tronics. Although an information theory of quantum mechanical channels is *not* presented, the theoretical foundation for such a theory may well be contained in Takahasi's stimulating paper.

As indicated by the above discussion, this volume contains a wide variety of material, some of which was interesting and stimulating, and some of which fell far short of expectations. I expect that most readers will have similar mixed feelings.

IRA JACOBS
Electromagnetic Research Department, Bell Telephone Laboratories, Inc., Whippany, New Jersey

History of Science

Michael Faraday. A biography. L. Pearce Williams. Basic Books, New York, 1965. 547 pp. Illus. $12.50.

It is indeed unfortunate that this extremely readable and comprehensive biography, obviously the product of painstaking scholarship, should have its many virtues seriously jeopardized by the basic point of view from which it was written.

The following items suggest the positive accomplishments and characteristics of the biography. First, Williams has attempted to consider essentially the whole scope of Faraday's investigations and to place them within their scientific context. Second, he has selected creatively from a diversity of primary sources including published and unpublished notes, notebooks, letters, diaries, and journals, as well as *Faraday's Diary* and the published papers of Faraday and other investigators. Third, the biography makes liberal and effective use of long citations from the primary sources. Fourth, Williams has been able, frequently, to succinctly and clearly present a complex situation in either Faraday's personal life or his experimental work by developing a skillfully chosen representative aspect of the situation. In short, Williams has written some very good history in these instances. Fifth, he has forcefully conveyed Faraday's profound commitment to the idea of the "convertibility of forces."

In tracing Faraday's theoretical achievements, Williams has attempted a grandiose synthesis. Thus, he insists on a single, hidden basis for essentially all of Faraday's theory construction during his most productive 25-year period. Williams states (pp. 77–78) that "Although he did not publicly announce his commitment to the [Boscovich] theory of point atoms until 1844, Faraday worked within this framework from his earliest productive years." Subsequently Faraday's acceptance of Boscovich's theory is dated at 1823 (probably), his commitment to it at 1826, and the early indications of his break with it at about 1848. In presenting the theoretical component of a number of Faraday's contemporaneous investigations, Williams implies, without convincing demonstration, that to make a given investigation intelligible it is *necessary* to accept Faraday's commitment to Boscovich's theory. Each of these presentations follows an exceedingly simple pattern. By conjecture Williams depicts Faraday as (i) basing his reasoning, more or less directly, on Boscovich's "point atomism," (ii) developing a clear set of concepts which, then, (iii) suggest an experimental confirmation.

Williams's rich and provocative consideration of the discovery of electromagnetic induction exemplifies several of the above comments. In his view (p. 161), Faraday used Ampère's ideas as a touchstone in such manner that "his concepts became clearer and clearer until he was led by them to the discovery of electromagnetic induction." By plausible reasoning which is grounded, ultimately, in Boscovich's "point atomism" and which, admittedly, "contains a good deal more conjecture than is desirable" (p. 169), Williams represents Faraday as *expecting* those two transient pulses, the detection of which constitutes his discovery. However, the relevant published literature suggests that the transciency surprised Faraday and that he subsequently invented his undetected "electro-tonic state" as a steady interpulse "response" thus eliminating the transiency. The other instances of Williams's contention of Faraday's adherence to Boscovich's "point atoms" are similarly not indispensable.

It thus remains useful to consider Faraday as having been openly committed to general qualitative ideas, such as the "convertibility of forces," and further to study the clarification of his concepts as occurring *with* his experimental results and not necessarily as a prior condition for them.

J. BROOKES SPENCER
Oregon State University, Corvallis

Theology and Social Progress: A Cargo Cult

Road Belong Cargo. A study of the Cargo Movement in the southern Madang District, New Guinea. Peter Lawrence. Humanities Press, New York, 1964. xviii + 291 pp. Illus. $6.50.

The cargo cults that have swept the area of Melanesia for the past several generations have been, since World War II, of increasing interest to scholars and public administrators. They are perhaps the most gaudy of all the varieties of revitalization movements that spring up, characteristically, among peoples who have lost faith in their own old traditions. Such intensively emotional movements as these, in the remaining colonial areas of the world, in the independent but underdeveloped countries, and among the underprivileged in advanced countries, are of considerable importance to all concerned with policy and the application of policy in foreign and domestic affairs, for they are the milieu in which intergroup relations must be carried on.

The cargo cults and related movements of Melanesia have been the subject of several excellent recent studies, some of them already reviewed in the pages of *Science*: Margaret Mead's *New Lives For Old* and Theodore Schwartz's *Paliau Movement*, which are intensive studies of a single movement; P. M. Worsley's survey, *The Trumpet Shall Sound*; and several others. Peter Lawrence's book *Road Belong Cargo* is a welcome addition to this library, for it combines intensive field study of the cults of a region with careful attention to historical process. Lawrence spent about three years in the field in the Madang area of the Trust Territory of New Guinea, studying not just a single tribal group but a region. The historical and regional survey aspects of the study are important, for, now that there are numerous examples of individual movements in particular tribes, it is important to proceed to an understanding of how the endemic cargo idea spreads and evolves in a whole area, with movements flaring