

**Crystal structures.** 2nd Edition, Vol. 3. By R. W. G. WYCKOFF. Pp. 981. New York, London, Sydney: Interscience Publishers, 1965. Price 210s.

Erfreulich rasch ist in der 2. Auflage von Wyckoff's *Crystal Structures* den beiden ersten Bänden der dritte gefolgt. Er enthält vom Gesamtwerk die Kapitel VIII, IX und X, welche die Kristallstrukturen der Verbindungstypen  $R_x(MX_4)_y$ ,  $R_x(M_nX_p)_y$  sowie die Hydrate und Ammoniakate behandeln.

Die Darstellung des Stoffes entspricht jener in den vorausgehenden Bänden. Man findet wieder die hervorstechenden Züge des Werkes: hohe Aktualität – die Literatur ist bis 1963 berücksichtigt! –, sehr gute Zuverlässigkeit und reiche Illustration. In der Regel werden zu jedem Struktur-

typ zwei Bilder der Projektion der Atomanordnung nach einer günstigen Richtung gebracht, wobei im ersten die Atomschwerpunkte dargestellt sind, im zweiten ist hingegen die Struktur als *Kugelpackung* gezeichnet.

Durch die zunehmende Schwierigkeit, die ständig und rasch anwachsende Literatur über Kristallstrukturbestimmungen zu übersehen, ist dieser Teilband aus Wyckoff's Gesamtwerk ebenso wie seine beiden Vorgänger für alle an anorganischen Kristallstrukturen Interessierten unentbehrlich. Es ist nur zu hoffen, dass die weiteren Bände rasch und in der gleichen Güte folgen werden.

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## International Union of Crystallography

### Conference in Melbourne, Australia, 16-21 August 1965

At the invitation of the Australian Academy of Science an International Conference, consisting of a Symposium on *Electron Diffraction* and a Symposium on *The Nature of Defects in Crystals*, was held in Melbourne from 16 to 21 August 1965. The meeting was organized under the joint auspices of the Academy and the International Union of Crystallography, with the support of the Commission on the Solid State of the International Union of Pure and Applied Physics.

The Conference was attended by about 220 Australian and 110 foreign scientists, the latter coming from 16 countries, and by about 60 accompanying members. Generous financial assistance received from UNESCO through ICSU and from the International Atomic Energy Agency, in addition to the funds made available by the Australian Academy of Science, the International Union of Crystallography and the International Union of Pure and Applied Physics, had made it possible for travel and subsistence grants to be offered to a large number of invited participants from overseas. Donations were further received from about twenty-five academic, governmental, commercial and industrial organizations and institutions. These donations were mainly used to defray part of the organizational expenditure. The organizers of the Conference as well as the participants are most grateful for the financial support and other donations.

For the organization of the Conference a number of Committees had been established. The Conference Organizing Committee under the chairmanship of R. I. Garrod, and with J. N. King as secretary, was responsible for the general policy and planning of the meetings. The responsibility for the scientific programme was vested in two Programme Committees which were headed by J. M. Cowley and W. Boas. The Commission on Electron Diffraction of the IUCr and the Commission on the Solid State of the IUPAP

assisted in the planning of the programmes of the two Symposia.

No less than seven sub-committees shared the responsibility for the various details of the organization. The conveners of these sub-committees were K. L. Sutherland (finance), R. C. Gifkins (conference literature), J. L. William (exhibition), A. McL. Mathieson (technical visits), L. M. Clarebrough (excursions), M. E. Hargreaves (social functions) and Mrs C. K. Coogan (ladies' programme).

The Conference was held in the buildings of the University of Melbourne, the Conference Office being located in the new Architecture Building. The meetings were formally opened on Monday morning 16 August in Wilson Hall. Sir MACFARLANE BURNET, President of the Australian Academy of Science, introduced Senator the Hon. J. G. GORTON, Minister-in-Charge Commonwealth Activities in Education and Research, who opened the Conference and welcomed the participants to Melbourne. Dame KATHLEEN LONSDALE, Senior Vice-President of the Union and President of the Conference, who represented the President of the Union, J. D. Bernal (who owing to serious illness had not been able to come to Melbourne), expressed thanks on behalf of all participants. After reviewing the various activities of the Union, in particular in the field of publications, she explained the importance of the topics of the Conference.

The scientific sessions of the Conference were held in the Redmond Barry Building. The programme comprised both invited and contributed papers, and in each Symposium 61 papers were read in seven morning and afternoon sessions. At a Joint Session, which was devoted to the study of crystal defects by diffraction methods, particularly with electrons, five further lectures were given.

The names of the speakers and the titles of their papers are listed at the end of this report. A bound volume

containing extended abstracts of nearly all contributions (and of some papers which were withdrawn or cancelled) was given to all registered participants. Copies of this volume are still available, and can be ordered from Pergamon Press, Oxford, England, at the price of £5 per copy.

On the occasion of the Conference, the Second Bragg Lecture, entitled *Disorder in the solid state*, was given by Dame KATHLEEN LONSDALE in the Old Arts Building on Tuesday evening 17 August.

During the period of the Conference an exhibition of scientific equipment and materials relevant to the themes of the meeting was held in the Beaurepaire Centre. This exhibition was formally opened by E.G. Bowen, Chief of the Division of Radiophysics, C.S.I.R.O., on Tuesday 17 August. There were twenty exhibitors. The apparatus on display included three electron microscopes which were working, X-ray and neutron diffraction equipment, lasers, atomic absorption and infra-red spectrophotometers, vacuum and general ancillary equipment. A display of electron micrographs and electron diffraction patterns was also arranged as part of the exhibition, and included exhibits by both local and overseas delegates. A detailed exhibition handbook was published and given to all participants in the Conference.

For the convenience of the participants the Organizing Committee had made various arrangements which contributed to the success of the Conference. So it had arranged for college accommodation for a great number of participants, many of them from overseas. Those who made use of this arrangement are grateful for the hospitality offered by Newman College, Ormond College, Queen's College, Trinity College, and University Women's College. Mention may also be made of the morning and afternoon teas which were served free of charge in the main concourse of the School of Architecture during the intervals in the scientific sessions.

The programme of social events included the following functions. On Monday 16 August a Reception was given by the State Government of Victoria in Queens Hall, Parliament House. The Hon. A.G. RYLAH, Acting Premier, welcomed the participants, and Dame KATHLEEN LONSDALE thanked him and the State Government for the hospitality received. The afternoon of Wednesday 18 August was kept free for a sightseeing tour through the City of Melbourne and to the Dandenong Ranges. A Conference Dinner, sponsored principally by Philips Industries Pty Ltd, was enjoyed in the Ball Room of the Southern Cross Hotel on Thursday 19 August. Speeches were made by A.L.G. REES (Secretary, Physical Sciences, Australian Academy of Science, and Chairman, Chemical Research Laboratories, C.S.I.R.O.), H.J. BROWN (representing Philips Industries Pty Ltd), and F. SEITZ (President U.S. National Academy of Science, Chairman of the IUPAP Commission on the Solid State). On Friday 20 August the participants were guests of the Organizing Committee at a Cocktail Party held in the Union House of the University. At this reception Dame KATHLEEN LONSDALE repeated the thanks of all participants to the organizers, and in particular to R.I. Garrud for the energy and time which he had spent in organizing the meetings. After R.I. Garrud had thanked all who had assisted in the organization, the Conference was officially closed. The last event was, however, a most interesting excursion on Saturday 21 August to the Sir Colin Mackenzie Sanctuary at Healesville, about forty miles from Melbourne. The participants in this excursion enjoyed the sight of a fine collection

of Australia's unique fauna, including kangaroos, koalas, emus, and the platypus which is a special feature of the Sanctuary.

For the accompanying members an additional programme of social events was arranged, including a luncheon on Tuesday 17 August, and a number of car and bus tours.

Visits to about ten laboratories in and around Melbourne were arranged for participants during and after the Conference. For the delegates from overseas, arrangements had further been made for visits to more than thirty laboratories and university departments in Australia where work related to the subject matter of the Conference was proceeding. A number of the members of the Conference also participated in a Post Conference School, which was devoted to *The study of crystal defects by diffraction methods*; this was held at the Mayer Chalet at Warburton, near Melbourne, from 23 to 25 August.

### List of Contributions

At the Conference the following papers were read; those with more than one author were presented by the author whose name is marked with an asterisk.

#### *Symposium on Electron Diffraction*

- P. P. EWALD (U.S.A.). The dynamical theory of diffraction in the perfect crystal.
- Y. H. OHTSUKI\* & S. YANAGAWA (Japan). A new method on the dynamical theory of electron and X-ray diffraction. I. General theory.
- N. KATO (Japan). Dynamical diffraction theory for highly distorted crystals.
- A. HOWIE (U.K.). Diffraction channelling of fast particles in crystals.
- M. HORSTMANN & G. MEYER\* (Germany). Influence of temperature on electron-diffraction intensities of Al.
- S. MIYAKE\* & R. MIIDA (Japan). Absolute intensity measurements of electron diffraction from thin metal films.
- P. HAYMANN\* & J. J. TRILLAT (France). On a phenomenon of multiple reflections of electrons.
- P. B. HIRSCH, A. HOWIE\* & J. P. JAKUBOVICS (U.K.). Diffraction contrast in ferromagnetic and antiferromagnetic materials.
- A. W. S. JOHNSON (Australia). A single-crystal structure analysis of molybdenum pentachloride-graphite.
- D. WATANABE (Australia). Electron-diffraction study on the titanium-oxygen alloy system.
- K. KIMOTO\* & Y. FUKANO (Japan). The study of the crystallization of amorphous, thin films of germanium by the scanning technique of electron diffraction.
- J. V. SANDERS (Australia). The structure of opals.
- J. M. COWLEY (Australia). The production of  $\beta$ -BeO by electron irradiation.
- A. F. MOODIE (Australia). Some structural implications of N-beam interactions.
- P. GOODMAN\* & J. C. MILLS (Australia). Calculation and measurement of dynamic diffraction intensities.
- P. S. TURNER\* & D. J. H. COCKAYNE (Australia). The phase grating approximation for thin single crystals.
- M. TOURNARIE (France). Cyclical method on structures by electron diffraction.
- T. B. RYMER\* & C. D. JOHNSON (U.K.). High-voltage scanning electron-diffraction camera with energy filter.

- S. KIMOTO\*, M. SATO, K. KIMOTO & Y. FUKANO (Japan). Scanning technique for electron diffraction.
- C. W. B. GRIGSON (U.K.) (paper read by R. ALDERSON). Some developments in scanning electron diffraction.
- G. R. BRADBURY (Australia). Automatic logging of intensity and energy data in electron diffraction.
- S. OGAWA\*, S. INO & D. WATANABE (Japan). Epitaxy of metals on alkali-halide crystals cleaved in vacuum.
- M. BLACKMAN\* & B. COOPERSMITH (U.K.). On the epitaxy of copper on silver.
- K. MIHAMA\* & Y. YASUDA (Japan). Initial stage of epitaxial growth of evaporated gold film on sodium chloride.
- L. O. BROCKWAY\* & A. P. ROWE (U.S.A.). The epitaxial growth of cuprous oxide on thin single crystals of copper.
- J. SANCHO, F. RAMOS & L. BRU\* (Spain). An electron-diffraction study of some alkali-halide thin films condensed from the vapour in vacuum.
- H. RAETHER (Germany). Inelastic electron scattering (excitation of plasma losses).
- S. KUWABARA (Japan). Intensity measurement of electron-diffraction ring patterns of gold, silver and aluminium films by means of 'Gegenfeld' filter technique.
- C. R. HALL & P. B. HIRSCH\* (U.K.). The contributions from thermal diffuse scattering and weak beams to the absorption of high-energy electrons.
- M. J. WHELAN (U.K.). Contributions of electron interband excitations and thermal scattering to absorption processes in crystals.
- Y. KAINUMA (Japan). An elementary theory of inelastic scattering of fast electrons in crystals.
- J. GJØNNES (Australia). The influence of Bragg scattering on inelastic and other forms of diffuse scattering.
- D. WATANABE\* & J. GJØNNES (Australia). Dynamical diffuse scattering from MgO crystals.
- P. M. J. FISHER (Australia). The application of the Gjønnes theory of diffuse electron-scattering to the problem of short-range order diffraction of electrons.
- L. H. GERMER\* & J. W. MAY (U.S.A.). The structure of crystal surfaces: adsorption of oxygen and carbon monoxide on a (110) tungsten surface.
- D. LYNCH\* & J. C. KELLY (Australia). Examination of clean alkali-halide surfaces by inelastic scattering of slow electrons.
- S. MIYAKE\* & K. HAYAKAWA (Japan). On the nature of low-energy electron-diffraction by crystal.
- R. BAUDOING, C. COROTTE, P. DUCROS\* & D. LAFEUILLE (France). Low-energy electron-diffraction study of (111) surfaces of silver.
- H. E. FARNSWORTH\* & C. A. HAQUE (U.S.A.). Low-energy electron-diffraction observations for calibrated nickel films on (111) copper.
- S. HAGSTROM, H. B. LYON & G. A. SOMORJAI\* (U.S.A.). Low-energy electron-diffraction study of platinum single-crystal surfaces.
- C. BURGGRAB, S. GOLDSZTAUB\* & B. LANG (France). Work done in the field of low-energy electron diffraction.
- P. B. SEWELL\*, E. G. BREWER & M. COHEN (Canada). Reflection electron-diffraction studies of gas-adsorption phenomena.
- K. MOLIÈRE\* & R. SZOSTAK (Germany). Low-energy electron-diffraction study of absorbed layers on  $\alpha$ -iron.
- J. HARADA\* & G. HONJO (Japan). Diffuse streak diffraction patterns of X-rays and electrons due to low-frequency transverse lattice vibrations.
- K. KOMATSU\* & K. TERAMOTO (Japan). Interpretation of diffuse streak diffraction patterns from single crystals.
- R. UYEDA\* & M. NONOYAMA (Japan). Extinction and absorption of 100 kV electrons and of electrons in the 500 kV electron microscope.
- S. TAKAGI\* & K. ISHIDA (Japan). Intensity distribution in equal-thickness fringes.
- H. WATANABE (Japan). Mean absorption coefficient in aluminium crystals. I. Effect of inelastic scattering. II. Temperature dependence.
- G. LEHMPFUHL (Germany). Study of anomalous absorption of electrons by convergent-beam electron-diffraction.
- A. J. F. METHERELL, S. L. CUNDY & M. J. WHELAN\* (U.K.). Combined electron microscope and Mollenstedt electron-velocity analyser.
- T. ICHINOKAWA (Japan). A new electron-energy analyser of magnetic type.
- H. BOERSCH (Germany). Elastic and inelastic scattering.
- H. HASHIMOTO (Japan). Electron-microscopic images of crystals containing a lens-shaped cavity and a plate-shaped layer.
- K. F. HALE\* & M. HENDERSON BROWN (U.K.). The use of dark-field electron microscopy in the study of dislocations and precipitates in thin foils.
- A. LABERRIGUE\*, P. LEVINSON, P. BONHOMME & G. SONNET (France). Electron microdiffraction by superconducting alloys at very low temperatures.
- T. HIBI\* & S. TAKAHASHI (Japan). Coherence of electron beam and contrast of electron-microscope image with electron-diffraction pattern.
- W. HOPPE\* & R. LANGER (Germany). Numerical calculations of the images of single atoms in electron microscopes.
- G. DUPOUY, F. PERRIER\* & R. UYEDA (France). High-voltage electron diffraction and electron microscopy.
- W. C. T. DOWELL\* & J. L. FARRANT (Australia). Contrast limitation of point and line resolution in electron micrographs.
- W. BOLLMANN (Switzerland). Precision goniometer measurements of diffraction effects in transmission electron microscopy.
- J. L. FARRANT\* & J. D. MCLEAN (Australia). The imaging of a protein crystal lattice.

*Symposium on The Nature of Defects in Crystals*

- K. LONSDALE\* & J. STEPHENS (U.K.). The defect mechanism of an organic single-crystal chemical reaction.
- D. R. CUTTEN & L. G. ERICSON\* (Australia). Free radicals as crystal defects.
- Y. FARGE, M. LAMBERT & A. GUINIER\* (France). Attempts at identification of new bands observed in irradiated LiF.
- M. ADAM, P. BERGÉ, G. BLANC & M. DUBOIS (France) (paper presented by A. GUINIER). Study of the state of impurities in lithium fluoride.
- I. D. CAMPBELL\* & C. K. COOGAN (Australia). Magnetic resonance studies of defects in ionic crystals containing linear triatomic ions.
- W. LOW\* & J. T. SUSS (Israel). E.S.R. studies of radiation effects in simple oxides.
- B. S. HICKMAN\*, D. G. WALKER & T. M. SABINE (Australia). The behaviour of defects in neutron irradiated magnesium oxide.
- L. A. BURSILL, A. C. MCLAREN\* & P. P. PHAKEY (Australia). Radiation damage in quartz and zircon.
- M. W. THOMPSON\*, R. S. NELSON & R. SIZMANN (U.K.). The channelling of energetic ions in copper and gold as a means of investigating crystal defects.

- R. J. MACDONALD\* & D. HANEMAN (Australia). Ion-bombardment induced defects in germanium films.
- H. WENZL\*, W. SCHILLING & K. ISEBECK (Germany). Electrical resistivity, volume and energy of Frenkel defects in aluminium.
- G. A. JEFFREY (U.S.A.). Structures related to the wurtzite B4 type by block inversion and shear.
- F. JELLINEK (Netherlands). Order and disorder in transition-metal chalcogenides.
- R. SATO (Japan). Layer fault in oxygen-deficient  $U_3O_8$ .
- B. G. HYDE, D. J. M. BEVAN\* & L. EYRING (Australia). A structural model of the rare-earth oxides  $RO_x$  ( $R = Ce, Pr, Tb$ ;  $1.5 < x < 2.0$ ).
- E. W. GORTER (Netherlands). Deviations from stoichiometry in ionic compounds.
- S. ANDERSSON (Sweden). The substitution of  $F^-$  and  $OH^-$  for  $O^{2-}$  in pentavalent niobium oxides.
- B. M. GATEHOUSE\*, R. S. ROTH & A. D. WADSLEY (Australia). The modification of the  $Nb_2O_5$  structure by controlled cation substitution.
- A. EIKUM & R. E. SMALLMAN\* (U.K.). On the defect structure in oxygen-deficient rutile.
- B. T. M. WILLIS (U.K.). Neutron-diffraction studies of non-stoichiometric compounds.
- B. G. HYDE (Australia). Partial dislocations, phase transformations and non-stoichiometry in metal oxides.
- N. C. STEPHENSON (Australia). Anion vacancies in perovskite structures.
- G. D. RIECK\* & F. C. M. DRIESSENS (Netherlands). Defective ion distribution and vacancies in spinels  $Mn_2Fe_{3-t}O_4$ .
- F. HANIC (Czechoslovakia). Non-stoichiometric coordination compounds.
- G. JEHANNO & P. PERIO\* (France). Variation in periodicity in alloys with long-range order.
- J. W. ELTIS\* & E. O. HALL (Australia). Diffraction studies of the defect structure  $\beta$ -NiAl.
- T. L. ESTLE\*, W. C. HOLTON, A. R. REINBERG & M. DE WIT (U.S.A.). Electron paramagnetic resonance studies of point imperfections in II-VI compounds.
- W. G. R. DE CAMARGO (Brazil). Random layer structure of autunite by grinding.
- J. S. KOEHLER (U.S.A.). Point defects in metals.
- D. KUHLMANN-WILSDORF (U.S.A.). The growth and annealing of stacking-fault tetrahedra in f.c.c. metals.
- M. H. LORETTO\*, L. M. CLAREBROUGH & R. L. SEGALL (Australia). Annealing of defects in quenched copper, silver and gold.
- S. YOSHIDA\*, M. KIRITANI & Y. SHIMOMURA (Japan). Voids in quenched face-centred cubic metals.
- F. W. YOUNG (U.S.A.). On the origin of dislocations in copper crystals.
- A. SEEGER\* & K. P. CHIK (Germany). Vacancies and vacancy agglomerates in f.c.c. metals.
- M. DOYAMA\* & R. M. J. COTTERILL (U.S.A.). Atomistic calculations of defect configurations and energies in copper.
- R. A. JOHNSON (U.S.A.). Calculations for defects in body-centred cubic metals.
- R. O. SIMMONS (Belgium). Concentrations and free energies of atomic defects in crystals.
- H. PEISL & W. WAIDELICH\* (Germany). Evidence for Frenkel defect formation in LiF during neutron and X-ray irradiation.
- R. BULLOUGH (U.K.). The core structure of an edge dislocation in copper.
- R. THOMSON\* & Z. USMANI (U.S.A.). Theory of bound states on stacking faults.
- R. A. BROWN (Australia). Electron distribution about an edge-dislocation in a metal.
- F. KROUPA\* & J. NOVOTNY (Czechoslovakia). Interaction of dislocation dipoles with point defects.
- F. R. N. NABARRO (South Africa). The geometry of disclinations in a crystal.
- A. K. HEAD (Australia). The equilibrium and stability of dislocations in a non-uniform stress field.
- L. M. GILLIN\* & A. KELLY (U.K.). Twinning in graphite.
- C. L. BAUER (U.S.A.). Statistical thermodynamics of point defect-dislocation interactions.
- A. SEEGER\* & F. J. WAGNER (Germany). The relaxation of dumb-bell interstitials in Ni.
- R. R. HASIGUTI\* & T. KODAMA (Japan). Quenched-in vacancies in dilute aluminium-germanium alloys.
- K. LÜCKE\*, F. HULTGREN & H. INAGAKI (Germany). Ultrasonic observations of point defect annihilation by dislocations.
- R. B. NICHOLSON (U.K.). The interaction of point defects and solute atoms in aluminium alloys.
- K. L. KLIEWER (U.S.A.). Ionic space charge and the distribution of defects in silver halides.
- P. HANNAFORD\* & C. J. HOWARD (Australia). Mössbauer studies of radiation damage in solids.
- J. R. MANNING (U.S.A.). Vacancy fluxes and the Kirkendall shift in binary alloys.
- H. BETHGE (Germany). Some observations on individually moved dislocations in NaCl crystals.
- F. LÜTY (Germany). Dipole centres in alkali halides.
- H. F. SYMMONS\* & J. S. DRYDEN (Australia). The aggregation of  $Mn^{2+}$ -vacancy complexes in sodium chloride.
- W. A. SIBLEY\*, J. H. CRAWFORD & E. SONDER (U.S.A.). Effect of deformation and impurities on the formation of F-aggregates.
- G. J. DIENES (U.S.A.). The characteristics of interstitial chlorine in alkali halides.
- J. KLUGE, P. MÜLLER & J. TELTOW\* (Germany). Defect interaction in the silver halides.
- H. CURIEN\* & J. PETIAU (France). Dissolution, precipitation and association of cationic divalent impurities in LiF.
- G. HEILMANN & E. E. SCHNEIDER\* (U.K.). Ultramicroscopic study of defects in crystals of high purity.
- L. TAUREL & J. CHAPPELLE\* (France). Study of dislocations by optical methods.

#### Joint session

- S. AMELINCKX (Belgium). The electron microscope as a tool for the study of crystal defects.
- N. KATO (Japan). Some fundamental aspects of dynamical diffraction theory for electrons and X-rays in distorted crystals.
- A. R. LANG (U.K.). The use of X-ray topography as a tool for the study of crystal defects.
- P. B. HIRSCH (U.K.). Electron microscope investigations of dislocations.
- J. M. COWLEY (Australia). Electron diffraction from unresolvable defects.