

ECONOMIC GEOLOGY

Seventy-Fifth
Anniversary Volume

1905-1980

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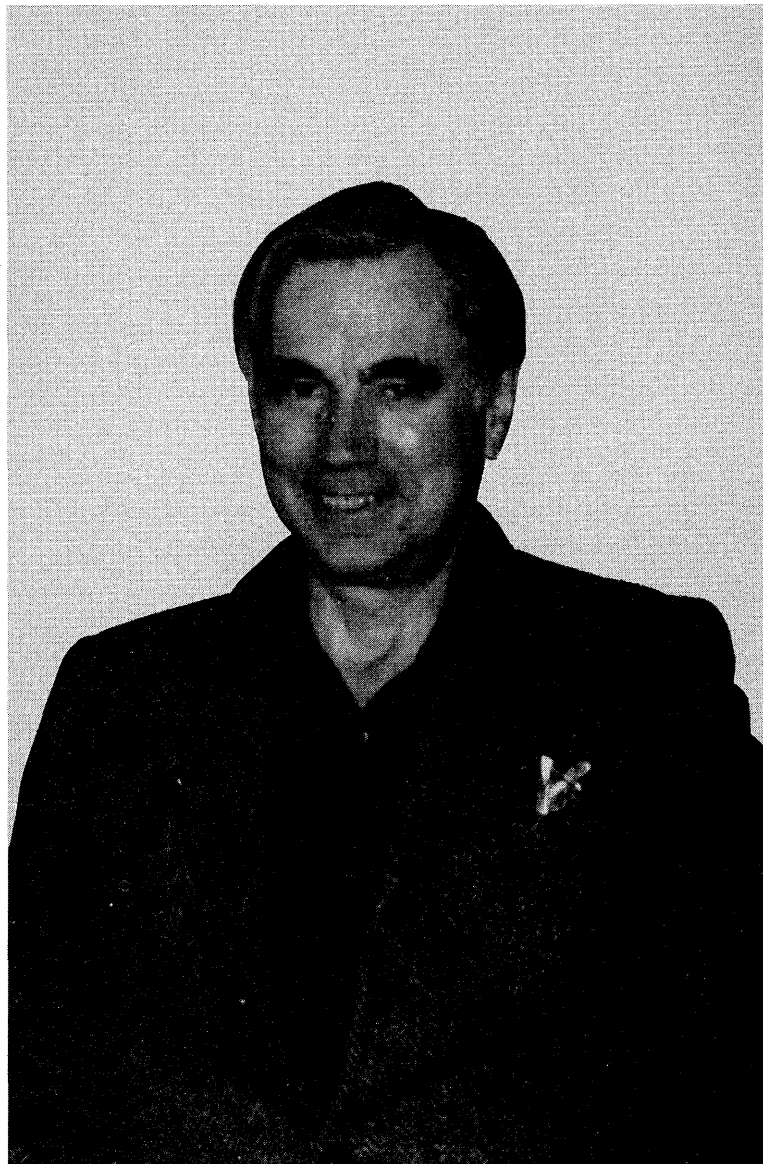
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Contents

Dedication to W. S. White.....	<i>Paul B. Barton, Jr.</i>	1
Introduction.....	<i>Paul K. Sims and Brian J. Skinner</i>	3
Ore-Forming Processes in Geologic History.....	<i>Charles Meyer</i>	6
The Relation of Mineral Deposits to Early Crustal Evolution.....	<i>C. R. Anhaeusser</i>	42
Geology and Concepts of Genesis of Important Types of Uranium Deposits.....	<i>J. T. Nash, H. C. Granger, and S. S. Adams</i>	63
Gold and Uranium in Quartz-Pebble Conglomerates.....	<i>D. A. Pretorius</i>	117
Sediment-Hosted Stratiform Deposits of Copper, Lead, and Zinc.....	<i>Lewis B. Gustafson and Neil Williams</i>	139
An Overview of Sandstone Lead Deposits and their Relationship to Red-Bed Copper and Carbonate-Hosted Lead-Zinc Deposits.....	<i>A. Bjørlykke and D. F. Sangster</i>	179
Porphyry Copper Deposits		
Part I. Geologic Settings, Petrology, and Tectogenesis.....	<i>S. R. Titley and R. E. Beane</i>	214
Part II. Hydrothermal Alteration and Mineralization.....	<i>R. E. Beane and S. R. Titley</i>	235
Character and Origin of Climax-Type Molybdenum Deposits.....	<i>W. H. White, A. A. Bookstrom, R. J. Kamilli, M. W. Ganster, R. P. Smith, D. E. Ranta, and R. C. Steininger</i>	270
Skarn Deposits.....	<i>M. T. Einaudi, L. D. Meinert, and R. J. Newberry</i>	317
Active Geothermal Systems and Hydrothermal Ore Deposits.....	<i>Donald E. White</i>	392
Fluid Flow and Genesis of Hydrothermal Ore Deposits.....	<i>L. M. Cathles</i>	424
The Granitoid Series and Mineralization.....	<i>Shunso Ishihara</i>	458
Volcanic-Associated Massive Sulfide Deposits.....	<i>J. M. Franklin, D. M. Sangster, and J. W. Lydon</i>	485
Nickel Sulfide Deposits: Classification, Composition, and Genesis.....	<i>A. J. Naldrett</i>	628
The Character and Economic Significance of Precambrian Paleoweathering and Erosion Surfaces in Southern Africa.....	<i>Andrew Button and Noel Tyler</i>	686
Nickeliferous Laterite Deposits.....	<i>J. Paul Golightly</i>	710
Ferromanganese Nodules of the Deep Sea.....	<i>G. Ross Heath</i>	735
Geology, Geologists, and Mineral Exploration.....	<i>Ernest L. Ohle and Robert L. Bates</i>	766
Some Concepts and Techniques in Geochemical Exploration.....	<i>William C. Overstreet and Sherman P. Marsh</i>	775
Electrical Methods in Mining Geophysics.....	<i>Gerald W. Hohmann and Stanley H. Ward</i>	806
Gravity and Magnetic Methods in Mineral Exploration.....	<i>Phillip M. Wright</i>	829
Gamma-Ray Spectrometry in Geologic Mapping and Uranium Exploration.....	<i>Stanley H. Ward</i>	840
Well Logging and Borehole Geophysics in Mineral Exploration.....	<i>W. E. Glenn and Gerald W. Hohmann</i>	850
Seismic Methods in Mineral Exploration.....	<i>Phillip M. Wright</i>	853
The Environment of Exploration: Economic, Organizational, and Social Constraints.....	<i>Geoffrey G. Snow and Brian W. Mackenzie</i>	861
The Appraisal of Mineral Resources.....	<i>DeVerle P. Harris and Frederik P. Agterberg</i>	897
Physical Factors that Could Restrict Mineral Supply....	<i>John H. DeYoung, Jr., and Donald A. Singer</i>	939
Changes in the Political and Social Framework of United States Mineral Resource Development, 1905-1980.....	<i>Eugene N. Cameron</i>	955

Dedication to Walter S. White



Walter S. White

It is with great pleasure and appreciation that his friends and colleagues dedicate this 75th Anniversary Volume of *Economic Geology* to Walter S. White. Rarely does an individual who has such a great influence on his profession maintain such a low profile as "Whitie" has managed to do over the last 25 years.

Whitie is a longtime fixture of New England and Lake Superior geology, but we will not deal here with this aspect of his career, nor will we belabor his long

and productive career in the U. S. Geological Survey. Instead, we shall consider the signal service he has performed on behalf of the profession through his participation in the affairs of the Economic Geology Publishing Company.

In 1957 Whitie became Secretary and a Director of the Publishing Company, and in 1966 he succeeded Harold Bannerman as President. For the next seven years, Whitie guided the Publishing Company

through a series of critical maneuvers including: new editorial procedures; a confrontation with its long-time patron, the Society of Economic Geologists; and particularly delicate dealings with stockholders of the Publishing Company and their heirs, regarding a reorganization required by changes in the tax laws. Throughout all this he functioned quietly and effectively, using his quick wit, fine sense of humor, and appreciation for the feelings of others to achieve what those of us around him had deemed well nigh impossible.

In the mid-1960s, *Economic Geology* was facing a crisis. Alan Bateman had served as Editor for almost 50 years and had been operating much of the time almost single-handedly. During those years the journal had increased in size and the science had increased in complexity to the point where no one person, no matter how devoted, could carry the sole editorial burden; yet Alan was unwilling to ask for help beyond his highly qualified, but seldom used, Board of Associate Editors. Moreover, Alan's venerable age and the departure from Yale University of Roy Jensen, raised concern about the immediate continuity should the Editor falter. With tact and respect Whitie persuaded Alan to accept (at first grudgingly, but soon enthusiastically) the hard-working Editorial Board that, under the direction of, first, Bateman and, later, Brian Skinner, has served the journal and profession so well for 15 years.

The reorganization of the Publishing Company is a classic of Whitie's behind-the-scene statesmanship. As originally chartered in 1905, the Publishing Company had 80 shares with a par value of \$25. Most were purchased individually by economic geologists who recognized the need to support the new journal. As the years passed, the Company prospered, but no

dividends were ever paid (none were ever intended); shares for the most part were repurchased (always at the \$25 par value) by the Company and resold to younger geologists. Some shares found their way into the coffers of the Society of Economic Geologists where they remained, and others became part of the estates of deceased shareholders. The Company received bequests and return on investments so that by the mid-1960s a portfolio valued at about a quarter of a million dollars had accumulated. Moreover, times had changed and the Internal Revenue Service began to look on organizations such as the Publishing Company with such covetous eyes that a formal change to a "not-for-profit" organization was needed; but to accomplish this required the unanimous consent of all shareholders. This consent was easy to obtain from the individual professional geologists and from the Society who understood the true nature and function of the organization, but the heirs and administrators of estates viewed each of the shares under their control as a $1/80$ th portion of a quarter million dollars and, thus, of considerably greater value than the \$25 offered for each share. Fortunately, Whitie's persistent and unswerving efforts finally convinced all of the holdouts that the Publishing Company really was a non-profit group so the essential reorganization could come about.

Today we have a strong and productive Economic Geology Publishing Company whose principal publication, *Economic Geology*, is preeminent among all geotechnical journals. This enviable position has come through the long and devoted efforts of many, but without Walter White's catalytic and cohesive role in a time of difficulty, the efforts of others would have gone for naught. Whitie, old chum, we will be forever indebted to you.

Seventy-Fifth Anniversary Volume

Introduction

The first notions of a new journal came to J. E. Spurr during the closing days of 1904. When he shared his thoughts with friends in Washington, D. C., they were so enthusiastic about the suggestion that they formed themselves into an ad-hoc committee to seek ways to implement the idea. The ad-hoc group met informally for several months and by May of the following year was ready to announce the birth of an unusual new publishing company and the journal the company would produce. The first formal meeting of the Economic Geology Publishing Company took place on May 16, 1905. The first issue of the new journal appeared in October of the same year, and the first volume was completed in December 1906. The birthing was not easy, but it was successful because the founders provided much of the financing as well as the first papers. The story of those earliest days and the many struggles of the fledgling journal is engagingly recounted by Alan M. Bateman in an article published in the Fiftieth Anniversary volume.

From inception, management of the *Journal* has differed from the management of most scientific journals. There was no sponsoring society, so the founders raised capital by incorporating and selling shares in the venture. The *Journal* has been owned and published by the Economic Geology Publishing Company ever since. There is no record that the founders experienced difficulties in selling shares in the Company, but they must have had some because the Publishing Company had a goal that other corporations (and presumably many of the investors) would have found difficulty in understanding: the new corporation was committed to keeping the books balanced but not to making a profit.

Initially incorporated in the District of Columbia, the Publishing Company was reincorporated in 1970 as a nonprofit membership corporation in Delaware. The modification in corporate status came in response to a suggestion made by the Internal Revenue Service.

The affairs of the Publishing Company are controlled by a Board of Directors, and the *Journal* is sold to the public by direct subscription. Day-to-day operations of paper selection, review, and printing are in the hands of the Editor, while business matters, such

as subscriptions and advertising, are in the hands of the Business Editor.

The one tie the Publishing Company has with a society was instituted many years after the *Journal* was founded—with the Society of Economic Geologists. When the Society was founded in 1920 it first considered publishing its own bulletin. Because the venture seemed financially questionable, and the coffers of the new society were bare, an arrangement was reached whereby members of the Society first received offprints of papers written by its members and eventually *Economic Geology* as part of the membership fee. The arrangement is a straight-forward financial one, but it has led to sixty years of close and effective cooperation between the two organizations. But even though most Directors of the Publishing Company also have been Society members and five Directors are now appointed to the Board of the Publishing Company to represent Society interests, the organizations remain separate and independent. At the present time only 30 percent of those who receive *Economic Geology* do so through membership in the Society of Economic Geologists—the great majority of the approximately 8,000 subscribers purchase the *Journal* directly from the Economic Geology Publishing Company.

The founders of the *Journal* were of two minds when it came to choosing a name for the new publication. Their original choice was *Journal of Applied Geology*, but during the organizing meetings of 1905 Applied Geology was changed to Economic Geology. The name has led some to be confused about the purposes of the *Journal*, thinking, apparently, that economic geology means the economics of geology. But there was no confusion in the minds of the founders. They knew exactly what they meant when they used the term economic geology. The subject was defined in their original statement of purpose—a statement that has guided the *Journal* to the present day. The *Journal*, they said,

“will be devoted primarily to the broad application of geological principles to mineral deposits of economic value, to the scientific description of such deposits, and particularly to the chemical,

physical and structural problems bearing on their genesis. With the engineering and commercial aspects of mining, *Economic Geology* will not be directly concerned . . .”

They intended the emphasis to be mineral deposits and so it has remained to the present day—but not all mineral deposits. The deposits of special interest are those in which are found the ore minerals, that small group of minerals and mineral substances for which we find uses in our technological society.

Papers in *Economic Geology* have ranged widely in scope. Prior to the formation of the American Association of Petroleum Geologists in 1920 and publication of their *Bulletin*, *Economic Geology* was the preferred site for many of the early classics in petroleum geology. For many years, too, papers dealing with ground water appeared frequently in the pages of the *Journal*, as did papers on coal geology, certain aspects of engineering geology, and geophysics. The balance and range of papers submitted at any given time reflected the prevailing interests of the profession at that time. Although the number of papers submitted on topics in coal geology and ground water has declined over the past 25 to 30 years, they continue to be welcome in the *Journal*.

Most of the papers that appear in *Economic Geology* concern metallic and nonmetallic mineral deposits. The pattern has changed little since publication of the first issue, and as a result the fascinating evolution of ideas concerning how, where, and when the different kinds of mineral deposits formed is recorded in the pages of the seventy-five volumes of *Economic Geology*. No other record of the subject is so complete or so extensive. By the time fifty volumes had been printed—in 1955—the record was 42,000 pages long, and the Directors of the Publishing Company decided to print a Fiftieth Anniversary Volume containing 25 papers in which were reviewed the most important topics of economic geology as then perceived. The volume was a great success and had a major influence on students in the decade that followed its appearance. Some of the fine papers in the volume are still referred to in current research literature—a remarkably long referral history for a scientific paper of any kind.

Economic Geology's third quarter century—1955–1980—has been a period of great change and development in all sciences. Thirty-five thousand *Journal* pages were printed during the period, and because the page size was increased approximately 40 percent with Volume 63 in 1968, more papers were published in the 25-year period than during the first 50 years. The growth reflects and records a science that is changing almost issue by issue. The reasons for change are not difficult to discern. One reason is the increasing use of laboratory experiment through

which the chemistry of rock types, of wall-rock alterations, and of ore mineral assemblages can be simulated and studied under controlled conditions. Multiple hypotheses can be pared down to a very few possibilities and this narrowing and focusing of ideas has led, in turn, to major advances in our knowledge of the physical and chemical conditions under which mineral deposits form. As the body of data from experimental geochemistry grew, there developed another reason for change. Experiments are limited, but through thermochemical calculations it is possible to be quantitative and to calculate conditions of formation that cannot be simulated in the laboratory or directly measured from information preserved in the ore and gangue minerals. The move toward quantification and calculation continues apace and will probably be one of the major areas for advance during the next 25 years. Yet another reason has come through refinements to mass spectrometers, which has led in turn to systematic studies of isotopic fractionations, especially the stable isotopes of hydrogen, carbon, oxygen, and sulfur. The chemistry of the fluids that transported the ore constituents can finally be tested because isotopic signatures offer an opportunity to identify sources of materials. Many long-held beliefs have finally been tested, and some of the answers have proved to be very surprising. These and many other advances in geochemistry have recently been admirably reviewed in the second edition (1979) of the *Geochemistry of Hydrothermal Ore Deposits* edited by H. L. Barnes.

Not all of the advances in economic geology have come through geochemistry. The enormous growth in demand for mineral resources has led to a period of unprecedented, worldwide mineral exploration. As a result, classes of deposits that were unknown in 1955 are now represented by several examples, and the number of examples in some long-recognized classes—such as porphyry coppers—have been multiplied many-fold. With a greatly increased sample size and with the much deeper understanding of tectonic settings that has come through the realization of plate tectonics, it is apparent that certain types of deposits occur in specific tectonic settings. Furthermore, we can now prove through radiometric dating that the frequency with which certain classes of deposits formed varied through geological ages. Changing ideas concerning time and tectonic setting have inevitably refined the skills of those who seek to discover new deposits and those same ideas now hold out the promise that eventually we may be able to estimate, with some degree of certainty, the frequency of mineral deposits in the crust.

When the Board of Directors of the Economic Geology Publishing Company, under the leadership of President George Becraft, decided in 1978 to publish a Seventy-Fifth Anniversary Volume, their goal was

the same as that of their predecessors for the Fiftieth Anniversary Volume—to publish authoritative reviews of the most important topics in economic geology today. The appearance in 1979 of *Geochemistry of Hydrothermal Ore Deposits* filled the need for reviews of most topics in geochemistry. What was clearly needed in addition was a volume that brought together the many new ideas concerning time and place of mineral deposition, of exploration for new deposits, and of the assessment of undiscovered mineral potential in untested ground.

Detailed planning for the Seventy-Fifth Anniversary volume together with selection of topics and invitations to authors was entrusted to a committee appointed by the Board of Directors of the Publishing Company in consultation with the Executive Committee of the Society of Economic Geologists. Committee members were P. B. Barton, Jr., George E. Becraft, DeVerle Harris, Peter F. Howard, V. E. McKelvey, A. J. Naldrett, E. L. Ohle, D. A. Prentorius, W. C. Prinz, Brian J. Skinner, Tatsuo Tatsumi, John C. Wilson, and Paul K. Sims, Chairman.

The papers that make up this volume are grouped under three general headings: Geology of major classes of mineral deposits; Application of geology, geophysics, and geochemistry to mineral exploration; and Economic and social factors that affect exploration and development of mineral deposits. The papers on geology are arranged generally so as to emphasize changes in the nature and type of mineral deposits through geologic time. Coverage of major deposit types is by no means complete because in some cases completeness would have led to duplication. For example, the volume contains no papers on iron ores because that will be the subject of a publication arising from the IGCP's large project, *Iron-Formations of*

the Hamersley Basin and Analogous Basins of Iron-Formation Deposition.

More than forty hardworking volunteers provided formal reviews of the papers and an even larger number of people helped with informal reviews. Without their help, hard work, good judgment, and sound advice the volume could not have reached its high standard of scholarship. Paul K. Sims served as editor for the volume and was assisted by DeVerle Harris and John C. Wilson in seeking reviews of manuscripts in their special fields of knowledge. Louise Taylor of the U. S. Geological Survey provided indispensable record-keeping and clerical assistance. For the enormous task of copy editing former Editorial Assistants Betty Weinman and Virginia Lee Fisk got back into harness and together with Catherine Wilder and present Editorial Assistants Nancy Ahlstrom and Mabel Peterson the task was completed without disrupting the production of regular issues of *Economic Geology*. We are greatly in debt to all who helped in this complex undertaking.

The real merits of the volume rest, of course, on the tireless efforts of those who authored the 29 papers. All members of the profession and those who will join the profession in the years ahead, stand in their debt. The Committee for the Seventy-Fifth Anniversary Volume speaks for everyone in thanking the authors for their hard work and dedication.

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