BOOK REVIEWS

The Legacy of Hiroshima. By Edward Teller and Allen Brown. 325 pp. Doubleday & Co., Inc., Garden City, N. Y., 1962. $4.95. *Reviewed by David Frisch, Massachusetts Institute of Technology.*

EDWARD Teller has given us—and/or caused Allen Brown to give us—a book containing much discussion of our nuclear and space military-political positions and objectives, quite a few personal reminiscences, some popular descriptions of scientific and technical developments, and a brief discussion of education.

The central subject of *The Legacy of Hiroshima* is the interaction of weapons, national strength, and international affairs. Teller's theses are stated at the beginning: "We have been frightened by the display of our own power at Hiroshima, and we have lost our sense of proportion. On the one hand, we think of an all-out war as a cataclysm that will wipe out mankind. On the other hand, we think of an abolition of nuclear weapons as a means to restore stability and to avoid a future war. These two patterns of ideas are driving us toward a tragedy which, when it comes, will be of our own making. . . ."

"We cannot be strong unless we are fully prepared to exploit the biggest modern power, nuclear explosives. . . . Nuclear weapons can be used with moderation on all scales of serious conflict. Nuclear weapons do not mean the end of the world, but they do mean the end of non-nuclear power."

It follows that: "Only after international tensions are relaxed and mutual confidence established by measures of conventional disarmament should we tackle the infinitely more difficult task of nuclear disarmament."

The background for these remarkably final opinions is given partly in terms of four historic decisions on nuclear policy. About the 1939 decision to attempt to build A-bombs Teller says: "I concluded that President Roosevelt was telling us that the duty of scientists was to see that the most effective weapons would be available for use if necessary, that we would stand morally guilty before the free world if we refused to lend our talents to the cause of the free world. . . . I left the meeting feeling that I was committed to do whatever I could—regardless of the ultimate consequences—to help provide the instruments of strength for the defense of freedom." Note that the duty of a scientist was to get the strongest weapons no matter what, not just to get A-bombs before the Germans got them.

Teller regrets the tragic decision in 1945 to drop the bomb on Hiroshima without warning. He recalls the Franck-Szilard advice to give first a harmless demonstration to the Japanese, but he doesn't discuss the arguments which were used for and against such a merciful display. It would be of great interest to have such a discussion because many of the arguments which were used against a more humane first use of the bomb seem now to have been reasoned out in extremely bad technical and political perspective, and, in fact, there is a depressing similarity between some of those arguments and many of the ideas presented in Teller's book. For example, he fears that the Soviets may achieve a clandestine AICBM breakthrough by testing H-bombs in outer space and so destroy us. In 1945 it was feared that a bomb dropped on Japan as a demonstration might be a dud and then picked up and used back on us. Again, Teller thinks we should resume testing in part to perfect tactical nuclear weapons, underestimating the possible international terror consequent on a tactical nuclear exchange. In 1945 the decision for a live bombing of Hiroshima reflected an underestimation of the dramatic impact of an atomic bomb exploded harmlessly at night.

The 1950 decision to go full speed ahead with H-bombs is treated as perilously long overdue, again without careful examination of the alternatives. What might have happened if we had followed instead a policy of having awesome strength in deliverable A-bombs, but without developing the H-bomb until forced to by prior development by the Russians? Perhaps it might have been much like the recent past in which the Soviets had a superiority in ICBM's without being appreciably nastier than usual. Can Teller really believe that we can or should keep ahead on every front with no recognition of saturation where it exists?

The decision to stop testing in 1958 is treated as a nearly fatal mistake: "We now know that our self-imposed moratorium on nuclear experiments during the Geneva negotiations was idiotic and dangerous, that we allowed our hopes to arrest our weapons development at the 1958 level while Russian progress was accelerating, that the Soviet Union never did stop nuclear tests but was conducting experiments all along." How can a physicist present that last flat statement to the public without any indication of proof?

Here are a few other expressions of Teller's morbid fear of the Russians and mistrust of our own strength: "But our present retaliatory force is a wasting asset, and the Russian leaders know this." "The probability that a nuclear gap exists right now, in addition to a missile gap, is frightening and real." "Our response [to the Russian development of the A-bomb] was a refusal to respond, and this was significant in leading us from our strength of 1945 to our weakness of the 1960's." One notes that Teller's preoccupation with our Soviet adversary makes for an almost complete neglect

of the n^{th} country problems, much as, for example, Blackett neglects them in a recent article in *Scientific American* (April 1962).

Teller gives an outline of what he hopes is the political evolution of the free nations: Protected by technical superiority (derived in part from more freedom from secrecy), and helping the underdeveloped peoples through Project Plowshare and other research, we should develop through NATO to Atlantic Union and ultimately to a world government. These ideas are all on the side of the angels, but there is no serious discussion of the problems involved in their implementation.

The personal reminiscences in *The Legacy of Hiroshima* would perhaps be more exciting if the identities of the antagonists weren't revealed so early in the book. Of course, it would have been impossible to conceal the identity of the hero, but with some effort the various villains could have been disguised longer. A model for a more dramatic presentation of this kind of material may be found in "Tom Swift and His Giant Psychosis".

The popular science writing is excellent, especially the brief clear treatment of the Einstein time dilation. Teller and Brown are exceptionally good reporters where there is a simple, unambiguous answer.

Finally, the brief discussion of education contains such thoughts as: "A great battle has been won by the Soviet Union in the schoolroom"; Scientists in America "are, in fact, considered outside the society"; and, "But Strauss' appointment as Secretary of Commerce was not confirmed by Congress, and early adoption of the metric system in our country suffered another setback."

Linear Differential Operators. By Cornelius Lanczos. 564 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1961. $12.75. *Reviewed by J. Gillis, Weizmann Institute of Science.*

THE world of scientific books has been having its population explosion and the linear differential equations family has by no means been the least fertile. In the circumstances a reviewer may hope to be pardoned a tremor or two as he picks up a new book on linear differential operators. That this reviewer was able to do it this time without any tremor at all is due to the pleasure he has derived in the past from the earlier books of the same author.

The chief theme is linear differential equations, both ordinary and partial. What is novel about the book is that, without any sacrifice of accuracy or rigor, it really concentrates on how to solve the equations. The central method is that of the Green's function. Other methods are indeed introduced, but they are all based on a Green's-function approach. Indeed this exposition of the power of the Green method as a unifying principle in linear differential equations is a striking reminder of how much we owe to the Nottingham miller who found his own way in mathematics 130 years ago.

Lanczos' presentation is painstakingly careful. It may be criticized in places where the distinction between careful and excessive exposition seems slightly blurred. But such decisions must always be questions of personal taste. Certainly the meticulous presentation can be most valuable to anybody teaching the subject and anxious for some new idea to clarify his message. He is very likely to find here just what he wants. It is not quite so obvious that the style of exposition is the best for a student, who might possibly find himself so bewildered by the mass of details that he cannot discern among them the essential idea.

Apart from the usual material, one finds in Lanczos' book a wealth of ideas and applications of the sort not normally encountered in a work on this subject. To cite a few examples, almost at random, there is the application of Green's functions to estimating the Taylor-series remainder and Lagrange interpolation error, the interesting little note on the nature of high fidelity and of the relative importance in that connection of harmonics and of transients, and the short but lucid discussion of the conservation laws of mechanics. The Sturm-Liouville set of ideas is based most naturally on Green methods, and this leads us to WKB methods, expounded with great clarity. And there is then an extremely useful account of special functions, chiefly with the idea of applying WKB to the calculation of their asymptotic properties.

Most books on partial differential equations fall into one of two classes. There are those which tell us everything about the equations except how to solve them; and the others which limp through a few routines, once more separating the variables in equations which were separated by Fourier and Poisson and have been separated so many times since then that it is difficult to see them without wincing. And so we are grateful to the author for a book which transcends both classes and really has something to say which is both useful in substance and original in presentation.

Advances in Computers, Volume 2. Franz L. Alt, A. D. Booth, R. E. Meagher, eds. 434 pp. Academic Press Inc., New York, 1961. $14.00. *Reviewed by Peter L. Balise, University of Washington.*

SINCE rapid progress is being made in so many different directions that no one can be expert in all phases of computation, it is increasingly important to be able conveniently to draw upon the knowledge of specialists. *Advances in Computers* will inform its readers about developments outside their own fields by providing introductory but not elementary presentations of advances, which may be supplemented from its large reference lists. Continuing Volume 1 (which considered programming for business applications, weather prediction, language translation, game playing, recognition of spoken words, and binary arithmetic), Volume 2 lucidly presents five additional topics.

Jim Douglas, Jr. outlines the more efficient finite-difference methods for partial differential equations