IAGOD: History and Aims

by Robert W. Boyle

Affiliated to IUGS are three international groups concerned with economic geology and mineral deposits: the Society of Economic Geologists (SEG), the Society for Geology Applied to Mineral Deposits (SGA) and IAGOD, the International Association on the Genesis of Ore Deposits. The origin, structure and activities of SEG and SGA have been described in previous issues of *Episodes* by R.W. Hutchinson (September 1986) and by F. Saupé (June 1987) respectively, and IAGOD President-Elect R.W. Boyle here profiles that association, partly as a prelude to its 8th quadrennial symposium to be held next year in Canada. (Ed.)

The Birth of IAGOD

The idea for a new organization in the field of mineral deposits was first initiated in 1961 by J. Kutina with the support of J.H. Bernard, Z. Pouba, M. Vanecek, M. Stempok, F. Mrna and others of the Institute of Geological Sciences at Charles University and the Geological Survey of Czechoslovakia both in Prague. To bring the concept to fruition, it was decided to hold an international symposium on the genesis of ore deposits in Prague in 1963 under the auspices of the Czechoslovak Academy of Sciences and supported by the Survey, Charles University, and the Geochemical Society.

The task of the symposium as envisaged by its originators was to discuss, with broad international participation, specific topics concerning the genesis and nature of ore deposits, particularly the questions of zoning of ore deposits and ore fields and the transport of metals by hydrothermal solutions, subjects on which varied opinions existed among both Eastern and Western ore geologists. A specific feature of the symposium was to be the publication and distribution prior to the symposium of a collection of contributions for discussion by the participants. To assist the Czech organizers, the National Committee of Geologists of the U.S.S.R., chaired by Academician V.I. Smirnov, created a unit under the chairmanship of Academician D.S. Korzinski to organize contributions by Soviet ore geologists. Those from Western Europe, U.S.A., Canada and Asia were coordinated by Dr. Kutina.

The meeting, entitled "Problems of Post-Magmatic Ore Deposition with Special Reference to the Geochemistry of Ore Veins," was held in Prague, September 16 to 21, 1963 (Figs. 1, 2), and was attended by more than 300 geologists from 27 countries (Davidson, 1963a, b).

The inaugural ceremony of the symposium, held in the Carolinum Hall of Charles University, Prague, appropriately included a lecture by Academician J. Koutek on the scientific work of the great Czech geologist Frantisek Posepny, whom all students of ore genesis will recall as the author of one of the classic papers on the origin of mineral deposits by post-magmatic hydrothermal fluids (Posepny, 1894 and see Skinner, 1987). Over 100 scientific papers were presented at the symposium, and these were later published in two volumes including translations (Kutina, 1963).

The symposium was remarkably successful in bringing eastern and western geologists together to discuss the many problems of ore genesis, and an invitation was made to hold a similar meeting in Yugoslavia on zoning, paragenesis and other aspects of ore genesis in 1967. To assist in planning this second symposium and to facilitate discussion on the

genesis of mineral deposits, a provisional "Commission on the Genesis of Ore Deposits" was appointed with Dr. Kutina as President and E. Ingerson, C.F. Park, H.D. Holland (all U.S.A.), W. Uytendogaardt (The Netherlands), D. Schachner (F.R.G.), P. Laffitte (France) and C.F. Davidson (U.K.) as western representatives. A meeting held about this time in Poland of the International Commission on the Metallogenic Map of Europe endorsed these arrangements.

The great interest shown at the Prague symposium prompted the provisional commission to formalize a proposal for an organization whose principal aim would be the study of the genesis of ore deposits. This initiative was taken at a formal meeting during the 22nd International Geological Congress in New Delhi, India, on December 19, 1964. Support from the Society of Economic Geologists conveyed by Prof. Park, and from the Soviet Academy of Sciences through Academician Smirnov was crucial in the formation of the new organization. In New Delhi the provisional commission became the International Association on the Genesis of Ore Deposits. Draft statutes for the association were approved by those present, and the following officers were elected: President: Slobodan Rakic (Yugoslavia.), 1st Vice President: Prof. Park, 2nd Vice President: Academician Smirnov, Secretary: Dr. Kutina. The IUGS Council meeting during the IGC in New Delhi authorized the preliminary

Figure 1. Dr. J. Kutina, Institute of Geological Sciences, Charles University, opening the 1st IAGOD Symposium, Problems of Post-Magmatic Ore Deposition, Prague, Czechoslovakia, 16th September 1963.

affiliation of IAGOD, and following completion of the statutes IAGOD became a member of IUGS on January 15, 1966 (see Kutina, 1966).

The objectives of the Association are to promote international cooperation in the study of the genesis of ore deposits and to further the growth of knowledge in this field. These tasks are achieved in several ways. International symposia are organized by IAGOD or under its sponsorship every four years between International Geological Congresses. In recent years, IAGOD has also sponsored a variety of meetings and symposia in conjunction with other organizations interested in the genesis of mineral deposits. IAGOD also works through several Commissions and Working Groups, and information is distributed by the Secretary and Associate Secretaries to members as Circulars. National representatives and individual members also engage in IAGOD activities.

IAGOD Gains Strength

For various reasons the symposium planned for 1967 in Yugoslavia could not be held there, but fortunately Prof. Davidson stepped into the breach. The papers submitted to the Yugoslavian Organizing Committee were transferred to him, and the second symposium was held from September 8 to 17, 1967, at the University of St. Andrews in Scotland (Fig. 3).

The strenuous effort by Prof. Davidson in organizing the second symposium on short notice undoubtedly led, as Park remarked in Pouba and Stemprok (1970), to his untimely death a month and a half later. Davidson was from its inception an enthusiastic supporter of IAGOD and was convinced, as he told me several times, that the study of the genesis of mineral deposits knows no political boundaries, and that communication between ore geologists from East and West would lead, not only to more friendly understanding, but also to more thorough solutions of the genesis of ore deposits.

The themes of the St. Andrew's symposium were: the source of metals in hydrothermal deposits; the depth of formation and the vertical extent of ore deposition; and "regularities" of different wall-rock alteration in the course of mineralization processes in hydrothermal deposits (Anon., 1967). More than 125 papers on these three themes were presented, most being published in Pouba and Stemprok (1970), dedicated to the memory of Prof. Davidson. Looking back at the St. Andrews symposium it seems to me that whereas

Figure 2. Jachymov (Joachimsthal), Czechoslovakia. Medieval silver mine visited on one of the field trips of the 1st IAGOD Symposium.

the various problems in the three themes were not solved, at least the outlines of future research in their solution were established.

Following the establishment of IAGOD as an affiliated member of IUGS, further revisions of the Statutes of IAGOD took place and a number of Commissions and Working Groups were inaugurated. Today the slate of officers of IAGOD includes: a president; a first and second vice president; a secretary general and associate secretary general; a membership secretary; a chief treasurer and two assistant treasurers, one in the U.S.S.R. and another in Czechoslovakia. Six regional councillors responsible for IAGOD activities in Europe, Asia, North America, Africa and the Southwestern Pacific complete the slate (Fig. 4).

At present IAGOD has commissions on ore forming fluids in inclusions (COFFI); tectonics of ore deposits (CTOD); manganese (COM); paragenesis (CPa); ore deposits in mafic and ultramafic rocks (CODMUR - see box); fluorite-barite

CODMUR - NEW TO THE IAGOD STABLE

The IAGOD Commission on Ore Deposits in Mafic and Ultramafic Rocks (CODMUR), established in 1982, provides a permanent home for those activities begun within the framework of IGCP Project 161 (Sulphide Deposits in Mafic and Ultramafic Rocks), which terminated at the end of 1987. The new commission does not, however, confine itself to sulphide deposits, especially as large deposits of the platinum-group elements are closely linked to chromite deposits and the parent magmatic processes. Its terms of reference include, in addition to deposits of magmatic Ni-Cu-PGE, those of chromite and vanadiferous titanomagnetite, apatite concentrations and any other deposits whose origins are closely linked to mafic and ultramafic rocks.

The new commission could not have been set up at a better time. High PGE prices and a continuing strong demand for Ni and chromite have resulted in very active exploration programs for these commodities worldwide. CODMUR thus has a very important function in providing a forum in which explorationists and researchers can exchange views and coordinate research efforts on these fascinating ore deposits. The commission has, for example, taken over the

responsibility for the international platinum symposia, organized in the past on an ad hoc basis by interested groups in host countries. Accordingly, the Fifth International Platinum Symposium, the first official CODMUR activity, will take place from August 1 - 3, 1989 in Espoo, Finland.

The officers are presently establishing a network of national correspondents whose main functions would be to promote the aims of CODMUR, to disseminate information on its activities, and to inform the secretariat on pertinent developments in their own country for wider dissemination. Persons interested in these activities and who wish to be kept informed of developments are requested to contact either the Chairman, Prof. H. Papunen, Department of Geology, University of Turku, SF-20500 Turku, Finland or the Secretary, Prof. G. von Gruenewaldt, Department of Geology, Institute for Geological Research on the Bushveld Complex, University of Pretoria, Pretoria 0002, South Africa.

- H. Papunen

Figure 3. Participants in the 2nd IAGOD Symposium held at St. Andrews University, Scotland, September 1967.

deposits (COFAB). There are also working groups on skarns, remote sensing and mineral exploration, metamorphism of ores, metallogeny of Bohemian Massif, tin and tungsten deposits, and on structure of ore fields and ore deposits, global tectonics and metallogeny, and statistical treatment of tectonic and mineral deposit data, the latter three all being part of CTOD.

Recent IAGOD Symposia

More than 580 scientists from 45 countries attended the Third Quadrennial IAGOD Symposium in Tokyo and Kyoto, Japan, in 1970, which was held concurrently with the International Mineralogical Association (IMA). Support for the Symposium and publication of the proceedings was provided by the Science Council of Japan and various national industrial concerns. Field trips were held both before and after the meetings to examine many of the mineral deposits of northern, central and southern Japan (Nambu, 1970), including those of Kuroko type, epithermal gold type, uranium (ningyoite), pyrometamorphic Fe-Cu-Pb-Zn, pyrophyllite, sulphur, and the active Sakurajima volcano.

The proceedings of the joint IAGOD-IMA-symposium (Y. Takéuchi and others, 1971b) cover the geochemistry and crystallography of pyrite, pyrrhotite, sulphosalts, and various other minerals, and with the geochemistry, isotope geochemistry, and fluid inclusions studies of many mineral deposits, geothermal and fumarolic occurrences from many parts of the world. A separate IAGOD volume also edited by Y. Takéuchi and others (1971a) comprises the papers given in IAGOD symposia on "Ore deposits as related to geological structure and tectonics" and "Stratabound sulphide ore deposits (excluding those of the Mississippi Valley type)."

The Fourth IAGOD Symposium was held in 1974 in Varna, Bulgaria, and was attended by 420 participants including 224 from 32 foreign countries. The themes this time were factors controlling the vertical extent of ore deposits, base metal (Pb-Zn-Cu) mineralization associated with volcanism (including minor intrusions), and the significance of isotopic composition in the genetic interpretation of ore deposits. Of the 164 papers presented at the various general sessions and at the meetings of the Commissions and Working Groups, 132 were published in Russian and English in three volumes edited by B. Bogdanov and others (1976). Two publications edited by Dragov and Kolkovski (1974) and Yovchev and co-workers (1974) provided an excellent geological basis for the field trips associated with the conference.

Snowbird, Utah (U.S.A.) was the site in 1978 for the Fifth IAGOD Symposium, sponsored and supported by the U.S. National Committee on Geology, the U.S. Geological

Survey, the Society of Economic Geologists, the National Science Foundation, IUGS and several oil and mining corporations. The registration was 489 geologists from 35 countries.

The main themes of the fifth symposium were ore deposits related to continental volcanic and subvolcanic processes, ore deposits related to plate tectonics, volcanogenic massive sulphides, stratabound mineral deposits, porphyry copper deposits, and geochemistry and stable isotope geochemistry of mineral deposits. Of the two publications that resulted, one (Ridge, 1980) contained the general papers on

Figure 4. Early presidents of IAGOD. (Clockwise from the upper left) C.F. Davidson, 1963-1967; C.F. Park, Jr., 1967-1972; T. Watanabe, 1972-1976; J.D. Ridge, 1976-1980.

TABLE 1: IAGOD Officers 1988

President:	G. Kautsky (Sweden)
1st Vice-President	R.W. Boyle (Canada)
2nd Vice-President	M. Štemprok (Czechoslovakia)
Vice-President at large	G.A. Tvalchrelidze (U.S.S.R.)
Vice-President at large	T. Hopwood (Australia)
Secretary-General	M. Vaneček (Czechoslovakia)
Associate Sec.-General	I.R. Jonasson (Canada)
Member Secretary	H.J. Forster (F.R.G.)
Chief Treasurer	C.B. Sclar (U.S.A.)
Associate Treasurer	M. Palas (Czechoslovakia)
Regional Councillors:	
For Africa: M. Hilmy (Egypt)	
For Asia: S.C. Sarkar (India)	
For Europe: D. Thadeu (Portugal)	
For North America: B.F. Leonard (U.S.A.)	
For South America: S.E. Rodriguez (Venezuela)	
For Southwestern Pacific: L.A. Frakes (Australia)	

the genesis of ore deposits and on studies of the ore geology of specific districts or deposits (exclusive of western North America). The other consisted of papers on various mineral deposits of western North America (Ridge, 1979).

Tbilisi, in the U.S.S.R., was the site in 1982 of the Sixth Quadrennial IAGOD Symposium, supported by the Soviet Academy of Sciences, the Ministry of Geology, and the National Committee of Geologists. Ore-forming hydrothermal systems, the relationship between ore formation and granitic magmatism, and mathematical methods in the study of ore deposits were the three themes. One volume was published (Janelidze and Tvalchrelidze, 1984) on general topics related to the genesis of ore deposits and on the ore geology of specific districts and individual deposits, and another containing papers given at sessions of the IAGOD commissions and working groups is to be published by the Soviet Academy of Sciences.

The most recent IAGOD symposium was held in 1986 in Lulea, Sweden, with support from the geological surveys of Sweden, Finland and Norway, the Nordic Council of

Ministers, the Technical University of Lulea and the Nordic mining industry. More than 400 papers were given orally and 21 poster presentations held on gold occurrences in Precambrian shields, massive sulphide deposits in volcanic environments, mineralization associated with granitoids, and genetic problems. IAGOD Commissions and Working Groups held sessions on tectonics, paragenesis, liquid inclusions, fluorite and barite deposits, skarn deposits, manganese deposits and tin and tungsten deposits. Summaries of the papers given during meetings of these Commissions and Working Groups are given by Sarkar (1986), and abstracts were edited by Stephens (1986), with the full papers edited by Zachrisson (1988). Papers on gold in the Precambrian shields were published in a special issue of *Economic Geology* (Hutchinson and Vokes, 1987).

The seven IAGOD symposia held to date have resulted in some first class publications, which address practically all aspects of the genesis of mineral deposits. The scope has been worldwide, involving contributions from geologists and geochemists of many countries. Though many intricate and complex chemical and geological problems involved in the genesis of mineral deposits remain unsolved, the outlines of future research for their solution have been clearly established on a global basis.

Dr. R.W. Boyle (601 Booth Street, Ottawa, Ontario, Canada K1A 0E8) was a member of the Geological Survey of Canada from 1952 to 1985 and was Head of the Geochemistry Section during that period. Now retired, Dr. Boyle is President-Elect of IAGOD. His principal research has been in the geology, geochemistry and origin of the precious metals, and he is especially well known for his comprehensive publications on gold.

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