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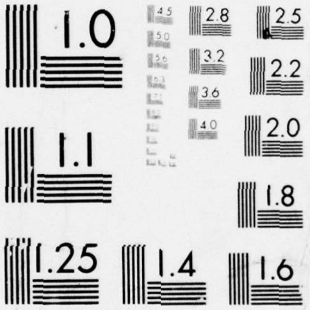

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PHYSICS

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EUROPEAN SCIENTIFIC NOTES

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SCATTERING OF BETA PARTICLES

F. Suzor and G. Charpak of the Collège de France, Paris, have previously reported (Comptes Rendus 231, 1471 (1950); 232, 332 and 720 (1951)) the observation of much greater back-scattering for beta particles than for the conversion electrons from Tc^{99} and In^{115}. They have accordingly suggested the possibility that beta particles are in some way different from electrons. Other investigators in the same laboratory have found a similar discrepancy (ESN 5, 105, 1951).

Recent work of Suzor and Charpak shows no significant difference in scattering of electrons and beta rays. The technique in these latest experiments is essentially that used earlier. Suzor and Charpak attribute the anomalous scattering previously observed to the fact that their original conversion electron sources contained carrier material.

An account of Suzor and Charpak's study of the back-scattering of electrons as a function of energy is expected to be published soon, probably in the Journal de Physique.

NUCLEAR EMULSION ALTITUDE-RECORDER

A novel device for recording the altitude during cosmic-ray balloon flights has been developed by K. Kristiansson at the University of Lund. It records the residual range of α-particles which come to rest in a photographic emulsion after they have traversed a path in air whose pressure corresponds to the altitude.

The device has the advantages of simplicity, low weight, low cost, ruggedness, and zero temperature coefficient; all of these characteristics are of great importance in balloon experiments. In its present state good sensitivity down to pressures of about 1 cm of mercury is obtained.

The units which have been used in actual flights are built of a thin aluminum tube 15 cm long and about 2 cm diameter. The tube is open on one side to the atmosphere. On one end is mounted a source of polonium α-particles and on the other end a piece of C-2 nuclear emulsion.

Before the flight one half of the C-2 emulsion is covered and the other half calibrated by allowing α-particles to fall on it while in a bell jar at various known pressures. During the flight the calibrated portion of the emulsion is covered and the rest exposed. After the flight the number of α-particle tracks is determined as a function of depth of emulsion, each depth corresponding to a particular pressure (and therefore to altitude), while the number of tracks is proportional to the time the balloon spent above this altitude. Therefore an integral altitude-time curve of the flight is obtained. The use of the pre-flight calibration minimizes errors and uncertainties which might occur in connection with the development, such as swelling of the emulsion.

THE ISOTOPIC COMPOSITION OF ARGON IN NATURAL GASES

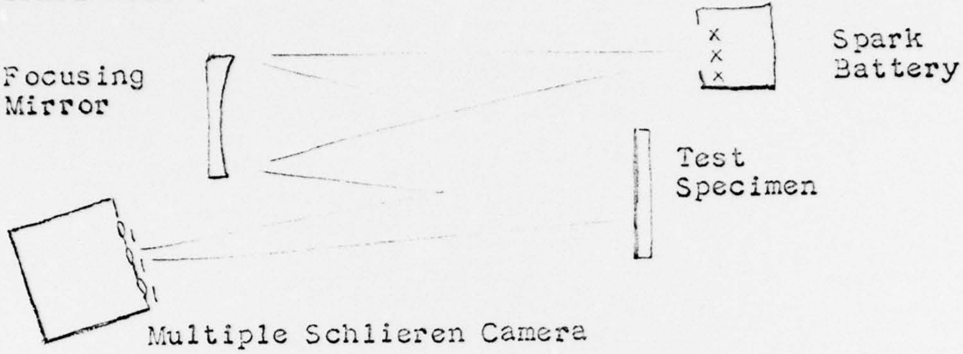
At the Physical Institute of the University of Rome, Professor Amaldi has several collaborators applying their Nier-type mass-spectrograph (designed and constructed in their Institute) to a variety of problems. These include the isotopic composition of argon in Italian natural gases, thermal diffusion and intermolecular forces between unlike molecules, and catalysis.

The isotopic composition of argon in two different natural gases from the Larderello region was found to be significantly different from that in air. Drs. Boato, Careri, Nenciur, and Santangelo found that the relative A^{40} content of these gases was about 25°/o higher than that of air. (cf. Ann. di Geof. 4, 1 (1951)) This work is being extended to natural gases from different sources and it may throw some light on their origin, as it is assumed that A^{40} arises largely from K capture in K^{40}.

AN EXPERIMENTAL TECHNIQUE FOR RECORDING ELASTIC WAVES IN SOLIDS

Prof. Hubert Schardin (Freiburg -i.-B.) has been making high-speed motion picture studies on the breaking of glass by means of a technique which has a large range of possible other application. The principal experimental tool in his investigation is a multiple spark schlieren arrangement, used by the author in numerous other contexts to obtain sequences of pictorial records from phenomena proceeding at very high speeds. The apparatus differs from a common schlieren system by possessing, instead of a single light source, a compact battery of 24 sparks and a corresponding number of knife edges and camera lenses, each being placed at one of the source images projected by the common schlieren optics. The sparks are fired in sequence, a known delay occurring between successive discharges. In this particular instance, a time delay of from 10 - 2 micro-seconds between successive pictures proved satisfactory. The installation, however, permits a reduction of the interval between successive frames to a fraction of a micro-second.

This apparatus makes it possible to record not only the propagation of cracks, but also the progress of the elastic waves initiating and accompanying the breaking. For this purpose three different experimental arrangements are used. The first is the generally employed procedure of stress optical analysis, exploiting stress-induced birefringence and its effect on polarized transmitted light. The second arrangement also operates with transmitted light, using the schlieren edges to render visible the deflection of the light caused by regions of the glass plate where the two surfaces are deformed in opposite directions (the deviation caused by parallel deformation, i.e. bending, is too small to be detected). The third set-up is sketched below:



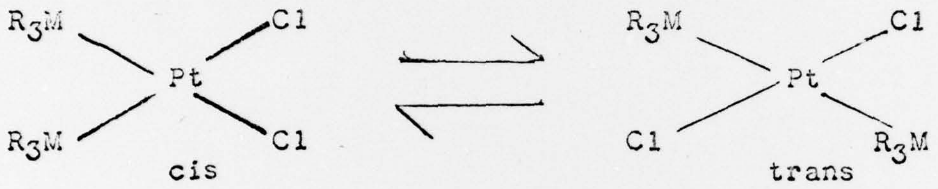
The light of the spark sources is reflected from the silvered surface of the test specimen and refocussed by a concave mirror on to the schlieren edges. Very small deformations of this surface will now cause corresponding brightening or darkening in the image obtained by the camera. The merit of this arrangement lies in its ready adaptability for similar investigations using opaque materials, provided it is possible to smooth the surface adequately. Complete flawlessness of the surface is not necessary because deformations are recorded as changes from initially prevailing conditions, and ordinary window glass has been found satisfactory.

The photographs illustrate and distinguish the numerous phenomena accompanying the propagation of elastic waves in glass, as well as their interaction and their reflection from free boundaries. Longitudinal and transverse waves are readily distinguished by their different speeds of propagation. Bending waves can be distinguished from shear and pressure waves by the fact that they show dispersion, their velocity depending on the ratio of wave length to plate thickness. Interaction phenomena between these waves and with the forming surface of an incipient crack are strikingly illustrated, giving unambiguous guidance in formulating the basic assumptions for a simple theory. Schardin is able to get close agreement between observations and theory even in cases of considerable complexity, such as, for instance, the origin and configuration of Wallner lines on the breaking surfaces of a rod which has failed in tension. The majority of this work will be found described in Glastechnische Berichte 23, 1, 67, and 325 (1950).

STEREOCHEMISTRY OF PLATINUM COMPLEXES

J. Chatt and R. G. Wilkins have been studying the cis- trans isomerization reactions of platinum complexes. This work, which is carried out at the Butterwick Research Laboratory of Imperial Chemical Industries, has led to the view that d orbital bindings are involved and determine the relative stability of the isomers.

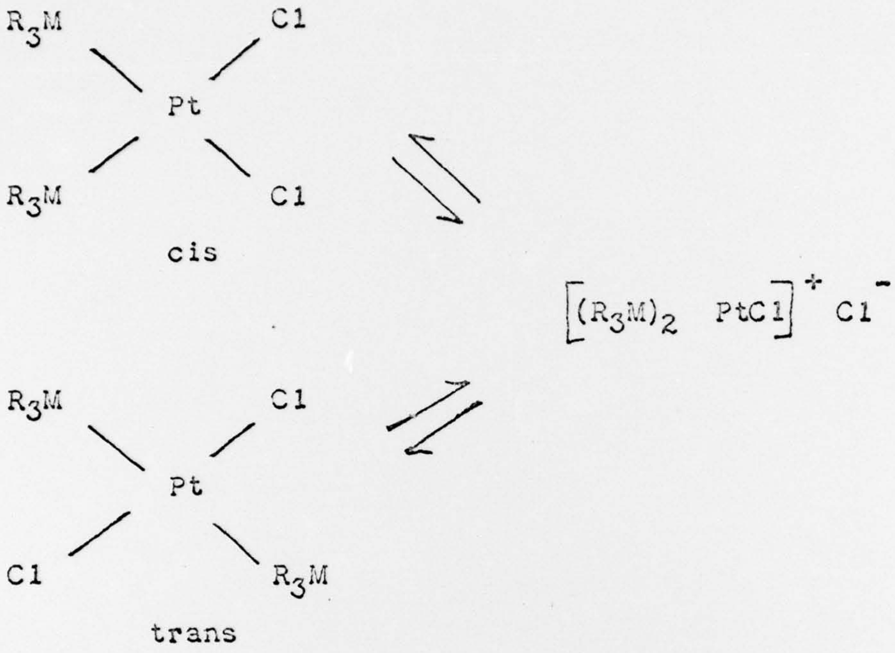
The equilibria studied can be represented as



where R is alkyl (ethyl, n-propyl, n-butyl) and M is a metal (P, As, Sb). Dielectric constant determinations in benzene solutions were used to measure the rate of isomerization and the position of equilibrium. The As and Sb compounds isomerize spontaneously at 25°C, but in P compounds a trace of R_3P has to be added as catalyst. The former two probably produce their own catalyst by dissociation.

The trans form is always predominant in the equilibrium mixtures, but the percentage of cis form varies between wide limits. For example, in the propyl series it is 3.2°/o for the P compound, 1.8°/o for As and 22.2°/o for Sb. These changes are due to the d orbital binding dependence on the spatial distribution of vacant orbitals and on the maximum overlap at equal size (Pt and Sb have nearly equal atomic radii).

The mechanism chosen can be represented by the following scheme:



(cf. Nature 165, 637 (1950); 167, 435 (1951))

MOLECULAR SPECTROSCOPY RESEARCH AT THE UNIVERSITY OF BOLOGNA

The University of Bologna is probably the most active centre of research in physical chemistry in Italy at the present time. Professor G. B. Bonino is directing the work with a staff including five assistants, about 35 research workers, and other personnel. Their main field of activity is molecular spectroscopy, particularly Raman spectroscopy. In addition, work is in progress on optical activity, chromatography, polarography, and theoretical quantum chemistry. The work is discussed in Technical Report ONRL 67--51, available from the Technical Information Division, Code 250, Office of Naval Research, Washington 25, D.C. A brief account is given below.

The Raman Spectra of Carbonyl Compounds

In continuing their program on intermolecular forces and spectra of carbonyl compounds, the Raman spectra of acetophenone, benzaldehyde, and their mixtures and solutions in different solvents have been studied in some detail. It was found that the C = O frequency of acetophenone moves from 1680 cm^{-1} to 1690 cm^{-1} when pure acetophenon is diluted with benzene. In a similar study performed on benzaldehyde the C = O frequency at 1698 cm^{-1} was found to remain absolutely constant when pure benzaldehyde was dissolved in benzene down to a mole fraction of 0.1. The results obtained on various mixtures of benzaldehyde and acetophenon show that the C = O frequency of acetophenon in such mixtures will again change from 1680 to 1690 cm^{-1} in dilute solutions while the corresponding frequency of benzaldehyde at 1698 cm^{-1} remains constant.

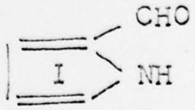
The Raman spectrum of furfuraldehyde was investigated in a number of different solvents. It has been known for some time that the C = O frequency in pure furfuraldehyde is split into a doublet. In the pure liquid this doublet has been observed by various authors in the form of two frequencies at about 1668 and 1690 cm^{-1}. A detailed investigation by Rolla and Chiorboli at Bologna has demonstrated that while the separation of this doublet is essentially constant (21±2 cm^{-1}) the relative intensities of the components can change from 0.8 to 4.0, depending on concentration and solvent used.

Spectroscopy of Pyrrolle and its Derivatives

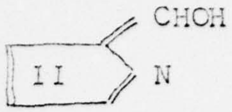
The NH frequency at 3μ of pyrrolle 

was found to undergo a splitting in carbon tetrachloride solutions. The doublet separation is about 0.1μ. The new, second component, which is on the low frequency side, becomes relatively stronger at decreasing concentrations: at infinite dilution only the new band remains.

This behaviour was found to be characteristic of the pyrrolle system, and was also observed in several derivatives. Thus the similar behaviour of



suggests that the correct formula is I rather than the tautomeric alternative II:



CRYSTAL STRUCTURE DETERMINATIONS

A number of new crystal structure determinations were described at the Crystallographic Congress in Stockholm mentioned elsewhere in this issue. A list of those reported is given below.

Robinson (Cambridge, England): Mn_3 Si Al_9.

Rooksby and Tombs (Wembley, England): cobalt oxide, ferrous oxide, and manganous oxide at 95°K and 205°K.

Magneli (Uppsala): tungsten oxides and alkali tungsten bronzes.

Rooksby and Steward (Wembley, England): alkaline earth tungstates of the general composition R_3WO_6.

B. Aurivillius (Stockholm): mixed bismuth oxides of the perovskite-layer type $Bi_4Ti_3O_{12}$.

Berger (Uppsala and Göteborg): B_2O_5.

Schlyter and Sillen (Göteborg and Stockholm): lanthanum fluoride.

Unmack (Copenhagen): bayerite.

Nowacki and Scheidegger (Bern): $Cu_4(NO_3)_2(OH)_6$.

Luzzati (Paris): HNO_3 and its mono- and tri-hydrates.

Lindqvist (Uppsala): polymolybdates.

De Wolff (Delft): $Mg\ Hal_2 . 3Mg(OH)_2 . 8H_2O$.

Stanley (Cardiff): $NaK_5Cl_2(S_2O_6)_2$ and $NaK_2Cl(S_2O_6)$.

Lundgren (Stockholm): $U(OH)_2SO_4$, $UOSO_4$.

Edstrand (Stockholm): antimony (III) oxyhalides.

Aurivillius (Stockholm): cinnabar and montroydite.

Nitta, Tadokoro, and Osaki (Osaka): sulphamic acid.

Jack (Newcastle): VF_3, CoF_3, MoF_3, and TaF_3.

Berger and Blanca (Madrid): barium dithionate.

Rivoir and Smith (Madrid): thallous sulfate.

Berger and Gomes (Madrid): thallous nitrate.

Kiessling (Uppsala): boron-containing ternary systems with both transition metals and non-metallic elements.

Nowotny (Vienna): $TiSb_2$, VSb_2, TiSb, Ti_4Sb, Ti_4Pb, Mn_3As, PdZn, PdCd, PtZn, PtCd.

Jeffery (London): calcium silicates and their hydration products.

Megaw (Cambridge): afwillite.

Bailey, Ferguson, and Taylor (Cambridge, England): felspars.

Ito and Sadanaga (Tokyo): anorthoclase and microline felspars and milarite (with Morimoto).

Seifert (Münster): euxenite-blomstrandine group.

Claringbull (London): schultenite.

Melon and Toussaint (Liège): bialite and tavistockite; thoreaulite and buttgenbachite (variety of connellite).

Brasseur (Liège): unit mesh of hydrated lead uranates.

Sörum (Trondheim): plagioclase felspars.

Zussman (Cambridge, England): hydroxyproline.

Penfold (Cambridge, England): alpha-pyridone.

Robertson (Glasgow): tropolone and its cupric and ferric derivatives.

Brown (Manchester): di-p-xylylene.

Nowacki and Bürki (Bern): the purine homolog Xantazol.

Amoros (Barcelona): HCl-l-glutamic acid.

Nitta, Matsuda, and Osaki (Osaka): quinhydrone.

Pasternak (London): pentachlorocyclohexene $C_6H_5Cl_5$.

Shahat (London): moleic and fumaric acids.

Oda, Atoji, and Watanabe (Osaka): a cubic modification of hexachloroethane.

Jerslev (Copenhagen): "anti" p-chloro-benzaldoxime.

Font-Altaba (Barcelona): saccharine and its Mn, Ni, and Co derivatives.

Corbridge and Cox (Leeds): metal-tripyridyl coordination compounds.

Grdenic (Zagreb): mercury diethylene oxide.

CRYSTALLOGRAPHIC CONGRESS

The Second International Congress of Crystallography was held in Stockholm from 27 June to 5 July 1951. Two hundred and thirty papers were presented of which about 85 were on the determination of the structures of specific crystals. About 70 papers were concerned with methods of handling and reducing observations by mathematical, optical, and machine techniques. Some of the papers of interest to metallurgists are abstracted below.

X-ray Line Broadening in Cold-Worked Metal

Three papers concerned with the effect of cold work on the shape of X-ray diffraction lines gave rise to spirited discussion. Auld and Garrod (Victoria, Australia) analyzed lines from iron wires strained in tension and from iron filings deformed by compressing them into compacts. They were able to distinguish between particle-size and strain broadening, but were unable to find, between the wires and the filings, any difference which might be ascribed to a difference in the mechanism of deformation. Their technique of determining the true line-breadth and the intensity distribution by the Stokes-Fourier method was criticized by Eastabrook and Wilson (Cardiff), both in discussion and in another paper in which they showed that the poorly measurable tails of the lines have a great effect on the calculated Fourier transform of the line profile. Bertaut (Grenoble) agreed with this view and pointed out that this source of error makes it difficult to separate strain and particle-size broadening and also introduces fictitiously small values for the particle size. Finally Williamson (Birmingham) showed that cold work reduces the integrated intensity of all reflections, but increases the diffuse background scatter; this possible source of error had not been discussed in the original paper on the subject by Averbach and Warren.

X-ray Microbeam Studies

Gay and Hirsch (Cambridge, England) reported the results of some investigations on cold-worked metals carried out with X-ray beams from 13 microns to 1 millimeter in diameter. In cold-worked aluminum, photographed in back reflection with a beam smaller than 1 millimeter, the usual diffuse Laue ring is resolved into spots at any degree of deformation. From the number of spots, it is found that the crystals are broken down into fragments whose diameter reaches a lower limit of 2 microns at 10^{o}/o reduction. These are probably formed by spontaneous polygonization. At 60^{o}/o reduction the fragments exhibit the unusually large mutual mean angular disorientations of the order of one degree, as well as misorientations as great as 15 degrees with respect to the original grain. Spot-broadening, and hence distortion within the particles, decreases during recovery. In copper and nickel a much smaller beam is required to resolve the ring, but in tin a 1 millimeter beam may be used. In copper, the minimum particle size is about 2.6 microns, and is reached after 7^{o}/o reduction. At large deformations resolution becomes very difficult in this metal.

Deformation Textures

From the established slip and twinning systems for single crystals Clews and Calnan (Teddington, England) have been able to derive the textures formed in face and body-centered cubic and in hexagonal polycrystalline metals by tension, compression, wire-drawing, and rolling. Representatives of other laboratories working on the same problem were not on hand to discuss this paper.

Crystal Growth on Substrates

Finch (London) and his associates, Wilman and Layton, presented the results of studies on the influence of substrates on the structure of crystals grown on them. In some cases the substrate is active, and the growing nuclei remain in pseudomorphic or epitaxial relationship with it even though the necessary atom coordination is only achieved at the expense of perfection of lattice fit. When the misfit is considerable, pseudomorphism is preferred, and the strain may either be partly relieved by slip, by twinning, or by rotational slip, or may force the formation of a solid solution or even of a new phase.

These experimental conclusions throw considerable light on the growth of electrodeposits. With inactive substrates, when the bath conditions are such as to maintain a high metal-ion concentration at the cathode, the crystals grow with a densely populated lattice plane parallel to the cathode surface (lateral growth). When the ion concentration falls off, the crystals grow with one of the most densely populated atom rows normal to the cathode (outward growth). If the substrate is active, the deposit begins to grow epitaxially, but reverts to the form dictated by the bath conditions. The change occurs sooner if the substrate is fine-grained and if the bath conditions favor outward growth.

Sigma-phase and β-Uranium

Some controversy arose concerning the structure of β-uranium, the phase which is stable between 650°C and 750°C, between Tucker (Schenectady) and Thewlis (Harwell, England). The latter suggested, on the basis of his powder photograph results, that the 1.4°/o chromium alloy used by the former does not have the same structure as pure β-uranium. A similar controversy arose concerning the structure of the sigma phases in cobalt-chromium and in iron-chromium alloys between Dickins and Douglas (Cambridge, England) and Bergman and Shoemaker (Pasadena). In all cases the unit cell was reported to be tetragonal and to contain 30 atoms. It was agreed that the space group is identical in the sigma-phase alloys and in β-uranium, but the authors differed on the choice between $P4nm$, $P4/mnm$, $P\bar{4}n2$, and $P4/mn$. Dickins and Douglas made their observations on single crystals of sigma cobalt-chromium.

In the discussion, Goldschmidt (Sheffield) reported finding sigma-structures in 5°/o molybdenum-95°/o manganese at 1200°C, in all iron-molybdenum compositions between FeMo and Fe_2Mo_3, and in iron-tungsten and cobalt-tungsten alloys.

Valences of Transition-Metal Constituents in Alloys

Two researches were reported which were designed to test the prediction by Raynor (Birmingham) that the transition metals Cr, Mn, Fe, Co, and Ni can exhibit negative apparent valences in certain electron-rich alloy combinations. Douglas and Nicol (Cambridge, England) working with $Co_2 Al_9$, $MnAl_6$, and $Ni_4Mn_{11}Al_{60}$, and Robinson (same laboratory) working with Mn_3SiAl_9, found that if aluminum is assigned the normal valence 3, and silicon the valence 4, the Raynor prediction is verified, and the maximum valences of the metals listed above may reach effective negative values of 4.66, 3.66, 2.66, 1.71, and 0.61 respectively. These values were derived from studies of the prominent Brillouin zones, the boundaries of which are determined from the observed intense X-ray reflections.

X-ray Diffraction Apparatus

Among several improvements to X-ray diffraction apparatus, one which elicited great interest was reported by Goldstaub (Strasbourg). It is a fine-focus tube capable of producing a brilliance of 5.3 KW/mm^2 at 30KV. The cathode is a tantalum plate heated by electron bombardment, and is surrounded by a concave electrode at the same potential. The convex anode is pierced by a hole through which passes the converging electronic beam. An electron lens produces on the anticathode a concentrated image of the cross-over. The focal spot has a diameter of 0.05 mm.

Age Hardening

Guinier (Paris) sketched his recently evolved views on the phenomenon of age hardening. He showed that the anomalous scattering observed by X-ray diffraction in age-hardening alloys cannot be explained solely by the hypothesis of Geisler and Hill whereby foreign atoms segregate into zones without altering the structure of the matrix. Neither can the scattering be explained by the formation of very fine precipitates. Guinier suggests that the observed patterns are due to the presence of coherent precipitates or segregation zones in which a structure different from that of the matrix is developed by shear transformations of the martensite type.

Martensite Transformations

Jack (Newcastle) reported the results of a study on the tempering of martensitic steels, in which he analyzed X-ray diffraction results, hardness, and specific volume changes. His material consisted of rods of 1.3°/o carbon steel quenched from 1100°C. At 80°C to 160°C the martensite transforms into a close-packed hexagonal iron carbide, which he calls ϵ-Fe$_3$C because it is isostructural with the ϵ-phase in FeN alloys. This transition carbide precipitate is oriented, coherent, strained, and rod-shaped. At 230°C to 280°C the retained austenite is transformed. At 260°C to 360°C the ϵ-phase is changed into finely dispersed two-dimensional cementite platelets parallel to the (001) cementite planes.

A new analysis by Richards (Birmingham) brought out the possibility that the austenite-martensite transformation takes place by pencil glide in the direction $[0\bar{1}1]_A$ to a position of minimum atomic misfit in this direction at the common interface. Any relative displacement of the austenite on opposite sides of the martensite plate is then cancelled by twinning of the latter on $(121)_M$, giving rise to the martensite midrib. This conclusion is consistent with one of the 24 possible variants of the Kurdjumow-Sachs relationship. Barrett (Chicago) criticized this result: the displacement of scratches and optical evidence indicate that the midrib is not a twin plane.

Cementation of Iron

Trillat (Paris) and Oketani (Tokyo) described an electron-diffraction study on the cementation of iron films prepared by evaporation in vacuo onto NaCl cleavage surfaces at 500°C. The films so prepared are polycrystalline and 40-100 millimicrons thick. Annealing at 600°C produces large crystals whose (100) planes are parallel to the NaCl surface.

Both finely and coarsely crystalline films were carburized in the presence of charcoal, of pure CO, or of water gas. At temperatures below 300°C, no carburization occurs, but because the gas contains some CO_2 derived from CO, Fe_3O_4 is produced. Between 500°C and 540°C, pure CO transforms the iron in one hour into Fe_3C, and the electron-diffraction pattern contains in addition some rings attributable to Fe_3O_4. The (111) plane of the cementite is roughly parallel to the (100) plane of the iron, but there is a spread in relative orientation of approximately 5°. In the presence of hydrogen, the cementite recrystallizes after a time, and loses its orientation relation with the original iron. At temperatures above 650°C a deposit of graphite masks the underlying structures.

The compound Fe_2C is only observed between 300°C and 400°C and only in the presence of $CO-H_2$ mixtures. It is always preceded by the formation of Fe_3C, and occurs only when oxidation is absent.

Oxides with High-Speed-Steel Carbide Structure

One of the most widely discussed papers was an account by Karlsson (Uppsala) of the discovery of oxides of the type M_3Ti_3O, which have metallic and not ionic properties and possess the same structure as the high-speed-steel carbide Fe_3W_3C. In these oxides, M may be Mn, Fe, Co, Ni, or Cu, but not V, Cr, or Zn. Some intersubstitution between Ti and M atoms is possible without change of structure. The probable limits are the compositions M_3Ti_3O and M_2Ti_4O, the substitution being at the 32:(e) positions of M atoms. No variation of oxygen content is possible.

Complete structure data have been accumulated for Mn_3Ti_3O and for Cu_3Ti_3O. The unit-cell dimensions of the latter are identical with those of the compound

($CuTi_2$) previously investigated by Novos and Bond. It is probable that their compound was in fact Cu_3Ti_3O, since CuTi alloys are very strong deoxidizers.

Two nitrides, isomorphous with these oxides, and having the corresponding composition Me_3Ti_3N have also been found.

The compounds are not easy to prepare, as the reaction MO_x+M+Ti used in their manufacture is often sluggish up to elevated temperatures, and then suddenly becomes explosive. The constituents are melted together in vacuo.

Much interest in these compounds was evinced by high-temperature-alloy metallurgists, and in particular by students of metal-ceramic combinations.

Electron Diffraction

A number of papers were presented on the subject of Kikuchi-line theory, on the use of Kikuchi lines in structure analysis, on fine structure in electron-diffraction patterns, and on electron-diffraction apparatus.

Gas phase molecular structures described by European scientists were acetone and the acetyl halides by Allen (Oxford) and carbon suboxide and acraldehyde and crotonaldehyde by Mackel (Belfast).

Finch and Webb (London) demonstrated the advantage of using high accelerating potentials. The resulting decrease in absorption causes a smaller temperature rise in the specimens, and these may be of greater thickness and therefore less delicate to work with. Excellent photographs of mica specimens 5000 A thick were obtained at 140 KV. Amorphous surface films 5 A thick on quartz and 100 A thick on rutile were clearly observed on electron-diffraction photographs obtained by using high potentials and grazing incidence.

Order-Disorder Transformations

Using optical diffraction patterns of two-dimensional diffraction gratings made with 1600 holes of various sizes, Edmunds, Hinde, Taylor, and Lysson (Manchester) demonstrated that the shapes of superlattice spots in X-ray defraction patterns from single crystals can be explained solely on the basis of short-range order. Using the optical analog, it is observed that as the short-range-order parameter increases, the diffuse background shrinks, first to spots of the shape found in X-ray patterns, and finally to sharp superlattice spots. Guinier objected that the fine structure of the large spots cannot be explained except on the hypothesis of anti-phase domains, within which long-range order is perfect.

Fournet (Paris) described experimental verification in $AuCu_3$ and in CuZn of the exact general equation of Yvon for long-range order in order-disorder transformations. Yvon's theory is therefore an improvement over that of Cowley.

Jack (Newcastle) described a new iron nitride which occurs in the tempering of nitrogen martensite and of nitrogen ferrite. It is a martensite in which the interstitial atoms are completely ordered. It is an intermediate in the decomposition of martensites of all compositions between Fe_4N and Fe_2N. Transformations of this kind are also observed in the cobalt-nitrogen and in the cobalt-carbon systems.

In these transformations, changes in the directional-valence forces, and not in size factor, are responsible for the formation of least-strain-energy structures in which alternate cells contain the interstitial atoms, the resultant distortion being absorbed by the intermediate empty octahedral cells.

Crystallization of Selenium

Studies of the crystallization velocity of supercooled liquid selenium of varying degrees of purity and as a function of temperature were reported by Borelius (Stockholm).

"THE TIMES REVIEW OF THE PROGRESS OF SCIENCE"

"The Times" (London) has announced a new quarterly to be called "The Times Review of the Progress of Science." The subscription price by mail is 2/6 (35 ¢)

per year to the United States. The present issue has papers on biology, mathematics, metallurgy, psychometrics, geology, chemistry, etc. The authors include Prof. A.V. Hill, Dr. Erwin Schrödinger, Prof. Frederick Bartlett, Dr. E.C. Bullard, Sir John Simonsen, Dr. Edward Hindle, and Prof. E.L. Hirst. Orders may be sent to "The Times," London, E.C.4.

PERSONAL NEWS ITEMS

Dr. E.C. Kendall of the Mayo Clinic, Nobel Prize Winner 1950, will deliver the Heberden Oration at the British Medical Association House, London, on 19 September 1951.

C.A. Coulson, Professor of Theoretical Physics at King's College, London, has been appointed Rouse Ball Professor of Mathematics at Oxford to succeed Professor E.A. Milne in January.

FORTHCOMING EVENTS

The following meetings are considered to be of future interest to American scientists:

Date	Meeting	Place
16-20 Sept.	German Mathematical Society Meeting	Berlin
22 Sept.	The Biochemical Society 300th Meeting at Rowett Research Institute	Aberdeenshire
25 Sept. - 2 Oct.	Centennial of Austrian Meteorological Service	Vienna
6-21 Oct.	Industrial Exhibition of Berlin	Berlin
11-13 Oct.	German Meteorological Society	Bad Kissingen

Prepared by the Scientific Staff
Submitted by Dr. M. E. Bell
Deputy Scientific Director

Philip D. Lohmann

PHILIP D. LOHMANN
Captain, U.S.N.
Assistant Naval Attache for Research