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LETTERS OF THE COMMISSION ON MANGANESE (IAGOD)

REPORT ON THE 2ND INTERNATIONAL SYMPOSIUM ON THE GEOLOGY AND GEOCHEMISTRY OF MANGANESE

organized by the IAGOD Commission on Manganese, sponsored by the IGCP and IUGS
25th JGC, August, 1976, Sydney, Australia

by I. M. VARENTSOV
Secretary, Comission on Manganese

In the progress of Geosciences during the last decades the advances in the studies of geology and geochemistry of manganese and associated transitional metals take the proper place. The findings of large deposits of the manganese ores in Australia, Africa and South America as well as huge accumulations of manganese, nickel, cobalt, copper and other economically valuable metals in certain regions of the World Ocean can be regarded as evidences.

The 1st International Symposium on broad aspects of geology and in a lesser degree on the mineralogy and geochemistry of manganese was held during the 20th International Geological Congress in 1956 in Mexico.

The IAGOD Commission on Manganese at its Business Meeting in 1970 in Tokyo — Kyoto decided to organize the 2nd International Symposium on the Geology and Geochemistry of Manganese in 1976 during the 25th IGC and to publish the Proceedings of the Symposium in form of an International Monograph.

The main goal of the 2nd International Symposium on the Geology and Geochemistry of Manganese was to summarize and discuss the advances in these areas reached in the last twenty years period, focussing the attention to the following three main topics:

Section I: Geology of manganese deposits on the continents;
Section II: Problems of geochemistry and mineralogy of manganese;
Section III: Manganese on the bottom of Recent Basins.

During the organization of the Symposium the necessary and useful co-ordination with other bodies of the IUGS was established: e. g. with the IUGS Commission for Marine Geology (Prof. DR. E. SEIBOLD, University of Kiel, FRG). It was decided to organize a joint session of the Symposium on Geology and Geochemistry of Manganese and the Symposium on the Economic Geology of the Sea Floor (fuels excluding).

In preparing the Symposium on Geology and Geochemistry of Manganese the officers of the IAGOD Commission on Manganese as well as the conveners of the sections played the major role.

57 contributions from 13 countries were submitted for the Symposium on the Geology and Geochemistry of Manganese (see 25th IGC Abstracts vol. 3, Symposium 104.3, pp 759—801). 36 papers covering the principal areas of geology, geochemistry and mineralogy of manganese were selected for oral presentation. The papers will be published in the Monograph on the Geology and Geochemistry of Manganese, in 1977 by the Publishing House of the Hungarian Academy of Sciences in co-operation with the Schweizerbartsche Verlagsbuchhandlung (Stuttgart, FRG).

Section I: Geology of Manganese Deposits on the Continents

Convener: SUPRIYA ROY (India)

11 papers were presented and discussed on the results of the studies on manganese deposits of Australia, Africa, South America, Japan and India.

The most interesting papers dealt with the geology, mineralogy and genesis of manganese deposits of North Australia (Groote Eylandt Manganese Deposits), Central West Africa (Moanda Manganese Deposit, Gabon; Nsuta Manganese Deposit, Ghana). These deposits belong to the type that has not been known well: lateritic concentration of primarily poor accumulations of manganese. This process leads to formation of huge deposits of high grade manganese ores, the reserves being evaluated as hundreds of million tons.

The prominent paper was presented by S. ROY, Professor of Geology (Jadavpur University, Calcutta, India): „Certain Genetic Problems of Manganese Deposits". The paper suggests some subdivisions of manganese deposits on the basis of data on the recently investigated ore-bearing regions of India, Africa, South America and the present-day basins.

Section II: Geochemistry and Mineralogy of Manganese

Conveners: R. GIOVANOLI (Switzerland)
R. BURNS (USA)
R. SOREM (USA)

15 papers were discussed at the Section II. Mineralogical papers were delivered by R. G. BURNS (USA), F. V. CHUCKROV (USSR), R. GIOVANOLI (Switzerland), R. K. SOREM (USA) and others. All these papers can be regarded as a new stage in the study of the very complex compounds — oxide, hydroxide minerals — of manganese, iron and associated transitional metals. These studies were carried out on the up-to-date level: structural-crystallochemical researches with wide utilization of methods of modern instrumental analysis.

The geochemical problems were treated in papers presented by K. BOSTRÖM (Sweden), C. LALOU *et al.* (France), R. M. MCKENZIE (Australia), J. C. MILLS *et al.* (Australia), K. H. WEDEPOHL (FRG).

The remarkable feature of papers on geochemistry of manganese is the use of informations obtained by the methods of modern instrumental analysis for many components aimed at the understanding of the natural processes. Noteworthy is a predominant tendency to create the global system of the geochemical patterns of distribution of manganese and associated metals. The paper by K. BOSTRÖM shows

that the volcanic processes of the Mid-Oceanic Ridges and the fracture zones play an essential role in the accumulation of manganese ores in the World Ocean. The paper by K. LALOU *et al.* was listened to with special attention. It was shown by radioisotopic dating (^{230}Th, ^{14}C) that the rate of growth of ferromanganese nodules of the abyssal parts of the World Ocean is some orders higher than it was estimated previously. The conclusions allow us to explain the existence of huge accumulation of manganese ores of economic value formed during the Quaternary period.

The scientific and practical significance of the presented geochemical papers is that they are the first attempts to create the genetic approaches which are adequate well enough with the real natural conditions in all their diversity. It is evident that, having such scientific background and knowing the factors controlling the ore formation, the geologists will be able to obtain in the nearest future a tool for identification of regions promissing for ore accumulations of manganese, nickel, cobalt and other metals.

Section III: Manganese on the Bottom of Recent Basins

Conveners: E. SEIBOLD (FRG)
D. S. CRONAN (U. K.) (Joint Session)
I. M. VARENTSOV (USSR)

10 papers were presented and discussed at the session. As it was mentioned above, this section was a joint session with the Symposium of IUGS Comission for Marine Geology, entitled „Economic Geology of the Sea Floor" (fuels excluding). The main task of the section was to discuss the major reviewing papers summarizing the present-day state of investigations of mineral deposits on the bottom of recent basins. Papers were discussed on the progress in the U. S. Interuniversity Manganese Nodule Project by E. J. DASCH and E. GERARD (USA); on the Red Sea metalliferous muds by M. SCHOELL and R. D. BIGNELL (FRG); on ferromanganese ore accumulations in shallow-water basins by I. M. VARENTSOV (USSR); on the comparison of processes leading to concentration of economically valuable metals in metalliferous sediments and nodules by H. BAECKER (FRG) and D. S. CRONAN (U. K.); on technical problems in ocean mining by J. P. LENOBLE and G. PAOTOT (France). Reviewing papers were also discussed: on the geology and genesis of placer deposits in the sea (Australia, New Zealand, S. E. Asia); on genesis of the oceanic phosphorites by P. L. BEZRUKOV and G. N. BATURIN (USSR).

The papers delivered and their discussion showed that the World Ocean contains great resources of ores. The preliminary mining of ores has been started, and in the nearest future the mining companies of the industrially developed countries will be able to mine rich abissal ore accumulations.

The scientific and practical importance of the papers discussed at the Symposium lies in summarizing the advances of the studies of wide aspects of geology and geochemistry of manganese for the las 20 years' period. These papers and the others submitted will be published in volumes of the Monograph on the Geology and Geochemistry of Manganese. This book will inform the geologists of the World on the important achievments in this field of sciences.

REPORT ON THE ORGANIZATIONAL MEETING OF THE IGCP PROJECT NO. 111 GENESIS OF MANGANESE ORE DEPOSITS, AUGUST 22, 1976, SYDNEY

by IGOR M. VARENTSOV
Secretary, IAGOD Commission on Manganese

Chairman: PROF. GY. GRASSELLY, President of the Commission on Manganese
Secretary: IGOR M. VARENTSOV, Secretary of the Commission on Manganese
National representatives:
Australia: R. M. MCKENZIE, I. W. REID, K. J. SLEE, W. C. SMITH
Brazil: EVARISTO RIBEIRO FILHO
Hungary: GY. GRASSELLY
India: SUPRIYA ROY
New Zealand: G. GLASBY
Roumania: the head of the delegation
S. Korea: SOO JIN KIM
Sweden: K. BOSTRÖM
Switzerland: R. GIOVANOLI
USA: R. G. BURNS, P. A. RONA, R. K. SOREM
USSR: I. M. VARENTSOV

Many participants of the IGC were also attending the Meeting.

GY. GRASSELLY, President of the Commission on Manganese in his presidential address reported that the IAGOD Commission on Manganese proposed to the IGCP Board the project: Genesis of Magnese Ore Deposits. The IGCP Board accepted the project under category A, No. 111, priority area 4. PROF. GRASSELLY emphasized the importance of a well organized and co-ordinated international co-operation in the research work itself not only in organizational work.

On October 1, 1975 the IAGOD Commission on Manganese forwarded the 1st Circular with the information on the Project No. 111 to National Committees on Geology as well as IGCP National Committees of more than 80 countries. Responses from many countries have been received. In these responses also the necessity of the co-operation and the readiness to co-operate are expressed.

I. M. VARENTSOV proposed for discussion the following agenda:

1) Consideration of the fundamental idea of the project and subject areas
2) Structure of the project and election of officers.
3) Mechanism of co-operation and the further plans.
4) General discussion.

The items on the agenda were accepted.

ad 1) I. M. VARENTSOV, Secretary of the Commission stated that the IAGOD Commission on Manganese is the base on which the Project can be started. The Commission is an international body with many experiences on co-ordination of international researches in this area of geology. At present, the Commission united the leading scientists in geology, mineralogy and geochemistry of manganese. This can be evidenced by the 2nd International Symposium on the Geology and Geochemistry of Manganese. It should be born in mind that the real tasks of the project cover not only the problems of the geology and the genesis of manganese ore deposits,

they should be regarded as a broad theme: Manganese and other transitional metals in the Earth's crust.

The experiences in the international researches on the wide aspects of geology f manganese and the preliminary evaluation of the possiblities of the researchers of ifferent countries ready for participation in the common work allow to outline he main subject areas of the project.

PANEL I

Geology and genesis of manganese deposits on the continents

Within this panel the following major themes can be outlined:

I/a Geology and genesis of volcano-sedimentary manganese deposits.
I/b Geology and genesis of manganese deposits of the weathering crust.
I/c Geology and genesis of Precambrian manganese deposits.

PANEL II

Problems of mineralogy and geochemistry of manganese and associated transitional metals

The following major themes can be outlined within this panel:

II/a Genetical problems of manganese mineralogy.
II/b Manganese and transitional metals in natural waters.
II/c Geochemistry of the processes of manganese ore formation (experimental studies and investigation of natural phenomena).

As the themes outlined are of principal and general character the collaboration of the researchers within this panel should be of close international co-operation.

PANEL III

Mangenese and associated metals on the bottom of recent basins

Is seems appropriate to outline some themes within this panel:

III/a Manganese on the bottom of Mediterranean and shelf basins.
III/*b* Geochemistry of manganese ore accumulations (metalliferous sediments, nodules) related with volcanism in the World Ocean.
III/c Formation of manganese ores in the regions of the Pacific Ocean: South-Western regions.
III/d Processes of development of the axial zones of the World Ocean with special reference to formation of ore accumulation of manganese and associated metals.
III/e Study of mineral composition and texture of the nodules of the great accumulations of manganese ores in the World Ocean as a method to learn the history of formation.
III/f Geochemistry of ore formation of manganese and the associated metals in the transition zone: ocean — continent.

The participants discussed and adopted the subject areas mentioned above. In the detailed talks (S. Roy, India, R. Giovanoli, Switzerland, K. Boström, Sweden, D. S. Cronan, U. K., R. Sorem, USA, and others) constructive suggestions and remarks were done which particularly specify the real possiblities of the forthcoming researches.

ad 2) The participants discussed and accepted that the Staff of the Project consists of

Project leader (the President of the IAGOD Commission on Manganese).

International co-ordinator (the Secretary of the IAGOD Commission on Manganese).

Heads of the Project panels and working groups, resp.

After discussion of the suggested proposals the following persons were elected as leaders of the Project and the Panels and Working Groups, respectively:

Project leader: GYULA GRASSELLY (University, H-6701 Szeged, Pf. 428, Hungary).

Co-ordinator of the Project: IGOR M. VARENTSOV (Geological Institute, USSR Acedemy of Sciences, Pyzhevskiy pereulok 7, 109 107 Moscow, Zh—17, USSR).

Leaders of the panels:

Panel I: SUPRIYA ROY (Dept. of Geol. Sci., Jadavpur Univ., Calcutta-32, India)

Panel II: R. GIOVANOLI (Laboratorium für Elektronen-Mikroskopie, Universität Bern, Postfach 140, CH-3000, Bern 9, Switzerland).

Panel III: K. BOSTRÖM (Dept. of Econ. Geol., University of Lulea, 95 187 Lulea, Sweden).

Leaders of the working groups (subdivisions):

III/a K. BOSTRÖM (address shown above).

III/b D. S. CRONAN (Dept. of Geology, Royal School of Mines, Imperial College of Science and Technology, Prince Consort Road, London SW 7, 2 BP, U. K.).

III/c G. P. GLASBY (New Zealand Oceanographic Institute, P. O. Box 12-346, Wellington North, New Zealand).

III/d P. A. RONA (National Oceanic and Atmospheric Administration, 15 Rickenbacker Causeway, Miami, Florida 33 149, USA).

III/e R. K. SOREM (Dept. of Geology, Washington State University, Pullman, Washington 99 163, USA).

III/f R. G. BURNS (Dept. of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA).

In the discussion it was emphasized that the number of Working Groups can be changed depending on those problems which can arise in the future and are worthy to be included into the project.

ad 3) The work within the panels and working groups is carried on by the researchers co-ordinated by the heads of the working groups. The solution of principal problems of the Project, the organization of meetings, coordination of the work among the panels and working groups are carried on by the international co-ordinator and the project leader, respectively.

Between the sessions the current affairs are considered and co-ordinated by correspondence. The major problems (including the financial policy, distribution of funds, etc.) should be discussed at the session of the Project.

The leaders of the Working Groups of the Project are kindly requested:

a) To outline the detailed scientific and business programme of the activity of the Working Group. The programme should contain information on the following items:

Scientific task and objectives

Methods

Field and laboratory researches
Meeting and joint excursions
Schedule of the work

b) The organizations and individuals interested should be widely informed and invited to take part in the research work according to the suggested programme.

c) After consideration of comments received the leaders are requested to compile the detailed programme of the Working Group.

This detailed programme should contain the following items:

1) title of the theme (subdivision, working group),
2) name of the Working Group leader,
3) official contact address,
4) list of participating organizations, researchers,
5) principal decisions expected to be taken, especially with reference to the original objectives of the Project subdivision (theme), their expansion and modification,
6) the foreseeable field and laboratory researches,
7) the foreseeable meetings, excursions etc.

d) To inform currently the Project co-ordinator about the progress in the realization of the subdivisions programme.

Please, to present the final programme to the co-ordinator within 6-months period.

The next session of the IAGOD Commission on Manganese and the IGCP Project No 111: „Genesis of Manganese Ore Deposits" is planned to be held in 1978, in Salt Lake City, USA within the frame of the IAGOD Symposium .However, it seems reasonable to consider the possibility to organize a meeting within the Second Symposium on the Origin and Distribution of the Elements — Paris — UNESCO, May 10—13, 1977. Some sections of this Symposium may be of common interest and the meeting would offer a good possibility to discuss the detailed programme of the Project subdivisions.

ad 4) The participants whole-heartily adopted the beginning of the Project. It was noted that at present time the solution of the manyfolded problems of geology and geochemistry of economically valuable metals could be managed only on the basis of an international collaboration. The scientists of the different countries only under these conditions can exchange the scientific informations, the experiences. The participants asked the Co-ordinator of the Project to compile a preliminary report on this meeting and to distribute it among the organizations and individuals interested.

It was decided to publish the reports on the 2nd International Symposium on Geology and Geochemistry of Manganese, on the Business Meeting of the IAGOD Commission on Manganese as well as on the IGCP Project Meeting in the „Acta Mineralogica—Petrographica Universitatis Szegediensis", Szeged, Hungary.

All the organizations and individuals are requested to submit their proposals and comments to the leaders of the Project.

REPORT ON THE BUSINESS MEETING OF THE IAGOD COMMISSION ON MANGANESE

August 22, 1976, Sydney, Australia

IGOR M. VARENTSOV
Secretary, Commission on Manganese

Chairman: GY. GRASSELLY, President of the IAGOD Commission on Manganese.
Secretary: I. M. VARENTSOV, Secretary of IAGOD Commission on Manganese.
Participants: R. M. MCKENZIE, A. R. MILNES, I. W. REID W. C. SMITH, K. J. SLEE (Australia), EVARISTO RIBEIRO FILHO (Brazil), GY. GRASSELLY (Hungary), T. WATANABE (Japan(, SUPRIYA ROY (India), G. GLASBY (New Zealand), SOO JIN KIM (S. Korea), K. BOSTRÖM (Sweden), R. G. BURNS, P. A. RONA, R. K. SORON (USA), I. M. VARENTSOV (USSR) and others.

1. The Chairman addressed with an introductory talk; he wellcomed the participants — representatives of 11 nations on behalf of the Officers of the IAGOD Commission on Manganese and IUGS.

After a brief discussion the participants accepted the agenda of the Meeting.

2. According to the agenda I. M. VARENTSOV presented a report on the previous activity of the IAGOD Commission on Manganese. It was stated that at the 1st Business Meeting of the Commission on Manganese, 1970, Tokyo—Kyoto was decided to organize the 2nd International Symposium on Geology and Geochemistry of Manganese within the 25th International Geological Congress and to publish the International Monograph-Proceedings of the Symposium. During 6-years period the Commission on Manganese held scientific and business meetings: 1972, Montreal, Canada, 24th IGC; 1974 — Golden Sands — Varna, Bulgaria, IAGOD Symposium. At these sessions the state and advances in preparations of the 2nd International Symposium on Geology and Geochemistry of Manganese were discussed. At the scientific sessions of the Commission the papers that could be mostly considered as the parts of some works were discussed. These works were subsequently submitted for the Monograph.

All the previous activity of the Commission on Manganese were focussed to reach the main goal: organization of the 2nd International Symposium on Geology and Geochemistry of Manganese. This Symposium can be regarded as a prominent event in the International activity of the Commission, united the leading specialists of the World in this field of science.

The activity of the Commission can be evidenced by a steady increasing of the submitted papers of the proper scientific significance at three sessions:

1970. Tokyo—Kyoto, Japan. It was discussed 6 papers presented by the specialists from 5 countries. The abstracts and the papers were published in the Proceedings of the joint IMA—IAGOD Session, Japan.

1972. Montreal, Canada. 8 papers presented by specialists from 4 countries were discussed; the abstracts and the papers were published in the Proceedings of the 25th International Geological Congress, 1972.

1974. Golden Sands — Varna, Bulgaria. 13 papers presented by specialists from 5 countries were discussed, the abstracts were published in a special volume of the IAGOD Symposium, and the papers are to be published in the Proceedings.

1976. Sydney, Australia. 36 papers presented by geologists from 13 countries

were discussed. The abstracts were published in the volumes of the 25th IGC, the extended numbers of papers will be published in the International Monograph — the Proceedings of the 2nd Symposium on Geology and Geochemistry of Manganese.

However, along with the evident achievements of the Commissions activity there are some shortcomings. It seems that the work of some national representatives of the Commission should be more active. It was noted that such important producers of manganese as countries of Africa and South America, have not yet been represented in the Commission by National Representatives.

3. The participants of the Meeting adopted the proposal to ask the head of the Brazilian National Committee for Geology and the head of the University of Sao Paolo to support the nomination of Dr. Evaristo Ribeiro Filho (University of Sao Paolo, Brazil) as a National Representative in the Commission on Manganese.

4. The participants, and especially the members of the Editorial Board of the Monograph were informed on the progress in preparation of the materials for publication.

GY. GRASSELLY and I. M. VARENTSOV made the explanations about the development of relations between the Publishing House of Hungarian Academy of Sciences and the Editorial Board of the Monograph. After an attentive consideration of the conditions of the work of the Editorial Board (the memo by Varentsov of July 1, 1976) the present associated editors confirmed their inttention to work on the processing of the manuscript.

It was decided after the discussion that the appropriated deadline of presentation of all the processed papers to the Publisher may be the end of 1976. This deadline is somewhat conditional as it can be kept if the Publisher could complete all the formalities to guarantee the proper fulfilment of the conditions of the agreement on publication of the Monograph.

5. I. M. VARENTSOV informed the participants about the further plans of the Commission. It was stated that after realization of the main tasks: the organization of the 2nd International Symposium on Geology and Geochemistry of Manganese, the 25th IGC, 1976, Australia, and the publication of the International Monograph — the Proceedings of the Symposium, the activity of the Commission should develop in the two chief aspects: a) Participation and co-ordination of the work on the Project: Genesis of Manganese Deposits, International Programme of Geological Correlation; b) To carry on the traditional forms of the Commission's activity on wide information of the specialists on different areas of geology of manganese and associated metals, as well as the work on the international co-operation of the investigations.

The proposal was adopted to hold the next session of the Commission (Technical and Business Meetings) within the forthcoming IAGOD Symposium, 1978, Salt Lake City, USA.

6. *The election of Vice-President*

I. M. VARENTSOV, Secretary of the Commission informed that JOHN VAN N. DORR II (Geological Survey, Washington, D. C., USA), the former Vice President retired in 1975. J. V. N. DORR II told the Officers of the Commission about his wish to resign the duty of Vice-President of the Commission. The officers of the Commission complied with J. V. N. DORR's request, and, bearing in mind his long and fruitful service for the manganese geologists of the Western Hemisphere, suggested him to accept the post of Honorary Vice-President of the Commission.

I. M. VARENTSOV informed the participants of the proposal made by D. S. CRONAN (U. K.) to nominate on the post of Vice-President R. K. SOREM, Professor of the Washington State University (Pullman, USA). The U. S. A. were said to be a country of advancing researches on wide aspects of geology, geochemistry and mineralogy of manganese and associated metals, and that this Nation could be represented in the Commission at a high level. R. K. SOREM is a prominent scientist in mineralogy and geology of manganese whose works are well known in the world.

The proposal about nomination of R. K. SOREM on the post of Vice-President of the Commission was supported by D. S. CRONAN (U. K.), K. BOSTRÖM (Sweden), R. G. BURNS (USA) and others.

In response, R. K. SOREM expressed his gratitude to the participants for the honour and said that he, as Vice-President, would do all hist best for realization of the Commission plans and strengthen the international co-operation.

7. *Discussion.* The participants of the Meeting adopted the activity of the Commission on Manganese. They noted the significance of the 2nd International Symposium on Geology and Geochemistry of Manganese and publication of the International Monograph — Proceedings of the Symposium. Professor T. WATANABE (Japan), Past President of the International Association on Genesis of Ore Depoits expressed his appreciation and gratitude to the Commission's Officers for the work done. T. WATANABE emphasized that the activity of the Commission on Manganese could be regarded as a model of its scientifical and practical importance, as well as the organization of highly efficient international collaboration of the scientists and specialists of different Nations of the World.