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IMU

BULLETIN

OF THE

INTERNATIONAL MATHEMATICAL UNION

No. 3 June 1972

Secretariat

Box 41

S - 182 51 Djursholm

SWEDEN

INTERNATIONAL MATHEMATICAL UNION

Executive Committee

(1 January 1971 - 31 December 1974)

President:	Professor K. Chandrasekharan
Vice-Presidents:	Professor A. Adrian Albert
	Academician L.S. Pontrjagin
Secretary:	Professor Otto Frostman
Members:	Professor M.F. Atiyah
	Professor Y. Kawada
	Professor N.H. Kuiper
	Academician M. Nicolescu
	Professor E. Vesentini
Past President:	Professor H. Cartan

Report of the 30th Meeting of the Executive Committee

Steklov Institute, Moscow, September 20, 1971

The following members of the E.C. were present at the meeting: Professor K. Chandrasekharan (President), Professor H. Cartan (Past President), Professor A.A. Albert (Vice-President), Academician L.S. Pontrjagin(Vice-President), Professor O. Frostman (Secretary), Professor M.F. Atiyah and Professor N.H. Kuiper (Members).

Professor Kawada, Academician Nicolescu and Professor Vesentini had expressed their inability to attend.

The President made a reference to the death on June 3, 1971, of Professor Heinz Hopf, a Past President of IMU (1954-1958) and asked the members of the E.C. to honour his memory by observing a minute's silence. This was done.

IMU Fellowship

The E.C. decided to create an IMU FELLOWSHIP, with a grant of about $ 2.000 a year, for mathematicians in developing countries, working at the post-graduate level. The respective National Committees for Mathematics should be invited to give their support. Announcement of the fellowship should be made in the IMU Bulletin. Applications should be sent to the Secretary of the Union, who would then circulate them to the International Advisory Group (IAG) for a recommendation, which should be forwarded to the Executive Committee for further action. It was agreed that, if necessary, the required funds should be obtained by postal ballot among all members of IMU.

International Advisory Group

Academician Pontrjagin reported that Academician Keldysh had expressed his inability to serve as a member of the International Advisory Group because of the pressure of his other duties, and that the Soviet National Committee would like to propose Academician I.M. Vinogradov in his place. This was agreed unanimously.

Proposal for a New International Mathematical Centre

Concerning the proposal to create a new International Mathematical Centre with a view to helping the developing countries, the E.C. felt that, at least for the time being, the utilization of the support and cooperation of existing mathematical centres of repute, all round the world, might be more fruitful and efficient and less expensive. The IAG that had been set up was an expert

body, with many directors of research represented on it, which could supervise, on a continuing basis, any new international project aimed at helping forward mathematics in developing countries.

IMU Lectures 1972

The E.C. decided to accept the proposal by Professor Y. Kawada that the lectures that Professor F. Hirzebruch had been invited to give in Tokyo in February-March 1972, by the Mathematical Society of Japan, should be treated as IMU Lectures (subject to the privileges and obligations attached to the lectures as determined by the E.C.).

Mathematical -Physical Conference

A preliminary proposal by Academician N.N. Bogoliubov (member of the Soviet National Committee for Mathematics) for an International Conference on "Mathematical problems of quantum field theory and quantum statistics" was discussed. As this proposal was in accordance with the idea of establishing closer contacts between mathematics and other scientific disciplines, the E.C. decided to support the proposal and to allocate $ 1.000 for organizational expenses.

Payment of dues

On a reference made by the Secretary, it was agreed to record that Mexico had defaulted in the payment of its dues.

Presentation of a Fields Medal to Professor S. Novikov

The Soviet National Committee of Mathematics arranged a luncheon to meet the Executive Committee of IMU at the House of Scientists in Moscow on September 20, 1971. By agreement between the Chairman of the Soviet National Committee and the President of IMU, Professor S. Novikov received the Fields Medal on that occasion from the hands of Professor Henri Cartan, past President of IMU, and Chairman of the Committee for the award of the Fields Medals at the International Congress of Mathematicians, Nice, 1970. Among the invitees were also members of Professor Sergei Novikov's family.

ANNOUNCEMENTS

IMU Fellowship

Attention is drawn to the IMU Fellowship of $ 2.000 a year for mathematicians in developing countries. The deadline for applications (to be sent to the Secretary of the Union) is extended till October 1, 1972.

IMU Canberra Circular

Attention is drawn to the IMU Canberra Circular about events in the mathematical world such as conferences, and visits issued by Professor B.H. Neumann, Department of Mathematics, Institute of Advanced Studies, Australian National University, P.O.B. 4, Canberra, ACT 2600, Australia.

The circular contains news of futute meetings of mathematicians, and of visits of individual mathematicians. Mathematicians everywhere are invited to extend their co-operation to Professor Neumann and to help in making the circular ever more useful.

Interdisciplinary Lincei Centre of Mathematical Sciences and their application

IMU has been informed of the creation of a new mathematical centre under the auspices of the Accademia Nazionale dei Lincei. The centre seeks to carry out research work, organize seminars, issue publications, and make available scholarships, financial means and research facilities. Further information can be had from Professor Beniamino Segre, President of the Lincei Academy, Via della Lungara 10, 00165 Roma.

Lincei Prizes

The International Prize "Antonio Feltrinelli" of the Lincei Academy, Rome, has been awarded to Professor Jean Leray, Paris. The National Prize of the same academy has been awarded to Professor Aldo Andreotti, Pisa.

GEDENK-KOLLOQUIUM HEINZ HOPF

A Colloquium in memory of Heinz Hopf was organized by the Eidgenössiche Technische Hochschule, Zürich on November 19, 1971. It was opened by Professor Peter Henrici, Vorstand der Abteilung für Mathematik und Physik, with a tribute to Hopf's achievements. Professor Paul Alexandroff gave a lecture entitled "Erinnerungen". Professor F. Hirzebruch and Professor B. Eckmann gave one-hour lectures on Hopf's mathematical work. The President of IMU spoke about Hopf's connexion with the Union in the following terms:

"It is a privilege to participate in this colloquium to commemorate Heinz Hopf. Seldom was a great mathematician so beloved as a person. Even more seldom was such a mathematician also interested in the comradeship and cohesiveness of the mathematical community at large.

Gentle in spirit, refined in manner, disciplined in emotion, loyal in friendship, determined but patient, quick in response to any call for help, forceful but economical in speech, courageous, and shy to the point of seeming reserved, Hopf embodied rare human qualities.

His finest monument is, of course, his mathematical work. And one can hardly find a trio of mathematicians dearer to him than Professors Paul Alexandroff, Beno Eckmann, and Fritz Hirzebruch, to speak to us about it to-day. I will not poach on their preserves.

I should like, however, to touch just one of his many endeavours on the international plane – his stewardship of the International Mathematical Union. His mathematical stature and constructive philosophy enabled him to mould that still young organization into the authentic voice of the world community of mathematicians. His non-political nature aided in the expansion of the Union, and he quickly got the Union's constitution revised to reflect that expansion. His global perspective helped launch a programme of international research symposia which was not confined to the western world, and which remains the strongest card in the Union's hand. The Symposium on Algebraic Number Theory held in Tokyo in 1955, and the Symposium on Zeta-functions held in Bombay in 1956, are landmarks in the scientific history of those countries, and perhaps also in the evolution of our science. The symposium for young topologists in Oxford (1955), where he characterized himself as a grandfather and the late Professor J.H.C. Whitehead as just a father, showed his kinship for, and faith in, the younger generation. During his presidency was initiated the Union's programme of international exchanges, of which the most recent example is Professor André Weil's visit to the Soviet Union. It was with his enthusiastic support that the preparation of the scientific programme of the International Congress of Mathematicians first became internationalized. And he played a key role in the devolution on the Union of responsibility for the administration of the Fields Medals. He it was, again, who brought about the decision on the first issue of the World Directory of Mathematicians in 1958. In all this activity, as in every other, Heinz Hopf's intellectual integrity burned with a hard gem-like flame. We salute him as a great mathematician, a great human being, and a dear friend. His mathematics had that touch of simplicity and inevitableness which one associates with the very greatest work. He was also a simple man, who prized the simple pleasures of life, and was ever grateful to this country, of which he counted himself a simple citizen."

Heinz HOPF (1894 - 1971)

par Henri Cartan

Le 19 novembre 1971 l'Ecole Polytechnique Fédérale de Zürich célébrait la mémoire de Heinz Hopf, décédé quelques mois plus tôt: A son tour, l'Union Mathématique Internationale se doit de rendre hommage à son ancien Président, qui fut l'un des grands mathématiciens de notre temps.

Allemand de naissance (il était né à Breslau le 19 novembre 1894), Heinz Hopf venait de commencer ses études universitaires quand éclata la guerre de 1914. Mobilisé pendant quatre ans, il reprit ses études à Breslau en 1919, puis aux Universités de Heidelberg, Berlin et Göttingen. Après avoir obtenu son doctorat à Berlin en 1925, il enseigna comme Privatdozent dans cette Université de 1926 à 1931, avec une interruption d'un an en 1927 pour un séjour à Princeton comme boursier Rockefeller. C'est en 1931 qu'il fut applelé comme professeur à l'Ecole Polytechnique Fédérale de Zürich; il y enseigna jusqu'à sa retraite en 1965. Il put ainsi exercer une influence durable dans cette Ecole qu'avaient déjà illustrée Dedekind, Hurwitz, Minkowski, Hermann Weyl.

Le nom de HOPF, après celui de BROUWER, restera attaché à l'histoire de la Topologie. Les idées qu'il a introduites se sont révélées d'une fécondité remarquable. Ce n'est pas que Hopf ait déroulé de grandes théories générales; il s'est, au contraire, attaqué à des problèmes précis, que souvent personne n'avait eu l'idée de poser; il en a donné des solutions, complètes ou partielles, qui révélèrent des relations insoupçonnées jusqu'alors et suggérèrent des généralisations ou de vastes développements possibles. Par ses travaux, par l'inspiration qu'y puisèrent ses élèves directs ou indirects, Hopf eut une influence exceptionnelle sur le développement de la Topologie pendant une trentaine d'années. Parmi ses élèves directs, qui lui doivent l'orientation de leurs premiers travaux, citons les noms de STIEFEL, SAMELSON, ECKMANN, KERVAIRE, HIRZEBRUCH.

Hopf est de ceux qui, sous l'influence d'Emmy NOETHER, ont contribué à l'algébrisation de la Topologie. Mais s'il maniait avec virtuosité les concepts algébriques, Hopf pensait que le rôle de l'intuition géométrique est irremplaçable. Il a d'ailleurs expliqué lui-même sa façon de concevoir le rôle de l'Algèbre en Topologie (1): "Le processus d'algébrisation (de la Topologie) a eu des effects de clarification, de simplification et d'unification, il a conduit à des résultats nouveaux et inattendus; en outre l'algèbre ne fournit pas seulement des moyens pour traiter les problèmes topologiques, mais il semble bien que la plupart des problèmes possèdent eux-mêmes un côté dont le caractère algébrique est manifeste. Cependant les grands succès de ce développement comportent aussi, me semble-t-il, un certain danger: le danger d'une perturbation de

l'équilibre des mathématiques, lorsque naît la tendance à négliger complètement le contenu géométrique des problèmes et des situations topologiques. Cette tendance signifierait un appauvrissement de la mathématique." Hopf lui-même a contribué à rétablir l'équilibre en montrant, sur des cas concrets, comment la géométrie peut servir à éclairer et mieux comprendre des problèmes qui, en apparence, sont du domaine de l'algèbre pure. Ce perpétuel échange entre l'Algèbre et la Topologie est certainement l'un des traits caractéristiques de l'oeuvre de Hopf.

Il n'est pas possible d'analyser ici l'oeuvre mathématique de Heinz Hopf, ni même de donner une liste exhaustive des sujets qu'il a abordés. Nous nous contenterons de choisir quelques exemples caractéristiques de sa manière.

(1) En 1925 (2), Hopf étudie les zéros (supposés isolés) d'un champ de vecteurs tangents à une variété compacte M, et montre que la somme de leurs "indices" est égale à la caractéristique d'Euler-Poincaré $\chi(M)$: premier exemple d'une relation entre des propriétés "locales" et un invariant de caractère global. Il prouve aussi que si $\chi(M) = 0$ il existe effectivement un champ partout non nul.

(2) Dès 1931 (3), Hopf donne une classification des applications continues f d'une sphère S^3 dans une sphère S^2, grâce à l' "invariant de Hopf" $\gamma(f) \in Z$ dont il fera la théorie générale dans son fameux mémoire des Fundamenta (1935) (4): $\gamma(f) \in Z$ est défini pour chaque application continue $f: S^{2n-1} \to S^n$, il est nul si n est impair, et peut prendre toute valeur paire si n est pair. La recherche des applications f dont l'invariant $\gamma(f)$ a une valeur donnée est mise en relation avec l'étude du "type" d'une application $S^{n-1} \times S^{n-1} \to S^{n-1}$; la "construction de Hopf" associe en effet à chaque $g: S^{n-1} \times S^{n-1} \to S^{n-1}$ de type $(c_1, c_2) \in Z \times Z$ une application $f: S^{2n-1} \to S^n$ telle que $\gamma(f) = c_1 c_2$. Le problème de l'existence, pour un entier n pair, d'une application $S^{n-1} \times S^{n-1} \to S^{n-1}$ de type(1,1) est alors posé; il ne sera résolu qu'en 1958 par J.F. Adams, qui prouve qu'il n'y a pas d'autre valeur possible de n que celles signalées par Hopf (n = 2, 4 ou 8). Il faut aussi observer que l'étude de Hopf fournissait le premier exemple connu d'applications continues $S^a \to S^b$ (avec $a>b>1$) non homotopes à une application constante; ce fut le point de départ de l'étude des groupes d'homotopie des sphères. L'invariant de Hopf prouvait que les groupes d'homotopie $\pi_{4n-1}(S^{2n})$ sont infinis; comme on le sait, J.P. Serre a prouvé en 1951 que ce sont les seuls groupes $\pi_a(S^b)$ $(a>b)$ qui soient infinis.

(3) En 1940 Hopf s'attaque à l'étude topologique des groupes de Lie compacts. E. Cartan, L. Pontrjagin, R. Brauer et Ch. Ehresmann venaient de déterminer les nombres de Betti des groupes simples compacts appartenant aux grandes classes, et avaient constaté expérimentalement quelques lois qu'il restait à vérifier dans le cas des 5 groupes exceptionnels. Hopf invente une méthode générale, d'une simplicité déconcertante, et prouve que l'homologie rationnelle d'un groupe topologique G de dimension finie (et dont les groupes d'homologie sont de type fini) est celle d'un produit de sphères de dimensions impaires. Il y parvient par une simple analyse de la situation algébrique qui résulte, en homologie, de la loi de composition $G \times G \to G$. Dans une autre publication (6), Hopf donne une caractérisation topologique du "rang" d'un groupe de Lie compact: si l est le rang de G, l'application $x \to x^k$ de G dans G (k étant un entier quelconque $\geqslant 1$) est de degré topologique k^l. Ces travaux de Hopf ont inspiré une multitude de recherches sur les H-espaces, ainsi que sur les "algèbres de Hopf" (algèbres graduées A possédant une "application diagonale" $A \to A \otimes A$. Les algèbres de Hopf interviennent aussi de façon essentielle dans la théorie des "groupes formels".

(4) Dans trois mémoires fondamentaux parus aux Commentarii (7) Hopf introduit a partir d'idées géométriques, la théorie de l'homologie des groupes discrets. Il était simplement parti du problème suivant: culculer le deuxième groupe d'homologie $H_2(X)$ d'une espace X connaissant son groupe fondamental $\pi_1(X)$. Il donne alors une méthode algébrique pour calculer tous les groupes d'homologie $H_n(X)$ en fonction du groupe $\Gamma = \pi_1(X)$ lorsque les groupes d'homotopie $\pi_n(X)$ sont nuls pour $n \geqslant 2$. A cette occasion, Hopf introduit la notion de "résolution libre" d'une module; de sorte que ces articles contiennent en germe la nouvelle branche des mathématiques appelée aujourd'hui "algèbre homologique.

(5) Il faut encore mentionner la notion d' "éclatement" d'une variété analytique complexe en un de ses points, bien que Hopf n'ait publié que tardivement sur ce sujet (8). Il prouve que toute "modification" d'une variété analytique de dimension (complexe) deux peut être obtenu par une succession finie d'éclatements (σ-Prozesse). Ceci est l'analogue d'un théorème dû à Zariski dans le cadre de la géométrie algébrique. Les idées de Hopf ont été utilisées avec succès par Hirzebruch; elles ont influencé dans une certaine mesure la théorie de la résolution des singularités dans le cas analytique complexe (Hironaka).

(6) Enfin, il faut signaler le rôle historique qu'a joué le fameux livre "Topologie I", fruit d'une longue collaboration entre Heinz HOPF et Paul ALEXANDROFF. Ce traité, publié en 1935, et le livre "Lehrbuch der Topologie" de Seifert-Threlfall paru en 1934, furent les premiers exposés modernes de la Topologie; ils ont servi a former toute une génération de mathématiciens. Malgré les années qui ont passé, malgré les immenses développements qui ont suivi, le livre d'Alexandroff et Hopf reste aujourd'hui un ouvrage de référence.

En 1964, à l'occasion du 70-ième anniversaire de Heinz Hopf, l'Ecole Polytechnique Fédérale publia un volume de "Selecta" (9) qui rassemble en 300 pages l'essentiel de son oeuvre mathématique. Les années qui suivirent cet anniversaire ne furent guère des années heureuses; après une très longue maladie, Madame Hopf s'éteignit en 1967. Resté seul, entouré surtout de quelques anciens élèves fidèles, Hopf voyait sa propre santé décliner peu à peu et s'attristait de ne plus pouvoir travailler comme autrefois. C'est à Zollikon (Zürich) qu'il mourut le 3 juin 1971.

Ceux qui l'ont connu n'oublieront jamais sa finesse et sa douceur, alliées à une grande fermeté du caractère. Ils n'oublieront pas non plus le professeur ou le conférencier: Hopf n'avait pas besoin d'élever la voix pour se faire écouter; la précision de son langage ne l'empêchait pas, bien au contraire, d'éveiller l'intuition chez son auditeur; à partir de quelques constatations simples, de caractère élémentaire, il posait des problèmes neufs et les regardait sous leurs différents aspects: analytique, géométrique, algébrique. C'est au mathématicien, mais c'est aussi à l'homme que nous voulons rendre hommage aujourd'hui.

Références.

(1) Conférence au Congrès d'Edinburgh (1958) sur l'oeuvre de René THOM. (Proc. of the Int. Congress of Mathematicians, Cambridge, Univ. Press, 1960).

(2) Abbildung geschlossener Mannigfaltigkeiten auf Kugeln in n Dimensionen (Jahresbericht der D.M.V., 34, 1925, 130-133). Vektorfelder in n-dimensionalen Mannigfaltigkeiten (Math. Ann. 96, 1926, 225-250).

(3) Ueber die Abbildungen der dreidimensionalen Sphäre auf die Kugelfläche (Math. Ann. 104, 1931, 637-665).

(4) Ueber die Abbildungen von Sphären auf Sphären niedrigerer Dimension (Fundamenta Mathematicae, 25, 1935, 427-440).

(5) Ueber die Topologie der Gruppen-Mannigfaltigkeiten und ihrer Verallgemeinerungen (Annals of Math. 42, 1941, 22-52).

(6) Ueber den Rang geschlossener Liescher Gruppen (Comm. Math. Helv. 13, 1940/41, 119-143).

(7) Fundamentalgruppe und zweite Bettische Gruppe (Comm. Math. Helv. 14, 1941/42, 257-309). Ueber die Bettische Gruppen, die zu einer beliebigen Gruppe gehören (Comm. Math. Helv. 17, 1944/45, 39-79). Beiträge zur Homotopietheorie (Comm. Math. Helv. 17, 1944/45, 307-326).

(8) Schlichte Abbildungen und lokale Modifikationen 4-dimensionaler komplexer Mannigfaltigkeiten (Comm. Math. Helv. 29, 1955, 132-156).

(9) SELECTA Heinz HOPF, Springer Verlag 1964.

FINANCIAL REPORT

for the period January 1 to December 31, 1971

1. INCOME

The Union had the following five sources of income during the year:

A Dues from the member nations;
B UNESCO/ICSU contribution;
C Interest on Bank Accounts;
D Reimbursement of ICSU dues;
E Reimbursement of travel expenses and grants.

A. During the financial year 1971, dues were paid at the

(i) Chase Manhattan Bank by

Hungary	III	1971	
Ireland	I	1971	
Israel	II	1971	
Japan	IV	1971	
Poland	IV	1971 rest	
Spain	II	1971	
USA	V	1971	Total US $ 2.901.40

(ii) Swiss Credit Bank by

Austria	II	1971	
Belgium	III	1970 and 1971 part	
Bulgaria	I	1971	
DDR	III	1971	
Netherlands	III	1971	
Switzerland	III	1971	
USSR	V	1971 part	Total Sw.Fr. 12.435.-

(iii) Swedish Postal Giro Account by

Argentina	I	1971
Australia	II	1971
Brazil	I	1971
China-Taiwan	I	1971
Cuba	I	1970 and 1971
Czechoslovakia	III	1971
Denmark	II	1971
Finland	II	1971
France	IV	1971

Great Britain	V	1971
Greece	I	1971 and 1972
Iceland	I	1971
India	III	1970 and 1971
Italy	IV	1971 part
New Zealand	I	1971
Norway	I	1971
Poland	IV	1972
Portugal	I	1970 and 1971
Rumania	II	1971
South Africa	I	1971
Sweden	II	1971
Turkey	I	1969

Total Sw.Cr. 35.430.79

Total income from membership dues in 1971:

(i)	US Dollars	$	2.901.40
(ii)	Swiss Francs 12.435.-	"	3.238.28
(iii)	Swedish Crowns 35.430.79	"	7.290.29
		$	13.429.97

(Ex. $ 1.00 = Sw.Fr. 3.84 = Belg.Fr. 44.82 = Sw.Cr. 4.86)

Subscriptions were due from the following countries at the end of 1971:

1966:	Mexico (part)
1967:	Mexico
1968:	Mexico and Yugoslavia *)
1969:	Mexico and Yugoslavia *)
1970:	Mexico, Pakistan, Turkey and Yugoslavia **)
1971:	Belgium (part), Italy (part), Mexico, North Korea **), Pakistan, Turkey, USSR (part) *) and Yugoslavia.

*) Paid in January 1972

**) Part paid in January 1972

B.	UNESCO/ICSU contribution	$	8.750.00
C.	Interest on Bank Accounts: Swiss Credit Bank (fixed deposit a/c) Sw.Fr. 2.012.30	$	524.04
D.	Reimbursement of ICSU dues	$	187.55
E.	Reimbursement of travel expenses and grants	$	886.27

The total income received during the year 1971 was:

A	Membership dues	$	13.429.97
B	UNESCO/ICSU subvention	"	8.750.00
C	Interest on Bank Accounts	"	524.04
D	Reimbursement of ICSU dues	"	187.55
E	Reimbursement of travel expenses and grants	"	886.27
		$	23.777.83

2. EXPENDITURE

A. Actual expenditure in 1971 compared with the amounts authorized by the Sixth General Assembly (Schedule A of the budget)

	Expenditure			
	Authorized	Actual	Difference	
	$	$	$	$
1. a) Secretarial help, IMU office	2.750.00	565.84	2.184.16	—
b) Secretarial help, President	300.00	139.14	160.86	—
c) ICMI	300.00	300.00	—	—
d) CST (1970-1971)	200.00	400.00	—	200.00
2. Office expenses (incl. postage)	800.00	1.109.58	—	309.58
3. Travel expenses of the E.C.	4.000.00	5.200.36	—	1.200.36
4. President's and Secretary's expenses	300.00	287.75	12.25	—
5. Contribution to ICSU (2% of dues)	300.00	224.41	75.59	
6. Publication and Dissemination of IMU News	300.00	300.00	—	—
7. Audit fee	100.00	154.32	—	54.32
8. Contingencies	850.00	3.401.36*	—	2.551.36
	10.200.00	12.082.76	2.432.86	4.315.62
B. Scientific activities of the Union and its Commissions and Committees (including ICMI, Exchange, Colloquia, Symposia, Conferences. Summer Schools, Lectureships)	6.000.00	875.60	5.124.40	—
	16.200.00	12.958.36	7.557.26	4.315.62

* Cost of printing and free copies to the National Adhering Organizations of the World Directory of Mathematicians, 4th edition.

B. Details of expenditure under UNESCO/ICSU/IMU Grant (Schedule B of the budget)

(i) UNESCO/ICSU Grant

International Colloquium on Number Theory, Moscow, September 14-18, 1971	$	3.210.19	
Third Prague Symposium on General Topology, Prague, Aug.30-Sept. 4, 1971	$	920.37	
IMU Lectures	"	2.000.00	$ 6.130.56
Reserved for 1972			" 2.619.44
		Total	$ 8.750.00

(ii) IMU Grant

Meeting of the Editors of the Reviewing Journals in Moscow, Contribution to AMS	$	300.00	
Exchange Commission	"	575.60	$ 875.60

TOTAL EXPENDITURE

a)	under IMU Budget (Schedule A)		$ 12.082.76
b)	under IMU Budget (Schedule B)		" 875.60
c)	under UNESCO/ICSU (Schedule B)		" 6.130.56
		Total	$ 19.088.92

Total income 1971		$ 23.777.83
Total expenditure 1971		" 19.088.92
	Surplus	$ 4.688.91

3. Financial Statement for the period January 1 to December 31, 1971

	$	Sw. Fr.	Belg. Fr.	Sw.Cr.
a) 1. Bank balance in current a/c on 1.1. 1971	695.51	19.430.40	18.655.00	2.407.44
2. In fixed deposit with Swiss Credit Bank		82.135.98		
Add.: Receipts during 1971				
1. Memberships dues	2.901.40	12.435.00		35.430.79
2. UNESCO/ICSU Grant	8.750.00			
3. Interest on deposit a/c		2.012.30		
4. Reimbursement of ICSU dues	187.55			
5. Reimbursement of				
a) travel expenses				4.048.00
b) grants		300.00		259.29
6. Inter Bank transfer				14.988.11
	12.534.46	116.313.68	18.655.00	57.133.63

b) Expenditure

	$	Sw. Fr.	Belg. Fr.	Sw. Cr.
1. a) Secretarial help, IMU office				2.750.00
b) Secretarial help, President		534.30		
c) ICMI	300.00			
d) CST	400.00			
2. Office expenses (incl.postage)	16.80	546.80		4.618.85
3. Travel expenses of the E.C.	1.786.76	5.636.20		12.372.75
4. President's and Secretary's expenses		1.104.95		
5. Contribution to ICSU (2% of dues)	224.41			
6. Publication and Dissemination of IMU News	300.00			
7. UNESCO/ICSU (Schedule B)	2.000.00	4.000.00		12.096.00
8. IMU Grants (Schedule B)	875.60			
9. World Directory of Mathematicians				16.450.80
10. Audit fee				750.00
11. Contingencies	6.00	40.00		
12. InterBank Transfer		12.477.30		
	5.909.57	24.339.55		49.038.40
Balance	6.624.89	91.974.13	18.655.00	8.095.23

Summary of Net Assets as on 31.12.1971

	US $	Sw. Fr.	Belg. Fr.	Sw.Cr.
In current account	6.624.89	7.837.85	18.655.00	8.095.23
In fixed deposit account		84.136.28		
Net Assets	6.624.89	91.974.13	18.655.00	8.095.23

THE CHASE MANHATTAN BANK

Reconciliation Statement as on December 31, 1971.

Balance as per Bank Statement as on 31.12.1971.		$ 6.374.89
Less: Cheques issued but not presented as on 31.12.1971:		
In favour of E. Calabi	$ 100.00	
Y. Katznelson	" 100.00	
H.M. Stark	" 50.00	
B. Banaschewski	" 100.00	" 350.00
		$ 6.024.89
Incorrect debit item by the Chase Manhattan Bank		" 600.00
		$ 6.624.89

Prepared by:

Otto Frostman
Secretary
International Mathematical Union

Audited by:

Bo Lilliesträm-Tjus
Authorized Public Accountant

Annual Report to the National Adhering Organizations

January 1 - December 31, 1971

A. Membership.

The following 41 countries were members of the Union in 1971:

Group I Argentina, Brazil, Bulgaria, China-Taiwan, Cuba, Greece, Iceland, Ireland, Mexico, New Zealand, North Korea, Norway, Portugal, South Africa, Turkey;

Group II Australia, Austria, Denmark, Finland, Israel, Pakistan, Rumania, Spain, Sweden, Yugoslavia;

Group III Belgium, Canada, Czechoslovakia, German Democratic Republic, Hungary, India, the Netherlands, Switzerland;

Group IV France, Federal Republic of Germany, Italy, Japan, Poland;

Group V Great Britain, USA, USSR.

This membership corresponded to a total voting strength of 94 and an annual income from membership dues of $ 14.083.20 (equivalent to 108 units).

B. Scientific Activities.

I Colloquia and Symposia.

(i) International Conference on Number Theory, Moscow, September 14-18, 1971.

The Conference was organized by the Academy of Sciences of the USSR and co-sponsored by the International Mathematical Union. Academician I.M. Vinogradov acted as Chairman of the Organizing Committee with Academician Yu. V. Linnik and Professor A.A. Karatsuba as vice-chairmen, Professor I. Kabiljus, Yu. V. Prohorov and I.R. Shafarevich, Dr. V.V. Sazonov and Dr. A.B. Zhizhchenko as members. The IMU representatives on the Organizing Committee were Professors E. Bombieri and K. Chandrasekharan. The scientific programme covered Analytic and Algebraic Number Theory and related topics.

The Conference was attended by mathematicians from Bulgaria, Czechoslovakia, Federal Republic of Germany, Finland, France, German Democratic Republic, India, Italy, Japan, the Netherlands, Poland, Switzerland, UK, USA and USSR. The foreign participants, in all 31, were guests of the Academy of Sciences of the USSR during their stay in Moscow.

For the detailed scientific programme, see Appendix A.

(ii) Third Prague Symposium on General Topology, August 30 - September 3, 1971.

This Symposium formed a continuation of the previous two topological symposia held in 1961 and 1966. It was organized by the Czechoslovak Academy of Sciences together with the Slovak Academy of Sciences, the Charles University and the Association of Czechoslovak Mathematicians and Physicists. Professor J. Novák acted as Chairman of the Organizing Committee, the other members of which were Z. Frolík, J. Hejcman, M. Husek, M. Katetov, V. Koutník, V. Pták, M. Sekanina, S. Schwarz. The International Mathematical Union gave financial support towards the travel expenses of some of the invited foreign speakers, chosen in co-operation with Professor I.R. Shafarevich.

The Symposium was attended by 158 mathematicians among whom 51 were from Czechoslovakia and 107 from foreign countries.

The lectures given by invitation are listed in Appendix B.

II Exchange Programme – IMU Lectures

Under the Exchange Programme travel grants were paid to Professor A. Weil (Paris) for a visit to USSR and to Professor P.R. Ahern (Pisa) for a visit to Ireland.

For the IMU Lectures in 1971, see IMU Bulletin, No. 2, September 1971, p. 5-6.

III International Commission on Mathematical Instruction (ICMI)

(i) Preparations for the Second International Congress on Mathematical Education were being made; thus an International Programme Committee and an Organizing Committee in the UK were set up and the first circular concerning the Congress was issued and sent to all countries represented on ICMI. The Congress will be held at Exeter, England, August 29 - September 2, 1972.

(ii) The Executive Committee of ICMI will be established according to the Terms of Reference at the Exeter Congress. Until then it is composed as follows:

President	Professor Sir James Lighthill (UK)
Past President	Professor H. Freudenthal (the Netherlands)
Secretary	Dr E.A. Maxwell (UK)
Members	Professor A. Pescanini (Italy)
	Professor S. Iyanaga (Japan)
	Professor J. Novák (Czechoslovakia)
	Professor H.O. Pollak (USA)
	Professor S.L. Sobolev (USSR)
	Professor J. Surányi (Hungary)
	Professor B.H. Neumann (Australia)
	Professor L. Nachbin (Brazil)

C. Meetings of the Executive Committee

The Executive Committee met twice in 1971: in Zurich on May 14-15 and in Moscow on September 20. An extract from the minutes of the first meeting was published in this Bulletin, No. 2, September 1971, p. 3-9; for the second meeting, see above, p. 3-4.

Appendix A.

International Conference on Number Theory

A.A. Albert (USA): On associative division algebras.
A.N. Andrianov (USSR): Siegel's forms and zeta-functions.
A. Baker (UK): Recent advances in transcendence theory.
B.J. Birch (UK): Canonical points of elliptic curves.
E. Bombieri (Italy): Large sieve inequalities and applications.
D.A. Burgess (UK): Dirichlet characters and polynomials.
J.W.S. Cassels (UK): Recent work on sums of squares.
K. Chandrasekharan (India): Exponential sums in the development of number theory.
V.A. Demianenko (USSR): On the uniform boundedness of the torsion of elliptic curves over algebraic number fields.
O.M. Fomenko (USSR): On scalar product of Hecke's L-series.
F. Hinzebruch (FRG): Hilbert's modular group: resolution of the cusps.
Y. Ihara (Japan): Some special prime divisors in arithmetic of function fields.
M. Jutila (Finland): On Linnik's constant.
A.A. Karatsuba (USSR): On some problems of prime number theory connected with I.M. Vinogradov's method.
H. Koch (GDR): Multiplicative structure of fields and norm symbol.
J.P. Kubilius (USSR): On the distribution of values of the arithmetic functions.
A.F. Lavrik (USSR): Dirichlet's periodic functions with functional equations of the Riemann type.
Yu. V. Linnik (USSR): Recent development of I.M. Vinogradov's methods and their applications.
T. Mitsui (Japan): On the partition function of positive definite matrices.
L.J. Mordell (UK): Exponential sums related to Kloosterman sums.
B. Novak (Czechoslovakia): The theory of lattice points in multidimensional ellipsoids.
A.N. Parshin (USSR): On the arithmetics of elliptic curves.
V.P. Platonov (USSR): The arithmetic theory of linear algebraic groups and number theory.
K. Ramachandra (India): Largest prime factor of the product of k-consecutive integers.
A. Schinzel (Poland): Reducibility of quadrinomials.
I.R. Shafarevich-I.I. Pyatecki-Shapiro (USSR): The arithmetics of surfaces of type K3.
A.B. Shidlovsky (USSR): On the arithmetic properties of values of analytic functions.
V.G. Sprindzhuk (USSR): Applications of trigonometric sums method to the problems of diophantine approximations of dependent quantities.

S.A. Stepanov (USSR): A constructive method in the theory of equations over finite fields.

T. Tatuzawa (Japan): On the extended Hecke theta formula.

T. Tonkov (Bulgaria): On the mean length of finite continued fractions.

A.I. Vinogradov (USSR): Artin's conjecture and the law of reciprocity.

V.E. Voskresensky (USSR): The geometry of linear algebraic groups.

Appendix B

Third Prague Symposium on General Topology

R.D. Anderson (USA): Some open questions in infinite-dimensional topology.

M.Ja. Antonovskij (USSR): Nesimetricnye blizosti, ravnomernosti i razryvnye metriky.

A.V. Arhangelskij (USSR): On cardinal-valued topological invariants.

S.P. Arya (India): Sum theorems for topological spaces.

B. Banaschewski (Canada): On profinite universal algebras.

K. Borsuk (Poland): Some remarks concerning the theory of shape in arbitrary metrizable spaces.

Z. Frolík (Czechoslovakia): Topological methods in the theory of measurable and measure spaces.

J. de Groot (the Netherlands): On the topological characterization of manifolds.

H. Herrlich (FRG): On a generalization of perfect maps.

E. Hewitt (USA): Harmonic analysis and topology.

F.B. Jones (USA): The utility of empty inverse limits.

M. Katetov (Czechoslovakia): On descriptive classification of functions.

K. Kuratowski (Poland): A general approach to the theory of set-valued mappings.

S. Mardesić (Yugoslavia): A survey of the shape theory of compacta.

E. Michael (USA): On two theorems of V.V. Fillipov.

J. Nagata (USA): A survey of generalized metric spaces.

A. Pietsch (GDR): Ideals of operators on Banach spaces and nuclear locally convex spaces.

V. Pták (Czechoslovakia): Banach algebras with involution.

A.K. Steiner (USA): On the lattice of topologies.

J.C. Taylor (Canada): The Martin compactification in axiomatic potential theory.

J.E. West (USA): Identifying Hilbert cubes; general methods and their application to hyperspaces by Schori and West.

A.V. Zarelua (USSR): On infinite-dimensional spaces.