Chandrasekhar's prediction soon came true. Today, turbulence is playing a central role in the understanding of the structure of interstellar matter. Weizscaker has outlined a general cosmogony, the essential feature of which is the prominent role ascribed in the interplay turbulence and rotation. Martin Schwartzchild has extended the Heisenberg theory of turbulence to include the agency maintaining turbulence for the case when the turbulence results from thermal instability. It has important applications in the interpretation of solar granules.

Chandrasekhar has turned his attention in recent years to the new and fascinating field involving the interplay of hydrodynamics, electromagnetic theory and turbulence. Even more recently, he associated himself with Fermi, in work on interstellar magnetic fields.

Finally, a few remarks about Chandrasekhar's general attitude towards science and research may not come amiss. Chandrasekhar has preserved the two most lovable characteristics of the pure scientist, an unbending desire for freedom of thought and expression combined with quiet confidence. Any estimate of Chandrasekhar's contribution as an astrophycist is incomplete if reference is not made to the great school of astrophysics he has created. Even a casual glance through the volumes of the *Astrophysical Journal* during the past twenty years will reveal that a considerable fraction has been stimulated by suggestions of Professor Chandrasekhar He was made the Managing Editor of that famous Journal a few years ago. But the best tribute to a scientist is to attempt to emulate his example and pursue science with passion, humility and confidence, qualities which sum up the characteristic of a true student of science.

SYMPOSIUM ON CRYSTALLOGRAPHY

THE International Crystallographic Union held a symposium in Madrid from 2-7, April under the patronage of *Consejo Superior de Investigation Cientificas*, Spain. The three topics discussed during the symposium were: (1) Structure on a scale between the atomic and microscopic domains. (2) Open Meeting of the Commission of Crystallographic Apparatus, and (3) On Crystallographic Teaching.

Prof. Wyckoff in his Presidential Address pointed out the scope and importance of the study of macromolecules by electron microscopic and X-ray methods and the valuable results these studies have yielded. He also stressed the necessity of discussing the methods of teaching employed in various centres of crystallographic study.

Over fifty papers were read on structural studies in the submicroscopic domain using X-ray as well as electron microscopic and electron diffraction techniques. Special mention may be made of the beautiful electron micrographs exhibited by Prof. Wyckoff having such a fine resolution as to show up even details within the molecule in shadowed replicas of macromolecular crystals. A large number of papers dealt with texture studies of metals and alloys as well as other substances of commercial interest like grease and coal. The small angle scattering from fibres and individual particles was the subject of a number of theoretical and experimental investigations. The correlation of the data revealed by X-ray diffraction and electron microscopy was also discussed. The Commission for Crystallographic Apparatus discussed new apparatus and methods to tackle special crystallographic problems. Papers presented dealt with microfocus and rotating anode tubes, special cameras for single crystal counter diffractions, a miniature Weissenberg camera with a film radius 5 mm. and cameras for small angle scattering studies. Parrish stressed the advantages of using focussing monochromators for the X-ray diffractometer and also the superiority of scintillation counters wtih pulse height discriminator over the G-M counter in eliminating dead time effects, increasing quantum efficiency, producing higher peak to background ratio and in being capable of detecting even sulphur K radiation (5·5 Å).

The session of the Commission on Crystallographic Teaching started with invited papers dealing with special aspects of teaching crystallography and was followed by a lively discussion. The opening paper was by Prof. Bernal on the 'History of the Present Status of Crystallographic Teaching'. The paper, "Lecture Demonstrations in Crystal Physics", by Prof. A. V. Shubnikov (U.S.S.R.) accompanied by beautiful short films clearly demonstrating the various aspects of crystal growth, simple models for dislocations and vacancies, etc., was one of the highlights of the session, and created very wide interest and discussion on the advantages of the use of motion picture demonstrations in explaining phenomena to students.

There were discussions regarding the type of courses that a student with a limited time at his disposal could avantageously undergo. The technique of teaching the subject, logical difficulties of comprehending the ideas involved in space groups and symmetries and the necessity of propaganda to create more widespread understanding of the capabilities of X-ray crystallographic techniques were some of the other topics discussed.

At the closing session of the symposium the President expressed his gratitude to the patron for extending the invitation to the Union for holding the symposium in Madrid and for all the hospitality extended during the period.

GOPINATH KARTHA.

TUBERCULOSIS VACCINES

IT is now more than thirty years since a live vaccine containing B.C.G. (bacille Calmette-Guérin) was first used in man. In the interval B.C.G. vaccination has come to be accepted in many countries as an effective method of preventing progressive tuberculosis, and it has been particularly widely used since 1945. In 1937 Wells discovered the mycobacterium of vole tuberculosis, and later explored the use of a live vaccine containing it. Vole-bacillus vaccine has since been used in a few countries, but on a very small scale compared with B.C.G. vaccine. Its value as a preventive measure has also not been fully assessed.

In July 1949, the British Medical Research Council, aware that a clinical trial of these two vaccines was needed to provide essential information, appointed a Tuberculosis Vaccines Clinical Trials Committee to plan and direct an appropriate investigation. The first report of this trial, which is still in progress, has been published in a recent issue of the *British Medical Journal* (February 25, 1956, p 413).

During the two-and-a-half years after entry to the trial the total number of participants known to have died was 38. None of these deaths was due to tuberculosis, and there seemed to be more than chance differences between mortalities in the various groups. Among the vaccinated children 99·6% of those receiving B.C.G and 94·4% of those receiving vole-bacillus vaccine became tuberculin-positive. However, the potency of the batch of vole-bacillus vaccine used in the earlier part of the trial was low, and of 1,900 who were vaccinated with the later batch all became positive reactors to tuberculin.

The children who have been under observation for a longer period up to four years, provide some further information. The intervals between entry to the trial and the earliest manifestation of tuberculosis in the unvaccinated negative reactors and in the positive reactors showed interesting differences. On the whole, in the groups of positive reactors the incidence of evident tuberculosis was fairly even over the first three years whereas among the unvaccinated negative reactors the incidence during the first year was notably lower, and only during the second year reached approximately the same levels as those of the group showing high tuberculin sensitivity on entry. This can presumably be correlated with the fact that these children left school and started to run a greater risk of infection with tuberculosis within 6-12 months after entry to the trial. Another important point which this extended analysis shows is that the more favourable experience of the vaccinated children was maintained during the whole of the four years of observation.

This trial has shown beyond doubt the benefit of B.C.G. vaccination for adolescents in an urban industrialized community. The study of all participants, including those initially tuberculin-positive, has permitted an assessment of the benefit to be expected from routine B.C.G. vaccination in this particular group of subjects; the apparent reduction in the incidence of tuberculosis over the period of two-and-a-half years as a result of giving B.C.G. vaccine to all those initially tuberculin-negative would have been of the order of 35%. The high incidence of tuberculosis in those who were initially highly sensitive to tuberculin emphasizes the desirability of including in a scheme of B.C.G. vaccination provision for frequent re-examinations of this group. The question of the relative merits of vole-bacillus vaccine and B.C.G. is to be the subject of a further study. Certainly it appears at present that the vole-bacillus vaccine gives rise to a higher incidence of undesirable immediate effects.

Not enough is known at present to allow the prescription of an optimal age for vaccination, and if there is indeed such an age it may well vary with changing circumstances. The best compromise might be to offer vaccination to school children as a routine at the age of about 12—a little earlier than in the trial, since 40% of the participants were already infected on entry—and to make vaccination against tuberculosis conveniently available at any age to children whose parents request it.