understand that this is not a military weapon. It is used to wipe out women and children and unarmed people and not for military purposes. Se we have got to treat them differently from rifles and cannons and ordinary things like that". The President decided that the Atomic Energy Commission should retain custody.

In October 1959, after the explosion of the first Russian atomic bomb, the issue of the hydrogen bomb known as the "Super" was debated within the Atomic Energy Commission's General Advisory Committee, chaired then by Robert Oppenheimer. The General Advisory Committee was very much divided. Conant was flatly against it: "We have built our Frankenstein"; Oppenheimer was against; Rabi was for; Lilienthal against. We know from later evidence that there were doubts about its technical feasibility and that later work transformed the situation.

A special committee of the National Security Council, Acheson, Johnson (Secretary of Defence) and Lilienthal, reported to the President, who ruled in favour of developing the "Super" (January, 1950).

Lilienthal was almost continuously attacked and vilified by some members of the Joint Congressional Atomic Energy Committee. Senator Hickenlooper charged the Commission in 1949 with gross mismanagement, and a Committee investigation proceeded under the glare of television lamps for several weeks. Complete trivialities were discussed, such as the loss of a few milligrammes of enriched UO_2 at the Argon Laboratory, later found in a dustbin. A great fuss was made about a *March of Time* film containing pictures already released in 1945. The Committee insisted on a full F.B.I. clearance for A.E.C. Fellows appointed for basic research in Universities. At one meeting of the Committee, "7 Senators and 8 Congressmen were busy reading a security file on a Miss B. employed at Los Alamos—about her drinking habits and where she slept—the great issues of co-operation with the U.K. had to wait".

President Truman told Lilienthal, "Don't let this tempest in a teapot get your goat, Dave. You let it get under your hide and you'll get like Forrester [committed suicide May 22, 1949]; no need worry about it".

The diaries reveal Lilienthal as a very humane man, much troubled by the implications of the nuclear bomb for the world; striving always to ensure that their implications were discussed at the highest policy-level. Truman is revealed as a very shrewd person; a person of vision, firm in decision and well able to handle military departments and their demands. J. D. COCKCROFT

QUASARS

Quasi-Stellar Sources and Gravitational Collapse

(Including the Proceedings of the First Texas Symposium on Relativistic Astrophysics.) Edited by Prof. Ivor Robinson, Prof. Alfred Schild and Prof. E. L. Schucking. Pp. xvii+475. (Chicago and London: The University of Chicago Press, 1965.) 10 dollars; 72*s*.

QUASI-STELLAR Sources and Gravitational Collapse, appearing 18 months after the first Texas Symposium on Relativistic Astrophysics to which it refers, is already a historical document. It has been overtaken by the second 1964 Conference, by preparation for the third and by a series of discoveries of such moment and at such a pace that the normal media of publication have been more than usually inadequate.

In 1960 the combined work of the radio and optical astronomers led to the identification of the radio source known as 3*C* 295 (the number in the Cambridge Catalogue) with a cluster of galaxies in Bootes. This was the most remote object known—about 4,500 million light years distant with a red shift of 0·47. There seemed no immediate hope that a significant increase in the penetration of the telescopes might help to resolve the arguments about the type of cosmology applicable to the real universe. Yet the search for more distant objects which was then in progress is really the starting point of this book.

Palmer and his collaborators at Jodrell Bank had found that two radio sources in the Cambridge Catalogue 3*C* 48 and 286 had angular diameters less than 2 sec of arc—much smaller than that of the Bootes source and hence by implication more distant. Accurate positional measurements of these sources at Cambridge and at the California Institute of Technology enabled Sandage to identify 3*C* 48 late in 1960 as a sixteenth magnitude blue star. For more than a year it seemed that 3*C* 48 and the other objects similarly identified were luminous blue stars in the Milky Way. Then early in 1963 came the famous announcement that the 'stars' were, in fact, objects with exceedingly large red shifts.

So much has happened since then that it is important to remember that at this Texas Symposium in December of that year only half a dozen of these quasi-stellar radio sources, or quasars, had been discovered and the red shifts of only four obtained. This included the red shift of 0·545 for 3*C* 147, making it the most distant object then known. Thus the observational and theoretical papers in this volume are based on these data, which are a small part of the information available to-day on the quasi-stellar sources. (At least 40 are now known with 18 red shifts.)

The theoretical papers are predominantly concerned with the properties of massive objects and with the possibility that the great energy of the radio galaxies and quasars (more than 10^{60} ergs in some cases) may be released through the processes of gravitational collapse. Of course, the energy difficulties existed for the radio galaxies long before the discovery of the quasars, but the latter added the additional problem of the energy needed to sustain the great luminosity of these objects. The papers offer no real solution, neither is any known to-day, although a repetition of this discussion would be likely to be far more critical of the gravitational collapse theory and speculate on possibilities of highly efficient nuclear burning or total annihilation as sources of the energy.

The observational papers include, of course, those concerned with the quasi-sources and give the detailed arguments that the red shift is a cosmological effect and not a gravitational shift. There are, too, the valuable papers on the identification of the radio sources as a whole and their nature which have stood the test of time better than the papers on the quasi-sources.

Nearly all the papers in this volume are now reprints of existing or subsequent publications mainly from the *Astrophysical Journal* or *Nature*. The fortuitous timing of the conference does, perhaps, justify to some extent this collection as a unique mark of yet another revolution in astronomy and astrophysics which has already led to the discovery of objects with red shifts four times greater than those discussed here. The collection also enables one to express overall admiration for the outstanding observational and theoretical work of the authors, which has created a situation of unparalleled interest and potential in astronomy, astrophysics and cosmology.

BERNARD LOVELL

HURWITZ—COURANT

Funktionentheorie

Von A. Hurwitz und R. Courant. Mit einem Anhang von H. Röhrl. Vierte vermehrte und verbesserte Auflage. (Die Grundlehren der Mathematischen Wissenschaften in Einzeldarstellungen, Band 3.) Pp. xiv+706. (Berlin: Springer-Verlag, 1964.) 49 D.M.

THE first edition (1922) of *Funktionentheorie* contained three parts. Parts 1 and 2 were based on lectures of Hurwitz. Part 1 (130 pages) expounded the