readers will be the summary of I. B. Hopley's useful study of Maxwell on color and color vision. Maxwell's performance as a teacher is reevaluated; the long-standing assumption that he was a poor lecturer is questioned, and his effort toward making laboratory work part of the physicist's education is stressed. One curious paragraph suggests that it is time to take a "fresh look at the premises and hypotheses" at the basis of electromagnetic theory because considerable confusion concerning electromagnetic theory exists today; presumably this refers neither to the attempts to create non-Maxwellian electrodynamics (Born and Infeld and others), nor to the action-at-a-distance theories (Feynman and Wheeler).

The theorist R. E. Peierls, in an essay entitled "Field theory since Maxwell," begins with passages from Maxwell's 1864 paper on electromagnetic theory. The excerpts indicate that terms referring to the physical model introduced in the previous paper are not to be taken literally, but that energy considerations *are* literal: "All energy is the same as mechanical energy." Peierls, like Randall, speculates on the introduction of displacement current. It would seem reasonable that such speculations should rely only on Maxwell and not on contemporary views. These speculations should not use the basic equations in the symmetrical form common today (due to Heaviside and Hertz); they should use Maxwell's original 20 equations involving the potentials. Peierls convincingly analyzes the change from the 19th-century search for mechanical models of the electromagnetic field to our present disinterest in such models. He then discusses other fields of contemporary physics, the quantization of fields, and the restrictions imposed on measurements of fields (particularly the electromagnetic field) due to quantization, and in so doing summarizes the work of Bohr, Rosenfeld, and Peierls himself. He ends, not surprisingly, by mentioning the troubles encountered in contemporary quantum field theory.

The most interesting paper in the collection may well be C. A. Coulson's "Interatomic forces." Kinetic theory was an early concern of Maxwell; his belief in velocity distributions led him to reject the billiard ball model of molecular collisions and to seek a power law for repulsive force between particles. Underlying this work, and much other work of the period, was the concept of "molecule." Maxwell wondered how a theory could account completely for an unseen world of molecules—"a strangely modern cry to come from an early Victorian," Coulson comments. The passages in which Maxwell reacted to Darwinism are fascinating; his three great papers on electromagnetic theory are roughly concurrent with *The Origin of the Species*, and he shared the interest of his age in evolution. He rejected any evolutionary processes on the molecular level, seeing molecules as eternal and unchangeable, coexistent with nature herself. "No theory of evolution can be formed to account for the similarity of molecules, for evolution necessarily implies continuous change, and the molecule is incapable of growth or decay, of generation or destruction." Coulson concludes with some modern considerations on interatomic forces and shows that Maxwell could not have reached these conclusions without the intellectual equipment of the 20th century.

The last three papers begin with comments on Maxwell, but do not investigate his work directly. Two outline particular areas of science which are based on electromagnetic theory, and the third is concerned with an application of the quantum theory of radiation. Sir Edward Appleton begins his discussion, "Radio and the ionosphere," with the Heaviside-Kennelley layer and proceeds to the experimental studies of the E and F layers by ionospheric sounding devices. E. G. Bowen's interest centers on radio telescopes. He first formulates six requirements for such an instrument, then shows how the Australian 210-foot telescope attempted to meet these requirements, and finally discusses some results obtained with the instrument. R. A. Smith's discussion of masers and lasers takes us even farther from Maxwell, for in this treatment quantum considerations are critical.

One can hopefully view this volume as part of a modest Maxwell "revival." After a long period with little attention, some interest is again being shown. A new biography and other Maxwellian studies now being undertaken may add measurably to our knowledge of the greatest physicist of the 19th century.

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Darwiniana

Charles Darwin. Evolution by natural selection. Gavin de Beer. Doubleday, Garden City, N.Y., 1964. xii + 290 pp. Illus. $4.95.

Darwiniana. Essays and reviews pertaining to Darwinism. Asa Gray. A. Hunter Dupree, Ed. Harvard University Press, Cambridge, Mass., 1963. xxiv + 327 pp. $5.

Ever since the centennial year of Charles Darwin's *Origin of Species* (1859), numerous books and papers have appeared on Darwin and on his life and works. With every new publication, this question arises—Why another? Apparently Sir Gavin de Beer felt that he should answer the question, and he did so by calling attention to what is still happening: (i) In London, 240 participants on a television program were asked what names they associated with evolution. One third of them associated no name at all, an-