BOOK REVIEWS

GEOLOGICAL CORRELATION

Special Issue: International Geological Correlation Programme IGCP Scientific Achievements 1973-1977

Bassett, M.G. (ed.)

UNESCO, Paris, 1978, 120 pp.

The International Geological Correlation Programme (IGCP) was originally conceived as a vehicle for establishing stratigraphic correlations across national boundaries and between continents. The Programme quickly expanded in scope to the point where its name is no longer strictly appropriate in English-speaking countries without allowing for broad latitude in defining "correlation". Indeed, it has been suggested that "coordination" be used instead as this word properly describes the function of the Programme which now, under joint IUGS-UNESCO direction, includes more than 60 individual projects, about one-third of which relate to geological correlation *sensu stricto*, while the remainder to such disparate topics as remote sensing, computer applications, ore genesis, and many others.

"Scientific Achievements 1973-1977" opens with several pages of introduction and summation by John Reinemund and Janet Watson, identifying the goals of IGCP in humanistic as well as scientific terms, the progress made in the first five years, and aspirations for the future. Readers unfamiliar with IGCP will find the Reinemund-Watson discourse a comprehensive and useful analysis that strives, quite successfully on the whole, to place the scientific results produced by IUGS adherents into the more socio-economic frame represented by UNESCO. Inasmuch as the major part of IGCP support comes from UNESCO, this orientation is appropriate; similarly, the headings under which reports of 40 projects are grouped reflect the emphasis placed by UNESCO on such aspects as human needs, environmental concern, technology transfer.

Geologists need not be geopoliticians to profit from reading "Scientific Achievements 1973-1977". This reviewer undertook to read the volume more from a sense of duty than from any innate desire; quickly, however, the work-ethic drive was replaced by simple selfish pleasure as it became clear that I was being made privy to some of the findings and speculations of multinational consortiums to which I would have no normal access before ultimate publication (in journals that I would probably not read!). The catholicity of subject matter is such that the reports provide a fascinating overview of a spectrum of forefront science that most of us cannot encompass.

Are you aware of the "show-and-tell" technique for resolving controversies in the field? Or of the "golden spike" method of establishing stratigraphic boundaries? Both of these gems are included by W.B.F. Ryan and Maria Cita in their report on Messinian correlation (Project 96), in a delightful document that brings one up to date on the Miocene salinity-crisis controversy, notes progress in data gathering and analysis, and acknowledges the existence (while identifying potential resolutions) of interdisciplinary, international, interpersonal, and intergenerational differences. Are you comfortable in a discussion of S-type and I-type granites, their distribution and their significance? Read the report on Circum-Pacific plutonism (Project 30) by Paul Bateman -- there are implications far beyond the Pacific realm, extending into many fields other than igneous petrology. These are but random examples; every reader will discover nuggets of knowledge outside his/her immediate area of concern and competence. Such extensions are mandatory if geology and geologists are

to break out of the current pattern of increasingly constrained specialization.

The better IGCP projects fall into one of three baskets: 1) studies of provinces that cross a number of national boundaries or are interrupted by rifted ocean basins (for example, "The Caledonide orogen" - Project 27); 2) problems common to widely-separated areas (for example, "Basins of iron-formation deposition" - Project 132; and 3) techniques and methodologies of potentially global application (for example, "Late Cenozoic magnetostratigraphy" - Project 128.) Several exemplars of each type are reported in "Scientific Achievements 1973-1977"; some, such as "Correlation of Caledonian stratabound sulphides" - Project 60, represent the coming together of long established but intellectually isolated working groups; others, for which a need has long been recognized, have seized upon IGCP as a readily available mechanism for international cooperation. The results are highly encouraging. These reports of the first five years of effort merit bibliographic notice and a much wider visibility than that provided by IGCP's house organ, and its limited circulation.

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Geology and Mineral Resources of Japan

Keisaku Tanaka and Tamotsu Nozawa (eds.)

Sumitomo Printing and Publishing Co. Ltd., Tokyo, Japan, 1977, 3rd edition, Vol. 1, Geology, 430 pp.

The first two editions of *Geology and Mineral Resources of Japan*, compiled by the Geological Survey of Japan, were published in 1956 and 1960 respectively. Although the Japanese islands have long been important for studies of volcanology, metamorphism and seismology, their significance has been brought more sharply into focus by the concepts of plate tectonics, developed mainly during the interval following publication of the second edition.

The third edition contains twenty-three chapters grouped into four parts. The first two present, in 68 pages, excellent summaries of the geology, geological framework and tectonic evolution of Japan. A 1:1 000 000 geological map of Japan (to be issued in the near future) or the currently available 1:2 000 000 geological map will aid in following the summaries. Part three (210 pages) is a fairly comprehensive account of the stratigraphy from the Silurian, the oldest system represented by known fossiliferous strata, to the Quaternary. Part four deals with igneous activity and metamorphism in 136 pages. A selected bibliography is limited to a page of comprehensive publications in English about the Japanese Islands.

The text is well supported by numerous figures and tables, and in general, the clarity of these is commendable, except for one or two page-size figures which would have benefitted from less reduction. Excellent use is made of tip-in illustrations to minimize the necessary reductions. Several figures are enhanced by the effective use of a few colours, as for example, in presenting distributions of various kinds of volcanic and granitic rocks and geophysical data.

The extreme complexity of Japan's geology is emphasized by the recognition of eight pre-Neogene geosynclinal regions, the rocks of which are grouped into four terranes. These terranes are further subdivided into twenty-two structural units based on facies distribution of Paleozoic strata, development of Mesozoic and Paleogene sedimentary basins and

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the distribution of metamorphic belts. The structural units are commonly separated by major faults. Of fundamental importance is the easterly trending Median Tectonic Line parallel with the general zonal structural trends of Southwest Japan and bordering the high pressure metamorphic rocks of the Sambagawa belt on the north. The Line divides Southwest Japan into an inner zone on the Sea of Japan side and an Outer Zone on the Pacific side. The north-south trending Tanakura Tectonic Line is considered as the boundary between Southwest and Northeast Japan.

In Southwest Japan the trends of Paleozoic and Mesozoic rocks are essentially parallel with the trend of the island arc, whereas in Northeast Japan the structural trends are oblique to the trend of the arc. It is of interest that remnant magnetization of Cretaceous granitic and metamorphic rocks is generally northeasterly in Southwest Japan and north-westerly to north-northwesterly in Northeast Japan, indicating a considerable bending of the ancient Honshu Arc, presumably between late Cretaceous and middle Tertiary time. It is speculated that the bending was related to the formation of the Izu-Mariana Arc in Neogene time. The complexities noted above in a well studied region should present a few sobering thoughts to those involved in deciphering the geological history of ancient mobile belts.

The part of the book devoted to stratigraphy is amply documented with figures showing distributions, stratigraphic columns, correlation tables, geology, paleogeography and faunal lists and zones. It is clear that in Japan, as well as in other regions where eugeosynclinal strata are abundant, new insight into the stratigraphy of non-calcareous rocks is being afforded by the study of microfaunas. For example, some rocks formerly considered as Permian are now known to be Triassic based on conodonts.

The classic studies of metamorphism in the Abukuma, Hida, Ryoke, Sangun and Sambagawa belts are summarized using Miyashiro's well known classification of high-pressure, medium-pressure and low-pressure types of regional metamorphic rocks. The discussion of volcanic rocks is thorough and reflects their importance in the geology of Japan. Of great significance has been the recognition by Kuno of three general petrographic provinces in the late Cenozoic volcanics. A tholeiitic province lies on the Pacific Ocean side of the islands and an alkali province lies on the Sea of Japan side. A calc-alkali province overlaps the boundary between the other two and occupies almost all parts of the Japanese Islands. It is generally assumed that the zonation described above is related in depth to the seismic plane dipping towards the continental side. Averages of numerous chemical analyses support the classifications and zonal distributions of the volcanic rocks.

Much information is available on granitic rocks in Japan. The book contains syntheses of petrographic, chemical and radiometric data which show many similarities with those elsewhere in the Circum-Pacific region. Despite the information, there appear to be no clear relationships between plutonism, regional metamorphism and orogeny.

Succinct descriptions of Quaternary tectonic movements, combined with data on Quaternary volcanism and geophysical measurements are pertinent to a region that provides one of the most important models of island arc tectonics.

Although the book's objective is to present a brief summary of the present knowledge of Japan's geology, it succeeds in making available a wealth of information that provides much more than a simple introduction to the major disciplines of earth science studies in Japan. For students with particular interest in eugeosynclinal sedimentation, regional metamorphism, plutonism, volcanism and global tectonics, it is an essential reference.

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Geological Survey of Canada

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