

RECORD OF THE FOURTH GENERAL ASSEMBLY OF THE INTERNATIONAL MATHEMATICAL UNION

Saltsjöbaden (Sweden), August 11—13, 1962

A G E N D A

1. Opening of the Assembly.
2. Presidential Address.
3. Appointment of Working Committees:
(i) Nominating Committee, (ii) Budget Committee, (iii) Committee on Resolutions, (iv) Steering Committee for the session on ICSU-ICMI-SCOTS, (v) Tellers.
4. Commissions of the Union: reports, and plans for future activities.
 - (a) ICMI (SCOTS)
 - (b) Exchange Commission, IMU Lectureship Programme
 - (c) Commission for Documentation of Mathematical Literature and for Scientific Publications.
5. Symposia: reports.
6. Financial Report for 1958-1962; budget estimates for 1963-1966; raising of membership dues.
7. Relations with ICSU-UNESCO.
8. IMU and the International Congress of Mathematicians.
9. Change of Group of Adherence.
10. Elections:
 - (a) Executive Committee.
 - (b) Commissions.
11. Resolution adopting reports.
12. Next meeting of the General Assembly.
13. Any other item with the permission of the President.

ICSU = International Council of Scientific Unions

ICMI = International Commission on Mathematical Instruction

SCOTS = Special Committee on the Teaching of Science.

I. PARTICIPANTS

(a) *Executive Committee*

| | | |
|---------------------|-----|--|
| President: | ... | Professor Rolf Nevanlinna |
| Vice-President: | ... | Professor P. S. Alexandroff |
| Vice-President: | ... | Professor Marston Morse |
| Secretary: | ... | Professor K. Chandrasekharan |
| Members: | ... | Professor G. Choquet Professor B. Eckmann Professor H. Kneser Professor K. Kuratowski |
| Retiring President: | ... | Professor H. Hopf. |

President Nevanlinna was in the chair during the sessions of the General Assembly on August 11 and 13. The General Assembly, together with the alternate delegates, went into committee on August 12, and Professor Hopf was in the chair during that session, at the request of the President.

(b) *Delegates*

| | | |
|-----------------|-----|---|
| Australia: | ... | Professor T. G. Room |
| Belgium: | ... | Professor L. Godeaux Professor F. Bureau |
| Brazil: | ... | Professor L. Nachbin |
| Bulgaria: | ... | Professor N. Obreschkoff |
| Canada: | ... | Professor G. de B. Robinson Professor R. L. Jeffery Professor N. S. Mendelsohn |
| China-Taiwan: | ... | Professor Shing-Meng Lee |
| Cuba: | ... | Professor R. Rubio |
| Czechoslovakia: | ... | Professor M. Katetov Professor St. Schwarz |
| Denmark: | ... | Professor W. Fenchel Professor N. E. Nørlund |
| Finland: | ... | Professor O. Lehto Professor S. Louhivaara |
| France: | ... | Professor H. Cartan Professor R. Fortet Professor A. Revuz Professor L. Schwartz |

| | |
|------------------|--|
| Germany: | Professor H. Behnke Professor F. Hirzebruch |
| Greece: | Professor C. Papaioannou |
| Hungary: | Professor A. Renyi Professor J. Suranyi Professor P. Turan |
| India: | Professor K. Balagangadharan Professor K. Chandrasekharan Professor N. L. Ghosh |
| Ireland: | Professor J. R. McConnell |
| Israel: | Professor A. Dvoretzky Professor H. Hanani |
| Italy: | Professor E. Bompiani Professor G. Sansone Professor B. Segre Professor A. Terracini |
| Japan: | Professor Y. Akizuki Professor M. Hukuhara |
| The Netherlands: | Professor F. van der Blij Professor H. Freudenthal Professor H. D. Kloosterman |
| Norway: | Professor S. Selberg |
| Pakistan: | Professor L. M. Chawla |
| Poland: | Professor K. Kuratowski Professor E. Marczewski Professor S. Straszewicz Professor T. Wazewski |
| Portugal: | Professor A. Almeida Costa |
| Spain: | Professor A. Dou |
| Sweden: | Professor O. Frostman Professor A. Pleijel |
| Switzerland: | Professor G. de Rham Professor B. Eckmann Professor A. Pfluger |
| United Kingdom: | Miss Mary Cartwright Sir William Hodge Professor E. A. Maxwell Professor M. H. A. Newman Professor I. N. Sneddon |

| | |
|----------------------------|--|
| USA: | Professor M. Morse Professor L. Bers Professor S. MacLane Professor E. J. McShane Professor M. H. Stone |
| USSR: | Professor P. S. Alexandroff Professor M. A. Lavrentiev Professor Ju. A. Mitropolskii Professor P. S. Novikov Professor I. N. Vekua |
| Yugoslavia: | Professor G. Kurepa |
| (c) Observers | |
| UNESCO: | Dr. H. Roderick |
| (d) IMU Secretariat | Mrs. T. Tischhauser Mr. Raghavan Narasimhan |

II. President's Report

This is reproduced in full, in Appendix A.

III. Appointment of Committees

The President nominated, and the General Assembly approved the appointment of, the following Committees:

| | |
|------------------------------|--|
| Nominating Committee: | Professors R. Nevanlinna (<i>Chairman</i>) Y. Akizuki H. Behnke H. Hopf Sir William Hodge M. Katetov L. Nachbin P. S. Novikov L. Schwartz M. H. Stone |
| Budget Committee: | Professors M. H. A. Newman (<i>Chairman</i>) E. Bompiani K. Chandrasekharan G. Choquet B. Eckmann W. Fenchel H. Hopf M. A. Lavrentiev M. H. Stone |

| | |
|--|--|
| <i>Resolutions Committee:</i> | Professors S. MacLane (<i>Chairman</i>) P. S. Alexandroff F. Bureaux R. Fortet E. A. Maxwell |
| <i>Steering Committee for the session on UNESCO-ICSU-ICMI affairs:</i> | Professors H. Hopf (<i>Chairman</i>) K. Chandrasekharan M. Morse H. Roderick M. H. Stone |
| <i>Tellers</i> | Professors I. N. Sneddon (<i>Chairman</i>) A. Dvoretzky O. Lehto |

The Nominating Committee was to receive nominations to the new Executive Committee, from the floor as well as from the present Executive Committee, till 9 P.M. on August 11, 1962, and to present a slate for election on August 13, 1962. The Budget Committee and the Steering Committee met at 3 P.M. on August 11, 1962.

IV. Commissions of the Union

(a) *ICMI*

A report was presented by the President of ICMI, Professor M. H. Stone (this is reproduced in full, in Appendix B). This was discussed in detail in the special session on August 12. It was noted that the SCOTS had been established in order to execute a special contract with UNESCO, and that there was no reason to continue the SCOTS in its present form, after its assigned task had been accomplished. (See Resolutions Nos. 1, 8).

(b) *Exchange Commission*

A report was presented by the Chairman, Professor S. MacLane (this is reproduced in full, in Appendix C). This was discussed in detail, and it was decided to continue the Exchange Commission to prosecute the IMU Lectureship Program. (See Resolution No. 6).

(c) *Commission for Documentation of Mathematical Literature and for Scientific Publications*

A report prepared by the Chairman, Professor J. F. Koksma, was distributed (this is reproduced in full, in Appendix D). Professor Fenchel gave a gist of the report, and explained the difficulties in the nature of the work envisaged. After some discussion, it was decided to discontinue the Commission, and to request the new Executive Committee to take such further action as they might deem appropriate. (See Resolution No. 1).

V. Symposia and related activities

Detailed reports on the following meetings were printed and circulated:

- (1) International Congress of Mathematicians, Edinburgh, 1958.
- (2) International Colloquium on the Algebraic and Topological Foundations of Geometry, Utrecht, 1958.
- (3) International Symposium on Foundations of Mathematics, Warsaw, 1959.
- (4) International Colloquium on Differential Geometry and Topology, Zürich, 1960.
- (5) International Colloquium on Linear Spaces, Jerusalem, 1960.
- (6) International Colloquium on General Topology and its relations to modern Analysis and Algebra, Prague, 1961.
- (7) Instructional Conference on Functional Analysis and some of its applications, London, 1961 (it was noted that 7 was supported under the IMU Lectureship Program).

In view of the success attained by all these colloquia, it was decided to continue the program as hitherto. It was further decided to support other activities (conferences, summer institutes etc.) on a limited and a temporary basis, the decision in each individual case being, of course, left to the Executive Committee. (See Resolution No. 2).

VI. Budget

The Budget Committee recommended, and the General Assembly approved

- (1) an increase in the value of the unit subscription (which is at present \$ 65.20) by 50% from January 1, 1963, and
- (2) the following budget for each of the years 1963-66, on the understanding that transfers are permitted from one item to another, and from one year to another, provided that no appropriation from schedule B is allowed to augment the provision made in schedule A.

SCHEDULE A: Authorized *Annual* Expenditure for the period 1963-66:

| | U.S. Dollars | |
|--|--------------|----------|
| 1. Secretarial help | | |
| (a) IMU Office | ... | 1,800 |
| (b) President | ... | 300 |
| (c) ICMI | ... | 300 |
| 2. Office Expenses (incl. postage etc.) | ... | 600 |
| 3. Travel Expenses (E.C. and others) | ... | 1,800 |
| 4. President's and Secretary's Expenses | ... | 200 |
| 5. Contribution to ICSU (2% of dues) | ... | 200 |
| 6. Publication and Dissemination of NEWS | ... | 300 |
| 7. Audit Fee | ... | 100 |
| 8. Contingencies | ... | 850 |
| | | <hr/> |
| | | \$ 6,450 |

SCHEDULE B: Authorized *Annual* Expenditure for the period 1963-66:

U.S. Dollars

| | |
|--|------------------|
| Scientific activities of the Union and its Commissions and Committees (ICMI, Colloquia, Symposia, Conferences, Summer Schools and Lectureships etc.) ... | \$ 4,000 |
| Total ... | <u>\$ 10,450</u> |

The General Assembly voted a sum of \$ 200.—as the Union's contribution to the Inter-Union Committee on the Teaching of Science.

VII. Relations with ICSU-UNESCO

ICSU

The proposed changes in the structure of ICSU were discussed. Professor K. Chandrasekharan gave a summary of the conclusions arrived at by the Committee on the future structure of ICSU. It was noted that three important changes were contemplated:

- (1) the abolition of the Bureau;
- (2) the creation of an Executive Committee consisting of 14 representatives of the Unions, and 10 representatives of the National Members of ICSU, together with 4 officers;
- (3) and, the retention of the present voting strength of the Unions in the General Assembly of ICSU.

The consensus of opinion was in favour of such a revision, but definitely against any further diminution of the statutory role of the Unions which form the real core of ICSU. (See Resolution No. 10).

UNESCO

Dr. Roderick explained the role of UNESCO and the projects which could interest the Department of Natural Sciences of UNESCO. In particular, he mentioned that fruitful collaboration with the Union was possible in developing a program for the exchange of mathematicians. This was expected to be taken up for further discussion between UNESCO and IMU.

Dr. Roderick also mentioned the possibility of publishing the full report of the SCOTS (not merely the summary of about 25 pages required under the contract) in an appropriate form.

VIII. International Congress of Mathematicians

There was a general discussion on the organization of big international congresses. The consensus of opinion was in favour of organizing such congresses, though only once in 4 years. Professor McShane suggested that perhaps the Congress could be spread out over a longer period of time, with fewer items on the program every day, so that members could get a chance to see and hear whom they wanted. Professor

Stone remarked that as congresses grew bigger, the number of places where they could be held would become fewer. Professor Hopf wished to emphasize the requirement that the invited addresses given in such congresses should be meant not only for the specialists in the fields directly covered by the addresses, but also, or even more so, for specialists in other fields. He expressed the hope that more and more of the young mathematicians would participate in the Congress.

There was general agreement, however, that the pattern of collaboration that had evolved, and become established, between the Organizing Committee of the Congress and the Executive Committee of the Union, should be continued in all future Congresses, as was emphasized by the President in his Opening Address. These points of agreement were:

1. that the Fields Medals Committee is appointed by the Union, that their decision is communicated to the Secretary of the Union, who will obtain the medals from Canada, and that only the arrangements for the actual presentation are looked after by the Organizing Committee of the Congress;
2. that the scientific program of the Congress (especially the invited one-hour and half-hour lectures) is decided upon by a Committee appointed by the Union, with 4 representatives of the Organizing Committee of the Congress, 4 representatives of the Executive Committee of the Union, and, in addition, a Chairman appointed by the President of the Union;
3. and, that the recommendation for the location of the 1970 Congress is made by a Committee appointed by the Union, and having on it at least 2 representatives of the Organizing Committee of the 1966 Congress.

The General Assembly signified its approval of these points, without any dissent.

IX. Elections

(a) Executive Committee

The following Executive Committee was elected, by written ballot, for the four-year period, beginning January 1, 1963:

| | |
|---------------------|---|
| President: | Professor G. de Rham |
| Vice-President: | Professor H. Cartan |
| Vice-President: | Professor K. Kuratowski |
| Secretary: | Professor K. Chandrasekharan |
| Members: | Professor J. C. Burkill Professor F. Hirzebruch Professor M. A. Lavrentiev Professor D. Montgomery Professor B. Segre |
| Retiring President: | Professor R. Nevanlinna. |

(b) *Commissions*

ICMI

Ten members-at-large:
Professor A. Lichnerowicz (*President*)
Professor Y. Akizuki
Professor H. Behnke
Professor S. Bundgaard
Professor G. Choquet
Professor H. Freudenthal
Professor O. Frostman
Professor R. L. Jeffery
Professor A. Kolmogorov
Professor E. Moise.

Exchange Commission

Professor B. Eckmann (*Chairman*)
Professor L. Garding
Professor S. Iyanaga
Professor E. Marczewski
Professor E. J. MacShane
Professor I. N. Vekua.

X. Miscellaneous

All the reports presented to the General Assembly were adopted (see Resolution No. 11).

A resolution was adopted calling for the next General Assembly at about the same time and place as the next International Congress of Mathematicians (see Resolution No. 9).

A resolution of thanks to the President and the retiring Members of the Executive Committee was adopted (see Resolution No. 12).

XI. Resolutions

The General Assembly

1. Resolved that the Commission on Publication and Documentation be discontinued after January 1, 1963 and that the tasks previously envisaged by that Commission be referred to the new Executive Committee for examination and appropriate action.
2. Resolved that the General Assembly favors an expanded program of scientific activities of international interest on a limited and temporary basis and authorizes the new Executive Committee to take appropriate action.
3. Resolved to increase the value of the unit contribution by 50%, beginning 1963.
4. Resolved to authorize a contribution of \$ 200.—to the Inter-Union Committee on the Teaching of Science.

5. Resolved to approve the budget for 1963-66 as presented by the Executive Committee. For details see item VI.
6. Resolved that the Exchange Commission be continued, with the charge of carrying on IMU Lecturers Program and related activities.
7. Resolved to accept the report of ICMI, subject to minor editorial changes and subject to its completion by the submission of an additional report by the Secretary-Treasurer, and to approve in principle the implementation by ICMI of the recommendations numbered 1, 2 and 3 on page 17 of this report.
8. Resolved to recommend to the new Executive Committee the dissolution of the SCOTS as soon as that Committee has finished the precise work it has been asked to do.
9. Resolved that the Fifth General Assembly of the IMU be held in 1966 at about the same time and place as the next International Congress of Mathematicians.
10. Having discussed the question of re-organization of the structure of ICSU, resolved to express the opinion that the scientific Unions form the real core of ICSU, and that their statutory role in ICSU should not be diminished.
11. Resolved to approve all reports submitted to the General Assembly, including the report of the President, the reports of the various Commissions and Committees, and the printed reports, financial and other, submitted by the Executive Committee.
12. Resolved to express its profound gratitude to the President of IMU, Professor R. Nevanlinna, and to all members of the E.C., who carried out their tasks with such brilliance.

PRESIDENTIAL ADDRESS

By PROF. R. NEVANLINNA

LADIES AND GENTLEMEN,

I call the Fourth General Assembly of the International Mathematical Union to order, with a word of welcome to all the delegates. I derive particular pleasure from the fact that the two past Presidents of the Union, Professor Marshall Stone and Professor Heinz Hopf, and the two past Secretaries, Professor Enrico Bompiani and Professor Beno Eckmann, are present here in one capacity or another. I am happy also to welcome the representative of UNESCO, Dr. Roderick.

It has been the custom that the General Assembly opens with an address by the President. I should like, very briefly, to review the work of the Union since the General Assembly at St. Andrews in August 1958.

I think it would be correct to say that the Union is now more firmly established, and that its work, although modest, has been definitely fruitful. Almost all the countries in which mathematical activity is sizeable are now members, with a few exceptions, and I hope, before long, that we shall be able to say that no country in which there is significant, independent, mathematical activity, remains outside.

One of the principal activities of the Union has been the support of the International Congress of Mathematicians. I am glad to say that the Union has been able to establish rather close relations with the Organizing Committee of the Stockholm Congress. As in the past, we have agreed to give financial support to the Congress, to the extent of \$15,000. But, for the first time, the scientific program is based to a large extent, if not entirely, on the recommendations of a Consultative Committee formed jointly by the International Mathematical Union and the Swedish Organizing Committee. A definite procedure has been established by the Union for the appointment of the Fields Medals Committee and for the appointment of the Committee to recommend the location of future Congresses. This will have become, in the coming years, an established tradition.

The support of international research symposia by the Union has gone steadily forward. As you will notice from the printed report, we have supported symposia, or conferences, in Holland and Poland in 1959, Switzerland and Israel in 1960, England and Czechoslovakia in 1961. Our share of the financial burden, in these cases, is small compared to the support that these countries themselves gave to those symposia. But I think it would be correct to say that the Union has acted as a strong catalyst in

every case. I should like to thank ICSU for their allocations of UNESCO subventions, which enabled us to support these symposia. I strongly feel that the Union should try to contribute, from out of its own funds, additional support for this activity. You will no doubt consider this in the preparation of the next budget.

The program of IMU Lectureships, barely started at the time of the last Assembly, can now be pronounced to be a definite success. There is no longer any need to treat this as a "trial run". We have provided lectureships at the request of Poland, Great Britain, Hungary, Japan and Israel. Our financial contribution in all these cases has been rather small, compared with the success that the program has achieved. I commend for your consideration an expanded program during the next four years.

One of the most important Commissions of the Union is ICMI. It has had a long tradition. It has been notably active during the past four years. Meetings on mathematical education, of great value, have been organized in Aarhus, Belgrade, Lausanne, Bologna and Bogotá. And ICMI has acted as a coordinator and a helper in all these meetings.

In response to a request from UNESCO for cooperation in the preparation of a report on the coordination of the teaching of mathematics and physics at University level (based on a sample survey in 8 or 9 countries), we have established a Special Committee on the Teaching of Science (SCOTS) with Professor Stone as Chairman. The Committee is now executing a contract between UNESCO and the Union.

The General Assembly of ICSU, held in London in September 1961, set up an Inter-Union Committee on the Teaching of Science. The first meeting of this Committee, held in May, was attended by Professor Stone as the Union's delegate, and his election as Chairman of this Committee signifies the important rôle of mathematics in any program for the teaching of science. We look forward to close cooperation between ICMI, and SCOTS, and the ICSU Committee on the Teaching of Science.

The first World Directory of Mathematicians was brought out by the Union, in cooperation with the Tata Institute of Fundamental Research, Bombay, in 1958. A more complete second edition was brought out in August 1961, and a still more complete third edition will, we hope, appear in due course. The Directory, by its very nature, can never be perfect. But on the basis of the working arrangements established between the Union and the Tata Institute, we have every reason to hope for ever more satisfactory editions. I like to thank the Tata Institute and, in particular, Professor Chandrasekharan for his successful activity in this connection.

One of the tasks of this Assembly is to explore ways and means of enlarging the scope of the Union's activities. In any such scheme of enlargement, UNESCO and ICSU are bound to play a vital role, and the activities of ICMI have an immediate connection with UNESCO's world-wide activities. For this reason we are arranging a special session tomorrow which will be devoted to a discussion of our relations with ICSU and UNESCO, and our plans for ICMI.

I cannot conclude this address without calling your attention to an important point. To maintain our activities and to increase them, during these days when costs are generally going up, we need to enlarge our resources, and to expend our reserves, after providing for a safe minimum of, say, \$ 7,000 or 8,000—. It is right that the Union should approach ICSU for funds, but it is equally right that we should enlarge our resources, to finance our relatively modest program of scientific activities. For this reason we may have to consider an increase in the membership dues.

May I express the hope that this Assembly will take concrete steps to intensify our scientific activities, so well begun during Professor Stone's presidency, and so well established during Professor Hopf's.

Thank you

INTERNATIONAL COMMISSION ON MATHEMATICAL INSTRUCTION

Report for the Period 1959 - 62

1. **Meetings.** The principal activity of ICMI during the period 1959-62 has been to organize and hold meetings for the discussion of significant themes relating to mathematical education. Most of these meetings were jointly sponsored and organized in cooperation with other organizations. With one exception the proceedings either have been published already or are about to be published. The details of the six meetings held are as follows.

Symposium on "The Teaching of Geometry in the Secondary School", Aarhus (Denmark), May 30-June 2, 1960, jointly sponsored by ICMI and the Mathematical Institute of Aarhus University. The organizing committee comprised: H. Behnke, S. Bundgaard (Chairman), J.G. Kemeny, K. Piene, and S. Straszewicz. The proceedings were published by the Mathematical Institute of Aarhus University.

Symposium on "The Coordination of the Teaching of Mathematics and Physics", Belgrade (Yugoslavia), September 19-24, 1960, jointly sponsored by ICMI and the Yugoslav Association of Mathematicians and Physicists. The organizing committee comprised: G. Kurepa (Chairman), M.H. Stone, and V. Dajović. The proceedings are to be published by the Yugoslav Association of Mathematicians and Physicists.

Seminar on "The Teaching of Analysis in the Secondary School and the University", Lausanne (Switzerland), June 26-29, 1961, jointly sponsored by ICMI and the Swiss Mathematical Society. The organizing committee comprised: H. Behnke, G. de Rham, and M. Rueff (Chairman). The proceedings will be published in "L'Enseignement Mathématique".

Seminar for "A Discussion of the Aarhus and Dubrovnik Reports on the Teaching of Geometry at the Secondary Level", Bologna (Italy), October 4-7, 1961, jointly sponsored by ICMI and the Italian National Commission on Mathematical Instruction. The organizing committee comprised: P. Buzano, M.H. Stone, M. Villa (Chairman), T. Viola and G. Walusinski. The proceedings will be published in "L'Enseignement Mathématique".

Inter-American Conference on Mathematical Education (IACME), Bogotá (Colombia), December 4-9, 1961, organized by ICMI with the cooperation and support

of UNESCO, the Organization of American States, the National Science Foundation and the Colombian Association of Universities. The organizing committees comprised: Marcelo Alonso, Jose Babini, Howard Fehr (Secretary), L. Nachbin, M.H. Stone (Chairman), R. Torres and Pablo Casal. The proceedings will be published by the Organizing Committee under the editorship of Professor Howard Fehr, Secretary. The Conference formed an Inter-American Committee on Mathematical Education comprising: B. Alfaro Sagot (Costa Rica), A. Gonzales Dominguez (Argentina), A. Ferreira Gomes (Brazil), M.H. Stone (U.S.A., President), and José Tola P. (Peru).

Colloquium on "Three Selected Topics—I. Modern Mathematics in the Secondary School (J.G. Kemeny, reporter)—II. The Teaching of Algebra and Arithmetic (S. Straszewics, reporter)—III. The Training of Teachers (K. Piene, reporter)", Stockholm (Sweden), August 15, 16, and 18, 1962, organized by ICMI in connection with the International Congress of Mathematicians 1962. The organizing committee comprised: O. Frostman, A. Pleijell, L. Sandgren, M.H. Stone (Chairman), and G. Walusinski. Arrangements for publication of the proceedings have not been completed.

2. **Publications.** The status of "L'Enseignement Mathématique" as the official organ of ICMI was clarified in 1959 by the cooptation of the Editor, Professor J. Karamata, as a member of the Commission. A completely satisfactory modus operandi has not yet been worked out between ICMI and the editors of "L'Enseignement Mathématique". However work on the proceedings of the Lausanne and Bologna Seminars has strengthened the cooperation toward which both organizations have directed their efforts.

As noted in the preceding section, it has been possible to arrange for the publication of the proceedings of all scientific meetings of ICMI held during 1959-62 with the exception of the Stockholm Colloquium. It is hoped that this exception will be removed shortly.

3. **Meetings of the Executive Committee.** Meetings of the Committee have been infrequent, and much of its business has of necessity been transacted by mail. Apart from its first meeting, held in Paris on May 26-27, 1959, to discuss the themes for the 1962 Stockholm Colloquium and other scientific matters, and a meeting in Paris on December 7-8, 1960, these meetings were held in conjunction with scientific sessions of ICMI—namely, in Belgrade in September, 1960, and in Saltsjöbaden on August 10, 1962. An attempt to hold a meeting in Bombay in January, 1960, at the time of the Second Conference on Mathematical Education in South Asia failed because attendance fell short by one of the necessary quorum of four.

4. **Membership of ICMI.** Certain subcommissions failed to designate delegates for the period 1959-62 and thus effectively withdrew from the work of ICMI—it is to be hoped, only temporarily. In addition some subcommissions named their delegates very tardily. In consequence the election of officers and members of the Executive Committee was somewhat delayed; but it was completed in time to hold a first meeting in May, 1959. The Committee consisted of: Y. Akizuki, A.D. Alexandrov,

H. Behnke (Vice-president), O. Frostman, G. Kurepa (Vice-president), M.H. Stone (President), and G. Walusinski (Secretary). Professor H. Hopf was coopted as a member of ICMI to represent the President of IMU and to exercise the latter's statutory functions as a member of ICMI. He was accorded the status of a non-voting member of the Executive Committee.

The status of Luxembourg in relation to ICMI was clarified, in accordance with the new terms of reference for ICMI adopted by IMU, through the cooptation of Professor A. Gloden as a member of ICMI. The cooptation of the Editor of "L'Enseignement Mathématique", Professor J. Karamata, as a member of ICMI has already been mentioned above.

Czechoslovakia, Hungary, and Israel have taken advantage of their membership in IMU to associate themselves with the work of ICMI and have named delegates to the Commission during the period under review. Inquiries about such association have been made by certain other member-countries of IMU but there are still many which do not participate in the work of ICMI.

5. **Finances.** ICMI has been financed during the period 1959-62 chiefly by funds appropriated for its use by IMU. An annual subvention of \$300 has been voted by IMU from its own funds to cover the operating expenses of the offices of the President and Secretary of ICMI. Each year a larger subvention has been provided out of funds made available to IMU by ICSU for the organization of scientific meetings, the expenditure of these funds being subject to limitations set by ICSU. In particular no administrative expenses or publication costs could be paid with these funds. The amount thus appropriated by IMU from ICSU funds in support of ICMI's scientific program varied from year to year. Payments from these appropriations have been handled directly by the Secretary of IMU on certification of the Secretary of ICMI, as this procedure greatly simplifies the necessary accounting and auditing formalities. For a complete statement reference must therefore be made to the report of the Secretary of IMU for the period 1959-62.

ICMI has sought to set up also a separate fund of its own to supplement in useful ways the subventions received from IMU, especially for purposes for which the latter were by the terms of grant unavailable. By vote of the Executive Committee taken in May, 1959, voluntary contributions in multiples of a unit contribution of \$25 were solicited from the countries represented in ICMI. The following contributions have been gratefully received: in 1959, \$100 from Denmark, and \$50 from Italy; in 1960, \$25 from Luxembourg, \$25 from the Netherlands and \$25 from Sweden; + in 1961, \$50 from Italy and \$25 from Luxembourg; \$50 from Italy and \$125 from the U.S.A. The Secretary's account of this fund is appended.

The financial means hitherto available to ICMI have been inadequate, on the average, for a satisfactory execution of its program of scientific meetings and publications. Without the generous cooperation of other organizations fewer meetings could

have been held during the period under review, and no publication at all could have been achieved. Meetings such as those held in Aarhus, Belgrade, Lausanne, and Bologna were unavoidably small and of a regional character because of financial limitations. For such meetings ICMI has been able to authorize an expenditure of at most \$1000 each in direct support of the scientific program. Usually the authorized amount could not be fully expended because of last-minute withdrawals of invited participants. Experience shows that ICMI should have not less than \$1500 for each such scientific meeting. Moreover, if such meetings are to have a broader, less regional character, the expenditures for the scientific program should be increased to \$2500 each.

Because of geographical considerations, ICMI should be in a position to convene three rather than two scientific meetings each year, with a view to exerting a greater influence outside Europe. Thus it would be entirely reasonable for ICMI to envisage an annual budget of approximately \$9000. World interest in the field of mathematical instruction is becoming intense, and ICMI can hardly play its proper role in relation to the resulting movements for experimentation and reform unless it is able to maintain this rather modest level of activity.

The organization of large scientific meetings with participants drawn from a wide area is very expensive and can be undertaken only as a special activity supported by special contributions outside the regular budget of ICMI. The Bogotá Conference (IACME) of 1961 was provided for entirely outside the 1961 budget of ICMI, through the generous aid obtained from the various sponsors listed above. Some \$36,500 was raised for the organization of IACME and the publication of its proceedings. The actual expenses are expected to fall little short of this figure when the final accounting is made.

6. Contacts and Consultations. ICMI has sought at all times to establish contacts with other bodies working in the field of mathematical education with a view to finding promising areas for cooperation. Most of the contacts made have remained on an informal basis up to the present time.

For example, UNESCO's Department of Education has consulted various members of ICMI, especially the President and Secretary, with regard to the Symposium to be held in Budapest (Hungary) on August 27-September 8 under the auspices of the Hungarian National Commission for UNESCO.

In formulating and carrying out its program for the modernization of mathematical instruction OEEC (now OECD) has had the benefit of similar informal consultations. Several members of ICMI made important individual contributions to CEEC's Royaumont Seminar in 1959 and to the work on its Dubrovnik Report in 1960. Furthermore, a formal request was made by OEEC to ICMI in 1959 for assistance in preparing a list of outstanding mathematical texts suitable for widespread translation, and a tentative list was made up by a special subcommittee of ICMI.

In 1960 UNESCO's Department of Natural Sciences began discussing with IMU the possibilities of formal cooperation in the field of mathematical instruction at the university level. These discussions resulted in the conclusion of a contract for this purpose between UNESCO and IMU early in 1962, but the Executive Committee of IMU decided to create a Special Committee on the Teaching of Science (SCOTS) to handle its obligations under the contract as well as its developing general interests in the broader field of science education. A close cooperation between ICMI and SCOTS is thus to be desired in the future.

For a long time there has existed a semi-formal understanding between ICMI and the Musée Pédagogique to share the work of mounting the exhibitions of books and other educational materials at the International Congresses of Mathematicians. This arrangement was continued in 1962. The Musée Pédagogique benefits under it through the permanent acquisition of the books offered for exhibition at the Congresses.

Several international organizations interested in the improvement of mathematical education have come into being during recent years. Among these ICMI has ties at least with three by virtue of common memberships—namely, with the International Commission for the Improvement of Mathematics Teaching, the Committee on Mathematics in South Asia, and the Inter-American Committee on Mathematical Education. The establishment of closer cooperation between ICMI and these bodies, even on a purely informal basis, is much to be desired.

7. Recommendations. The formulation and execution of ICMI's program for 1963-66 becomes on January 1, 1963, the responsibility of the new membership and the new Executive Committee. However, some general recommendations based on the experiences of the last four years may be offered here as an aid in the work of expanding ICMI's role in stimulating fruitful discussion of the changing problems of mathematical education. It is therefore recommended:

- (1) that the general program of ICMI provide for not less than three scientific meetings during each calendar year, at least one of which should be outside Europe, with an annual budget of \$9000;
- (2) that ICMI study methods and means for satisfying the growing demand for an international bibliographical and informational service in the field of mathematical education which will promote and facilitate the exchange of information about studies, experiments, and action in this field;
- (3) that ICMI extend its activity to new areas, such as Africa, where current interest in the field of mathematical education would benefit through better information as to the current thinking of mathematicians concerning the problems, both new and old, which must be solved if mathematical education is to keep pace with mathematical and pedagogical progress.

These recommendations are either explained in the preceding text (viz. (1)) or are in large measure self-explanatory. In reference to (2), it should be mentioned that there is already evidence of a broader demand for such an international service to cover all science teaching rather than mathematics teaching alone. Conceivably it would be easier to obtain support for such a general service than for one disseminating information exclusively in the field of mathematical education.

By order of the Executive Committee, ICMI

Mashall H. Stone, President.

G. Walusinski, Secretary.

10th August, 1962.

INTERNATIONAL COMMISSION ON THE EXCHANGE OF MATHEMATICIANS

Report covering the period 1958-62

The Commission during the period 1958-62 has consisted of the following members: Professors E. Bompiani (Rome/Pittsburgh), T.M. Cherry (Melbourne), R.D. James (British Columbia), E. Marozewski (Wroclaw), S. L. Sobolev (Moscow), K. Yosida (Tokyo), and S. Mac Lane (Chicago), Chairman. In 1959 the Commission coopted Marston Morse as an additional member.

The main program of the Commission falls under three heads:

- I. IMU Lecturers program, started 1958,
- II. IMU sponsored Fellowships,
- III. Regional IMU Symposia.

In more detail.

I. **Lecturers.** Under this program the Union provides financial support to the National Committee of a member country which wishes to invite some distinguished mathematician from outside the country to give a series of lectures. Applications under this program have been received by the Commission, which made recommendations to the Executive Committee of the Union. Lecturers under this program have included:

- 1959 (i) Poland, Lecturer: Professor A. Tarski (Berkeley, California).
(ii) Great Britain, Lecturer: Professor H.S.M. Coxeter (Toronto).
- 1960 (iii) Hungary, Lecturer: Professor G. Szegő (Stanford, California).
- 1961 (iv) Japan, Lecturer: Professor H. Grauert (Göttingen).
(v) Great Britain, Lecturers: Professor J. Deny (Paris), L. Garding (Lund), C.E. Rickart (Yale).
(vi) Poland, Lecturer: Professor E.S. Andersen (Aarhus).
- 1962 (vii) Israel, Lecturer: Professor B. Eckmann (Zürich).

This program has been eminently successful. Its continuation is warmly recommended.

IIa. Fellowships. The Commission had proposed that IMU search for financial support for a small number of IMU Fellowships, intended for promising younger

mathematicians who wished to continue their studies in some country other than their own. No adequate sources of financial support have been found; in particular, it appears that most foundations prefer to support their own special projects.

IIb. In 1958 the Commission decided to try to prepare for general circulation a list of all international Fellowships available to Mathematicians. Subsequent investigation by Professor Morse showed this task to be impractical because of the large number of such fellowships and the variety of conditions attending them.

III. The Commission has informally considered the possibility of encouraging *Symposia of an expository and regional character*: These were to report an exposition of current trends of research in a broad field of Mathematics. No funds nor names for carrying out such symposia have been discovered.

IV. In the period 1954-1958 the Exchange Commission, as then constituted, operated as Information Service for mathematicians visiting Europe or travelling in Europe. Since the then response to this service was not very satisfactory, it has not been continued.

Conclusions. We recommend that the Exchange Commission be continued, with emphasis upon the Lecturers program and possibly upon related new activities.

August 11th, 1962.

Respectfully submitted for the Commission.
Saunders Mac Lane

COMMISSION ON DOCUMENTATION

Report of Professor J. F. Koksma

By the 3rd General Assembly of IMU at St. Andrews (August 1958) a Commission on Documentation of Mathematical Literature was established consisting of B. Amirà, Jerusalem, W. Fenchel, Copenhagen, J.F. Koksma (Chairman) and G. Sansone, Florence. In a letter of March 29, 1957 to the Executive Committee of IMU, Koksma had drawn attention to the fact that till now for mathematics no satisfactory system of classification exists, which might serve as a reliable base for documentation and retrieval of mathematical literature. All over the world libraries and abstracting journals are more or less urgently in need of such a system.

Among the classifications, which in the past have been composed, the UDC (Universal Decimal Classification) composed in 1910 and propagated by the FID (Federation Internationale de Documentation) deserves special attention, as the UDC intends to cover the whole field of pure and applied sciences and is widely used. Its Chapter 51 (sub-class of mathematics), however, is completely out of date, as it has been revised for the last time in 1937.

In the above-mentioned letter it was pointed out that the FID seriously wishes to compose a new version of Chapter 51 and tries to find the help of mathematicians for that task as well as the moral support of IMU.

Already before the St. Andrews General Assembly, Koksma had been authorized by the E.C. to take up appropriate contacts, especially with the FID, which is housed in the Hague. The FID expressed the readiness to offer all necessary help by their documentation experts, if some mathematicians, preferably living not too far from the Hague, would be found willing to undertake the mathematical part of the work.

At the first meeting of the Commission on Documentation at Edinburgh (August 16, 1958) the Commission agreed on the following modest procedure. Two young mathematicians, Dr. J. Dijkman and Drs. J. Verhoeff, belonging to the Staff of the Technical University of Delft, both of them interested in the subject of classification and whom the Chairman had found willing to start the work, should compile a comparative and critical description of the main classification systems which have been or still are in use now at important libraries and the big abstracting journals. Moreover, attention should be given to works which may contain theoretical or practical directives for future classifications (e.g. Bourbaki). That description together with the suggestions for the further work to which it would lead might be placed for the Commission by the Chairman for internal discussion, which, it is hoped, would lead to further steps.

A first report of the above-mentioned description was handed to the Chairman in 1959. It stated several valuable facts which, however, did not seem to lead to a more or less positive conclusion concerning the further task, as had been hoped for by the authors and the Chairman. Their discussions aiming at a definite version of the Report which might be placed for the Commission were interrupted by illness of the latter and only could be taken up again in 1962 after Drs. Verhoeff's return from the U.S.A., where he had made a study tour, including a visit to several documentation centres. Summarizing the findings of Dr. Dijkman and Drs. Verhoeff and the recent experiences of Drs. Verhoeff, we may state the following conclusions:

1. All existing systems of classification (as far as investigated by Dijkman and Verhoeff) are essentially unsatisfactory.

2. Documentary activities in mathematics are mainly directed to the needs of those who are already specialists in their fields and therefore may be hardly interested in the underlying classification scheme and its shortcomings as such. Any sensible opportunistic retrieval system *ad hoc* will more or less satisfy their wants.

3. The needs of much broader classes of those who have to use mathematical literature (books as well as periodicals), such as advanced students, industrial laboratories, scientific institutes etc. are widely neglected. They often depend on information by non-specialist library employees, who for mathematics (contrary e.g. to chemistry and technical sciences) must rely on classifications like the still widely used out-dated UDC Chapter 51.

4. For non-specialists meant sub 3 an improved classification, say, on UDC level, is urgent. In contradistinction to the case of specialists (cf. 2), such a classification should be based on the intrinsic properties of the subjects, expressed by a reliable terminology.

5. It is problematic whether a hierarchical classification as envisaged by the UDC will be possible at all for mathematics, in view of the natural laws which should be inherent to each such classification: different classes should be disjoint, each class should exhaust its subject, sub-classes should really be contained in the class itself etc., laws which are heavily violated by the existing classifications. The circumstance that any mathematical author at any time may give an additional meaning to an already existing word creates a special difficulty for a field where already fundamental terms like "algebra", "algebraic", "analysis", "elementary" for the layman have no well-defined meaning, and for the specialist often only are clear from the context.

6. It becomes clear that composing a classification which approximately would fulfil the above ideal is a creative task which only can be undertaken by a team of several mathematical experts. It would involve a certain standardization of mathematical terminology.

7. It is obvious that the main difficulty lies in the controversy between conclusions 5, 6 and 4.

8. As to 6, the Commission is of the opinion that such a task lies beyond its present scope. Nevertheless (a.o. from correspondence between the Editors of Mathematical Reviews and the Chairman) it is convinced that it would be of great importance for the mathematical world if it could be carried through, preferably under the auspices of IMU. Also the FID is strongly interested in such a project.

9. As to 4, one might aim at a less strict classification than meant in 5 and 6 but which in any case would mean an essential improvement of UDC Chapter 51. Such an improvement also would be welcomed by FID.

10. In the past years some mutations in the Board of FID have taken place, but the new officers have expressed the same wishes towards the classification of mathematics as their foregoers. At present they are in touch with UNESCO which probably will grant some funds for the work. The first aim is an improvement as meant in 9 which may be carried out by some mathematicians around the Hague like Verhoeff, Dijkman a.o. and perhaps might find the approval of IMU after having been placed before the Commission of Documentation.

In view of these conclusions, my advice is that the Commission

- (a) should inform the E.C. that it will postpone her work on the UDC till the FID project mentioned in 10 is delivered to it;
- (b) should make a proposal to the E.C. as to the appointment of a new member in view of my retirement;
- (c) should give its opinion as to the question whether in the above point 6 lies a task for IMU and if yes, which measures should be taken;
- (d) In its final report to the E.C. the Commission should summarize some minor but important means which might be helpful for better documentation and retrieval of mathematical literature similar to the rules for titling and abstracting which are in use already with physical, chemical and biological journals and to suggestions which have been made in the Commission on Publications a.i.