

International Union of Crystallography

Report of Executive Committee for 1969

Meetings

The Eighth General Assembly of the Union was held at the State University of New York at Stony Brook, Stony Brook, U.S.A., 13–21 August 1969, by invitation of the U.S.A. National Academy of Sciences – National Research Council. A summary report will be published in this journal; a more detailed report of the proceedings of the General Assembly will be published separately and will be sent to the National Committees for Crystallography and to all persons participating in the work of the Union.

The General Assembly met on the afternoon of Thursday 14 August, the evening of Saturday 16 August and the morning of Thursday 21 August. Apart from the normal routine business, such as the receipt and discussion of the reports of the Union's Commissions and Sub-committees for the period since the Seventh General Assembly (1966), and the election of new Officers of the Union and new members of the Union's Commissions, a number of important decisions were made. Perhaps the most important one was that the Union should seek formal incorporation in Switzerland as an Association under Articles 60 and following of the Swiss Civil Code, having its legal domicile in Geneva. This decision was taken by the General Assembly on 16 August with 50 votes in favour, none against and 5 abstentions. The Assembly unanimously approved the action taken by the Executive Committee in appointing a Union Executive Secretary to take over the day-to-day administration from the General Secretary and the Treasurer, in order to relieve these Honorary Officers from the load of work which had become too heavy. A number of amendments to the Union's Statutes and By-Laws were made. Two new Commissions of the Union, namely the Commission on Journals and the Commission on Crystallographic Studies at Controlled Pressures and Temperatures, set up earlier as *ad interim* arrangements, were confirmed. The Commission on *Acta Crystallographica*, after having been in existence for 21 years, was merged in the Commission on Journals. The Assembly approved the appointment by the Executive Committee of a standing Sub-committee on the Union Calendar, which was assigned the main task of planning and obtaining commitments for international meetings sponsored or co-sponsored by the Union for a period extending at least 3 years ahead.

Three changes in membership were made:

- (1) The Deutsche Vereinigung für Kristallographie of the Deutsche Gesellschaft für Geologische Wissenschaften, German Democratic Republic, was accepted as a separate member (Adhering Body);
- (2) The Sektion für Kristallkunde of the Deutsche Mineralogische Gesellschaft, Federal Republic of Germany, was accepted as a separate member (Adhering Body);
- (3) The replacement of the Ministry of Scientific Research and Cultural Affairs of India (which was the Adhering Body at the time of the Seventh General Assembly in 1966) by the National Institute of Sciences of India as Adhering Body in India was accepted.

At the Seventh General Assembly the societies mentioned above under (1) and (2) had agreed to form a group adher-

ence; these bodies are continuing their adherence separately. The total number of members (Adhering Bodies) is now 31.

The Eighth International Congress of Crystallography was held during the period of the General Assembly. The scientific programme consisted of a Congress Discourse and 484 papers presented in 8 parallel sessions. It was preceded by a Topical Meeting on the Crystallography of Biologically Important Substances (6–12 August, State University of New York College at Buffalo, 84 papers, no parallel sessions) and followed by 4 Topical Meetings (29, 14, 32 and 37 papers, 22–24 August) at Stony Brook, 1 Topical Meeting (34 papers, 22–23 August) at Brookhaven National Laboratory and a tour of scientific laboratories at Washington D.C. (25–27 August). The Union's Commission on Crystallographic Computing organized a Summer School on Crystallographic Computing, at Ottawa, Canada, 4–12 August. The meetings were attended by 710 active and 277 accompanying participants from the U.S.A. and 696 and 134 respectively, from 36 other countries, making a grand total of over 1800.

The Commissions of the Union also met in Stony Brook and organized 11 sessions on subjects falling within their domains. Exhibitions of Non-commercial Crystallographic Apparatus, Commercial Crystallographic Apparatus, Books and Crystallographic Photographs were also held. Various social events took place.

Executive Committee

The membership of the Executive Committee as elected by the General Assembly in Stony Brook is as follows

President: Prof. A. Guinier (France); Vice-Presidents: Prof. F. Laves (Switzerland), Prof. B. E. Warren (U.S.A.); General Secretary: Dr G. Boom (Netherlands); Treasurer: Prof. D. W. J. Cruickshank (U.K.); Immediate Past President: Prof. N. V. Belov (U.S.S.R.); Ordinary Members: Prof. D. C. Hodgkin (U.K.), Prof. N. Kato (Japan), Dr A. Linek (Czechoslovakia), Dr A. McL. Mathieson (Australia), Prof. B. K. Vainshtein (U.S.S.R.), Prof. W. H. Zachariasen (U.S.A.). [Dr Boom resigned as General Secretary on 3 April 1970. The Executive Committee accepted his resignation with regret and, after agreeing to recombine the offices of General Secretary and Treasurer, unanimously appointed Prof. Cruickshank to this joint office as from 3 April 1970.] Dr J. N. King took up his appointment as Executive Secretary on 1 February 1969.

Publications

In 1969, Volume 25 of *Acta Crystallographica* was published; Section A totalled 732 pages and Section B, 2672 pages. Volume 2 of the *Journal of Applied Crystallography*, consisting of 312 pages, was also published during the year. Volume 25 (index 1951–60) and Volume 26 (for 1961) of *Structure Reports* were published in September and February 1969, respectively. Volume 27 is expected to be published in late 1970.

Volume I of *International Tables for X-ray Crystallography* had to be reprinted for the second time, now with corrections and replacements. Two Parts of the total of

six of the Pilot Issue for the new and extended edition were sent to some 220 laboratories all over the world to gather criticisms and advice.

Early Papers on Diffraction of X-rays by Crystals, edited by J. M. Bijvoet, W. G. Burgers and G. Hägg, under the auspices of the Union's Commission on Crystallographic Teaching, was published in August. The manuscript was prepared with the aid of a contract with UNESCO under the UNESCO Pilot Project on the Teaching of Crystallography in relation to the Physics and Chemistry of Solids. The book contains (excerpts from) historic papers, in the authors' own words.

Adhering Bodies

The acceptances by the Eighth General Assembly of the Deutsche Vereinigung für Kristallographie of the Deutsche Gesellschaft für Geologische Wissenschaften, German Democratic Republic in Category II and the Sektion für Kristallkunde of the Deutsche Mineralogische Gesellschaft, Federal Republic of Germany in Category IV, together with the replacement of the Ministry of Scientific Research and Cultural Affairs of India by the National Institute of Sciences of India as the Adhering Body in India have been mentioned earlier in this report.

An application for membership from the Ministry of Scientific Research of the United Arab Republic was received in mid-1968. Further information on the membership of the National Committee was requested but has not been received yet.

The latest list of the Adhering Bodies of the Union and the names and addresses of the Secretaries of the National Committees is given in Table 1.

The list of memberships of National Committees will be given in the *Report of Eighth General Assembly*.

Sub-committee on the Union Calendar

In 1968, the Executive Committee appointed a permanent Sub-committee on the Union Calendar, with a member of the Executive Committee as Chairman. A new Chairman, Dr A. Linek, was appointed in August 1969 and the Sub-committee is now gathering information on proposed or prospective meetings, and is considering requests for I.U.Cr. sponsorship. It will coordinate the long-term planning of meetings which the Union organizes or co-sponsors and will actively encourage the initiation of small or intermediate-sized meetings in fields where development is significant. It is hoped thereby to avoid future triennial Congresses of Crystallography becoming excessively large and cumbersome to handle.

Work of the Commissions

Commission on Journals

During 1969 the Commission on Journals produced Volume 25 of *Acta Crystallographica* and Volume 2 of the *Journal of Applied Crystallography*. Like Volume 24, Volume 25 of *Acta Crystallographica* was divided into two sections, Section A (crystal physics, diffraction, theoretical and general crystallography) containing 732 pages, not counting the index, plus a supplement of 295 pages containing the abstracts of the papers offered for the Eighth International Congress. Section B (structural crystallography and crystal chemistry) contained 2672 pages, again not including

the index. The regular issues thus amounted to over 3400 pages, or approximately 40% more than during 1968. (The increase is 53% if the supplement is included.) Seven issues of the *Journal of Applied Crystallography* appeared, two belonging to Volume 1 and bearing the nominal date 1968. The sixth issue of Volume 2, bearing the date December 1969 was actually distributed in January 1970. There has been a considerable improvement in the promptness of publication of the *Journal of Applied Crystallography*, and it may confidently be hoped that the six issues for 1970 will actually appear during that year. Unfortunately, the irregularities in the publication of the *Journal of Applied Crystallography* have interfered somewhat with the regularity of production of the sections of *Acta*, which have sometimes been delayed by two or three weeks. The increase in the volume of publication in Section B has enabled the Technical Editor to reduce the backlog of papers, so that the average time required for publication in Section B is nearly two months less than it was during 1968. A survey of the contents of *Acta Crystallographica* for the last six years and for the *Journal of Applied Crystallography* for the last two years is given in Table 2.

The Commission met several times during the Eighth General Assembly. Regrettably, much of the attention of the Commission had to be directed to financial matters. The volume of regular publication in 1969 was about 50% higher than in 1968 when the subscription rates were increased last, and the cost of printing and distribution has risen somewhat as well. The Commission was therefore obliged to recommend substantial increases in the subscription rates for *Acta Crystallographica* for 1970 and subsequent years. The recommendations of the Commission were accepted by the Executive Committee, and full details were given in *Acta Cryst.* (1969) A25, 718, and elsewhere. The discount for personal subscribers was increased simultaneously, with the effect that the individual rate for Section A remained unchanged, and the percentage increase in the individual rate for Section B was less than the percentage increase for other subscribers. By adopting various economy measures, such as greater insistence on compactness of presentation and in particular by greater compression of *F* tables, it is hoped that these rates can be maintained until the next General Assembly.

Commission on Structure Reports

Volume 25 (Cumulative Index 1951–60) and Volume 26 (1961) were published during the year. An unexpected delay with one manuscript for Volume 27 prevented it also being published. The printing of Volumes 28, 29 and 30, which introduce a somewhat modified format, is delayed in each case by the manuscript for the Metals Section.

Co-editors are now working on most sections of Volumes 28–33 (1963–1968). It will be seen that a start is being made in the preparation of *Structure Reports* for recent years with the intention that these volumes should appear within two years. At the same time work is continuing on the back years. For the years from 1966 onwards, reports are only being written on proper structure determinations. Papers recording only cell sizes and space groups will no longer be reported. It is intended that this policy shall do much to improve the immediacy of *Structure Reports*.

Commission on International Tables

At the end of this year the second reprinted edition of Volume I was published. During the year the additional

Table 1. *Adhering Bodies*

Country	Category*	Adhering body	Secretary of National Committee
Argentina	I	Consejo Nacional de Investigaciones Científicas y Técnicas	MARÍA JIMÉNEZ DE ABELEDO, Laboratorio de Difracción, Comisión Nacional de Energía Atómica, Avenida del Libertador General San Martín 8250, Buenos Aires
Australia	III	Australian Academy of Science	J. DEEBLE, Australian Academy of Science, Gordon Street, Canberra City, A.C.T.
Austria	I	Österreichische Akademie der Wissenschaften	J. ZEMANN, Mineralogisches Institut der Universität, Dr Karl Lueger-Ring 1, 1010 Vienna
Belgium	II	Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique	R. PANKOWSKI-FERN, Institut des Matériaux, U.L.B., 87 Avenue Adolphe Buyl, Brussels 5
Brazil	I	Conselho Nacional de Pesquisas	R. R. FRANCO, Conselho Nacional de Pesquisas, Avenida Marechal Camara 350, Rio de Janeiro, G.B.
B.R.D. (German Federal Republic)	IV	Sektion für Kristallkunde of the Deutsche Mineralogische Gesellschaft	TH. HAHN, Institut für Kristallographie der Techn. Hochschule, Templergraben 55, Aachen
Canada	III	National Research Council	F. R. AHMED, Division of Biochemistry, National Research Council, Ottawa 7, Ontario
Chile	I	National Committee for Crystallography	I. GARAYCOCHEA, Laboratorio de Cristalografía, Universidad de Chile, Casilla 5487, Santiago
Czechoslovakia	I	Československá Akademie Věd	A. LÍNEK, Institute of Solid State Physics, Československá Akademie Věd, Cukrovarnická 10, Prague 6
D.D.R. (German Democratic Republic)	II	Deutsche Vereinigung für Kristallographie of the Deutsche Gesellschaft für Geologische Wissenschaften	H. NEELS, Institut für Mineralogie und Petrographie der Karl-Marx-Universität, Scharnhorststrasse 20, 703 Leipzig
Denmark	I	Akademiet for de Tekniske Videnskaber	I. K. LARSEN, The Royal Danish School of Pharmacy, Chemical Laboratory C, DK-2100 Copenhagen.
Finland	I	Suomalainen Tiedeakatemia	M. AALTONEN, Wihuri Physical Laboratory, University of Turku, Vesilinnantie 5, Turku
France	IV	Académie des Sciences (Institut de France)	A. AUTHIER, Laboratoire de Minéralogie-Cristallographie, 9 Quai Saint Bernard, Tour 26, Paris Ve
Hungary	I	Magyar Tudományos Akadémia	L. ZSOLDOS, Institute for Experimental Physics, L. Eötvös University, Muzeum krt 6-8, Budapest VIII
India	I	Indian National Science Academy	R. SRINIVASAN, Centre of Advanced Study in Physics, University of Madras, Guindy Campus, Madras 25
Israel	I	Israel Crystallographic Society	D. RABINOVICH, Department of Chemistry, The Weizmann Institute of Science, Rehovoth
Italy	III	Consiglio Nazionale delle Ricerche	G. COCCO, Istituto di Mineralogia della Università di Perugia, 06100 Perugia
Japan	IV	Science Council of Japan	Y. SAITO, The Institute for Solid State Physics, University of Tokyo, Roppongi 7, Minato-ku, Tokyo 106
Netherlands	III	Stichting voor Fundamenteel Onderzoek der Materie met Röntgen- en Elektronenstralen	D. FEIL, Chemical Physics Laboratory, Technische Hogeschool Twente, Postbus 217, Enschede
New Zealand	I	The Royal Society of New Zealand	P. P. WILLIAMS, Chemistry Division, D.S.I.R., Private Bag, Petone
Norway	I	Det Norske Videnskaps-Akademi	CHR. RØMMING, Department of Chemistry, University of Oslo, Blindern, Oslo 3
Pakistan	I	Pakistan Council of Scientific and Industrial Research	M. M. QURASHI, Pakistan Council of Scientific and Industrial Research, Off University Road, Karachi-32
Poland	I	Polska Akademia Nauk	K. ŁUKASZEWICZ, Institute of Low Temperature and Structure Research, Polish Academy of Sciences, Plac Katodralny 1, Wrocław
South Africa	I	South African Council for Scientific and Industrial Research	G. GAFNER, National Physical Research Laboratory, P.O. Box 395, Pretoria
Spain	III	Consejo Superior de Investigaciones Científicas	S. GARCÍA-BLANCO, Instituto de Química Física 'Rocasolano', Consejo Superior de Investigaciones Científicas, Serrano 119, Madrid 6
Sweden	II	Kungliga Vetenskapsakademien	S. ABRAHAMSSON, Crystallography Group, University of Göteborg, Medicinareg. 9, S-400 33 Göteborg 33
Switzerland	II	Schweizerische Gesellschaft für Kristallographie	J. D. DUNITZ, Laboratorium für Organische Chemie der ETH, Universitätsstrasse 6/8, CH-8006 Zürich
U.K.	V	The Royal Society	D. C. MARTIN, The Royal Society, 6 Carlton House Terrace, London S.W.1
U.S.A.	V	National Academy of Sciences - National Research Council	W. PARRISH, Dept. KO5, IBM Research Laboratory, Monterey & Cottle Roads, San Jose, California 95114

Table 1 (cont.)

U.S.S.R.	V	Akademija Nauk SSSR	V. I. SIMONOV, Institute of Crystallography, Leninsky Prospekt 59, Moscow B-333
Yugoslavia	I	Jugoslavenska Akademija Znanosti i Umjetnosti	B. KAMENAR, Laboratory of General and Inorganic Chemistry, Faculty of Science, Ul. Soc. Revolucije 8, Zagreb

* Adherence to the Union is in one of five Categories I-V, with corresponding voting powers and contributions as set out in Statutes 3-6, 5-5 and 9-4.

Table 2. Survey of the contents of the Union journals

Acta Crystallographica								
Vol.	Year	Number of pages	Articles			Short Communications		
			Number	Number of pages	Average length	Number	Number of pages	Average length
17	1964	1631	242	1406	5.81	127	162	1.28
18 & 19	1965	2172	330	1943	5.89	134	161	1.20
20 & 21*	1966	2273*	287	1751	6.10	118	159	1.35
22 & 23	1967	2094	315	1843	5.85	97	126	1.30
A 24	1968	714	108	688	6.37	27	34	1.25
B 24		1706	251	1687	6.72	62	89	1.44
A 25	1969	1027	120	733	6.11	25	31	1.24
B 25		2672	355	2547	7.17	74	149	2.01

Journal of Applied Crystallography								
Vol.	Year	Number of pages	Articles			Short Communications		
			Number	Number of pages	Average length	Number	Number of pages	Average length
1	1968	330	54	303	5.60	7	10	1.39
2	1969	312	50	272	5.44	12	21	1.75

* Volume 21 includes 304 pages of abstracts of papers presented at the Moscow Congress.

† Plus 24 pages of joint (A + B) index.

‡ For the first time the number of plate-pages was included in the number of pages per paper.

§ Volume A 25 includes 295 pages of abstracts communicated to the Stony Brook Congress and 276 pages of papers and discussion at the Cambridge Intensity Meeting, 1968.

Volume IV of the present edition of *International Tables* was in active preparation, and this is due to be published in 1971. It will be named *Mathematical, Physical, and Chemical Tables (Supplement)* and will contain updated tables of such quantities as scattering factors, absorption coefficients, wavelengths, etc., as well as some new material including tables of contents for all volumes of the edition and complete errata for all previous volumes.

Work continued on the Pilot Issue which is to provide the information required for the planning of the future edition. Since the number of contributors is quite large, progress cannot be fast, but two Parts have been issued to the laboratories nominated by the National Committees and others.

At Stony Brook, in August 1969, a series of meetings was held by members of the Editorial Committee in order to further the work on the Pilot Issue. At these meetings the position regarding the various Parts was as follows:

Part 1	<i>Direct Space</i>	Available in draft at Stony Brook
Part 2	<i>Reciprocal Space</i>	Available in draft
Part 3	<i>Patterson data</i>	Issued in print
Part 4	<i>Synoptic Tables</i>	Not available
Part 5	<i>Generalised Symmetry</i>	Issued in print
Part 6	<i>Physical Properties in Symmetric Media</i>	Not planned until 1971

Diagrams and Appendices to Parts 1-5 inclusive

Partly available in draft

The Pilot Issue covers only the projected Series A (*Symmetry Tables*). In addition the plan includes Series B (*Diffraction Tables*), but no work on this is envisaged for several years because the existing Volumes II and III, along with the new Volume IV, will satisfy requirements for a considerable time yet.

By the end of the year work on Parts 1 and 2 was largely completed, and these will be issued early in 1971. Those laboratories receiving the Pilot Issue are under the obligation to use the Parts and to send in criticisms, comments and suggestions. This 'feed-back' is being handled by Dr N. F. M. Henry, Department of Mineralogy, Downing Place, Cambridge CB2 3EW, England.

At the Eighth General Assembly, D. P. Shoemaker was elected to succeed N. F. M. Henry as Chairman of the Commission and the members of the Commission were re-appointed for a further three years.

Commission on Crystal Growth

The Commission met once during the Eighth General Assembly. One of the activities of the Commission was the organization of a Topical Meeting on Crystal Morphology and its Relation to Crystal Structure and Environmental Conditions, held during three days following the close of

the Congress. The meeting was attended by people from various disciplines. A report was produced on trends of future developments in the field of crystal growth. A glossary of terms on crystal growth has been compiled in German, English and French; the possibility of including Russian is being explored. Work is continuing on a directory of laboratories, institutes and persons working in the field of crystal growth.

New tasks being undertaken are (a) the compilation of a bibliography of review papers and monographs on crystal growth; (b) a proposal for standardization on the description of polar substances and a review on etch figures; (c) the organization of a summer school on crystal growth in 1971, preceding the Third International Conference on Crystal Growth at Marseille, France.

Commission on Crystallographic Apparatus

The main items of business during the first half of the year involved preparations for the Commission's activities during the Eighth General Assembly and International Congress. These included two Exhibitions, one of Non-commercial Apparatus, organized by R. Rudman, consultant to the 1966-69 Commission, and the other of Photographs of Crystallographic Interest, organized by F. H. Herbststein with the assistance of E. County (Art Department, State University of New York at Stony Brook). Both Exhibitions were conveniently located in the Lecture Hall Center; the former in the Hexagon Room and the latter, very effectively, on the walls of the hallways of the Center. Prizes were awarded for the best photographic prints. (See also the report on the General Assembly and Congress.)

During the Congress, the Commission also held an Open Session on Intensity Measurement Projects. L. D. Jennings reported on the results obtained in the powder project (see *Acta Cryst.* (1969) A25, 217) and summarized additional information derived subsequently, while P. Suortti (on behalf of the group of workers in Helsinki) reviewed the possibilities of a further development of the project. The general consensus of opinion was that it would be advisable to delay any further project study until some of the probable factors causing error were clarified by individual workers. For single crystals, S. C. Abrahams outlined the Commission's project and the results of the data analysis which drew attention to the marked increase in error range when the crystal is introduced as a variable. The possibility of extending the Single Crystal Intensity Measurement Project (SCIMP) to a second phase was discussed by A. McL. Mathieson, and the opinion of the meeting was that there was an adequate basis to formulate a project to investigate the influence of the crystal on the accuracy of measurement.

The final form of the Report on SCIMP was accepted by the Commission and submitted for publication in two parts (*Acta Cryst.* (1970) A26, 1 and 18).

The members of the Commission appointed at the Eighth General Assembly for the period 1969-72 held a meeting-in-person at Stony Brook to consider and plan the work to be tackled during its term of office. The main items were:

1. *Index of Crystallographic Supplies* (R. Rudman). This project is to be reactivated by a new member of the Commission who has had considerable experience in the collation of extensive material.
2. *Radiation Damage Project* (S. C. Abrahams). One factor which can militate against the collection of intensity data of adequate precision is radiation damage. There is little

information as to the different responses to radiation shown by different types of structure and hence little is known as to how the nominal F values derived may incorporate systematic errors. A project is to be arranged to provide some guide as to the range of damage which can be encountered.

3. *Intercomparison of F values from Dynamical Procedures* (N. Kato). To stimulate the measurement of X-ray F values by procedures not based on intensity and the assessment of their inherent accuracy, informal encouragement of individuals and groups will be given to carry out measurements on a selected material.
4. *Single Crystal Intensity Measurement Project - Phase II* (A. McL. Mathieson). As noted above, the completion of phase I of this project raised the question as to whether elaboration was warranted at the present time to achieve structure factors from different crystals, more concordant than in phase I. It was decided to proceed with the planning of phase II.
5. *Simultaneous Measurement Techniques* (U. W. Arndt). This allows for maintenance of Commission interest in these techniques and possible forward planning of a meeting on this subject.

Commission on Crystallographic Computing

During the period 4-12 August 1969, the Commission held an International Summer School on Crystallographic Computing at Carleton University, Ottawa, Canada. The school was attended by 170 participants from 18 countries, of whom 37 presented invited contributions on 14 topics related to the methods and computational aspects of crystal structure determination. The proceedings of this school will be published by Munksgaard in 1970, under the title *Crystallographic Computing*.

Work on the standard tests has been continued. The results obtained by the different programs have shown some discrepancies which are now being investigated. This by itself is a very good demonstration of the value of the standard tests.

During the Congress the Commission met twice in closed session, and held a joint open meeting with three other Commissions and an open meeting of its own.

Commission on Crystallographic Data

An extensive survey of opinions on the storage of structure factor tables was carried out by the Commission, and the results were discussed at a joint open meeting of the Commission and the Commissions on Crystallographic Computing, Journals and *Structure Reports*, held during the Eighth General Assembly. Because of the increased use of computers in the data field, liaison between the Commissions on Data and Computing has been strengthened by making their respective Chairmen *ex officio* members of the other Commission.

A memorandum on the publication of powder data was prepared by a working party and, after submission to the Executive Committee for approval, has been accepted for publication in the *Journal of Applied Crystallography*.

Commission on Crystallographic Nomenclature

The Commission, in cooperation with the Commission on *International Tables*, organized a joint open meeting during the Assembly. It has also functioned by correspondence, the main topics being symbols for groups of faces and groups of directions, and the description of small-angle

scattering experiments. The Commission would like to apologize for an error in its report for 1967 (*Acta Cryst.* (1968) A24, 708): in the fourth line of this 'the directions of the zone $\langle uvw \rangle$ ' should be 'the equivalent directions $\langle uvw \rangle$ '. (J. D. H. Donnay and J. Mélon (*Proc. Nat. Acad. Sci.* (1934) 20, 327-335) have suggested the name 'frame' for such an assemblage of equivalent directions.)

The Commission is represented through its Chairman on a Joint Sub-committee on Nomenclature recently established by the International Union of Crystallography and the International Mineralogical Association. The Union has several other representatives on this body.

Commission on Crystallographic Studies at Controlled Pressures and Temperatures

The establishment of this Commission was confirmed by the Eighth General Assembly on 16 August 1969, with the amended title as given above. The proposed terms of reference for the Commission were:

- (1) to assess the adequacy of existing organizations;
- (2) to devise appropriate ways of putting existing groups and isolated workers in touch with one another;
- (3) to make contact with other international bodies such as the International Geophysical Year, the Upper Mantle Project, or COSPAR with a view to promoting worthwhile studies on scarce materials such as meteorites or mohole cores;
- (4) to cooperate with the Commission on Crystallographic Apparatus of the Union in establishing the need for special types of apparatus for controlled pressure and temperature studies, with a view to encouraging manufacturers to meet identifiable needs;
- (5) to establish whether further publications, abstracts or data compilations concerning controlled pressures and temperatures would be useful;
- (6) to arrange meetings, or sessions at existing meetings, on work at controlled pressures and temperatures.

The Commission met twice during the General Assembly and held an open meeting. It also favoured the holding of a conference on crystallographic studies at very high temperatures in Odeillo, France in July or September 1971.

Commission on Crystallographic Teaching

1969 has seen the completion of a number of projects undertaken by the Commission, the election of a new Commission at the Eighth General Assembly and a series of tentative plans for the next three-year period.

In August 1969 the selection of historic papers entitled *Early Papers on Diffraction of X-rays by Crystals* (J. M. Bijvoet, W. G. Burgers and G. Hägg) was published. It contains the first chapters of the manuscript and it is hoped that the remainder will be published as a second volume if there is sufficient interest. The manuscript was prepared with financial assistance under the UNESCO Pilot Project on the Teaching of Crystallography in relation to the Physics and Chemistry of Solids. Other items under this Pilot Project which have been completed and published are: (1) two texts of programmed courses, *Two-dimensional Space Groups and Applications of Fourier Methods*, by H. Schenk (Netherlands); (2) a brochure containing drawings and instructions for building a simple two-circle ball driller for the making of crystal structure models by K. Lonsdale and H. J. Milledge (U.K.); (3) a text and a series of slides for a lecture on the application of the Mössbauer effect in

crystallography by T. Zemčik (Czechoslovakia); (4) a laboratory manual on crystal growth by L. Zsoldos (Hungary); and (5) *Tables for Indexing Electron Diffraction Spot Patterns from Single Crystals* by J. Komrska (Czechoslovakia). The distribution of these materials is under discussion. It is probable that copies will be available to crystallographers in developing countries direct from Dr N. Joel at UNESCO and other copies may be purchased directly from the authors whose names and addresses can be obtained either from the Secretary of the Commission on Crystallographic Teaching, Professor G. D. Rieck, or from the Executive Secretary of the Union, Dr J. N. King.

New members were elected at the General Assembly and the Commission has made various tentative plans for the future. It has already prepared and circulated a list of summer schools to be held in 1970 and it is considering the preparation of a file on crystallographic films. It has made tentative plans to meet at conferences which are being held in 1970 and 1971 and it is actively discussing the possibility of improving the teaching of very elementary introductions to crystallography at school level.

Commission on Electron Diffraction

Announcements in connexion with the preparation of a directory of persons working in the field of LEED have been placed in several journals. At the Eighth Congress the Commission organized open meetings on novel methods and species of electron diffraction. Topics suggested for similar meetings at the Ninth General Assembly and Congress in 1972 included:

- (1) the application of electron diffraction theory to contrast effects in high voltage electron microscopy;
- (2) the effects of electron diffraction on back scattering of electrons, secondary electron emission, etc. with reference to scanning electron microscopy;
- (3) inelastic scattering of electrons and its effects on electron diffraction and electron microscopy.

It was decided to prepare gas electron diffraction data in two stages: Phase 1 (Bibliographic Data) and Phase 2 (Numerical Data). The deadline for Phase 1 is 1 August 1970 and this task will be undertaken by H. M. Seip (University of Oslo, Norway; European and Western Hemisphere Literature), K. Kuchitsu (University of Tokyo, Japan; Japanese and Far Eastern Literature), I. Hargittai (Hungarian Academy of Science, Budapest, Hungary; U.S.S.R. and Eastern European Literature), collaborating with O. Kennard of the Crystallographic Data Centre, Cambridge, U.K. Phase 2, which involves more difficult decisions on the evaluation and presentation of data for publications such as *Tables of Interatomic Distances*, will be taken care of by L. S. Bartell. Special card formats will be devised with the help of Mrs Kennard's group at Cambridge.

Commission on Neutron Diffraction

The Commission met during the General Assembly and also organized a Topical Meeting on Chemical and Physical Aspects of Neutron Diffraction, at Brookhaven National Laboratory, 22-23 August.

It is intended to prepare a revised table of neutron scattering amplitudes of elements and isotopes, further to the table published in 1969 (*Acta Cryst.* (1969) A25, 391). The formal collection of data on magnetic form factors and the correlation of reactor and diffractometer performance in laboratories in different countries is also being considered,

Representation on other Bodies

Abstracting Board of the International Council of Scientific Unions

Two sets of meetings connected with the ICSU Abstracting Board have been held during 1969. The first, held in London, 27–29 January, was largely concerned with a reorganization of the structure of the Board and the adoption of new Statutes and By-Laws. Provision for associate members (that is, organizations that are neither member services nor scientific unions) was made in these Statutes and By-Laws. The second meeting was held in Rome, 17–18 September, with meetings of various committees and working groups on the days preceding and following. The *Zentralblatt für Mathematik* was admitted as a new member service, and the (U.S.A.) National Federation of Science Abstracting and Indexing Services was admitted as the first associate member. Considerable progress was reported on bibliographic descriptions, on multilingual thesauri in several fields, and on transliteration. An informal working group in crystallography was set up in connexion with the comparison and unification of classification schemes and the preparation of thesauri and standardized indexing terms. It is too early to say whether any substantial progress can be made in this field.

Full reports of these meetings have been circulated to the Executive Committee and others within the Union concerned with matters discussed by the Board.

Committee on Data for Science and Technology (CODATA) of the International Council of Scientific Unions

The Union representative, Mrs O. Kennard, attended the fourth meeting of CODATA held in Rome, Italy in June 1969. She gave a report on the activities of the I.U.Cr. and had an opportunity of discussing common problems with other Union representatives.

At the meeting a report on *Automated Information Handling in Data Centres*, prepared by the Task Group on Computing was discussed. Interested crystallographers can obtain a copy from the CODATA Office, Westendstrasse 19, 6 Frankfurt/Main, B.R.D. CODATA has also published during 1969 an *International Compendium of Numerical Data Projects* (Springer-Verlag, Berlin, Heidelberg). Crystallographic activities are well covered in this compendium.

Committee on the Teaching of Science of the International Council of Scientific Unions

This Committee was formed in 1968 to replace the ICSU Inter-Union Commission on Science Teaching, as resolved at the 12th General Assembly of ICSU in 1968, when it had been considered necessary to strengthen the organization within ICSU concerned with the teaching of science.

The Union's representative, the Chairman of the Commission on Crystallographic Teaching (C. A. Taylor), attended the first meeting of the Committee (Chairman: Dr M. Matyas), which was held in Paris, 12–13 December 1969. He presented a report on the work of the Commission on Crystallographic Teaching, and was appointed on the Subcommittee on Relations with International Organizations. The Committee adopted a draft constitution and resolved to meet the minimum number of times possible, consistent with its efficient operation. The costs of the meetings are borne by the Committee.

Commission on the Solid State of the International Union of Pure and Applied Physics.

The Commission has submitted a memorandum to the IUPAP Secretariat dealing with the mechanics of requesting sponsorship and with the criteria for granting sponsorship, based on the scientific value of the proposed conference, its international character and the availability of organizational manpower and financial resources. Several Conferences were sponsored by the Commission or by IUPAP during 1969.

One of the representatives of the I.U.Cr., E.F. Bertaut, has been appointed Secretary of the Commission.

International Council of Scientific Unions

The Union was represented at the 10th ICSU Executive Committee meeting by the Immediate Past President, Prof. N. V. Belov. The meeting was held in Erevan, U.S.S.R., 2–3 October 1969. The Executive Committee of ICSU recommended that an Inter-Union Commission on Geodynamics of the International Unions of Geodesy and Geophysics and of Geological Sciences be established, and that a Special Committee on Problems of the Environment (SCOPE) be created. It expressed its willingness to co-sponsor with UNESCO an international conference in 1971 on scientific information, for the purpose of stimulating commitments towards the objectives of the ICSU-UNESCO Joint Project to Study the Feasibility of a World Information System (UNISIST). There was also discussion on free international collaboration among scientists. Unions adhering to ICSU would be asked to keep records of visa refusals or abnormal delays and to exchange information on such problems.

Finances

The audited accounts of the Union for the year 1969 are given at the end of this Report. For comparison the 1968 figures are provided in italics. Negative quantities are indicated by parentheses.

The *Acta Crystallographica* account for 1969 shows a deficit of \$26,461 as compared with a profit of \$22,243 in 1968. This deficit is primarily due to the greatly increased number of pages published during the year and to rises in production costs. There were also smaller increases in several items of editorial expenditure. The income from advertisements is lower than for the previous year. As in 1968, the total cost of the Technical Editor's office is divided between the *Acta Crystallographica* account and the *Journal of Applied Crystallography* account in percentages based on the number of text pages published during the year; 92% and 8% respectively for 1969. The journals' accounts have also been charged with administrative expenses shown in the General Fund account. The *Acta Crystallographica* account is expected to show a sizable profit in 1970, due to the increase in subscription rates. This profit is badly needed, as the balance on the fund account at the end of 1969 was \$20,181, the lowest it has been since 1965.

The *Journal of Applied Crystallography* account for 1969 shows a profit of \$7,946 and the number of subscribers continues to increase. The account was opened in 1968 by transferring \$15,000 from the General Publications Fund. As the journal has made a profit of over \$15,000 since then and is expected to make a profit in 1970 also, it has been decided to transfer the \$15,000 back to the General Publications Fund so as to be available for support of other developments,

The *Structure Reports* account shows a profit of \$11,280 as compared with \$1,076 in 1968, in spite of the fact that two volumes were published in 1969. Some of the balance of the fund account, \$72,957, will be required for pre-publication expenses on future volumes, as work is now under way on all volumes up to 1970 in a determined effort to reduce the time to publication of *Structure Reports*.

The *International Tables* account shows a profit of \$5,961 as compared with a small deficit of \$802 in 1968, bringing the accumulated balance to \$36,911. Once again Volume I has had to be reprinted and the reprinting expenses will appear in the accounts for 1970. The cost of work on the Pilot Issue has now become and significant similar expenses will continue for several years.

In 1969, \$450 was received from the sale of 54 copies of *Fifty Years of X-ray Diffraction*. 327 copies of *Symmetry Aspects of M. C. Escher's Periodic Drawings* were sold, resulting in a net profit of \$652 after payment of royalties and an honorarium. *Early Papers on Diffraction of X-rays* was published in 1969 and 247 copies had been sold by the end of the year, when the deficit on the fund account was \$2,778.

The General Fund account shows an excess of income over expenditure of \$5,802 as compared with \$9,282 in 1968. The increase of administration expenses in 1969 to \$20,327, as compared with \$8,643 in 1968, is due mainly to the appointment of the salaried Executive Secretary in February. The total cost of his work during the year was \$10,379. In addition, \$1,200 was paid for legal fees relating to the incorporation of the Union. The travel grants for the Stony Brook meeting, \$9,273, were slightly higher than for the Moscow meeting in 1966.

The subvention received from UNESCO through ICSU remained constant at \$5,250. ICSU also assisted by refunding the subscription paid by the Union in 1968. As a result of changes in membership at the Eighth General Assembly the subscriptions from Adhering Bodies dropped to \$13,300 in 1969. Interest from investments and bank accounts was \$9,983 as compared with \$8,593 in 1968.

In 1969 a profit of \$2,198 was made on redemptions of £3,703 3¼% Australia 1965/69, f.2,000 3% Nederland 1937, \$3,000 3% Nederland 1947, f.1,000 4½% Nederland 1958, f.3,000 4½% Nederland 1960(I), f.1,000 4½% Nederland 1960(II), f.6,000 4½% Nederland 1964 and f.1,000 4% Unie van Zuid Afrika 1955. As on previous Balance Sheets the investments have been valued according to their quotations at the end of the year. Their depreciation in value, together amounting to \$8,570, has not been charged against the General Fund but has again been included as an asset on the Balance Sheet to avoid annual fluctuations in value influencing the General Fund account.

The larger part of the money with the Banks is still placed in deposit accounts, namely at the end of 1969, f.16,282 with the Amsterdam-Rotterdam Bank N.V., \$4,643 with the First National City Bank, Sw. Kr. 66,629 with the A.B. Svenska Handelsbanken and £14,007 with the Westminster Bank Limited. The amounts shown on the Balance Sheet for Debtors and Creditors relate to sums, principally on the publishing accounts, due at 31 December 1969. Where appropriate these amounts have since been settled.

The Balance Sheet shows that the assets of the Union have increased during the year from \$234,051 to \$236,904, excluding stocks of unsold publications.

INTERNATIONAL UNION OF CRYSTALLOGRAPHY

General Found Account for the year ended 31 December 1969

	U.S. Dollars		U.S. Dollars	
	1969	1968	1969	1968
Subscription to ICSU (2% of subscriptions received from Adhering Bodies in 1968)	295-60	244-00	5,250-00	5,250-00
Subscription to ICSU Committee on the Teaching of Science	200-00	200-00	244-00	157-20
Administration Expenses:			13,300-00	13,500-00
Honoraria: General Secretary, Treasurer and Secretarial Assistance	5,485-53	5,837-22	6,669-15	5,258-31
Audit and Accountancy Charges	660-00	660-00	3,313-54	3,335-07
Postages, Stationery, Printing and Sundries	1,660-96	887-45	2,198-45	1,292-86
Travelling Expenses	479-16	459-89		
Bank Charges and Differences on Exchange	129-59	(35-50)		
Legal Fees	1,200-00	-	57-37	51-25
Executive Secretary's Office: Salary and Expenses	10,379-06	-	10-04	47-33
Advertising and Expenses re appointment of Executive Secretary	62-09	800-66		
Depreciation of Office Equipment	270-40	33-00	513-40	493-27
Meeting of Executive Committee			102-26	98-31
Eighth General Assembly and International Congress, Stony Brook, U.S.A.:				
Travel Expenses and Travel Grants	9,272-77	-	411-14	394-96
Programme Committee Chairman's Expenses	968-63	2,459-31	6,098-00	-
Meeting of Programme Committee				
Net cost of International Conference Cambridge, England	10,241-40	2,459-31		
Travel Expenses of IUCr				
Representatives on other bodies	567-50	499-70		
Expenses of Commissions	12-96	83-88		
Cost of Printing and Distributing Bibliography No. 3				
Less Income from Advertisements	-	2,215-92		
<i>World Directory of Crystallographers</i> , 4th Edition. Miscellaneous Expenses	85-22	-		
<i>Excess of Income over Expenditure carried to Balance Sheet</i>	5,802-19	9,281-57		
	<u>\$ 37,531-61</u>	<u>\$ 29,230-68</u>	<u>\$ 37,531-61</u>	<u>\$ 29,230-68</u>

Acta Crystallographica Account for the year ended 31 December 1969

	U.S. Dollars		U.S. Dollars	
	1969	1968	1969	1968
Publication Expenses:				
Printing and Binding Volumes A25 and B25 (1968 A24 and B24)	125,148.41	87,314.52	149,158.80	147,036.66
Distribution and Postage	16,965.61	12,057.75	20,135.17	18,105.71
	<u>142,114.02</u>	<u>99,372.27</u>	<u>169,293.97</u>	<u>165,142.37</u>
Printing Index to Volumes A24 and B24	639.25	—	21,161.75	148,132.22
Printing and Distributing Acta Supplement S3 to Volume A25	4,392.41	—	5,480.73	7,988.31
Reprinting Volume 4 (1968 Volumes 1, 7 and 8)	3,496.25	10,182.94	703.92	4,776.81
Editorial Expenses:				
Editorial Honoraria	4,838.80	4,240.70	26,460.77	(22,242.56)
Secretarial Assistance	1,499.09	1,032.40		
Postages, Telephone and Office Sundries	1,475.89	1,316.32		
Travelling Expenses	224.92	147.45		
Technical Editing:				
Salaries and Expenses	15,916.96	12,628.82		
Depreciation of Office Equipment	198.71	165.02		
Administrative Expenses	24,154.37	19,530.71		
	<u>4,573.50</u>	<u>—</u>	<u>\$ 179,369.80</u>	<u>\$ 129,085.92</u>

Subscriptions to Volumes A25 and B25 (1968 A24 and B24)
Sale of Back Numbers and Single Copies

Less Publishers' Commission on Sales

Income from Advertisements
Less Advertising Agents' Commission and Expenses

Excess of Expenditure over Income carried to Balance Sheet

Journal of Applied Crystallography Account for the year ended 31 December 1969

	U.S. Dollars		U.S. Dollars	
	1969	1968	1969	1968
Publication Expenses:				
Printing and Binding Volume 2 (1968 Volume 1)	12,485.41	12,225.93	30,712.00	26,430.40
Printing Index to Volume 1	309.85	—	2,189.60	36.00
Distribution and Postage	2,152.69	803.09	32,901.60	26,466.40
Printing and Distributing Acta Supplement S3 to Volume A25	531.79	—	4,386.77	3,969.96
Editorial Expenses:				
Editorial Honoraria	2,134.47	307.85	28,514.83	22,496.44
Secretarial Assistance	440.43	369.08	1,020.52	307.40
Postages, Telephone and Office Sundries	143.60	20.17		
Travelling Expenses	347.48	141.50		
Technical Editing:				
Salaries and Expenses	1,384.08	1,722.11		
Depreciation of Office Equipment	15.29	—		
Administrative Expenses	4,465.35	2,560.71		
	<u>1,524.50</u>	<u>—</u>	<u>901.19</u>	<u>80.51</u>
Excess of Income over Expenditure carried to Balance Sheet	<u>7,946.43</u>	<u>7,133.60</u>	<u>\$ 29,416.02</u>	<u>\$ 22,723.33</u>

Subscriptions to Volume 2 (1968 Volume 1)
Sale of Back Numbers and Single Copies

Less Publishers' Commission on Sales

Income from Advertisements
Less Advertising Agents' Commission and Expenses

INTERNATIONAL UNION OF CRYSTALLOGRAPHY

Fifty Years of X-ray Diffraction Account for the year ended 31 December 1969

	<i>U.S. Dollars</i>	
	1969	1968
<i>Excess of Income over Expenditure carried to Balance Sheet</i>	545.56	624.21
	95.47	109.24
	<u>\$ 450.09</u>	<u>\$ 514.97</u>

Escher Drawings Account for the year ended 31 December 1969

<i>Excess of Income over Expenditure carried to Balance Sheet</i>	1,769.22	2,294.00
	309.61	401.45
	<u>807.99</u>	<u>146.88</u>
	<u>\$ 651.62</u>	<u>\$ 1,745.67</u>

Early Papers Account for the year ended 31 December 1969

Publication Expenses:		
Cost of Printing and Binding	7,541.56	3,500.00
Preparation of manuscript and Sundry Expenses	1,144.23	2,918.68
	<u>510.77</u>	<u>510.77</u>
	<u>\$ 8,685.79</u>	<u>\$ 2,777.88</u>
		<u>\$ 8,685.79</u>

We have examined the annexed Balance Sheet, and Income and Expenditure Accounts, and have obtained all the information and explanations which we considered necessary. In our opinion these accounts, together with the notes thereon, give a true and fair view of the state of affairs of the Union at 31 December 1969 and of the results for the year ended on that date.

Manchester, England

21 September 1970

Signed: MANN JUDD & Co.

Chartered Accountants

International Union of Crystallography

Ninth General Assembly and International Congress of Crystallography

The Ninth International Congress of Crystallography, organized by the Science Council of Japan for the International Union of Crystallography, and the Ninth General Assembly of the Union will be held in Kyoto, Japan, from 27 August to 7 September 1972.

The meetings will be held in the Kyoto International Conference Hall, Takaragaike, Kyoto. The provisional timetable is as follows: the Opening Ceremony and the first session of the General Assembly will take place on 27 August; scientific sessions will begin from 28 August. The Registration Desk will be open from 26 August.

The arrangement of the scientific programme will be broadly similar to that adopted for the Eighth Congress held in the U.S.A. in 1969. Scientific sessions will be composed of Frontier Topics, Open Sessions of Commissions of the Union, and *ad hoc* meetings. Abstracts of contributed papers on subjects covering a wide range of crystallography will be invited. Accepted abstracts will be printed in a book of Abstracts, which will constitute the scientific content of the Congress. Acceptance of an abstract will not necessarily result in an opportunity for oral presentation in the formal programme. The *ad hoc* meetings will be arranged with the intention of encouraging free discussion as well as the oral presentation of results.

Unlike the previous Congresses, neither Symposia nor

Topical Meetings will be planned before or after the Congress. However, some of the Frontier Topics will receive specific emphasis.

Further details of the Congress, including arrangements for registration, transport, accommodation, scientific visits *etc.*, will be described in the *First Circular* (an Information Booklet) which will be distributed about September, 1971.

Enquiries should be addressed to:

Professor Yoshihiko Saito,
General Secretary, Organizing Committee,
IX International Congress of Crystallography,
Science Council of Japan,
22-34, Roppongi 7 chome, Minato-ku,
Tokyo 106, Japan

Through the National Committees for Crystallography the Japanese Organizing Committee will distribute separate copies of the above announcement with a *Pre-registration Card*, early in 1971. This card will also serve as a request form for the *First Circular*. These materials will be obtainable from the Secretaries of National Committees for Crystallography, and also from the Executive Secretary of the International Union of Crystallography or directly from Professor Y. Saito at the above address.

Copies of the *First Circular* will be sent to all those who return the *Pre-registration Cards*. They will also be distributed through National Committees for Crystallography.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (M. M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.

The great experiments in physics. By HENRY S. LIPSON, F.R.S. Pp. vii + 181. Edinburgh: Oliver & Boyd, 1968. Soft cover. Price: 7s 6d.

This is a book principally about the experimental aspects of physics, set in a historical context. It is very readable, highly interesting, and stimulating in its coverage of the many aspects of the subject. It treats its material in thirteen chapters covering motion, the atmosphere of the Earth, heat, gases, sound, light, optical instruments, magnetism and electricity, radiation, structure of matter, structure of atoms, and the breakdown of classical physics. There is a final short chapter in which the author makes personal comment on the future of physics as he sees it. The text is well illustrated by fifty-two figures and nineteen plates.

These are the bare bones of the book but there is more to be said than that. At the beginning of his preface the author tells us that he is concerned with propaganda for experimental physics, with the particular aim of re-emphasizing the historical importance of a range of definitive experiments of physics and of showing how they have influenced the shape of physics as it exists today. He is undoubtedly successful in this aim and presents the reader in each case not only with the problem to be solved and the way the experiment solved it, but also with human sidelights on the men who conceived and conducted the ex-

periments. Physicists appear as human beings who can on occasion be wrong and who are not always as logically motivated as the layman might wish to believe. But they are linked to all creative people (or at least the best of them are) by an acute sense of observation, imagination, and respect for the apparently trivial – one of the nicest examples is that on p. 7 relating Galileo's observation of a swinging candelabrum in church. The reader cannot avoid being impressed by the personal physical risks that the early experimenters exposed themselves to, albeit unknowingly – Benjamin Franklin's turning himself into a temporary lightning conductor and von Kleist's receiving from an elementary Leyden jar ... 'a shock which stuns my arms and shoulders' are two examples. The discussion shows how far-reaching results can be deduced from the use of simple apparatus, although simplicity here is relative to modern complicated structures which may, in fact, themselves be simple in their principles.

The book raises other considerations at a deeper level, and allows the reader to draw a number of conclusions for himself. Thus the reader will see clearly that physics is a rather unusual blending of experiment and observation on the one side, and theoretical discussion on the other. The author states in his Preface that 'There is no foundation for the belief that has somehow or other insinuated itself into physics – that theory is on a higher plane than prac-