I am not aware of Debye having taken an active part in the development of wave mechanics or advanced quantum theory, except that, in a paper of 1923, he developed the theory of the Compton effect independently of Compton, whose paper preceded Debye's by a few weeks. But he did make a brilliant contribution to the dynamics of solids at a Congress on the Kinetic Theory of Matter in Göttingen, Easter 1913. His own papers on heat capacity and on the thermal scattering of X-rays are based on the assumption of linear forces between the atoms or linear elastic forces. It is impossible to explain with these the two general properties of solids, the thermal expansion and the slow conduction of heat. Debye showed in his contribution how to tackle the formidable problem posed by assuming non-linear forces, using again a catch-as-catch-can style. He showed how in a body with non-linear forces heat waves build up local and temporal fluctuations of density and of elasticity, so that for the passage of such waves the body resembles a medium turbid for light. A thermal wave is therefore dissipated and has only a finite range before it is converted into 'thermal noise'. In heat conduction energy does not ride with high velocity on the back of an elastic wave from the hot end of a bar to the cold end, but it diffuses along the bar from high to low energy concentration. Debye's theory was not yet perfect, but it laid a foundation; it took 15 years before Peierls added an important feature, the *Umklapp* processes.

Let me at least mention three further subjects that will always be connected with Debye's name:

(i) The explanation of the van der Waals forces between molecules;

(ii) the theory of polar molecules, which opened a wide field of molecular structure studies on the basis of dielectric measurements, and

(iii) the general theory of strong electrolytes, the Debye–Hückel theory.

All three subjects were started between 1920 and 1923, and they are all based on the interaction of dipoles and quadrupoles in a statistical manner. Each of the subjects has led to a great volume of further research of a physico-chemical nature. The latest interest of Debye centered on the determination of long-range molecular forces from the observation of light scattering by liquid systems in their critical state.

Debye had a brilliant career in many renowned academic positions; he received many awards and honours for his outstanding work, including the Nobel Prize for Chemistry in 1936. Neither success nor honours made him abandon his interest in all matters scientific, and in the young scientists who looked to him for encouragement and help. He was fortunate in finding a sudden death by heart failure which spared him the horrors of an incipient cancer. Thus he remained interested and active up to his last days. His name will remain alive in future generations through the Debye–Waller factor, the Debye temperature, the Debye–Hückel theory, and – perhaps the highest distinction for a scientist – through the unit of electric moment named after him.

P. P. EWALD

Notes and News

Announcements and other items of crystallographic interest will be published under this heading at the discretion of the Editorial Board. The notes (in duplicate) should be sent to the General Secretary of the International Union of Crystallography (G. Boom, Department of Metallurgy, University of Oxford, Parks Road, Oxford, England). Publication of an item in a particular issue cannot be guaranteed unless the draft is received 8 weeks before the date of publication.

Second Materials Research Symposium sponsored by the Institute for Materials Research of the National Bureau of Standards

16–19 October 1967

The Second Materials Research Symposium, sponsored by the Institute for Materials Research of the U.S. National Bureau of Standards on *Molecular Dynamics and Structures of Solids* will be held at Gaitersburg, Maryland, U.S.A. from 16 to 19 October 1967.

The primary emphasis of the Second Materials Research Symposium will be placed on the correlation of structural and dynamic information obtained by various experimental techniques applied to the study of solids. The Symposium will include studies of inorganic solids (including hydrogen-bonded systems), organic crystals, polymers, and biomolecules. The scope of the conference has been limited by omitting consideration of metals and alloys, simple ionic compounds such as alkali halides, and the effects of localized defects.

Invited lecturers will emphasize the complementary nature of infrared and nuclear magnetic resonance spectroscopy, neutron inelastic scattering, and neutron and X-ray diffraction techniques as applied to the studies within the scope of the Symposium. Contributed papers, however, will not be limited to research using only these techniques; the presentation of pertinent results of other techniques such as thermodynamic measurements, dielectric measurements, and Mössbauer spectroscopy is encouraged. Papers demonstrating the correlation between several experimental techniques will be particularly welcome.

Structure studies will be most pertinent if they include some discussion of thermal motion and vibrational amplitudes, and dynamic studies should emphasize intermolecular vibrations and rotations in solids. Intermolecular modes will be included if they are strongly influenced by intermolecular coupling, as in hydrogen-bonded and polymeric materials.

The programme will consist of morning and afternoon sessions equally divided between invited lectures and contributed papers. To allow ample time for discussion, a maximum time of ten minutes will be allowed for oral presentation of contributed papers. As part of the four-day Symposium, participants will be invited to tour the Bureau's new laboratory facilities including the 10-megawatt research reactor, the 100 MeV linear accelerator, and other laboratories of particular interest to the participants.

Those desiring to present papers should submit titles and abstracts of about 200 words to the Programme Chairman before 15 June, 1967. All individuals interested in receiving later announcements concerning the Symposium arrangements should address inquiries to: Dr Robert S. Carter, Programme Chairman, 2nd IMR Symposium, National Bureau of Standards, Washington, D.C. 20234, U.S.A.

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A.J.C.Wilson, Department of Physics, The University, Birmingham 15, England). As far as practicable books will be reviewed in a country different from that of publication.

The structure of glass, Vol. 5. Structural transformations in glasses at high temperatures. Editors: N.A.Toropov and E.A.Porai-Koshits. Translated from the Russian by E.B.Uvarov. Pp. ix+223. New York: Consultants Bureau, 1965. Price $25.00.

Dieser fünfte Band der Reihe *The Structure of Glass* ist in Themenstellung und Autorschaft der insgesamt etwa 20 Beiträge dem dritten Band (vgl. Besprechung *Acta Cryst.* **20** (1966), 323) sehr ähnlich. Sein Titel ist wohl nicht glücklich gewählt; legt man die übliche Definition der Gläser als *eingefrorene* unterkühlte (anorganische) Flüssigkeiten zugrunde, so betrachtet der vorliegende Band nicht die Transformationen im glasigen, sondern die Vorgänge im unterkühlten oder eigentlich flüssigen Zustand, insbesondere Kristallisationsvorgänge und ihre Vorstadien. Band 3 und Band 5 ergänzen sich daher; Band 3 gab einen Bericht über die auf dem 3. Leningrader Glaskongress gehaltenen Vorträge, Band 5 enthält weitere auf diesem Gebiet vom Grebenshchikov Institut für Silikatchemie durchgeführte Arbeiten.

Ganz klar geht es in diesem Band vor allem um die Erforschung der technisch so sehr wichtig gewordenen Glaskeramik. Nach einem einleitenden Referat von Porai-Koshits folgt ein theoretischer Teil, der 4 Arbeiten von Filipovich enthält. Darauf kommt ein Abschnitt über Untersuchungen der Phasentrennung in einigen Silikatsystemen. Das umfangreichste Kapitel beschäftigt sich mit Kristallisationsprozessen und physikochemischen Eigenschaften im System Li_2O–Al_2O_3–SiO_2 (also im Grundsystem der Glaskeramiken). Allgemeiner interessant ist darin eine kurze Arbeit über die röntgenographische Bestimmung des Glasanteils einer speziellen Glaskeramik. Ein weiterer Abschnitt behandelt Untersuchungen in Magnesium–Eisen–Silikatsystemen (darunter eine der Phasentransformationen des Cordierits). Den Schluss bildet eine 20 S. lange Arbeit über Struktur und Dynamik von Silikat- und Phosphatketten, die in ihrer Thematik alleinsteht und sich vor allem mit der Beweglichkeit solcher Ketten (theoretische Betrachtungen sowie Auswertung IR-spektroskopischer, röntgenographischer, elektrischer und Raman-spektroskopischer Messungen an Kristallen und Molekülen) beschäftigt.

Wie schon erwähnt, kann Band 5 als eine Art Fortsetzung von Band 3 betrachtet werden. Der Interessentenkreis entspricht daher dem des Bandes 3. Sehr erfreulich ist, dass die Übersetzung so schnell (im gleichen Jahr!) erscheinen konnte, so dass man ein aktuelles Bild vom Stande der russischen Forschung auf dem weiten Gebiet der Glaskeramik und ihrer Probleme erhält.

H.Wondratschek

Mineralogisches Institut
Technische Hochschule
75 Karlsruhe
Hertzstr. 16
Deutschland

The structure of glass, Vol. 6. Propertics, structure and physical-chemical effects. Editor: E.A.Porai-Koshits. Translated from the Russian by E.B. Uvarov. Pp. xii+230. New York: Consultants Bureau, 1966. Price $25.00.

Volume 6 der Serie *The Structure of Glass* setzt die Berichte von den russischen All-Union-Konferenzen über den Glaszustand fort. Er enthält 54 Vorträge, die auf dem 4. Leningrader Glas-Kongress 1964 gehalten worden waren. Der Stoff dieser Tagung wird auf zwei Bände verteilt, der jetzt vorliegende Band 6 wird später ergänzt durch den Band 7: *Methods of Studying the Structure of Glass.*

Vier grosse Abschnitte gliedern den Inhalt. Abschnitt 1 behandelt in 16 Referaten auf 90 Seiten allgemeine Fragen der Glasstruktur. Die einzelnen Artikel befassen sich vor allem mit strukturchemischen Modellen und den Problemen, die sie stellen sowie mit dem Zusammenhang zwischen Glasstruktur und Glaseigenschaften. Von besonderem Interesse sind dabei die am Schluss des Abschnitts zusammengefassten wichtigsten Diskussionsbemerkungen, die ebenso wie bei anderen Abschnitten ein deutliches Bild von der Vielfalt der noch offenen Probleme und der mitunter starken Verschiedenheit der Ansichten der einzelnen Autoren geben. Der zweite Abschnitt beschäftigt sich in 25 Aufsätzen auf ebenfalls 90 Seiten mit der Struktur anorganischer sauerstoff-