

they led to unsatisfactory conclusions, and I have long since decided that, on the analogy of generalized Lagrangian coordinates in classical mechanics, only a posteriori meanings can be found.

The exposition is mainly verbal, but mathematical formulas are quoted as needed, usually without detailed proof. There are also 22 notes at the end of the book that expand in detail points raised in the text. It is clear from his comments that North understands the underlying mathematical theory very well. Nevertheless it must be recorded with regret that the formulas contain a quite unusual number of misprints. Plus and minus signs are interchanged, indices are omitted or incorrectly printed, capital letters become lower case in successive lines, brackets are misplaced, and so on. The misprints are merely a source of irritation to the expert reader, but they might well prove to be a serious obstacle to a student. It is also surprising to see Oxford University Press allowing, in the text, so many misprints of the "fron" for "from" variety. I believe that the book is of permanent value, and it would be highly desirable to correct all misprints before further

printings are made. I have also noticed two places where I cannot follow the mathematical argument. On page 108, I am unable to deduce equation (30)—in which "sin" is misprinted for "sinh"—from (29) and the information contained in equations (27) and (28). If τ (or should it be T ?) and R are independent coordinates, the derivation cannot be made. There must be some unstated condition about the relation between τ and R . On page 346, I do not believe that the attempt to prove the transitive property for luminosity distances is legitimately made from equations (17)—here R^k is misprinted for R_2 . Luminosity distances are applicable to a set of luminous sources viewed at the same instant of time by a single observer. North wants to combine luminosity distances calculated by observers located at different places and at different times. I would say that this is an illegitimate use of the concept of luminosity distance. Nevertheless, in spite of these defects, the book can be heartily recommended to all students of cosmology.

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Science and Technology and the Less-Developed Countries

Science and Medicine in Central Africa (Pergamon, New York, 1965. 1008 pp., \$30), edited by George J. Snowball, is a collection of papers that were presented at the Central African Scientific and Medical Congress held at the College of Further Education (Lusaka, Northern Rhodesia) in August 1963. The Congress brought together scientists of widely divergent interests in the manner of the United Nations Conference on the Application of Science and Technology for the benefit of the less-developed countries.

The subject matter covers the physical, biological, social, and medical sciences. Some of the papers are presented in full, others in abstract form only. At the beginning of most papers there is a short explanatory statement which will assist the reader in selecting the papers of particular interest to him; these statements will also enable the reader to understand the overall complexity of attempting to change cultural patterns.

There is a fascinatingly wide range of information in this book for anyone

interested in the problems of newly emerging nations. The authors represent a judicious mixture of scientists steeped in African affairs and scientists from the wider world.

Agricultural education is discussed in an opening paper, with emphasis on a three-tier system of agricultural education in Britain, the needs of the fundamental research worker, the critical gap between the research scientists and the farmer, the educational needs of the farmer, and the need for some degree of specialization. The lessons of Britain have meaning for Rhodesia.

The need to teach the fundamental sciences to all school pupils is stressed in another paper. The planning of medical care services is discussed in relation to lessons learned from the mistakes of the National Health Service planning in Britain: namely, that the need for medical care does not decrease, but increases and becomes more expensive.

There is an article on airframe icing on a scheduled flight over the Sudan; geological and ground water research

is discussed. A novel method of water-borne sanitation appropriate to much of Africa is presented—a combination of aqua privy and stabilization pond. The sands of Kalahari-type are analyzed and discussed in relation to their origin.

A standard method of vegetation classification is put forward for consideration—a method that does not involve specialist knowledge and will be a boon for all those working in vector-control, for example. Even the dragon fly, and its role as an economic factor, comes in for discussion. Did you know that crocodiles eat adult dragon flies? Or that termite mounds may be partly created by the erosion of the surrounding land surface, not necessarily by the addition of material from above?

The impact that a changing cultural environment makes on the individual and the stresses engendered by living in two worlds, old and new, is presented. Papers on medicine occupy one fourth of the book.

In toto, this volume attempts to equate the reader with the interaction of the sciences, education, and economics. It presents the need for research in applied science and pure science. Education is a constant theme. But the greatest lesson that this Congress teaches is the interrelationship of the various disciplines, that Africa needs men of broad vision, as well as the specialist, who can relate the contribution of science to the betterment of human life. It is a must for those interested in Africa. More such interdisciplinary conferences are required; but they should be convened with defined objectives and a strictly limited series of papers.

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Respiratory Physiology

Cerebrospinal Fluid and the Regulation of Ventilation (Davis, Philadelphia, Pa., 1965. 456 pp., \$16.50), the proceedings of a symposium held at the Downstate Medical Center, State University of New York, in April 1964, has been published under the editorship of Chandler McC. Brooks, Frederick F. Kao, and Brian B. Lloyd. The symposium brought together scientists, from western Europe and the United States, who were interested in the role of the cerebrospinal fluid (CSF) in regard to respiratory physiology. Fourteen papers presented at the con-