International Union of Crystallography

Ninth General Assembly and International Congress of Crystallography

The Ninth International Congress of Crystallography, organized by the Science Council of Japan for the International Union of Crystallography, and the Ninth General Assembly of the Union will be held in Kyoto, Japan, from 27 August to 7 September 1972.

The meetings will be held in the Kyoto International Conference Hall, Takaragaike, Kyoto. The provisional timetable is as follows: the Opening Ceremony and the first session of the General Assembly will take place on 27 August; scientific sessions will begin from 28 August. The Registration Desk will be open from 26 August.

The arrangement of the scientific programme will be broadly similar to that adopted for the Eighth Congress held in the U.S.A. in 1969. Scientific sessions will be composed of Frontier Topics, Open Sessions of Commissions of the Union, and *ad hoc* meetings. Abstracts of contributed papers on subjects covering a wide range of crystallography will be invited. Accepted abstracts will be printed in a book of Abstracts, which will constitute the scientific content of the Congress. Acceptance of an abstract will not necessarily result in an opportunity for oral presentation in the formal programme. The *ad hoc* meetings will be arranged with the intention of encouraging free discussion as well as the oral presentation of results.

Unlike the previous Congresses, neither Symposia nor Topical Meetings will be planned before or after the Congress. However, some of the Frontier Topics will receive specific emphasis.

Further details of the Congress, including arrangements for registration, transport, accommodation, scientific visits *etc.*, will be described in the *First Circular* (an Information Booklet) which will be distributed about September, 1971.

Enquiries should be addressed to:

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Through the National Committees for Crystallography the Japanese Organizing Committee will distribute separate copies of the above announcement with a *Pre-registration Card,* early in 1971. This card will also serve as a request form for the *First Circular*. These materials will be obtainable from the Secretaries of National Committees for Crystallography, and also from the Executive Secretary of the International Union of Crystallography or directly from Professor Y. Saito at the above address.

Copies of the *First Circular* will be sent to all those who return the *Pre-registration Cards*. They will also be distributed through National Committees for Crystallography.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (M. M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.

The great experiments in physics. By HENRY S. LIPSON, F.R.S. Pp. vii + 181. Edinburgh: Oliver & Boyd, 1968. Soft cover. Price: 7*s* 6*d*.

This is a book principally about the experimental aspects of physics, set in a historical context. It is very readable, highly interesting, and stimulating in its coverage of the many aspects of the subject. It treats its material in thirteen chapters covering motion, the atmosphere of the Earth, heat, gases, sound, light, optical instruments, magnetism and electricity, radiation, structure of matter, structure of atoms, and the breakdown of classical physics. There is a final short chapter in which the author makes personal comment on the future of physics as he sees it. The text is well illustrated by fifty-two figures and nineteen plates.

These are the bare bones of the book but there is more to be said than that. At the beginning of his preface the author tells us that he is concerned with propaganda for experimental physics, with the particular aim of re-emphasizing the historical importance of a range of definitive experiments of physics and of showing how they have influenced the shape of physics as it exists today. He is undoubtedly successful in this aim and presents the reader in each case not only with the problem to be solved and the way the experiment solved it, but also with human sidelights on the men who conceived and conducted the experiments. Physicists appear as human beings who can on occasion be wrong and who are not always as logically motivated as the layman might wish to believe. But they are linked to all creative people (or at least the best of them are) by an acute sense of observation, imagination, and respect for the apparently trivial – one of the nicest examples is that on p. 7 relating Galileo's observation of a swinging candelabrum in church. The reader cannot avoid being impressed by the personal physical risks that the early experimenters exposed themselves to, albeit unknowingly – Benjamin Franklin's turning himself into a temporary lightning conductor and von Kleist's receiving from an elementary Leyden jar ... ' a shock which stuns my arms and shoulders' are two examples. The discussion shows how far-reaching results can be deduced from the use of simple apparatus, although simplicity here is relative to modern complicated structures which may, in fact, themselves be simple in their principles.

The book raises other considerations at a deeper level, and allows the reader to draw a number of conclusions for himself. Thus the reader will see clearly that physics is a rather unusual blending of experiment and observation on the one side, and theoretical discussion on the other. The author states in his Preface that 'There is no foundation for the belief that has somehow or other insinuated itself into physics – that theory is on a higher plane than prac-

tice...'. This is absolutely true, but your reviewer wonders whether this belief has in fact insinuated itself into physics; it may be in the minds of some immature workers, but this is hardly interesting. Experiment and theory blend together to form the unity that is physics, and to ask whether the one aspect is more important than the other is like asking whether the engine of a motor car is more important than the fuel that makes it work. The aim in physics is the generalization of the concepts of matter and energy, in models of the physical world of direct perception, towards greater unity and simplicity, moving towards greater abstraction and generality. The fall of an apple in the garden and the motion of the Moon are recognized (p. 6) not as unrelated events, but as different examples of the single phenomenon of gravitation. The great statements of physics, such as the conservation statements of mass, momentum and energy, are the end product of fine generalizations of a wide range of experiments and observations. There can be no physical content in an isolated experimental measurement, because such a single measurement cannot be set into the perspective of related measurements. All these are examples of the linking of experiments and theoretical discussion that forms the subject of physics: thus we find on p. 24 the important comment 'The good scientist nearly always carries out experiments for the purpose of checking expected results...' and this theme is substantiated and developed; for example on p. 14 we see' ... we make hypotheses and test them by experiment. This is the way physics makes progress'. One of the important aspects of physics is the recognition and positive use of experimental/observational errors of measurement. Results of experiment are represented graphically by drawing 'the best smooth curve' through the measured points, and this central activity involves very fundamental issues at the very root of physics. The reviewer feels some disappointment that this aspect of experimental work was not highlighted more in the text, because the recognition of the role of inescapable errors in the processes of generalization and involving probabilities must surely be counted as one of the major achievements of modern physics. There are instances in the book where such a discussion could have added further point to the arguments. Perhaps one could have been in connexion with the ideal gas law set down on p. 43. It is refreshing to find the gas law given its proper place with the remarks that this 'equation [of state] is usually stated so baldly in physics textbooks that its impact upon the budding physicist is muted. It is a remarkable result that has no parallel in any other branch of physics'. Such strong and important words are substantiated in chapter 4 which makes interesting reading, but an extension to include considerations of probability would have added further insight.

Many sentences in the book cause the reader to pause and ponder, sometimes in agreement but sometimes not. Thus we read (p. 173)' ... the problem of nuclear forces may be too expensive (for us to proceed further)': yes, all too often we tend to forget that we are not pursuing physics in isolation from the rest of the community. This may mean indeed that we have reached a limit in the development of nuclear physics (there must be some practical limit somewhere) but we might remember one of Michelson's greatest achievements (p. 81) where we learn that 'as a young student he was able to carry out experiments that were taxing the resources – both intellectual and financial – of his superiors'. Dare we hope for a nuclear Michelson? The pessimism of chapter 13 would seem to preclude this possibility (on p. 173: 'So we may be reaching the end of physics.' and later 'But it is possible that physics as a whole is now past its peak;' although as the author says himself further down the same page 'But perhaps I am quite wrong') – but it may well be that the pace of development in physics may have to slow down from what it has been during this century so far. And it is likely that combined physics and something else – in addition to geology and astronomy – will loom larger in the future. On p. 173 'activity may be shifting to some other subject, such as biology, in which physics will play an important, albeit a minor, part'. Such developments could indeed provide exciting possibilities for the future. Changing the subject, on p. 157 we read '...perhaps it is more important to know [how physics has grown] than to be perfectly conversant with current ideas, which, after all, may change'. The reviewer can hardly go along with that; our current knowledge of the physical world is what physics (as a whole) is now; this will affect the further development of the subject and is, after all is said and done, what the past development has produced – it is the end-point of the chain of argument which concerns the book.

Physics changes and our view and understanding of the material world changes as well – not irrationally but on the basis of the analysis of our environment that is physics. Physics is a 'horizontal' subject; the Galileo–Newton laws of motion are still modern in their proper context even though they have been known for about three hundred years, and the last word has still not been said about gravitation. These things are as modern as the Schrödinger equation that is only forty-five years old. This 'horizontal content' is shown clearly in the Plates of the book which span Galileo's first experiments in sound and an electron microscope picture of a virus protein. Perhaps the excitement of physics is in fact just this accumulative form where the discussion is based, at one and the same time, on a range of contributions by the greatest minds spanning the more recent and the more distant past. And we know it is improving because our experience is being continually generalized and extended.

The book is dedicated to the pupils of a school and they must surely count themselves very lucky to have had the opportunity of meeting this work at first hand from Professor Lipson. We must all thank him for an excellent, at times provocative, but always an interesting, book with plenty of variety, and hope that it reaches the wide audience that it should. It is more than a book about physics experiments; it is a book about physics itself. It will prove useful alike for the college student in supplementing his textbooks, the sixth former, and the interested general reader who is seeking a deeper appreciation of the history of a fascinating and important field of study.

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