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dry areas like the Bushveld, and stream sediments, can easily be checked for alluvial or eluvial cassiterite. A similar procedure has been widely used in the search for kimberlite pipes. In that case ilmenite pyrope are the pathfinders.

JOHN ALLCOCK


In 1970, its centennial year, the University of Missouri held a symposium on “Alaska—its mineral potentials and environmental challenges.” The seventeen papers by geologists, engineers, businessmen, and government officials concerned with Alaska have now been gathered into the second issue of the UMR Journal, edited by the symposium organizers, Paul Dean Proctor and Robert E. Carlile.

Eight of the papers will be useful to government and industry executives lacking prior experience in Alaska. Up-to-date summaries by Gryc and Weisenborn on the petroleum and solid mineral potential of Alaska, Earldy’s “Oil and Gas Reserves of the Siberian Shelf” and McCrossan and Proctor’s “Mineral Potential of Arctic Canada,” establish the Arctic as a potentially vast storehouse of energy and metals. John F. Schindler’s “Arctic Ecology: a decade of experience” is a condensed but delightful portrait of the North Slope. A paper on maintenance in the arctic environment by Norris, Kelley, and Livingston stresses the extraordinary level of pre-planning required at the Navy Research Lab at Pt. Barrow. Of specific interest to oil men are Marshall’s “State Regulatory Controls on Oil and Gas” and W. H. Pearn’s brief for above-ground construction of the 48-inch Trans-Alaska pipeline. Publication of Pearn’s remarks is especially welcome, because they distill numerous privately prepared translations of engineering literature on Soviet permafrost pipelining. This article should be widely read, both by pipeliners and by conservationists.

The remaining nine papers are largely nontechnical. “Arctic Oil and the S. S. Manhattan” and the “Environmental Challenges facing TAPS” (Trans-Alaska Pipeline System) might have appeared in corporate annual reports; statements by two Chamber of Commerce representatives are predictable (forward-looking), as is the U.S. Army’s experience in handling petroleum in an Arctic environment” (not much) and “The role of the independent in Alaska’s mineral development” (some). These and similar contributions are valuable for their accurate rendering of some of the language, attitudes, and thoughts now being heard in the debate on the State’s future.

Conspicuously absent are the views of conservationists and summaries by any of the several distinguished economists who have studied Alaskan development. A comprehensive synopsis of the elevated costs facing the mineral industry in Alaska would also be useful.

The Symposium, in concept and content, seems to suggest that development of Alaska’s mineral storehouse awaits only the engineering innovations needed to meet the challenge of the arctic climate and the mandate for environmental sanity. Although these are important ingredients, at least equally critical in Alaska’s stalled development are the conflicts between national and state views on such questions as the land freeze, native claims, and the priority of State land selection rights. And these questions, thorny in themselves, need to be answered at a time when the nation is debating conservation versus preservation, national and international fiscal philosophy, and land use, energy, and mineral policy. It would have been fitting for the Symposium to explore the interaction between these state and national issues and the development of Alaska’s mineral resources. In defense of the Symposium planners, however, the problems are more apparent today than they were in 1969, when the papers were scheduled.

“Alaska—its mineral potentials and environmental challenges” is neither a complete nor a crucial document, but it should not be overlooked by those actively following the debate on the State’s future.

A. T. Ovienza

U. S. GEOLOGICAL SURVEY

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The investigations of the lunar rocks may seem to be far removed from economic geology, and it is true that the lunar rocks contain none of the fine-grained, messy alteration mineral assemblages that characteristically envelop many terrestrial ore deposits. But there is much in the moon studies of pertinence to at least some phases of terrestrial ore deposition, in addition to the general fascination that moon studies hold for most earth scientists.

The Appollo 11 samples were collected in July of 1969, and after a quarantine period, portions of them were distributed to about 150 laboratories in the United States and abroad. The results of these investigations were reported at the First Lunar Science Conference in Houston in January, 1970. Brief summaries of these results were then published in the January 30, 1970 issue of Science. The full proceedings of the conference were published as a three-volume, 2,500-page supplement to Geochimica et Cosmochimica Acta (Pergamon, 1970, $60.00). The volume under review is essentially a condensation and critical review of the major findings. The original three volumes consist of 181 independent papers from almost as many laboratories. By eliminating the detail and the unavoidable duplication in this group of papers, the present authors have concentrated the important discoveries into a concise, readable, but fairly well documented presentation. A few of the
preliminary results on the Apollo 12 samples are included for comparison and there is an 8-page Glossary.

According to the fly-leaf, the authors were concerned with conveying an understanding of the Apollo 11 rocks, and the resultant volume has achieved this goal notably. As might be expected at this stage, there are many areas of lunar science in which differences of opinion remain, not so much as to the facts, but mainly as to their interpretation and significance. The authors have made many judgments in summarizing this mass of material and hence have incorporated some of their own thinking in reporting the work of others. Thus this reviewer cannot accept some of the statements they make concerning his own work, but such is the way of science.

The two aspects of lunar studies that will be of greatest immediate interest to economic geologists are the opaque minerals themselves, and the petrological studies of their origin. The major opaque mineral by far in the lunar rocks from Apollo 11 is ilmenite (10–18 weight %), some with as much as 0.3% ZrO₂. This ilmenite has apparently crystallized over a rather wide range in the cooling history of these iron-rich basalts. A few percent of various spinels are also found, ranging widely in composition, and including both chromites and ulvöspinel, with some rather unique compositions. Most important, however, are the complex sequences of formation of these various oxide minerals, particularly the spinels; these sequences may turn out to be a very important tool in understanding both lunar and terrestrial igneous petrology. Also of considerable interest to economic geologists is the abundance of troilite and native iron, usually associated, and probably at least in part separated as an immiscible melt.

The volume contains relatively few typographical errors, but shows signs of hurried preparation and production. Thus the otherwise very useful Glossary contains the definitions of about 240 technical terms used in the text, including even such things as “feldspar” and “igneous,” but it does not include such terms as “basal surge” and “β decays.” This reviewer’s copy had seven pages that had been wrinkled during printing. The eight color plates from the original volumes are reproduced here intact, but not as well printed. The illustrations are generally well chosen, but a few contain errors that seriously damage their usefulness. For example, the unwary student may never catch the fact that the logarithmic coordinate labels of Figure 4–15, which compares the abundances of 19 elements in the Apollo 12 crystalline rocks with the abundances in the oceanic tholeites, are erroneously reversed, thus giving exactly the opposite of the correct impression.

The similarity of coverage between this book and the only other similar one, by Mason and Melson (Wiley-Interscience, 1970, $8.95), invites comparison. Both books cover the same material, at about the same level, and in much the same way. Although published almost a year earlier, the Mason and Melson book is just about as current in its information. Both books will obsolesce rapidly, however, as the full proceedings of the Second Lunar Science Conference have already been published (MIT Press, 1971, 2,818 pp., $70.00), and the Third Lunar Science Conference, covering results from Apollo 14 and 15, and from the Russian Luna-16 sample, will be held in January, 1972. But until replaced by more current summaries, either of these two small volumes will suffice to give the interested reader a good overview of the lunar studies, and much food for thought as a result of the natural extrapolation to terrestrial rocks and processes.

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BOOKS RECEIVED

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South Dakota Geological Survey, Vermillion, 1971

Rept. of Inv. 102. Hydrology of Lake Poinsett. Assad Babari. Pp. 69; figs. 19; tables 2; plate 1.