Oxford symposium had to make the choice of proceeding on the larger front or the narrow: and, on the whole, each speaker tended to be criticized for not making the opposite choice. Will the history of science—in which the histories of the sciences will fall like the tributaries of a river—ever be written? asked Koyré. Oxford could only agree with him that time alone can tell.

A. R. HALL

JAMES CLERK MAXWELL

Clerk Maxwell and Modern Science

Edited by C. Domb. (Six Commemorative Lectures by Sir Edward Appleton, Dr. E. G. Bowen, Prof. C. A. Coulson, Prof. R. E. Peierls, Sir John Randall and Prof. R. A. Smith.) Pp. vii+118+5 plates. (London: The Athlone Press, University of London, 1963. Distributed by Constable and Co., Ltd.) 25*s*. net.

FROM 1860 until 1865, James Clerk Maxwell was professor of natural philosophy at King's College, London, and there produced some of his most significant work, in particular the two classic papers in which he first put forward the concept of the electromagnetic theory of light.

Six lectures, which form this book, were given to commemorate his work at King's College. All the lectures were given by distinguished physicists, some of whom, including Sir Edward Appleton, Sir John Randall and Prof. C. A. Coulson, have had direct connexions with the College and its Wheatstone Laboratory. The lectures divide into two groups. In the first, Sir John Randall provides a general background description of Maxwell's life and work; Prof. R. E. Peierls surveys developments in electromagnetic field theory since Maxwell, and Prof. C. A. Coulson discusses four basic questions facing Maxwell in the sphere of intermolecular forces and how they have since been answered. The three lectures in the second group are devoted to fields of research which, though intimately connected with electromagnetic radiation and thus ultimately deriving from Maxwell's investigations, have only been developed in recent years. Sir Edward Appleton writes on radio and the ionosphere; Dr. E. G. Bowen on radio astronomy and giant telescopes; and Prof. R. A. Smith explains the principles underlying the interaction of radiation with matter, and describes their brilliant application in the past few years to the construction of masers and lasers and to the generation of coherent beams of light.

This is a book for the student and teacher of physics rather than for the layman. It need scarcely be said, in view of the distinction of each of the contributors, that each section is a model of clear exposition and a scholarly treatment of its subject.

Maxwell, who lived for only forty-eight years, published more than a hundred scientific papers which fall into three groups: colour vision and optics; molecular theory, including heat and thermodynamics; and electricity and electromagnetic theory. It is remarkable that many of his papers opened new fields of research. Of these, two are fairly well known, but his work in optics and colour vision has sometimes been forgotten.

He developed the colour box and colour top into instruments capable of making measurements with mathematical precision, and he discovered the numerical laws for the evaluation of data from such measurements. He demonstrated that the sensations of all the colours of the spectrum may be simulated by suitable mixtures of three primaries, including subtraction as well as addition; and he showed the application of the trichromatic theory to the reproduction of a colour photograph, which is the basic principle of modern colour photography.

In 1871, the chair of experimental physics at Cambridge was founded and offered to Kelvin, who turned it down. Maxwell seems to have taken it reluctantly. Although he had no experience of teaching experimental physics he succeeded brilliantly both in his astuteness in bringing the Cambridge of his day to approve of his plans and in the high standards he achieved in the Cavendish Laboratory. He was able to steer the mathematical Tripos examination towards more physical subjects for some years. 'Applied mathematics', so often perversely narrowed to statics and dynamics, owed much to him. Sir John Randall gives us an excellent pen-picture of Maxwell the man, his literary and religious interests. It is exciting to speculate what else he might have accomplished had he been vouchsafed another decade or two of his life. Already in his famous paper "On the Dynamical Theory of the Electromagnetic Field", he discussed the problem of the gravitational field and thus began the long and as yet unsuccessful attempt to derive a unified field theory of matter.

The official historian of King's College says that Maxwell was dismissed from his chair because he could not keep order in his lectures, and this was certainly the tradition when I worked in the Wheatstone Laboratory. Sir John Randall can find no evidence to support this in the College archives, although some of these have been ransacked and many records are missing. Whatever is the truth concerning Maxwell's departure from King's College, it is fitting that so many distinguished physicists should have contributed under the auspices of King's College in so effective a manner to extol the genius of Britain's leading nineteenth-century mathematical physicist.

W. L. SUMNER

THE TOOTH OF TIME

La Notion de Temps

Équivalence avec l'espace (Actualités Scientifiques et Industrielles 1300). Par O. Costa de Beauregard. Pp. 207. (Paris: Hermann, 1963.) 18 F.

Le Second Principe de la Science du Temps

Entropie, Information, Irréversibilité. Par O. Costa de Beauregard. Pp. 158. (Paris: Éditions du Seuil, 1963.) n.p.

IN the past few years there has been a great revival of interest in fundamental problems concerning time, particularly among physicists and natural philosophers. This revival has not been confined to the English-speaking world, and among those in other countries who have contributed to the subject has been the well-known French theoretical physicist Count Olivier Costa de Beauregard. Recently he was awarded a Doctorat ès Lettres by the Sorbonne, and the two theses which he submitted have since been published. Both these are highly readable and provocative contributions to the literature on the concept of time, and it is to be hoped that attention will be directed to them abroad as well as in France.

The longer and more technical thesis, *La Notion de Temps*, is devoted to what the author calls the "first principle of the science of time", the equivalence between space and time first indicated by the introduction into physics of the theory of relativity. Costa de Beauregard has been impressed by the requirement of this theory that relations between events should be subject to covariant formulation. The usual distinctions between past, present and future presuppose frontiers between events that cannot be traced in a covariant way. Thus many writers on relativity, notably Einstein, Minkowski and Weyl, have declared that there is no "going-on" of time in the objective world. Events are simply there and do not happen. In the relativistic description of Nature, the world is spread out *sub specie aeternitatis* as a four-dimensional manifold, its division into space and time depending on the observer. This fusion of time and space has been