

# Geochemistry and the Environment: Vol. II, The Relation of Other Selected Trace Elements to Health and Disease

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# Book Reviews

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## **Geochemistry and the Environment: Vol. II, The Relation of Other Selected Trace Elements to Health and Disease**

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National Academy of Science, 163 p., 1977.  
\$12.00

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The advent of the Toxic Substances Control Act (TSCA) and the greater and greater concern on the environmental factors in disease has brought a new area of research to mineralogists and geochemists. Traditionally the mineralogist has had a key role to play in the area of occupational hazards of minerals such as asbestos and quartz polymorphs. In addition, particle surfaces are active and represent a means of concentrating toxic metals, metal-organic complexes, and viruses. There is evidence that certain mineral surfaces can stabilize viruses. As is usual, there is a great lack of communication between health researchers and mineralogists-geochemists, and hence a great deal of ignorance exists in development of experiments, etc. One can expect efforts in the area of geochemical factors in disease to increase exponentially for the next decade.

At an AAAS meeting in 1968, a group of individuals decided to formalize activity in order to define and understand the causal relationships between elements in the environment and health. The *Subcommittee on the Geochemical Environment in Relation to Health and Disease* was established under the U.S.

National Academy of Sciences. W. W. Rubey was most instrumental in seeing this committee established.

This volume is one of the many titles that has been released from efforts of this subcommittee. A series of titles have previously been published by the Geological Society of America and the new York Academy of Sciences in 1967, 1971, and 1972 and edited by H. L. Cannon, D. F. Davison and H. C. Hopps. In addition, there is the well known conference proceedings at the University of Missouri which is edited by D. D. Hemphill on *Trace Substances in Environmental Health* (now at Volume XI).

This volume is the outcome of a workshop effort, and most of the reports are written by a committee. There are two parts: eight chapters of review on the health effects of Be, Mg, Mn, Ni, Si, Sr, Sn, and V; and a second part on various papers including specific regional studies, interactions of trace metals, activities of the WHO, and a proposal for a national environmental specimen index.

The chapters on effects of the trace elements (although Si and Mg are certainly not trace elements) follows a pattern of discussion: a) the geochemistry (abundances, solubilities, mineralogy), b) analytical procedures, c) biochemistry, d) health effects, and e) research recommendations. Overall, each element is handled thoroughly although it is obvious that various individuals wrote the report. My greatest criticism is that the report is not up-to-date with most references ending in 1975. Hence new and interesting work such as the mutagenicity tests, hemolytic activity involving minerals is missing. However, a researcher can easily start with this volume and update the chapters using computer searches on TOXLINE or MEDLINE or the more traditional abstracting services. I found the second

portion of the volume interesting but not very informative. The WHO study has been published elsewhere in more detail (*Health Hazards of the Human Environment*, 1972) and the regional studies are perhaps worthy of study to ascertain why they were not successful in definition of the factors relating to health problems of a region. The chapter on interrelationships of trace elements was not developed.

Ingestion and inhalation are two main ways in which intake of trace elements comes about in the human body. Drinking water is the main route of ingestion, and standards for concentration of trace elements in drinking water do exist. The form of the elements is in most cases much more important than the amount of trace element ingested. This topic has not been addressed in regulations for potable water and unfortunately it was not addressed in more than passing in this volume. It is undoubtedly the most important factor in such discussions as cardiovascular disease and hard/soft water statistics. The chapter on Si covered most of the information on inhalation, since most particles are silicates. I found the discussion on direct effects of minerals quite well done, but the discussion on particulates as carriers of toxic substances was not up to the state-of-the-art. Surfaces of minerals are very active and various treatments of the surfaces before experimentation can have very great effects of their response.

As mentioned earlier, this area of health-geochemistry is growing at a very rapid pace. One cannot expect any publication to be up-to-date with the work that is being carried on at present. Publications of this sort can make all interested researchers aware of the details and complexity of their respective studies. I find, in particular, health researchers very ignorant of the com-

plexities of mineralogy.

As a final note, mention of the upcoming (March 1978) symposium, "Trace Metals and Health" of the Royal Society shows the continuing efforts of this group.

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## Geomorphology and Engineering

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Edited by Donald R. Coates  
*Dowden, Hutchinson and Ross, Inc.,  
Stroudsburg, Pa.,  
1976 (Dist. by Halsted Press Division of  
John Wiley and Sons Inc.), 360 p. U.S.  
\$27.50*

Robert M. Quigley  
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This book is in reality a volume of the proceedings of the Seventh Annual Geomorphology Symposium held at the State University of New York at Binghamton in September 1976. To achieve a single volume it is presented in small type on 360 pages which seemed to this reviewer more like 700 pages of normal reading.

The proceedings present an extensive, usually descriptive exercise in the application of geomorphology to engineering practice. Since it deals with an enormous breadth of subject matter, it probably contains a relatively small amount of information of interest to a single reader. Indeed, this reviewer found the book to be long and tedious except for selected papers in which he had some direct familiarity or interest. Nevertheless, complete reading is certainly an education even if a rather descriptive one.

The preface of the book is a short review of its purpose and contents; a dissertation requiring over 1200 words thus attesting to its extraordinary length. The format consists of five major parts each containing two to five papers (chapters). For this review, brief comments are presented on the contents of each major part as follows:

### Part I: Methods and Mapping

Chapter 1 on "Geomorphic Engineering" by D. R. Coates was to this reviewer an overly long exercise in oversell of the idea of a discipline of Geomorphic Engineering. I wonder if the author had in mind legal responsibility for design by such a new breed of engineer? Chapter 2 on "Landuse Contributions of Soil Survey with Geomorphology and Engineering" by Olson is a useful chapter describing U.S. Agricultural Soil Mapping techniques which include printouts of suggested landuse suitability including such items as suitability for septic or landfill purposes. Chapter 3 on "Mapping of Mountainous Soils West of Denver, Colorado, for Planning Purposes" by Schmidt and Pierce is chiefly an exercise in soil/rock designation applicable to the two problems of septic infiltration and excavation. Chapter 4 on "Preconstruction Terrain Evaluation for the Trans-Alaska Pipeline Project" by Kreig and Reger is a good review of the terrain evaluation and mapping techniques used to keep exploration time and costs at a reasonable level yet with a "known" level of risk associated with inevitable errors from lack of complete coverage of the pipeline route.

### Part II: River Engineering

Chapter 5 on "The Mississippi River Flood of 1973" by Noble is a general review of the 1973 flood and its stages relative to forecasts used for design of Mississippi protective works. The costs of the U.S. Mississippi River and Tributaries Flood Control Project relative to forecasted flood damages due to flood plain encroachment are revealing. Chapter 6 on "Geologic Control of Sand Boils along Mississippi River Levees" by Kolb is an excellent descriptive account of the role played by complex systems of meanders, bars, fillings, etc. on the distribution of sand boils. Chapter 7 on "Channelization: Environmental, Geomorphic and Engineering Aspects" by Keller is a good, conscientious description of the many factors to be considered in preserving the natural ecology of man-modified streams. Chapter 8 on "Drainage Basin Characteristics Applied to Hydraulic Design and Water-Resources Management" by Orsborn is a review and suggested new approach to modelling drainage basins to make optimum use of gaging stations. Worth reading.

### Part III: Resource Engineering

Chapter 9 on "Kinza Dam and the Glacial Foreland" by Philbrick is a case history of the problems, plans and eventual construction of a dam built in Pennsylvania. Conscientious use seems to have been made of extensive geologic and geomorphic input data. Chapter 10 on "Timber Harvesting, Mass Erosion and Steepland Forest Geomorphology in the Pacific Northwest" by Swanson and Swanson describes the effects of clear cutting timber-harvesting on mass wasting in high relief terrain. It is hard to believe that such slaughter of forested slopes is still permitted. Chapter 11 on "Forecasting the Effect of Landuse Plans on the Regional Market Conditions of the Sand and Gravel Business" by Fakundiny is an interesting discussion of market area rosettes, domains, and funnel maps and their long term modification as controlled by transportation routes, population growth and supplies. (Good economic geomorphology?)

### Part IV: Urbanization Effects

Chapter 12 on "The Urbanizing River: A Case Study in the Maryland Piedmont" by Fox is a comparative, descriptive account of erosion-sedimentation studies in urban and rural sections of the Patuxent River. Chapter 13 on "Geomorphology and Engineering Control of Landslides" by Leighton incorporates several good messages for geotechnical engineers about whom the author seems rather cynical. Chapter 14 on "Scientific and Engineering Parameters in Planning and Development of a Landfill Site in Pennsylvania" by Foose and Hess is a useful case history of landfill monitoring methods as applied to a site converted from a trench-type to an area landfill.

### Part V Geomorphic Synthesis

Chapter 15 on "The Role of Geomorphology in Planning" by Legget is a plea for geological and geomorphic input into political planning as affected by infrequent, hazardous, geologic events. Chapter 16 on "River Management Criteria for Oregon and Washington" by Palmer is likewise a plea for river management approaches compatible with natural events that occur within four major physiographic river zones related to gradient and therefore hydraulic flow characteristics.