



## EDITORIAL

### A Foreword from the Editor-in-Chief

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**T**his volume contains seven papers dealing with many areas of Geology including Petrology, Mineralogy, Engineering Geology, Regional Geology and more of different parts of the world. Journal of Geological Research aims to discover innovative methods, theories and studies in all aspects of Geology by publishing original articles, case studies and comprehensive reviews.

The scope of the papers in this journal includes, but is not limited to: Petrology, Mineralogy, Geochemistry, Stratigraphy, Deposit Geology, Structural Geology, Economic Geography, Hydrogeology, Engineering Geology, Regional Geology.

Some of the first geological thoughts were about the origin of the Earth. Ancient Greece developed some primary geological concepts concerning the origin of the Earth. Additionally, in the 4th century BC Aristotle made critical observations of the slow rate of geological change. He observed the composition of the land and formulated a theory where the Earth changes at a slow

rate and that these changes cannot be observed during one person's lifetime. Aristotle developed one of the first evidence-based concepts connected to the geological realm regarding the rate at which the Earth physically changes. However, it was his successor at the Lyceum, the philosopher Theophrastus, who made the greatest progress in antiquity in his work *On Stones*. He described many minerals and ores both from local mines such as those at Laurium near Athens, and further afield. He also quite naturally discussed types of marble and building materials like limestones, and attempted a primitive classification of the properties of minerals by their properties such as hardness.

Much later in the Roman period, Pliny the Elder produced a very extensive discussion of many more minerals and metals then widely used for practical ends. He was among the first to correctly identify the origin of amber as a fossilized resin from trees by the observation of insects trapped within some pieces. He also laid the basis of crystallography by recognising the octahe-

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dral habit of diamond.

By applying sound stratigraphic principles to the distribution of craters on the Moon, it can be argued that almost overnight, Gene Shoemaker took the study of the Moon away from Lunar astronomers and gave it to Lunar geologists.

In recent years, geology has continued its tradition as the study of the character and origin of the Earth, its surface features and internal structure. What changed in the later 20th century is the perspective of geological study. Geology was now studied using a more integrative approach, considering the Earth in a broader context encompassing the atmosphere, biosphere and hydrosphere. Satellites located in space that take wide scope photographs of the Earth provide such a perspective. In 1972, The Landsat Program, a series of satellite missions jointly managed by NASA and the U.S. Geological Survey, began supplying satellite images that can be geologically analyzed. These images can be used to map major geological units, recognize and correlate rock types for vast regions and track the movements of Plate Tectonics. A few applications of this data include the ability to produce geologically detailed maps, locate sources of natural energy and predict possible natural disasters caused by plate shifts.

The geology of the Earth's surface and its economic and environmental consequences have been recognized and studied over 250 years ago. The Earth's surface chemistry, and its many effects, has been identified for a much shorter period of time. The abundance of chemical elements in the surface material of the Earth is linked to agriculture, soil fertility, forestry, animal and human health, industrial pollution, mineral resource potential, environmental standards, water quality and land use planning. Represents an atlas that shows the geographical distribution of the elements in the common surface material the most effective way to summarize this information. In addition to providing awareness of the diversity of surface geochemistry, large-scale maps in the atlas can reveal geochemical features of unknown geological significance. Variations in the abundance of absolute and relative elements between different regions provide evidence to help decipher the geologic history of the continental crust of the Earth.

Given the many practical uses of spatial geochemical data, it is surprising that until the 1980s there was no need to identify a global geochemical atlas to com-

plement the many other atlases present in each library. Although atlases containing geochemical data sets began to appear for the first time in the 1970s, with the exception of Northern Fennoscandia, none of which exceeded the borders of one country. Apply only a few to a part of a country. The main obstacle to more comprehensive groups was that there were many different ways to collect, prepare and analyze geochemical samples, and that work started in different places had limited objectives in mind, especially for a project or area. Roads for a particular purpose have been improved, such as basic mineral exploration, often within constraints imposed by funding constraints and available facilities. Thus limited information was obtained only. Different projects define different wings of elements. Even if there are nominal similarities or data of abundance of elements produced by organizations in different countries or projects within a country, they can not often be quantified because there is no uniformity of methodologies used. These problems, which apply to data collected by national organizations, have been more severe with regard to data obtained in many countries in the context of mineral prospecting in the private sector. In any place there is no set of data available suitable for reliable large space groups.

Recognizing these shortcomings, and the fact that geochemical properties are not limited to national boundaries, informal discussions began between geo-chemists in the mid-1980s to look for ways to correct the situation. Almost all previous geochemical mapping projects have been planned as a means to assist in the assessment of mineral resources, or, where surveys are sufficiently detailed, directly into mineral exploration. The environmental impacts of the data, although recognized, were not the primary consideration because they were important for the mandate of geological finance agencies. As a result, analytical data on major biological components were not obtained because of additional costs. By the mid-1980s, the importance of environmental issues had become widely recognized, and geochemists generally agreed that the mapping database in all countries should be expanded to include the entire periodic table. Furthermore, analytical methods should be used to ensure that the detection limits are much lower than the normal levels of abundance.

Initially, there were two independent proposals, one created under the auspices of the West European Geological Survey (WEGS), which focused on Western Europe,

and a second proposal, developed from a previous group to explore the International Atomic Energy Agency (IAEA). The WEGS proposal was based on a set of over-bank samples, a relatively new concept. The members of the last project are aware that the geological map of the world has been assembled and that many geophysical data have been compiled as continental-scale maps, taking a more global view, geographically and in relation to the methods to be used. After 1989, the two groups worked together and one goal was pursued. Obviously, the first step is to decide on ways that would be appropriate for the production of a global series of geochemical maps. These data will provide the standard amount for all countries and continents.

In 1986, a proposal for an international geochemical mapping project was submitted to the Governing Committee of the International Geological Relations Program (IGCP), which established UNESCO and the International Union of Geosciences. After some hesitation, due to its ambitious goals, the project was accepted (No. 259), beginning in 1988. Support was also obtained for the concept from the International Association of Geochemistry and Chemical Chemistry. The annual funding provided by IGCP, although important in referring to the scientific acceptance of the project and supporting attendance at meetings, carried only a small percentage of the project cost, which was borne by the supporting national geological institutions. The first phase of the project reviewed the current data and methods. The surface of the earth consists of mountains, plains, deserts, rainforests, rocky promontories and broad non-uniform cover, in climatic zones ranging from the tropics to the Arctic. Except for the airborne gamma-ray spectrometer, which applies only to the identification of radioactive elements, one method of data collection cannot be applied to each ground surface. Unfortunately, there is no remote sensing technology capable of measuring all the abundance of elements from a distance, so sampling from the ground is necessary.

Consequently, many problems and perspectives had to be studied. These included sample media selection, sample spacing, sample preparation prior to analysis, and analytical procedures to be applied, both for restricting methods to those involving total extraction of existing elements. If partial extraction is used, the extraction method is acceptable. Process management, sample processing, storage, quality control and data processing

should also be considered.

Six years were needed to reconcile many different views on the above issues. The original international geochemical mapping project (IGCP 259) has become the Global Geochemical Baseline Project (IGCP 360). Experimental sampling was conducted in China, Canada and Finocandia to validate the very sparse sampling interest, which was a key factor in obtaining a systematic, systematic and rapid overview of global geochemistry at economically realistic costs. A necessary side-effect of the study was the development of a global reference network of equal size for the purpose of locating and controlling the sample. The culmination of the work, which included discussions with scientists in 35 countries, was the preparation of a report and recommendations. It was published in 1995 (reprinted in 1996) by the Department of Earth Sciences of UNESCO (Darnley, GE, Bjorklund, AJ, Polviken, P., Gustafson, N., Koval, PV, PV, Plant, M. and Xie Xuejing, with contributions from Garrett, RG and Hall, GEM 1995: [Reprinted with minor modifications 1996.] Global Geochemical Database for Environmental and Resource Management: Recommendations for International Geochemical Maps, Science Report 19, published by UNESCO, Paris. 122 pp., With the financial support of the International Union of Geosciences, the International Association of Geochemistry and Cosmic Chemistry, the Association of Exploration Geologists, the International Energy Agency Atomic, the Royal Society. Following the publication of the report, the International Union of Geological Sciences was established in 1996 a working group on global baselines Geochemical recommendations to encourage and provide advice and assistance in its implementation.

After the publication of the report, scientists and institutions in more than 100 countries expressed interest in participating in the compilation of a global geochemical database if funds could be made available. Approaches have been provided to a number of international organizations, including the United Nations Environment Program (UNEP), FAO, WHO and IAEA, which seek financial support for the implementation of the recommendations. All acknowledged the acute budgetary problems and said that it was the responsibility of national Governments to support the project. In 1996, matters advanced as the United Nations Natural Resources Committee formally approved a resolution proposing the establishment of a global land monitoring program,

based on the recommendations of the report. Regrettably, things have not progressed yet.

The recommendations contained in the report were implemented in a number of regional commissions, under the overall guidance of the Working Group Steering

Committee. Each regional committee represents either a group of countries, such as Europe and North America or one large country, such as China, Russia, Brazil, and India. In Europe, the European Geological Survey Forum (FOREGS) was the focus of a regional commission.