Global Transects — A New ICL Program

The Inter-Union Commission on the Lithosphere (ICL) has recently launched a new worldwide program of crustal transects. This is modelled on the North American Continent - Ocean Transect Program which focuses on the change of structure from ocean to continent and the evolution of each corridor over the past 700 Ma years. A great advantage of this approach is that it forces geologists and geophysicists to integrate their data.

The ICL transects will be compilations (in maps and cross-sections) of existing data along selected corridors that cross structures crucial for a better understanding of the nature and evolution of the lithosphere. It is estimated that about 200 transects would provide an appropriate global distribution (see Fig. 1). Many will be in developing countries.

Many transects will extend from the stable continental interior to the stable ocean basins. Others, like the European Geotraverse already underway, may comprise cross-sections through continental regions with important evolutionary features. Sections will extend downwards to the Moho and will be published at a scales of 1:500,000 or 1:1,000,000. For the Phanerozoic it has been decided to use the conventions worked out for the North American transects, but a new set will have to be made for Precambrian geology.

Three ICL groups are participating in the new program. Coordinating Committee 3 (Geosciences Within Developing Countries) is responsible for organizing transects in Africa, Asia and Latin America. CC 6 (National Representatives) will coordinate work in other parts of the world, and Working Group 6 (Structure, Physical Properties, Composition and Dynamics of the Lithosphere - Asthenosphere System) will be concerned with the overall evaluation of the transects.

The program will require agreement on locations of corridors, and on appropriate forms of presentation to take account of the natural differences among various corridors

as well as to ensure their inter-comparability. Leaders and participants will have to be identified for each transect, as will the institutions that have access to the relevant data. Agreement is now being sought on these matters and on a time-table for completion of the transects.

A series of pilot meetings is now being organized by the ICL to establish the basis for developing this global program. The key issues outlined need to be addressed by representatives of many regions and countries including those with experience in the North American program and the related European Geotraverse. The program will also draw on the experience of the SEATAR transects in SE Asia and the Circum-Pacific Map Project. □

Figure 1: Possible transects for Africa and South America.

Wide-Ranging Program for IUGS

A very full list of activities was reviewed by the IUGS Executive Committee at its recent annual meeting in Washington in this the 25th year since the Union was founded. Many of the scientific projects in progress or being proposed were screened first by the Advisory Board on Research Development, chaired by Howard Gould (U.S.A.).

The ABRD exists as an independent source of advice to the Executive on the Union's scientific activities and on new initiatives and directions.

Major programs now being developed by IUGS and endorsed strongly by the Executive deal with mineral deposit modeling, sedimentary basin analysis, and geological applications of remote sensing. The first two are described in separate news reports in this issue of Episodes, and GARS was reviewed in the March 1984 and June 1985 issues. A major project to compile maps of the Neogene of the Pannonian Basin is nearly complete, with many results presented at the 8th Regional Conference on Mediterranean Neogene Stratigraphy (RCMNS) held in Hungary last year. A series of

maps is expected to be released in the near future by Hungary. IUGS has also co-sponsored a USGS project on the geochemistry of tin in Bolivia. Led by G. Eriksen (U.S.A.), the study has detected a tin-bearing tuff regarded as a likely surface equivalent of and guide to a buried tin granite.

On the topic of urban geology, IUGS is co-sponsoring Landplan III, a symposium being organized in Hong Kong for December 1986 to examine the role of geology in urban development in southeast Asia. Sponsorship was also extended to a meeting on geochemical exploration in tropical rain forests held in Brazil last year, and to a study of metallogenesis of mafic-ultramafic rocks of the Circum-Caribbean.

New initiatives endorsed by the ABRD and the IUGS Executive include a proposal to organize a Circum-Atlantic project and one from SEPM for an international decade of sedimentary geology (see Episodes December 1985). In addition the Advisory Board recommended that the topic of

News Reports

natural disasters (eruptions, earthquakes, landslides, etc) be addressed by IUGS in cooperation with the International Union on Geodesy and Geophysics (IUGG).

The International Lithosphere Program (ILP) has maintained a high level of activity, following streamlining of its working groups and coordinating committees that had taken place last year. A proposal that the mandate for the ILP be extended beyond 1990 was accepted by the General Committee of ICSU and is scheduled for ratification by the ICSU General Assembly in 1986. If approved this will avoid a repetition, at least for a while, of past experiences when following the Upper Mantle Project and the International Geodynamics Program there were long gaps in planning and leadership for international research on the solid earth. One new initiative, a global transect program being developed under the ILP, is reviewed elsewhere in this issue of Episodes.

Much of the work of the Executive is devoted to a review of the activities, finances and plans of IUGS commissions, committees and affiliates. The recently formed Commission on Comparative Planetology had a very successful first year of operations in 1985, highlighted by the cosponsorship of the 16th Lunar and Planetary Science Conference and a workshop on megageomorphology, which is reported elsewhere in this issue. A map showing the global distribution of craters on Earth is being prepared for distribution later this year, and the Commission is again joining in the sponsorship of several international meetings this year.

The Executive approved a change in name from the Commission on Experimental Petrology at High Pressures and Temperatures to the Commission on Igneous and Metamorphic Petrogenesis, proposed by Commission Chairman, A.J. Naldrett (Canada). Its mission will be to represent and promote igneous and metamorphic petrogenesis in the sphere of international geoscience, by means of organizing meetings and publishing their results. Themes to be stressed include igneous and metamorphic processes, mantle mineralogy and petrology, thermal dynamics and experimental geochemistry, physical processes and petrogenesis, trace element and isotope geochemistry, fluid inclusion in petrogenesis and the genesis of ore deposits.

The Commission for Geological Documentation is a cosponsor of the 3rd International Conference on Geological Information to be held in 1986 in Australia. A major effort in recent years directed toward completing and editing of the multi-lingual thesaurus in geology was described in the last issue of Episodes.

INHIGEO, the IUGS Commission on the History of Geological Sciences, organized in 1985 an international symposium on the influence of scientific organizations in the development of geology. This was held in Edinburgh in April 1985, and plans are now in progress for the 13th INHIGEO Symposium in Italy in 1987 on the topic of the history of the rock and fossil record.

COGEODATA, the Commission on Storage, Automatic Processing and the Retrieval of Geological Data, in 1985 co-sponsored a workshop on the use of micro-computers for processing exploration data. This meeting, held in Valbonne, France, focussed on the need for information on available software, especially now that mining companies are increasingly going the route of cheap micros for their field workstations. A major symposium sponsored jointly with IAMG was held last September in Alma-Ata, Kazakhstan, on Quantitative Methods for Predicting and Evaluating Resources of Mineral, Oil and Gas. Soviet participants concentrated on mathematical theory, which seems now to be to the point where it can be translated into computer programs for specific resource studies. The meeting gave

Figure 1: At the Washington meeting: L-R - V. Sibrava (Czechoslovakia, Director of Unesco's Earth Sciences Division), R.L. Rutland (Australia, member of ABRD), H. Faure (France, President of INQUA).

Figure 2: W.W. Hutchison (left - IUGS President) greets J.W. Cowie (right - Chairman of Commission on Stratigraphy). P. Abelson (U.S.A., a former IUGS President) stands ready to intervene.

rise to plans for several future meetings, and a formal memorandum of operation was signed between COGEODATA and GEOINFORM, the geoscience documentation system of the European countries.

The International Commission on Stratigraphy (ICS) has had a busy year, especially with the formal decisions on boundaries and stratotypes reported in the special issue of Episodes, June 1985. John Cowie (England), Chairman of the Commission has taken over the work of the Subcommittee on the International Stratigraphic Lexicon upon the resignation of its members, and several manuscripts of varying length and quality are awaiting publication. In recognition of the growing importance of this field, a new committee on Quantitative Stratigraphy is being set up with F. Gradstein (Canada) as convener.

At a meeting of the Subcommittee on Precambrian Stratigraphy during 1985, the suggestion was forwarded to subdivide the Proterozoic into three eras: P1 (Proteran), P2

News Reports

(Deuteron) and P3 (Triteran). The Subcommittee on Cambrian Stratigraphy published a correlation chart on Australia, New Zealand and Antarctica during 1985 (as IUGS Publication No. 19). The Subcommittee on Ordovician Stratigraphy is finalizing for publication a correlation chart for the regions of Kazakhstan and Middle Asia. The Ordovician-Silurian boundary having now been formally defined at Dob's Linn in Scotland, the working group on this boundary has been disbanded. The Subcommittee on Devonian Stratigraphy continues its search for a boundary stratotype for the middle-upper Devonian series and for the Frasnian-Famennian.

The Subcommittee on Triassic Stratigraphy has accorded priority to discussion of the position and definition of the Permian-Triassic boundary, and the subdivision in terms of stages and substages of the lower Triassic. An updated version of the Paleogene Stratigraphic Correlation scale is now in press, and a meeting in March 1985 on the Eocene-Oligocene boundary led to a volume soon to be published entitled "Terminal Eocene Events." Several groups working on aspects of Neogene stratigraphy, met in September 1985 during the RCMNS Congress, which produced many publications, reviewed in the last issue of Episodes.

In the Subcommittee on Quaternary Stratigraphy the tendency now is to divide the Pleistocene into early, middle and late with the boundary between early and middle at the Brunhes-Matuyama reversal, and the middle and late Pleistocene boundary at 130,000 yBP. As a general rule paleomagnetic reversals with chronometric control are favoured as the basis for boundary definitions by the working group on Pleistocene subdivisions.

The Subcommittee on Stratigraphic Classification continued its preparations for a revised edition of the International Stratigraphic Guide together with a glossary of stratigraphic terms. The Subcommittee on Geochronology was involved in the publication in late 1985 of the Geochronology of the Geological Record, in association with the Geological Society of London. New statutes proposed by the ICS were ratified by the IUGS Executive at its meeting in Washington.

The Commission on Systematics in Petrology also had a very active year in 1985. A new classification of volcanic rocks based on total alkali-silica diagram was published (in Episodes and elsewhere), and minor revisions are now nearly complete. Consideration is now being given to the classification of ultra-basic and ultra-alkaline volcanic rocks and to the definitive publication of the Subcommittee's work,

provisionally entitled "The IUGS Classification of Igneous Rocks and Glossary of Rock Names," which may well be the final work of the subcommission. As now planned, this will contain an explanation of the recommended classification systems, a brief history of the work, a dictionary of terms to be used by petrologists, and a glossary of all igneous rock names. The Subcommittee on Systematics of Metamorphic Rocks is just beginning its work, but the Subcommittee on Databases for Petrology has continued activity at its normal high pace (see article by Chayes in last issue of Episodes).

Reports were presented from several other commissions, committees, and advisory boards, some of which were asked by the Executive to examine more closely their mandates and activities with a view to streamlining their operations. The Executive also reviewed the annual reports from most of the organizations affiliated to the union, noting a wide range of progress.

A meeting in Washington with the Bureau of the 28th International Geological Congress (IGC) to be held in 1989 gave the Executive an opportunity to review the progress in organizing this most important meeting, which is held under the sponsorship of IUGS. The Executive is keen to continue the precedent set by the Moscow Congress of setting aside a small percentage of IGC registration fees for purposes such as the sponsoring of scientists from the Third World. One alternative now being considered by IGC organizers is that of a scheme whereby national societies and other local groups and individuals will act as a sponsor and "geo-host" to delegates from developing countries. A report is expected later from an ad hoc committee set up after the Moscow Congress to examine the organization and content of future congresses. This is under the chairmanship of R. Trümpy (Switzerland), a Past-President of IUGS.

The Executive also met with the U.S. National Committee for Geology and resolved to strengthen its ties with other national members, involving them more meaningfully in the activities of the Union. Finally, approval was given for establishment of four categories of associated members in IUGS. These are open to industrial companies, national and international bodies (governmental or non-governmental), and individuals with "IUGS related interests." For the first two groups categories A and B apply with an annual membership fees respectively of US\$5,000 and US\$1,000. Category C and D with annual dues of US\$500 and US\$100 respectively apply to individuals. Further information on these categories of membership may be obtained from the IUGS Secretariat. □

Geological Literature to Developing Countries

A steady flow of publications is essential to the effective functioning of any scientific community, and the inability of many poorer nations to gain access to the scientific literature is a major cause of the isolation felt by their scientists. A simple, practical and relatively inexpensive contribution to overcoming this problem has been practiced for some years by the Association of Geoscientists for International Development. From its establishment in 1974, AGID has sent complementary copies of its newsletter to a wide range of universities, government departments and other geoscience organizations in Africa, Asia and Latin America. AGID has also operated for some years a service to recycle books and back issues of journals to libraries in developing countries.

The idea seems to be catching on, and several other geoscience organizations are now donating their current journals to Third World institutions. Episodes itself goes out regularly free of charge to some

300 geology departments in "Southern" universities, thanks to financial assistance from Unesco and IUGS.

The Society of Economic Paleontologists and Mineralogists (SEPM) has recently decided to distribute limited numbers of its *Journal of Sedimentary Petrology* to selected Third World institutions, and the International Association of Sedimentology is also now donating 20 copies of its official journal, *Sedimentology*. Fifty copies of *Geologische Rundschau*, published on behalf of the Geologische Vereinigung

(Geological Society of West Germany) are also beginning to be mailed regularly to developing countries, and the International Association of Engineering Geology is now donating its *IAEG Bulletin*. The Geological Society of London has agreed to contribute limited numbers of its *Journal* to Third World institutions that make a formal request to its Publications Secretary (Geological Society, Burlington House, Piccadilly, London W1, U.K.). The most recent addition to this donor group is the Geological Association of Canada, which is contributing 100 subscriptions of *Geoscience Canada*. And other Northern geological societies are also being encouraged to consider similar arrangements.

In some cases, the cost of these complimentary subscriptions are covered by specific donations from society members. In others, these are met by a general subvention from the organization's own budget. In any case, the cost of a run-on printing of an extra 100 copies or so of a journal is much less than the normal subscription price, and the main expenditure is for postage. With these considerations in mind, ICSU Press (see *Episodes*, September 1985, p.184) has recently sent out 260 complimentary paperback copies of its book (with Cambridge University Press) on *Global Change*.

As regards books already published and back issues of journals, the idea is to collect donated material for "recycling" to developing country institutions that can make use of it. There are many possible sources of material: the bookcases of retired or recently deceased scientists, duplicate copies from libraries, or simply contributions from those whose shelves are over-full or whose interests have changed. In some cases it may be possible to claim income tax deductions on donated professional material.

Under the AGID program, lists of donated items were sent to institutions that had requested them; wanted items were marked and the list returned to the coordinator who then selected the recipients. Shipping charges were covered partly by AGID and partly by assistance from several Canadian organizations. SEPM is now running a similar program through its headquarters in Tulsa, U.S.A., and several tons of books and journals have been sent out in recent months. The coordinator of the SEPM project is Dr. Molly Miller at the Department of Geology, Vanderbilt University (P.O. Box 6001, Station B, Nashville, TN 37235, U.S.A.).

The major difficulty is, of course, to identify suitable recipients, especially where the number of copies being distributed is small. Two very helpful listings of institutions here are the AGID Directory of Geoscience Departments in Universities in Developing Countries (3rd Edition 1983, available from AGID, Asian Institute of Technology, P.O. 2754, Bangkok 10501, Thailand) and the USGS Worldwide Directory of National Earth Science Agencies and Related International Organizations (available free from the Distribution Branch, Text Products Section, USGS, 604 South Pickett Street, Alexandria, VA 22304, U.S.A.).

However, even with these directories the problem remains to identify potential recipients that are active, interested in the subject matter involved, and not otherwise able to gain access to the literature. The time may thus be ripe for the coordination of such activities both within and outside the earth sciences, the establishment of further guidelines for identifying appropriate recipients, and for the development of book recycling schemes. A coherent program could help to encourage other societies and publishers to follow these examples. □

Shelf Areas of the Western Indian Ocean — Late Quaternary Evolution

The present level of the oceans is at a high interglacial position that is still changing variably, having been attained only some 6000 years ago. This elevation was seldom reached in the past. The sea level can be estimated at more than 20 m below the present situation during 75% of the Quaternary and more than 40-50 m below during 50% of the time, assuming that isotopic ratios of oxygen in oceanic cores can be used as proxies for the ocean water volume. Thus wide areas of continental shelves were exposed repeatedly to subaerial conditions during long periods, and their last submergence dates only from postglacial times.

The study of the paleogeographic evolution of shelf areas can provide valuable information on sea-level change, crustal movements, and mineral deposits related to submerged shorelines. This is one focus of IGCP Project 200, and a special working group on this topic is being led by P.A. Kaplin (U.S.S.R.).

In January and February 1986, this group took part in an international cruise by R/V "Professor Shtokman," of the Institute of Oceanology of the Soviet Academy of Sciences (Fig. 1). This was specially devoted to paleogeographic shelf investigations in the western Indian Ocean where previous sea-level data were scarce or non-existent.

Research was carried out along selected transects, across the Seychelles Bank, or perpendicular to the coasts of northwest Madagascar. In each transect several techniques

were used: continuous bathymetric and sparker profiling, sounding of the upper sedimentary layers with an "echo sounder-sedimentograph" of the Atlas-Deso 10 type, dredging of surface sediments, and sampling of water at various depths for analysis of suspended matter. Continuous cores, 62 to 127 mm in diameter and up to 4 m long, were collected using vibro-piston and percussion techniques, and side-scan sonar surveys of selected areas were made together with submarine videotapes and photographs. Geomorphological studies on land and levelling surveys of coastal features in the emergent parts of the transects were also carried out.

Fourteen transects were investigated, and 30 continuous cores were collected. Observations of the coastal geomorphology were carried out in Mahé, Coëtivy and Farquahar Islands (Seychelles), Saint-Joseph (Amirantes), and near Fandrina, Ankifi, Antany Mora Island, the Bombetoka Bay and Betobaka (Madagascar). Although permission could not be obtained to study the Tanzanian and Kenyan shelves, brief observations of elevated marine terraces were made near Dar es Salaam (Tanzania) and Mombasa and Malindi (Kenya).

A preliminary interpretation of the paleogeographic evolution of the Seychelles Bank can now be made on the basis of this investigation, together with some data obtained in 1983 by the R/V "Academician Petrovskiy." The Seychelles Bank

News Reports

Figure 1: Aboard the R/V "Professor Shtokman." In the background: a marine terrace near Mombasa.

consists of coral reef limestone capping granite bedrock, which is exposed in high islands such as Mahé and Praslin (Fig. 2). The reef forms an outer rim, which is developed discontinuously around the bank; it also comprises a number of inner patches, the highest of which reach depths of -20 to -15 m. The relief of the limestone corresponds either to older Quaternary reefs, especially where it is most prominent, or to new Holocene reefs deposited directly above the granitic bedrock. On the slopes of the outer rim and the patches, marine abrasion marks occur, mostly between -110 and -105 m, between -72 and -65 m, and at about -32 m. Localized depressions are widespread between -50 and -65 m.

During the last glacial period, the Seychelles Bank was a single wide island where weathering and karst processes were active. Several paleo-river valleys appear clearly, reaching the outer slope or the inner depressions. Clayey sediments, including quartzitic silts and sands, were produced by the weathering of granite and the comminution of debris. When the post-glacial sealevel had recovered to between -60 and -70 m, sea water flooded the inner depressions to create lagoons and produce coarse carbonate debris and coral fragments (Fig. 3). Subsequently, mangrove vegetation developed in the lagoons; remains are found as peat layers at depths ranging from -56 and -67 m. A suite of transgressive carbonate detrital sediments was deposited over the peat layers.

The upper parts of some cores reveal two horizons of coarser material, both in the Seychelles Bank and in north-west Madagascar. In the Amirantes Bank, two samples of shell material collected in 1983 from the upper coarser horizon were dated by radiocarbon at 2000 ± 200 yBP (MGU-954) and 2700 ± 200 yBP (MGU-964). These coarser horizons may be the product of sea-level fluctuations or climatically induced periods of increased wave activity.

Two similar coarse layers have also been found in some cores on the northwest Madagascar shelf, where the water depth is usually less than 40 to 50 m. Here more terrigenous sediment is found in the lower part of the cores than on the Seychelles Bank, but the carbonate content is greater in the upper part. Locally deltaic structures can be recognized.

Radiometric dating of several samples collected in 1986 will serve to define local sea-level position at different periods and may help to explain layers of coarser sediments in the upper parts of the cores. □

P.A. Pirazzoli
Paris, France

Figure 2: Schematic map of the Seychelles Bank.

Figure 3: Diagrammatic profile of the Seychelles Bank. Not to scale horizontally. Lengths of cores are given in metres below the sea floor.

First Call for the 28th IGC

The International Geological Congress (IGC) will hold its 28th session in Washington, D.C., U.S.A., from July 9 - 19, 1989. The meeting will be hosted by the National Academy of Sciences and the U.S. Geological Survey and will mark the first time that the Congress has met in the United States since 1933. The President of the Congress Bureau is C.L. Drake and the Secretary General B.B. Hanshaw. Other members of the Bureau include J.H. Medlin, L.T. Silver, C.D. Masters, H.R. Gould, P.R. Brett, W.L. Fisher, J.C. Reid, and P. Toulmin, III.

The scientific program of the Congress will consist of symposia, regular sessions, and poster presentations covering virtually every aspect of basic and applied earth science. Inter-disciplinary symposia will reflect the growing requirement for broad multidisciplinary approaches to many earth science problems. The increasingly important role of the geological sciences in a variety of social issues will be emphasized in sessions dealing with resources, pollution, geological hazards, and land use. Topics will be discussed both from a global viewpoint and by use of specific case histories.

Approximately 100 field trips are being planned for pre- and post-Congress sessions throughout the United States, including Alaska and Hawaii, and over 40 short courses and workshops will be offered. These will cover a wide range of topics and will provide up-to-date information and training in critical research areas.

The preliminary budget for the Congress is estimated at \$4.5 million, the bulk of which will be recaptured through fees for registration, excursions, exhibits, publication sales, and other self-supporting events. Contributions are now being sought to support special overseas students, publicity on a global basis and the development of scientifically exciting field excursions, which constitute one forum for exchange of knowledge that transcends language barriers. The American Association of Petroleum Geologists is handling the operational aspects of the Congress, and the Geological Society of America has agreed to support the Congress in a variety of ways.

28th International Geological Congress

Washington, D.C. USA
July 9-19, 1989

The first circular for the Congress will be mailed in late 1986 to all geoscientists who are members of major earth science organizations in the U.S.A., as well as to the heads of major organizations and societies worldwide. Those interested in receiving this announcement and who do not expect to be reached by the regular mailing should write now to the Secretary General, International Geological Congress, P.O. 1001, Herndon, VA 20070, U.S.A. □

Mineral Deposit Modelling: An IUGS-Unesco Program

This program had a highly productive year in 1985. Two successful workshops were held: in February 1985 in Khartoum, Sudan, in conjunction with the 5th Arab Conference on Mineral Resources, and in December 1985 in the Philippines. These meetings have improved existing deposit models, initiated new ones, and created a lively interest in mineral exploration. The Philippine workshop resulted in the publication of abstracts and a field guide, and technical papers and a subject bibliography will be published later. Plans are now being formulated for a workshop to be held in Brazil in the fall of 1986 during the Brazilian Mining Congress.

The new program is designed to advance knowledge and expertise in mineral deposit modelling for use in exploration, assessment, and development of resources. It is also aimed at transferring this knowledge and expertise to developing countries, and assisting in training and educating their geoscientists so that they can carry out the necessary work at home.

One function of the program is to compile and publish information on existing models, including brief summaries of the major attributes of mineral deposits, the identification of various models, and the definition of tectonostratigraphic

News Reports

domains for selected mineral deposit-types. Workshops are organized for presentation in developing countries, consisting of seminars and field trips to look at tectono-stratigraphic domains and deposits. A third function of the program consists of field studies and research programs to develop and modify deposit models appropriate to the specific terrains of developing countries.

Last December's workshop in the Philippines was held in conjunction with a symposium on mineral deposit modelling. Both meetings were jointly sponsored and organized by the Philippine Bureau of Mines and GeoSciences, the Geological Society of the Philippines, IUGS and Unesco. The symposium was attended by 121 scientists who reviewed deposit models for gold, porphyry copper, geothermal systems, massive sulphides, and chromite. This was followed by two workshops, one organized around models of hydrothermal systems and the other focussed on chromite deposits in ophiolite settings. The latter workshop improved our knowledge of podiform chromite deposits and the processes by which they formed. It also created a lively interest in exploration and in exchanging data and ideas.

During the chromite meeting, the group made field trips to the Acoje and Coto deposits, and from field relations observed there put together a familiar model in which the largest chromite deposits occur in the transition zones between tectonite peridotite and cumulate sequences. The former represents the residue of partial melting in the mantle, whereas the latter is the result of fractional crystallization of a very Mg-high basaltic liquid. Regardless of where the chromite deposits are found, they are always enclosed in dunite, but within the transition zone the distribution of deposits appears to be random, underlining the need for carefully detailed mapping. Massive chromite tends to be high-Al, while disseminated chromite tends to be high-Cr.

Figure 1: At the Coto Mines property, the biggest producer of high-Al refractory chromite in SE Asia.

Discussion in the workshop also focussed on how a descriptive and genetic model of chromite deposits could be used to devise strategies for exploration. The Philippines symposium has already resulted in the publication of a program with abstracts and guidebook for field excursions. □

After report by G.H. Allcott,
Reston, Virginia

IGCP Continues Despite Budget Cuts at Unesco

At a time when Unesco is still reeling from the financial effects of the U.S. withdrawal and now that of the U.K., the 1986-87 budget for the International Geological Correlation Programme (IGCP) has been increased by 13%, and an extra \$45,000 has been granted to assist the participation of developing country scientists. This welcome news was brought to the annual meeting of the IGCP Board in Paris in February by its chairman, J.F. Lovering (Australia). He reported that the IGCP had received the strong support of virtually all Member States who spoke at the Unesco General Conference in late 1985.

The IUGS President, W.W. Huthison, pointed out to the Board that the emphasis in IGCP seemed to be moving from simple correlations towards a focus on critical relations such as metamorphism and geodynamics, Precambrian events in Gondwanaland, terrains of the Circum-Atlantic, and global biological and rare events. Projects of a more immediate social and economic impact were also on the increase as, for example, on phosphorites, early organic evolution, sulphide deposits, palaeohydrology, tin-tungsten mineralization and Quaternary processes.

Together with the IGCP Scientific Committee, which had met the previous week under the chairmanship of B.J. Skinner (U.S.A.), the Board reviewed the progress of all 47

ongoing projects, nine of which were due to terminate at the end of 1985. Regional meetings of IGCP and its projects had been held in 1985 in Tahiti, Budapest, Gaborone, Bogota, and Rabat, mostly in association with other conferences. The Bogota meeting, held during the 6th Latin American Geological Congress last October, was especially noteworthy, for it brought together representatives from seven projects with strong Latin American inputs. The IGCP is clearly alive and well in South America, and interest in the projects there is steadily growing.

The Board repeated its earlier hope that an inter-regional program on "Quaternary Geology and Human Survival" would be established with a budget independent of the IGCP. This should be devoted to cooperative multidisciplinary research on problems of environmental change through time. To emphasize how important the Board considers this program, it proposed a one time allocation of IGCP funds to provide an opportunity for appropriate project leaders or their representatives to meet at the forthcoming INQUA symposium on "Global Change in Africa: Past-Present Future" in Dakar in April 1986.

Out of 16 new proposals for new projects submitted to the Board, eight were accepted as follows:

News Reports

- Project 226. Correlation of Manganese Sedimentation to Paleoenvironments (1986-88). Project leaders: Supriya Roy (Geology Department, Jadavpur University, 99/5/10 Ballygunge Place, Calcutta 700019, India) and B.R. Bolton (Department of Geology, La Trobe University, Bundoora, Victoria, Australia 3083). This project aims to determine the paleoenvironmental setting of manganese sedimentation during Proterozoic and Mesozoic to Cenozoic times, using genetic models established for various types of sedimentary manganese deposits. Correlations will be made to contemporary tectonic, physical, chemical, biological, hydrospheric and atmospheric domains, thus contributing to the understanding of the evolution of these deposits and to the development of conceptual models for manganese exploration.
- Project 237. Gondwana Floras (1986-1990). Project Leader: Dr. O. Rösler (Rua Nossa Senhora de Tatima, 45 - Capao do Imbuia, 80,000 Curitiba, PR - Brazil). The primary objective of this project is to produce an up-to-date summary of the floras of Gondwana. Certain taxonomic, biostratigraphic and paleogeographic problems will be treated for the first time on an intercontinental scale.
- Project 242. Cretaceous of Latin America (1986-1990). Project Leaders: W. Volkheimer (PRIBIPA, Casilla de Correos 131, 5500 Mendoza, Argentina) and J.A. Salfity (Universidad Nacional de Salta, Buenos Aires 177, 4400 Salta, Argentina). This will study the tectonic framework of the pre-Cretaceous basement, the development of sedimentary basins and the nature of their filling, and the evolution of their fauna and flora. Studies will also be made of synsedimentary volcanicity and plutonism, metamorphism, paleogeography and evolution in relation to global tectonics, and mineral resources.
- Project 245. Non-Marine Cretaceous Correlations (1986-1989). Project Leaders: N.J. Mateer (1467 N. 17th Street, Laramie, Wyoming 82070, U.S.A.) and Chen Pei-ji (Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing, Peoples Republic of China). This project will correlate the non-marine basinal deposits with marine sequences using techniques of biostratigraphy, magnetostratigraphy and physical stratigraphy. The aim is to improve the understanding of event stratigraphy, depositional environments, and economic resources of the basins investigated, and to provide reference areas for future studies elsewhere.
- Project 246. Pacific Neogene Events in Time and Space (1986-1990). Project Leader: R. Tsuchi (Geoscience Institute, Faculty of Science, Shizuoka University, Shizuoka 422, Japan). A successor to Project 114, this aims to evaluate the major events of the Neogene of the Pacific Basin, especially those relating to paleoclimatology, paleobiogeography, paleo-oceanography, tectonism and eustasy. It will analyze the precise temporal and spatial extent of major Pacific Neogene events, consider their nature, inter-relationships, causes and consequences, and clarify and emphasize their relationships with those recognized elsewhere.
- Project 247. Precambrian Ore Deposits Related to Tectonic Styles (1986-1987). Project Leader: V.I. Kazansky (Institute of Ore Deposits, Academy of Sciences of the U.S.S.R., 35 Staromonetny per., 109017 Moscow, U.S.S.R.). The successor to Project 91, this will concentrate on still unresolved problems of Precambrian tectonics and metallogeny. Major topics include: contrasts in mineral deposits between Precambrian greenstone belts of different style and age, late Archean magmatism and tectonism as sources of ore deposits in early Proterozoic sedimentary basins, evolution of Proterozoic epieratonic structures and their associated metallogeny, and tectonic controls on mineralization on Proterozoic mobile belts.
- Project 249. Andean Magmatism and its Tectonic Setting (1986-1990). Project Leaders: M.A. Parada (Depto. de Geologia, Casilla 13518, Correo 21, Santiago, Chile) and C. Rapela (Centro de Investigaciones Geol., Calle 1, No. 644, 1900 La Plata, Argentina). The aim is to characterize the main magmatic events and geodynamic significance of Andean igneous rocks. Specific studies will focus on the correlation of plutonic and volcanic events within different parts of the Andean Cordillera; the precise geochemical character of the Andean igneous rocks in relation to their tectonic environment, age, nature of magma source, and evolutionary history; the magmatic, metamorphic and tectonic interactions set in a framework of plate convergence; and Andean metallogeny and evaluation of volcanic hazards.
- Project 250. Regional Crustal Stability and Geological Hazards (1986-1987). Project Leader: Chen Qingxuan (Institute of Geomechanics, Chinese Academy of Geological Sciences, Fahuasi, Xijiao, Beijing, China). This will study the dominant factors controlling regional crustal stability, the characteristic "activities" of many natural hazards, and the improvement of methods and techniques of detecting and monitoring hazards. It will also evaluate the crustal stability of populated areas and of major engineering and mining works. Maps showing natural hazards and stability zones for regional crust will also be developed, and there will be training and education of users and technicians especially from developing countries.
- For several years now, the possibility has been discussed of linking more closely in the interests of economy the IGCP Scientific Committee and Board. However, the Board was informed that specific proposals from Australia to merge the two and from U.S.S.R. that they should meet jointly had been rejected by Director General of Unesco who stated that the present structure was about right. The Board noted that even if amalgamation were permitted, there would be insignificant savings that could be added to the annual contributions to individual IGCP projects.

This year marks the retirement of E. von Braun, the IGCP Secretary. As W.W. Hutchison stated, Dr. von Braun had shaped the program through a dramatic 12-year period and had kept it functioning on a day to day basis with enthusiasm and dedication. In view of the fear that the present crisis in Unesco would cause this position to be

frozen, A. Kaddoura, the Assistant Secretary General for Science at Unesco, assured the Board that attempts would be made to continue funding the post by Unesco or, if this were not possible, to look for outside funds or to reassign duties among the present Unesco staff. □

IUGS Program on Basin Analysis Gets Underway

For some years now IUGS has been laying the groundwork for a global program on sedimentary basin analysis. This is aimed at assisting developing countries in improving the mapping and assessment of their energy and mineral resources. The three main activities envisaged are: compiling geological and resource maps and cross-sections of the basins; introducing methods of assessing resources using these maps and sections; and systematizing the processing of data. The products are intended both to encourage exploration and to facilitate the management of natural resources. The program will by-pass the confidentiality problem by avoiding detailed studies of individual deposits.

The program is being first developed in East Asia, where it will be based partly on the results of the IGCP Project 32 (Stratigraphic Correlation Between Sedimentary Basins of the ESCAP Region) and partly on the SEATAR transects, now in their final stages of preparation. Here, IUGS is cooperating with the Circum-Pacific Council for Energy and Mineral Resources and its Circum-Pacific Map Project, and with CCOP, the United Nations Coordinating Committee for the Joint Prospecting for Mineral Resources in Asian Off-shore Areas (see Chung and Ten Cate, *Episodes*, vol. 8, p. 173-179, 1985). ASCOPE, the ASEAN Council on Petroleum, is also being involved through CCOP, as are national geological surveys in the region.

The plan here is to prepare 1:2,000,000 maps covering the seven areas shown on Fig. 1. For each of these a geographic base showing the bathymetry and topography is being compiled now by the United States Geological Survey. Maps will then be prepared to show the principal tectonic units, major structural features, thickness of strata, and other relevant information needed as a framework for basin resource assessment. The subsurface correlation of stratigraphy and the lithology of sedimentary units will be shown on cross-sections based partly on the SEATAR transects. Features to be illustrated in map form include structure, lithofacies and depositional environment. As a start, an updated and extended version is planned to the 1979 Tectonic Map of the Indonesian Region by Warren Hamilton, (USGS Professional Paper 1078).

The first major activity is a workshop on petroleum resource assessment scheduled for April 1986 in Kuala Lumpur. This will review concepts and methods of resource assessment, using in part a pilot study of the basins around Borneo. The results of the IUGS Hawaii workshop on this topic held in 1983 will form an essential background (C.D. Masters: "Petroleum Resource Assessment," IUGS Publication 17, 1984). Plans for developing and coordinating the East Asia Project in cooperation with CCOP will also be drawn up at this meeting.

Figure 1: Proposed outlines (dashed lines) to the seven 1:2,000,000 maps. SEATAR transects for the 1:1,000,000 strip-maps are shown as heavy lines.

In Latin America, IUGS is discussing the possibility of involving Argentina, Bolivia, Brazil, Paraguay and Uruguay in a pilot study of the Chaco-Parana Basin. An interesting proposal for a major thrust in Europe has just been made by the Hungarian Geological Institute as a follow-up to the very successful project on Paleogeographic Maps of the Pannonian Basin recently completed with the sponsorship of IUGS.

The suggestion here is to organize a new project on intra-cratonic sedimentary basins of Europe including, for example, the Betic, Paris, Swiss Molasse, North Sea, Po, Vienna, Carpathian, Doneck, Caucasian, and Maritsa Basins, ranging from western Europe to the Soviet Union. The focus would be on the vertical dimension, as the basis for reconstructing the evolutionary history of these basins. Studies would be aimed at their pre-sedimentary evolution, stratigraphy, depositional environments, diagenetic and subsidence processes, and their syn-sedimentary and post-sedimentary tectonic evolution. □

New and recent *GEOSCIENCE* from Springer

E. Schanda, University of Bern

Physical Fundamentals of Remote Sensing

1986. Approx. 220 pp. Soft cover DM 48, — ISBN 3-540-16236-4

Explains the physical relationships necessary to understand the methods and applications of remote sensing in the natural environment.

R. J. Huggett, Manchester

Earth Surface Systems

1985. 162 figs. XII, 270 pp. Hard cover DM 148, — ISBN 3-540-15421-3

Volume 1 in the new series, **Springer Series in Physical Environment**, explores models used to explain and predict the patterns and processes observed at the Earth's surface.

Developments and Applications of Geomorphology

Editors: J. E. Costa, Lakewood, CO; P. J. Fleisher, Oneonta, NY

1984. 120 figs. XIV, 372 pp. Hard cover DM 125, — ISBN 3-540-13457-3

"Most practicing geomorphologists will wish to have access to this volume; it deserves a place in all earth science libraries."

Choice

Archaean Geochemistry

The Origin and Evolution of the Archaean Continental Crust

Editor: A. Kröner, Mainz; G. N. Hanson, Stony Brook; A. M. Goodwin, Ontario

1984. 86 figs. X, 286 pp. (Final Report of the IGCP No. 92) Hard cover DM 92, — ISBN 3-540-13746-7

Summarizes results of a 9-year project to better understand the origin and evolution of the Archaean continental crust emphasising the use of isotopic, major and trace element geochemistry.

"Well presented... The price is reasonable... of considerable interest to academic petrologists and geochemists."

The Australian Geologist

Springer-Verlag
Berlin Heidelberg
New York Tokyo

Heidelberger Platz 3, D-1000 Berlin 33
175 Fifth Ave., New York, NY 10010, USA
37-3, Hongo 3-chome, Bunkyo-ku, Tokyo 113, Japan

The Nordic Seas

Editor: B. G. Hurdle, Washington, D. C.
1986. 262 figs., 19 color pls. XIV, 777 pp. Hard cover DM 198, — ISBN 3-540-96241-7

A multidisciplinary account of current knowledge of the physical environment of this important ocean area with detailed discussions of atmospheric physics and meteorology, physical oceanography, and geophysics.

H.-J. Isemer, L. Hasse, Kiel

The Bunker Climate Atlas of the North Atlantic Ocean

Volume 1: Observations

1985. 181 charts, 31 figs. VII, 218 pp. (Topics in Atmospheric and Oceanographic Sciences) Hard cover DM 275, — ISBN 3-540-15568-6

A high-resolution description of the mean state and annual variation of the climate of the North Atlantic Ocean for the period 1941–1972, based on climatological data originally evaluated by the late Andrew F. Bunker, who analyzed eight million observations from ships of the Voluntary Observing Fleet.

Submarine Fans and Related Turbidite Systems

Editors: A. H. Bouma, Houston, TX; W. R. Normark, Menlo Park, CA; N. E. Barnes, Houston, TX

1985. 251 figs. XIV, 351 pp. (Frontiers in Sedimentary Geology) Hard cover DM 220, — ISBN 3-540-96142-9

This state-of-the-art survey of modern fans and ancient turbidite systems includes discussions of models, the influence of tectonics and sea-level variations, and examples of oil potential. A wall map in the back pocket presents diagnostic parameters and morphometric maps for selected modern fans.

K. O. Emery, E. Uchupi, Woods Hole, MA

The Geology of the Atlantic Ocean

1984. 399 figs. XX, 1050 pp. Hard cover DM 382, — ISBN 3-540-90632-5

"Monumental... a detailed synthesis of an enormous amount of information; Emery and Uchupi deserve both our thanks and our praise. This work will be the primary reference on the geology of the Atlantic Ocean."

Episodes

Observation of the Continental Crust through Drilling I

Proceedings of the International Symposium held in Tarrytown (May 20–25, 1984)

Editor: B. Raleigh, Columbia University

1985. 211 figs. IX, 364 pp. Hard cover DM 114, — ISBN 3-540-15873-1

This volume, the first in the new series, **Exploration of the Deep Continental Crust**, represents a landmark in international scientific cooperation. Its publication coincides with the initiation of several national drilling programs, and the attempt by those nations to share information throughout the course of the program.

Geological Evolution of the Mediterranean Basin

Raimondo Selli Commemorative Volume

Editors: D. J. Stanley, Washington, D. C.; F.-C. Wezel, Urbino

1985. 287 figs. 24 tabs. XXVIII, 589 pp. Hard cover DM 248, — ISBN 3-540-96139-9

An up-to-date account of the geological evolution of the Mediterranean and adjacent lands, with special focus on the events affecting this region during the Neogene.

Carbonate Petroleum Reservoirs

Editors: P. O. Roehl, San Antonio, TX; P. W. Choquette, Littleton, CO

1985. 386 figs. XXII, 622 pp. (Casebooks in Earth Sciences) Hard cover DM 220, — ISBN 3-540-96012-0

Presents 35 detailed case studies involving 41 carbonate oil and gas reservoirs. Examples from around the world and from a variety of geologic eras provide information not available elsewhere.

R. V. Fisher, University of California; H.-U. Schmincke, University of the Ruhr

Pyroclastic Rocks

1984. 339 figs. XIV, 472 pp. Hard cover DM 148, — ISBN 3-540-12756-9

"A vast amount of personal experience and diligent scholarship went into producing this felicitous volume; the material is reliable, authoritative, and current, and the book is logically organized and clearly written. The illustrative material is effective and of exceptional quality."

Science

Springer