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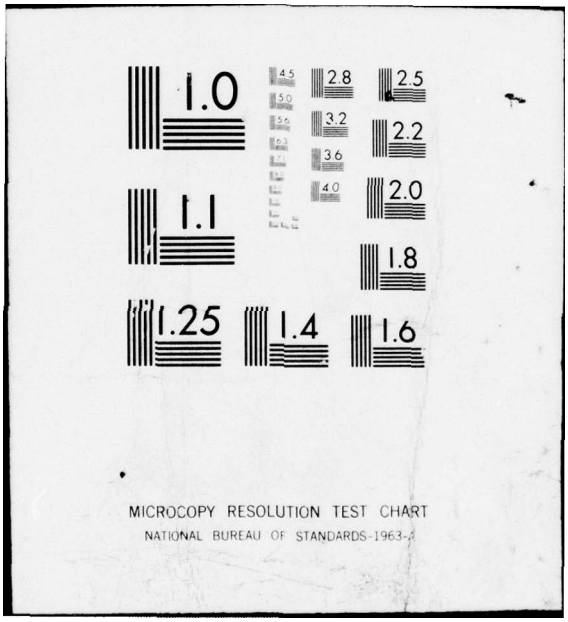
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EUROPEAN SCIENTIFIC NOTES.

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EUROPEAN SCIENTIFIC NOTES

15 March 1951 Vol. 5, No. 6

AMERICAN EMBASSY LONDON, ENGLAND

OFFICE OF NAVAL RESEARCH
London

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PROCESSING TECHNIQUES FOR NUCLEAR EMULSIONS

Most processing techniques in use at present for nuclear emulsions are based to a large extent on the methods developed by Dilworth and Occhialini; in particular, the method of "temperature development", in which the developer is first allowed to penetrate the emulsion at low temperature, has been universally adopted for thick nuclear emulsions. A detailed account of their methods is described in Report 13a of the Center of Nuclear Physics of the Free University of Brussels. Microfilms of this report are available from the Technical Information Division, Code 250, Office of Naval Research, Washington 25, D. C.

Background Grains in Nuclear Emulsions

At Imperial College, London University, Mr. A. J. Herz has been concerned for the past several months with developing standardized processing techniques for the cosmic ray emulsion work at the laboratory. His main emphasis has been on discovering means of reducing background grains and distortion. He has been investigating systematically the effects of temperature and time of development on grain density of minimum ionization tracks and on the background. His findings will be published in detail in the near future.

The preliminary results reported here were obtained using 200μ G-5 emulsions and ID-19 developer. The work will be continued with thicker emulsions and other developers as well. The minimum ionization tracks are those produced by sea-level μ mesons when the plates are

stored for a fortnight in a vertical position. Preliminary results indicate that development "saturates" after about 20 minutes, quite independently of temperature within reasonable limits (Fig. 1), and the only difference is that final grain density depends on the temperature of the developer.

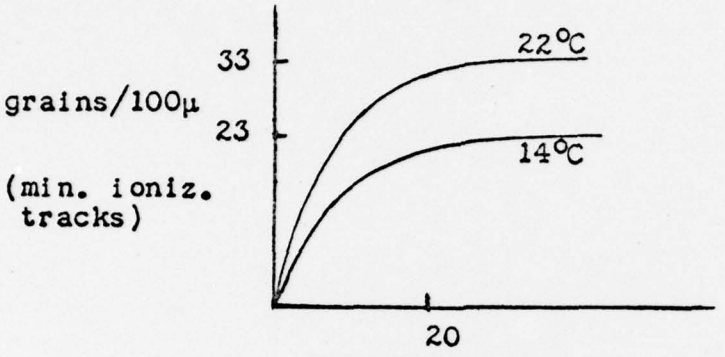


Fig. 1

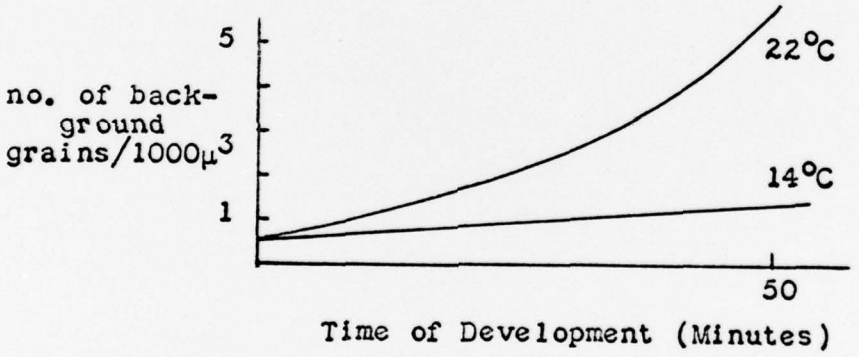


Fig. 2

On the other hand, background increases with time of development, particularly rapidly at elevated temperatures (Fig. 2). It is found also that a considerable amount of background is produced in the cold pre-development soaking stage (one hour at 5°C). Means of reducing the pre-development background are being explored.

Investigations on Developers at Bristol

In a forthcoming paper by Dainton, Gattiker and Lock of the University of Bristol, some further investigations are described dealing mainly with the penetration and temperature characteristics of different developers (cf. ESN 3, 222). The following developing solutions were investigated: D19b (metol-hydroquinone, pH 10.0), azol (para-aminophenol, pH 11.5), normal amidol (p-diaminophenol, pH 7.2) and amidol bisulphite (pH 6.7). Penetration time was measured by exposing the emulsion from the back to a light pattern and determining at what time this pattern begins to appear as the developing solution penetrates towards the emulsion-glass interface. Penetration time T was found to decrease with pH, and could be reduced by 30-40 percent by soaking the emulsion in distilled water before placing it into the developer. Penetration time was found to vary with emulsion thickness in the following manner:

$$T = k\,(\text{developer, temperature}) \times (\text{thickness})^{1.4}$$

All developers investigated were found to be quite sensitive to temperature, D19b more so than amidol. From the point of view of background and stain, amidol bisulphite was found to give better results. All developers showed good stability at high temperatures (27°C). To reduce swelling, and thereby distortion, the developer should have a pH similar to that of the plate (Dilworth et al). This makes it desirable to have a developer which is slightly acid. Amidol was found to give most satisfactory results for thick emulsions (greater than 300μ) with sodium bisulphite added to give a pH of 6.7.

A small amount of sodium bisulphite added to a hypo solution leads to a reduction of stain in emulsions. Ammonium chloride is not favored although it shortens fixing time, because it also tends to remove developed grains near the surface of the emulsion. The standard fixing solution in use at Bristol consists of sodium thiosulphate (400 g.) and sodium bisulphite (30 g.) with sufficient water added to make 1,000 mls. The pH of this solution is 5.0.

The processing routine used at Bristol is shown in the table below:

AMIDOL BISULPHITE DEVELOPER

	EMULSION THICKNESS				
	100μ	200μ	400μ	600μ	1000μ
Soak in distilled water	15 mins	25 mins	90 mins	120 mins	240 mins
Developer at 5°C	15 "	25 "	90 "	120 "	300 "
"Hot plate" 27°C	25 "	25 "	30 "	30 "	35 "
Stop bath	10 "	20 "	90 "	120 "	180 "
Fixing	2 hours	5 hours	24 hours	70 hours	100 hours
Washing	4 "	12 "	60 "	72 "	120 "
Drying+	6 "	12 "	60 "	100 "	120 "

AZOL DEVELOPER

	EMULSION THICKNESS		
	100μ	200μ	400μ
Soak in distilled water	15 mins	25 mins	90 mins
Cold developer 5°C	30 mins	90 "	120 "
Warm stage 18°C	105 "	105 "	105 "
Stop bath++	30 "	45 "	90 "
Fixing	2 hours	5 hours	24 hours
Washing	4 "	12 "	60 "
Drying+	6 "	12 "	60 "

+ Before drying, plates are soaked in a 1 percent glycerine solution for 1 hour

++ The stop bath may be 5 percent sodium bisulphite or 1/2 percent acetic acid

CHARGE SPECTRUM OF PRIMARY COSMIC RADIATION

Work is in progress at Bristol University on the determination of the charge spectrum of the primary cosmic radiation as measured by G-5 emulsions exposed at 95,000 ft. at geomagnetic latitude 55°. The tracks considered in this analysis are at least 6 mm. long in one emulsion and have δ-ray counts greater than 1.0 per 100μ. A paper by Dainton, Fowler and Kent, to be published shortly in Phil. Mag., concerns mainly the technique used for charge determination. Moreover, their preliminary results give strong indications of the presence of a large component of lithium, beryllium and boron in the primary radiation.

The method uses δ-ray count and scattering; it is capable of greater accuracy in the region of charge of 3-6 than the δ-ray-range method and, in addition, gives also the energy of the particle. δ-Rays must have at least four grains to be considered in this analysis; in subsidiary investigations the relationship between δ-ray counts and velocity is accurately established. The mean angle of Coulomb scattering α was used to determine the energy of the particles and gave reliable results up to energies of about 3 Bev per nucleon. The δ-ray-scattering method leads to clearly resolved peaks in the charge distribution up to a Z of about 8.

SINGLE CONTACT PbTe PHOTOCELLS

Single contact PbTe photocells have been studied recently at the Telecommunications Research Establishment by Dr. A. F. Gibson using single crystals grown by W. D. Lawson. Each cell consists of a cat's whisker contact touching or soldered to a crystal face. The cells are evacuated and their temperature is controlled over the range 77°K to 290°K.

It was found that rectification is a necessary condition for observable photosensitivity. The p-type specimens show both rectification and photosensitivity; the n-type specimens show neither.

The time constant of the cells was less than 5μsec., even at 77°K. The sensitivity was correspondingly reduced below that of normal PbTe cells.

Dr. Gibson successfully interprets his experiments on the basis of the "barrier height modulation" theory. His measurements show an effective barrier height of about 0.1 volts at 90°K and a temperature dependence of about -7×10^{-4} volts per degree. The effective electronic charge was also found to be temperature dependent but without a uniform slope. The effective charge at 90°K was found by six different methods to yield values of about 0.35 e for soldered junctions. The agreement among the measurements is felt to be excellent proof of the consistency of the theory.

Some analogous measurements have been made on natural p-type PbS crystals. The room temperature photosensitivity of these cells makes it possible to operate them in the open air. A very small spot of light formed by a microscope objective was then used to explore the sensitivity near the probe. The half width of the sensitivity spot was found to be 38 microns. The barrier height for PbS was found to change from 0.08 volts at room temperature to 0.20 volts at 90°K. Taking this change with temperature into account, Dr. Gibson is able to demonstrate that the "absolute sensitivity" is proportional to the time constant and inversely proportional to the absolute temperature.

SURFACE REACTION OF METHANE WITH DEUTERIUM

The reaction of methane with deuterium on evaporated nickel surfaces has been investigated in some detail by Dr. C. Kemball, Cambridge University. The most striking result is the high concentration of completely deuterated methane, CD_4, in the initial products of reaction. This is explained in terms of a surface which is almost completely covered with adsorbed deuterium. Initially, all adsorbed methane molecules stay on the surface long enough to undergo complete exchange. This result is consistent with the observations of Turkevich in the case of ethylene + deuterium. In this case, ethylene is the more strongly adsorbed component and the first reaction product to make its appearance is ethane, C_2H_6.

The mass spectrometer was used as the analytical tool in this work. Production of a single ionic species for each molecule present was assured by using low potential electrons (15.5 volts). The leak to the mass spectrometer amounted to about 3 percent of material per hour. The initial rate of formation of the four possible

reaction products was observed at three different concentration ratios of the starting materials. The results are summarized in the following table.

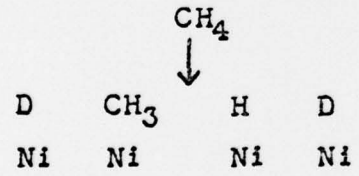
Reaction between Deuterium and Methane

Partial pressures in initial mixture in mm.Hg			Initial rate of formation in mm.x10^4/min.mgNi			
D_2	-	CH_4	CH_3D	- CH_2D_2	- CHD_3	- CD_4
4.85	-	12.7	16.9	- 2.7	- 21.5	- 56.5
4.85	-	3.26	2.6	- 0.16	- 2.3	- 12.5
14.5	-	3.26	1.3	- <0.04	- 0.46	- 3.5

By performing experiments at temperatures ranging from about 480°K to 530°K, the following energies of activation are obtained for the initial formation of the four reaction products:

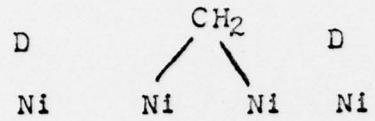
CH_3D	24	Kcal/mole
CH_2D_2	34	" "
CHD_3	31	" "
CD_4	31	" "

Kemball postulates two types of mechanisms to explain the observed results. Type 1 applies to the formation of CH_3D in terms of the following picture:



Assuming that surface equilibrium is established after a few seconds, the formation of CH_3D must be proportional to the first power of the initial methane pressure and to the inverse square root of the initial deuterium pressure. This is in agreement with the figures in column 1 of the table.

The type 2 mechanism which applies to the formation of the three other reaction products utilizes the following model:



According to this picture, 2,3 or 4 deuterium atoms can be introduced. The abundance of these three products is controlled by the relative probability of picking up a deuterium as against that of retaining a hydrogen.

It should be noted that the energy of activation figures given above suggest that the type 2 reactions should be slower than the type 1 reaction. The experimental observation is that they are faster and the explanation was found in terms of the entropy contribution. Since the type 2 mechanism leads to the formation of two HD molecules in each step it has a large positive entropy.

An inherent assumption underlying the work was that the mass spectrographic technique does not interfere with the results, i.e., that the chance of ionizing the different deuterated methanes is about the same. This was proven by experiments performed at about 1000°K in which the equilibrium constants between the different deuterated methanes were determined.

ROTATIONAL ISOMERISM IN ALCOHOLS

The co-existence of several rotational isomeric modifications in liquid aliphatic alcohols was recently demonstrated at the Laboratoire de Chimie Physique in Paris. M. Berthelot and Dr. Magat found that the relative intensities of several Raman spectral lines change as a function of temperature in ethanol, n-propanol and n-butanol.

The following energy differences were derived from the microphotometric intensity estimation of the photographic Raman spectra: ethanol 1,000 ± 200 cal.mole^{-1}, n-propanol 820 ± 180 cal.mole^{-1}, n-butanol 670 ± 190 cal.mole^{-1}. While rotational isomerism in ethanol is produced by rotation around the C-O bond, n-propanol and n-butanol can have

different rotational isomers produced by rotation around the C-O or around the C-C bonds. The precision of the experimental results is not sufficient to distinguish between these different higher energy forms and no complete analysis of the observed spectra has been attempted as yet.

The energy differences found in this investigation are essentially identical with those observed in the liquid normal paraffins. This indicates that hydrogen bonding in the liquid alcohols does not provide significant extra stability for any of the rotational isomers.

DISSOCIATION ENERGY OF THE C-Br BOND

Dr. M. Szwarc, Manchester University, is continuing his systematic studies on dissociation energies of chemical bonds by pyrolysis in a flow system (cf. Proc. Roy. Soc. A198, 267 (1949)). The dissociation energy of the C-Br bond has been obtained in a series of substituted bromomethanes. The results obtained are summarized below. All values are in Kcal/mole and are based on methyl bromide as the standard.

	$CH_3 - Br$ (67.5)		
	$CH_2Cl - Br$ 61.5	$CH_2Br - Br$	62.5
	$CHCl_2 - Br$ 53	$CHBr_2 - Br$	54.5
$CF_3 - Br$ 64.5	$CCl_3 - Br$ 49	$CBr_3 - Br$	49

The standard value for CH_3Br was estimated from independent thermochemical data. As can be seen, the change produced in the dissociation energies upon replacing fluorine by chlorine is very much greater than that produced by replacing Cl by Br. Furthermore, the sequences in columns 2 and 3 are quite similar. These results may be explained roughly in terms of van der Waals radii. If these molecules are represented by drawing in the appropriate circles around the central carbon atoms, it is found that the "overlap" between the halogens increases greatly in the replacement of F by Cl, but only slightly in that of Cl by Br. The reactions were followed by measurement of the rate of formation of HBr.

The dissociation energy of the C-Br bond in benzyl bromide was found to be 50.5 ± 2 Kcal./mole (J. Chem. Phys.,

17, 744 (1949)). The effect of various substituents in the benzene ring on this energy is currently being studied. The effects are very small and a few are listed below:

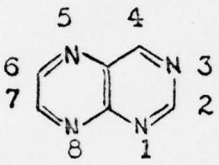
o-Cl, p-CH_3 . . . . . -1 Kcal.mole^{-1}

m-Cl, m-Br, m-CH_3, p-Cl, p-Br . . . . . 0 Kcal.mole^{-1}

SYNTHESIS AND PROPERTIES OF SIMPLE PTERIDINES

Dr. Adrien Albert and collaborators of the Department of Medical Chemistry, the Australian National University, presently located in London, is studying the synthesis and properties of pteridine (I) and its simple derivatives.

(I)



It is hoped this will lead to a better understanding of the relations between structure, physical properties and biological activity of these important compounds.

The condensation of 4,5-diaminopyrimidines with carbonyl compounds has been used to prepare a number of new pteridines having amino, dimethylamino, hydroxy, methoxy or chloro groups in the 2 or 4 position. 6- and 7-Monohydroxypteridines have also been prepared. The use of pyrazine derivatives as a route to pteridines has proved less fruitful. Substituted pteridines do not undergo many of the reactions characteristic of the analogous pyrimidines, purines or acridines. This means that substituents in the pteridine ring are, in general, best introduced before ring closure.

The solubility, pK_a u.v. spectra and chromatographic behaviour of the pteridines were determined. The simple hydroxy, amino and mercapto pteridines, in common with the naturally occurring ones, are practically insoluble in organic solvents and sparingly soluble in water. Pteridine itself, and the chloro, dimethylamino and methoxyl derivatives are highly soluble in cold water and organic

solvents, including petroleum ether. This striking difference is believed to be due to hydrogen bonding between the -OH, $-NH_2$, or-SH groups and the ring nitrogen atoms of adjacent molecules. That the difference in solubility is due to hydrogen bonding rather than dipole attraction is substantiated by the fact that the 2-dimethylaminopteridine is 540 times as soluble as the 2-amino derivative.

6-Hydroxypteridine displays O⇔C prototropy, a phenomenon never previously described for a hetero-aromatic hydroxy compound. Xanthopterin has a hydroxy group in the 6 position and a free 7 position and consequently shows this effect. Whether the unique biological properties of xanthopterin are connected with this chemical behavior is at present not known.

Some of this work has been reported in the Journal of the Chemical Society for February 1951, and further details will appear in that publication.

MODEL OF A SPIRAL GALAXY

Professor G. C. McVittie of Queen Mary College, University of London, presented before the Royal Astronomical Society on 9 March a summary of recent work done at Harvard University on the structure of spiral galaxies. The investigation was carried out in collaboration with Mrs. C. Payne-Gaposchkin and arose from her study of the distribution of special types of stars in our own galaxy.

A simple system was investigated in which at the "initial" instant the "galaxy" was in the shape of a long thin bar, whose mass was mostly concentrated at the center, rotating slowly with angular velocity ω about an axis perpendicular to the bar. At the initial instant the material of the bar formed itself into stars, which thereafter moved in a common plane, their subsequent motion regulated by the initial angular velocity and the gravitational attraction of the nucleus. The initial points of the orbits will be either aphelia or perihelia separated by a circular orbit. The bar is assumed to be terminated at a radius corresponding to the parabolic velocity, so that only closed orbits are considered. The region in the immediate vicinity of the nucleus is degenerate in this model and is not considered.

The locus of present positions at time t of the stars which formed one-half of the bar is called a spiral arm in the model. The locus is determined by three parameters: the mass M of the nucleus, the radius r_c of the circular orbit, and the time t since the formation of the stars. No simple expression can be found for this locus, but by use of a subsidiary set of curves the shape of the spiral arm can be found graphically. An important consequence of the theory is that the shape and size of a model galaxy do not determine M, r_c, and t uniquely, because these parameters occur in certain combinations, but if the velocities at various points along the spiral arm are also known, then the parameters can be determined.

The model has been tested by comparison with galaxy M33, for which a considerable amount of observational data is available on the size, shape and velocities of the spiral arms. The deduced mass of M33 is 7.3×10^8 Sun-masses, the radius of the circular orbit is 0.5 kiloparsec and the age of its arms is 1.8×10^7 years. These values are in fairly good agreement with those estimated by Meyall and Aller by other methods.

With advancing age the inner region of a galaxy becomes very complicated because the spiral arms formed on each side of the nucleus cross each other periodically. A second important feature is that a spiral arm may be simultaneously "leading" (receding from the nucleus with increasing polar angle) along a part of the locus and "trailing" (approaching the nucleus with increasing polar angle) along another part. This somewhat surprising result is a consequence of the variations in velocity going inward from one elliptic orbit to another.

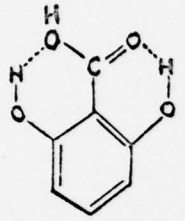
A trial and error method of fitting the model to our galaxy, whose shape, size and internal velocity distribution are not known, leads to the values M = 1.4 to 1.8 x 10^{11} Sun-masses, r_c = 9.1 to 11.3 kiloparsecs, and t = 7.3 to 9.1 x 10^8 years.

γ-RESORCYLIC ACID IN TREATMENT OF RHEUMATIC FEVER

Dr. James Reid of the Gardiner Institute of Medicine, Glasgow, Scotland, presented data at the Royal Society

of Medicine, London, 13 April 1951, on the treatment of rheumatic fever patients with γ-resorcylic acid (2,6-dihydroxybenzoic acid) (I).

Since compounds of salicylic acid (II) have proved so successful as agents in reducing clinical symptoms of rheumatic fever, γ-resorcylic acid, which incorporates the chelate ring found in salicylic acid, was subsequently tried on a series of patients after pharmacologic studies showed it to be relatively non-toxic in therapeutic doses of 0.6 to 1.0 grams per day.



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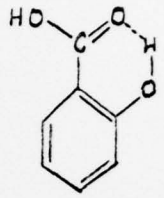

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Patients receiving treatment were relieved of joint pains in 1 to 4 days. One patient was able to move affected joints a few hours after the first course of treatment. Between 4 to 7 days, 6 of 7 patients had slight recurrence of symptoms, but no swelling of joints. One patient developed true arthritis. The effect of the drug on temperature, pulse and respiration was not as dramatic as that produced by salicylates, and temperature tends to fall by lysis rather than by crisis. The profuse sweating produced by salicylates was not present. Its effect on the erythrocyte sedimentation rate after treatment was underway was similar to that seen in salicylate therapy.

A development of a mild Cushing's syndrome was noticed in nearly all patients treated, and the fluid changes in the tissues of the body, by the action of the acid on body proteins, closely resembles that developing in patients receiving cortical hormones. In this regard, it was noted that γ-resorcylic acid produces marked inhibition of healing undifferentiated from that seen grossly and histologically in subjects treated with ACTH.

These data will appear in a forthcoming issue of the British Medical Journal.

ST. ANDREWS MATHEMATICAL COLLOQUIUM 1951

The Edinburgh Mathematical Society is sponsoring a Mathematical Colloquium at St. Andrews from 18-28 July 1951. The colloquium will consist of several short invited courses of lectures on topics of general interest to mathematicians, supplemented by a number of single lectures, which will usually be on more specialized subjects. The following courses have been arranged:

Prof. H.S.M. Coxeter (Toronto), "Kaleidoscopes and Quadratic Forms"
Mr. A. E. Ingham (Cambridge), "Analytical Theory of Numbers"
Prof. J. L. Synge (Dublin), "Geometry of Function Space"
Prof. G. Temple (London), "Mathematical Problems of Supersonic Aerodynamics"

The St. Andrews Colloquia were formerly held every four years, but this is the first post-war meeting. It is worth mentioning that the schedule fits in well with the meeting of the British Association for the Advancement of Science in Edinburgh 8-15 August, and the Edinburgh Festival. Application forms may be obtained from the Colloquium Secretary, Dr. D. E. Rutherford, United College, St. Andrews, Scotland. The combined membership and accommodation fee is £9.10.0.

NEW JOURNAL

The first issue of a new quarterly journal called "Vacuum" has just been published by the firm of W. Edwards and Company. The journal is a "review of developments in vacuum research and engineering". Twenty-eight pages of literature references and abstracts are given in the first issue along with 40 pages of contributed papers and reviews. American contributions are invited and subscriptions are welcome at $4.20 a year. Correspondence should be addressed to Worsley Bridge Road, Lower Sydenham, London, S.E. 26.

CONFERENCE ON AUTOMATIC CONTROL

A Conference on Automatic Control will be held 16-21 July at the College of Aeronautics, Cranfield, Bedfordshire, England. The Conference is being held under the auspices of the Department of Scientific and Industrial Research and is expected to cover the most recent advances ranging from fundamental research to industrial applications. Representatives from several countries have been invited to read papers but the major portion of the Conference will be devoted to discussion.

Details concerning the program, registration, accommodation, etc., may be obtained by writing:

The Organising Secretary
Conference on Automatic Control - 1951
Department of Scientific and Industrial Research
Charles House
5-11 Regent Street
London, S.W.1,
England

Those wishing to attend should signify their intention not later than 30 April. An exhibit of equipment will be held at the Conference.

INTERNATIONAL CONGRESS OF CRYSTALLOGRAPHY

The Second General Assembly and International Congress of the International Union of Crystallography will be held in Stockholm from 27 June to 3 July 1951, under the chairmanship of A. Westgren, vice-president of the Union. Crystallographers throughout the world are invited to attend the Congress and to present papers. In conjunction with the Congress, two symposia will be held on "Advanced Techniques in Structure Determination" and "Electron Diffraction in Liquids and Gases" for specialists in these fields.

Correspondence concerning contributions to the Congress or to the Symposia should be addressed to the Secretary of the Programme Committee, F. E. Wickman, Stockholm 50, Sweden.

LOW TEMPERATURE PHYSICS CONFERENCES

The U.N.O. Commission for Very Low Temperatures will hold its second meeting in Oxford on August 22-28, 1951. The program is as follows:

August 22 - Introductory Lectures
August 23 - Liquid Helium
August 24 - Superconductivity
August 27 - Magnetic Phenomena
August 28 - Thermal Properties

This meeting will be followed by the Eighth International Congress of Refrigeration in London on August 29-September 11.

INTERNATIONAL SPECTROSCOPY CONFERENCE

An international meeting of spectroscopists is being organized in Basel for June 28-30, 1951. The main subjects to be discussed will be: (1) Experimental Results of Atomic and Molecular Spectroscopy (Introduction by Professor B. Miescher, Basel), (2) Spectroscopy and the Chemical Bond (Introduction by Professor R. Mecke, Freiburg).

Those wishing to read a short paper at this meeting should inform Professor Miescher (Physical Institute, University of Basel) before May 15.

PERSONAL NEWS ITEMS

Dr. A. G. Evans, Senior Lecturer at Manchester University, has been appointed Professor of Chemistry at the University College of South Wales and Monmouthshire, Cardiff. He succeeds Professor W. J. Jones, who has retired.

Dr. M. E. Hains, Electron Physics Section, Associated Electrical Industries, Ltd., Research Laboratory, plans to visit various laboratories and universities in the United States during September-November.

ROYAL SOCIETY FELLOWS

The Royal Society elected 25 new Fellows at a meeting of the Society in London on March 15. They included:

C. S. Beals, Dominion Astronomer, Ottawa, Canada; J. S. K. Boyd, Director, Wellcome Laboratories of Tropical Medicine, London; D. G. Catcheside, Reader in Plant Cytogenetics, Cambridge; A. H. Cook, Assistant Director, Brewing Industry Research Foundation, London; S. J. Folley, head of Department of Physiology, National Institute for Research in Dairying; H. Frohlich, Professor of Theoretical Physics, Liverpool; G. Gee, Director, British Rubber Producers' Research Association; H. A. Heilbronn, Professor of Mathematics, Bristol; G. Herzberg, Director, Division of Physics, National Research Council, Ottawa; J. B. Hutchinson, Director, Central Cotton Research Station, Namulonge, Uganda; H. R. Ing, Reader in Pharmacological Chemistry, Oxford.

D. Lack, Director, Edward Grey Institute of Field Ornithology, Oxford; T. R. R. Mann, member of staff, Agricultural Research Council; K. A. G. Mendelssohn, University Demonstrator, Oxford; A. Neuberger, biochemist, National Institute for Medical Research, London; L. B. Pfeil, Director of Research, Mond Nickel Company, Limited; J. A. Prescott, Director, Waite Agricultural Research Institute, Adelaide, South Australia; M. H. L. Pryce, Wykeham Professor of Physics, Oxford; W. J. Pugh, Director, Geological Survey and Museum, London; J. A. Ratcliffe, Reader in Physics, Cambridge; T. A. Stephenson, Professor of Zoology, University College, Aberystwyth; W. H. Thorpe, Lecturer in Entomology, Cambridge; P. J. du Toit, President, Council for Scientific and Industrial Research, South Africa; A. M. Turing, assistant director, Computing Machine Laboratory, Manchester University; A.R.J.P. Ubbelohde, Professor of Chemistry, Queen's University, Belfast.

FORTHCOMING EVENTS

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

Date	Meeting	Place
3-6 May	German Physical Chemistry Society, "Physico-Chemistry Problems of Biology"	Göttingen
11-12 May 15-17 May	French Physical Society's 48th Annual Exhibition of Scientific Instruments and Apparatus	Paris
16-23 May	Symposium on Phase Contrast and Contrast by Interference (IUPAP)	Paris
24-30 May	Week of Exact Sciences	Berlin
28-29 May	National Physical Laboratory, Teddington, "Open Days" for industrial representatives	England
29-31 May	Annual Congress of Opthalmological Society of the U.K.	London

Prepared by the Scientific Staff
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