Shoji Nishikawa

Dr S. Nishikawa, Emeritus-Professor of Physics of the University of Tokyo, Chairman of the Japanese National Committee of Crystallography, and President of the Japanese Crystallographic Society, died suddenly in Tokyo on 5 January 1952. The Executive Committee of the International Union of Crystallography wishes to express the deep sympathy of all crystallographers to the Japanese Committee for the loss it has thus sustained.

It had been expected that Dr Nishikawa would attend the Second General Assembly of the Union in Stockholm last summer as Chairman of the Japanese delegation, but a heart attack earlier in the year made this impossible. He was apparently recovering strength from the earlier illness at the time of his death.

Dr Nishikawa was one of the earliest workers in the field of crystal structure. His use of space-group reasoning in connection with his determination of the structure of spinel (published in 1915) was one of the first applications of this theory which is now a mainstay of our science. He was the teacher and ever encouraging friend of many of the succeeding generation of X-ray crystallographers and students of electron diffraction in Japan; thus, in addition to his own researches, he fathered much of modern crystallography there.

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Third General Assembly and International Congress

The Executive Committee of the Union has accepted a kind invitation from the French Government to hold the third General Assembly and International Congress in Paris in the summer of 1954. The exact date will be announced later.

Reprints from *Acta Crystallographica*

It is now possible for authors to obtain reprints of their articles in *Acta Crystallographica* without limit of number, and these can be supplied with or without covers. Twenty-five reprints of each article are provided free of charge.

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (P. P. Ewald, Polytechnic Institute of Brooklyn, 99 Livingston Street, Brooklyn 2, N.Y., U.S.A.). As far as practicable books will be reviewed in a country different from that of publication.

Optical Crystallography. Von E. E. Wahlstrom. S. 247, mit 206 Abb. New York: Wiley; London: Chapman and Hall. 2. Auf. 1951. Preis $4·50; 36*s*.

Das Polarisationsmikroskop ist heute nicht mehr ausschliesslich das Werkzeug des Mineralogen und Petrographen, sondern es hat auch weitgehend Eingang in Chemie, Biologie und Technik gefunden. Neben den streng physikalisch fundierten Darstellungen der Kristalloptik besteht daher auch ein Bedürfnis nach mehr anschaulich gehaltenen, elementaren Einführungen für den Mikroskopischen Praktiker. Zu diesen ist das hier angezeigte Werk zu rechnen, dessen erste Auflage 1943 erschien.

Nach einer Einleitung in die geometrische Kristallographie (wobei eigentümlicher Weise die Kristallsysteme vor Erwähnung der Symmetrieeigenschaften eingeführt werden) und kurzen Ausführungen über die Natur des Lichtes folgt, in vierzehn Kapitel unterteilt, die Behandlung der für die Anwendung des Polarisationsmikroskopes wichtigen Phänomene. Leider ist die Darstellung verschiedenlich nicht frei von Unklarheiten und Irrtümern, wenn auch in dieser Hinsicht gegenüber der ersten Auflage grosse Fortschritte zu konstatieren sind. Der fatale Satz 'The quartz wedge resolves white light into its spectrum' (S. 100) und die Bezeichnüng der Ordnungen der Interferenzfarben als Spektra sind jedoch leider nicht verschwunden. Die Heranziehung der Fresnel'schen Konstruktion zur Bestimmung des Charakters der spitzen Bisektrix aus Interferenzbildern stellt zum mindesten eine unnötige Komplikation dar. Der Strahlengang im Mikroskop ist entschieden zu kurz behandelt und der Unterschied zwischen orthoskopischer und konoskopischer Betrachtungsweise wird nicht klar hervorgehoben. Anderseits sind Dinge erwähnt, welche in einem elementaren Leitfaden füglich hätten weggelassen werden können, wie z. B. die gnomonische Projektion, die ausführliche Darstellung der konischen Refraktion und die explizite Darstellung sämtlicher sechs Referenzflächen der Kristalloptik. Besonders letztere sind nicht nur unnötig, weil alle beim Mikroskopieren auftretenden diesbezüglichen Probleme mit der Indikatrix allein befriedigend gelöst werden können, sondern sie wirken nach den Erfahrungen des Referenten auf den Anfänger auch verwirrend.

Die ganze Behandlung vermeidet mathematische Formulierungen mit Ausnahme der (z. T. durch Druckfehler entstellten) Gleichungen der Bezugsflächen. Man kann sich prinzipiell fragen, ob dieser Standpunkt beim derzeit erreichten Niveau der mathematischen Mittelschulbildung noch notwendig oder auch nur zweckmässig ist, besonders wenn man in Betracht zieht welche Anforderungen auch in einführenden Vorlesungen in Physik oder physikalischer Chemie heute ganz allgemein gestellt werden. Selbstverständlich darf man nicht ins andere Extrem verfallen, aber für den Referenten besteht kein Zweifel, dass z. B. das Verhalten einer anisotropen Kristallplatte zwischen gekreuzten Nicols durch eine elementare Diskussion des bekannten Fresnel'schen Ausdruckes prägnanter und klarer dargestellt wird als durch noch so viele blosse Worte. Die Verwendung mathematischer Formulierungen in bescheidenem Ausmasse scheint auch deshalb für einführende Darstellungen angezeigt, weil dadurch dem Leser der Uebergang zu grösseren Werken oder zur Spezialliteratur wesentlich erleichtert wird und er den Anschluss besser findet.

Zu rühmen an dem Buche sind die zahlreichen zweckmässig konzipierten und korrekt in schiefer Paralleprojektion konstruirten Figuren, von welchen einige direkt als vorbildlich zu bezeichnen sind.

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X-ray Studies on Polymorphism. By T. Ito. Pp. 236, with 100 figs. Tokyo: Maruzen Co. Ltd. 1950. Price $10·00.

During the past ten years, Prof. Ito and his students have been actively engaged in the study of mineral crystal structures, and the results of this work are now reported in a series of papers which are collected in this volume. In view of the difficult circumstances under which the work has been done, the amount and character of information presented is truly astonishing. Actually, the title page places too much emphasis on the topic 'polymorphism', since there is no discussion of this important subject beyond the demonstration of the close structural relationship between different polymorphs in several cases, and the methods by which these relationships were made use of in the crystal-structure analyses. These cases are collected in the body of the symposium, and several other structures (the last six listed below) are collected in an appendix of equal extent. The crystal structures described are: eudidymite and epididymite, $HNaBeSi_3O_8$; α-celsian, $BaAl_2Si_2O_8$; enstatite, $MgSiO_3$; anthophyllite, $Mg_7(Si_4O_{11})_2(OH)_2$; epidote and zoisite, $HCa_2(AlFe)_3Si_3O_{13}$; boleite, $26PbCl_2.24CuO.9AgCl.27H_2O$; wollastonite and parawollastonite, $CaSiO_3$; tourmaline, $NaLiAl_8B_3Si_6O_{27}(OH)_4$; kotoite, $Mg_3B_2O_6$; lievrite, $CaFe_3Si_2O_8(OH)$; antigorite, $Mg_3Si_2O_5(OH)_4$; ludlamite, $Fe_3(PO_4)_2.4H_2O$; orpiment, As_2S_3.

Of greatest interest among these structures are the silicates, since several new types of SiO_4 linkages are revealed. The peculiar imbricated sheet structures of epididymite and eudidymite have been published by Prof. Ito previously; in α-celsian is found a sheet structure obtained by inverting one mica-like Si_2O_5 sheet over another and joining them at the apices (the analogy of this structure to the feldspars drawn by Prof. Ito seems a little farfetched); mixed SiO_4 and Si_2O_7 groups are postulated in epidote and zoisite (reminiscent of vesuvianite—but see below); threefold rings in the wollastonites and the polar sixfold rings in tourmaline. The book as a whole contains may new discoveries in coordination chemistry, and represents a truly original and valuable contribution to mineralogy and crystal chemistry in general.

In the analysis of a crystal structure, after the lattice constants and symmetry are established, two phases of the work may be recognized. The first is the one in which the key is sought with which to unlock the secret of the structure, leading to an approximate model of the true structure itself. The second involves the refinement of the structure, in order to determine accurate interatomic distances. This book bears eloquent testimony to Prof. Ito's genius in the first phase. To such a worker as this, structures like orpiment and ludlamite are routine, while we cannot help but be impressed with his solutions of problems such as the boleite structure. But, unfortunately, the second, refinement stage of most of these structures leaves much to be desired. To test the quality of a structure determination we may use various criteria, such as reasonableness of interatomic distances, quality of electron-density mapping, but preferably, where possible, the reliability index, R. Many of these structure determinations are based upon intensities characterized only as strong, medium and weak, and we can only judge by the bond lengths reported. Thus, in α-celsian, we observe that Si–O distance are found to be 1·57 and 1·71 Å; since there is good reason to believe that Si–O distances in one tetrahedral group will generally be nearly equal, the error in oxygen location, at least, is probably $\pm 0{\cdot}07$ Å. Examination of bond-distance tables for other structures shows that atomic positions carry errors generally of the order of $\pm 0{\cdot}05$–$0{\cdot}1$ Å. Such tables must be regarded as very approximate. In particular, the wollastonites should certainly have a more rigid treatment.

Where intensities are measured photometrically or with the ionization spectrometer, there is more opportunity to increase the precision of structure parameters. Although Prof. Ito did not calculate the reliability index for any of the structures, we may use this test where he tabulates observed and calculated intensities. Values obtained from his data are as follows:

		R
Eudidymite	(13 pinacoid reflections)	0·28
α-Celsian	(13 $000l$ reflections)	0·31
Enstatite	(107 $h0l$ reflections)	0·24
Boleite	(19 pinacoid reflections)	0·17
Kotoite	(13 pinacoid reflections)	0·23
Epidote	(126 $h0l$ reflections)	0·46

The epidote structure attracted some attention when Prof. Ito published on it (Ito, 1947), but that structure (a complex chain linkage) has been abandoned in the present report in favor of an entirely new one, consisting of mixed SiO_4 and Si_2O_7 groups. Twenty-two pinacoid reflections given for the 1947 structure yield $R = 0{\cdot}29$. Clearly, the crystal structure of epidote is still an entirely