

# The Geochemical News

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## NATIONAL SCIENCE FOUNDATION MEETING ON TRANSLATION PROGRAMS

On November 9-10, 1959, there was held in Washington, D. C., a meeting under the auspices of the Office of Science Information Service of the National Science Foundation, to exchange information on common problems faced by professional societies and academic institutions engaged in translation programs with National Science Foundation financial support. Earl Ingerson, Translation Editor for *Geokhimiya*, attended the meeting, representing the Geochemical Society. Other societies that were invited included: Acta Metallurgica, American Ceramic Society, American Chemical Society, American Geographical Society, American Geophysical Union, American Institute of Biological Sciences, American Institute of Chemical Engineers, American Institute of Physics, American Mathematical Society, American Meteorological Society, American Rocket Society, Inc., American Society of Mechanical Engineers, Annual Reviews, Inc., Engineers Joint Council, Instrument Society of America, Massachusetts Institute of Technology, National Academy of Sciences-(American Geological Institute), and Optical Society of America.

The agenda included a discussion of objectives and programs of the O. S. I. S. by Dr. B. W. Adkinson, and a description of the development of the Russian translation program by P. S. Feinstein. These were followed by discussions on such topics as the management of a translations program, problems of editorial control, quality, production and promotion, problems of increasing costs, discussion of the complete journal translation vs the selected article approach, and of the relationship of abstracting and indexing services to translation programs.

During the last five years the National Science Foundation has given assistance to the American scientific community in its efforts to communicate the results of scientific research published in foreign languages. The Foundation's earliest program in translations started in 1954, when it cooperated with the American Institute of Physics in supporting the cover-to-cover translation of the Russian Journal of Theoretical and Experimental Physics. During the fiscal year 1960 the Foreign Science Information Program anticipates spending \$1,200,000 of its total \$1,800,000 budget in continuing support of the 39 established journals. It is estimated that for fiscal 1960 the earth sciences will receive total support of approximately \$288,000. Chemistry is estimated to receive approximately \$307,000. In addition to cover-to-cover translations of selected journals, the Foundation has also supported translations of selected articles and compilations, and of books and monographs. These have been accomplished by 28 different professional societies, academic institutions, commercial organizations, and the government.

Special Libraries Association, which has long been concerned with problems of translation, established a central pool for scientific and technical translations at the John Crerar Library in Chicago. In January 1957 the Library of Congress transferred the government collection of translated Russian scientific and technical papers to this library. From 1955 through 1958, all translations received at this library have been listed in Translations Monthly. Those of our membership who are interested in more detailed information regarding the availability of translated Soviet scientific information are referred to the following: "Providing U. S. Scientists with Soviet Scientific Information", revised edition, prepared by the Office of Science Information Service, National Science Foundation, May 1959.

TRANSLATION GRANTS FROM NATIONAL SCIENCE FOUNDATION  
TO THE GEOCHEMICAL SOCIETY

<u>Grant Number</u>	<u>Date</u>	<u>Purpose</u>	<u>Amount</u>
NSF G5274	April 23, 1958	Translating and printing <u>Geokhimiya</u> for 1958	\$ 15,500.00
NSF G8424	April 15, 1959	Translating and printing <u>Geokhimiya</u> for 1959	13,200.00
NSF G8480	April 23, 1959	Translating and printing <u>Geokhimiya</u> for 1956	10,700.00
NSF G8481	April 23, 1959	Translating and printing <u>Geokhimiya</u> for 1957	10,700.00
NSF G5782	July 18, 1958	Translation and publication of 2 books	10,780.00
NSF G10050	October 20, 1959	Translation of 6 books	18,500.00

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## SOME ASPECTS OF EXTRA-TERRESTRIAL GEOCHEMISTRY

By

Jack Green - North American Aviation, Inc.

The crust of the earth (atmosphere, hydrosphere, lithosphere, and biosphere) may have directly or indirectly formed by defluidization of the mantle. If such a process were generally operative, it may have had certain effects on other planets and moons. Lunar defluidization and associated volcanism of a special type may have produced five major results implied in Table 1. 1) Extensive production of silicic extrusives including welded tuffs in non-mare areas and subsequent evolution of more mafic extrusives as maria. 2) Formation of calderas in and along zones of collapse and at fracture intersections. 3) Formation of relatively thick volcanic dust in non-mare areas and only thin spallation dust in mare areas. However, local accumulation of relatively thick dust in mare areas is probable in view of the post mare development of craters in maria. 4) Appreciable concentration of compounds in eternally shadowed zones particularly of Cl, Br, S, B, I, and F, and to a lesser extent, Cd, As, Hg, Sb, Ar, and Pb in non-mare areas relative to the average terrestrial sedimentary rock. Most of these elements have high neutron capture cross sections. 5) Concentration of these compounds as minerals formed in environments low or lacking in oxygen and under partial vacuum. These minerals might correspond to the closed tube sublimates obtained in determinative mineralogical techniques.

TABLE 1  
Geochemical Aspects of Lunar Degassing

PROCESS	FEATURE	ROCK TYPE	DUST	MINERALIZATION
Degassing	CALDERAS (Early)	Silicic Extrusives	Thick (volcanic)	N Cl*      Hg*
Volcanism	Central Peaks	Rhyolite Pumice Obsidian Ignimbrite		B*      Cd* S      F Br*    I* Sb*    Se* Zn     Pb
Partial Melting, Fractional Crystallization, Phase Change?	MARIA (Later)	Mafic Extrusives Basalt Tholeiite Tachylyte	Thin (spallation)	Nil?

\*High thermal neutron-capture cross section.

The usefulness of a diameter-depth plot of lunar craters and terrestrial calderas in proving or disproving the genetic relationship between them depends upon the method of data screening and accuracy of lunar altitudes reported in the literature. The writer feels that published comparisons by Baldwin (1949) are unfair in that screened diameter-depth lunar data are compared against un-screened diameter-depth caldera data. A plot of all craters for which data are available with certain terrestrial calderas indicates that one cannot exclude the possibility that calderas may be related to lunar craters. More instructive perhaps is the detailed examination of lunar surface features from the standpoint of terrestrial analogy. Such details are shown in Table 2. The term entry refers to the name of a specific lunar crater; a partial listing of which is given by Green (1959). Many examples of polygonalism in terrestrial calderas could be cited; likewise internal features such as central mountains, craters, and median ridges. The figure selected compares the invaded Beagle and Tagus craters in the Galapagos Islands with the Frascator and Beaumont craters

bordering Mare Nectaris (Fig. 1).

TABLE 2  
Caldera Features Found in Lunar Craters

<u>Polygonal Shape</u>	<u>Central Mountain</u> (simple and multiple)	<u>Central Crater</u> (inc. nested craters)	<u>Median Ridge</u>
25 entries	234 entries	43 entries	26 entries
<u>Pressure Ridge</u>	<u>Dark Floor</u>	<u>Rim "Dikes"</u> <u>and Radiating Structures</u>	<u>Internal Faulting</u> (incl. Terracing)
8 entries	32 entries	20 entries	250 entries
<u>Breaching</u>	<u>Alignments</u>	<u>Changes</u> (i. e. mist, lava flow, eruption)	<u>Lava Infilling</u>
40 entries	180 entries	15 entries	9 entries

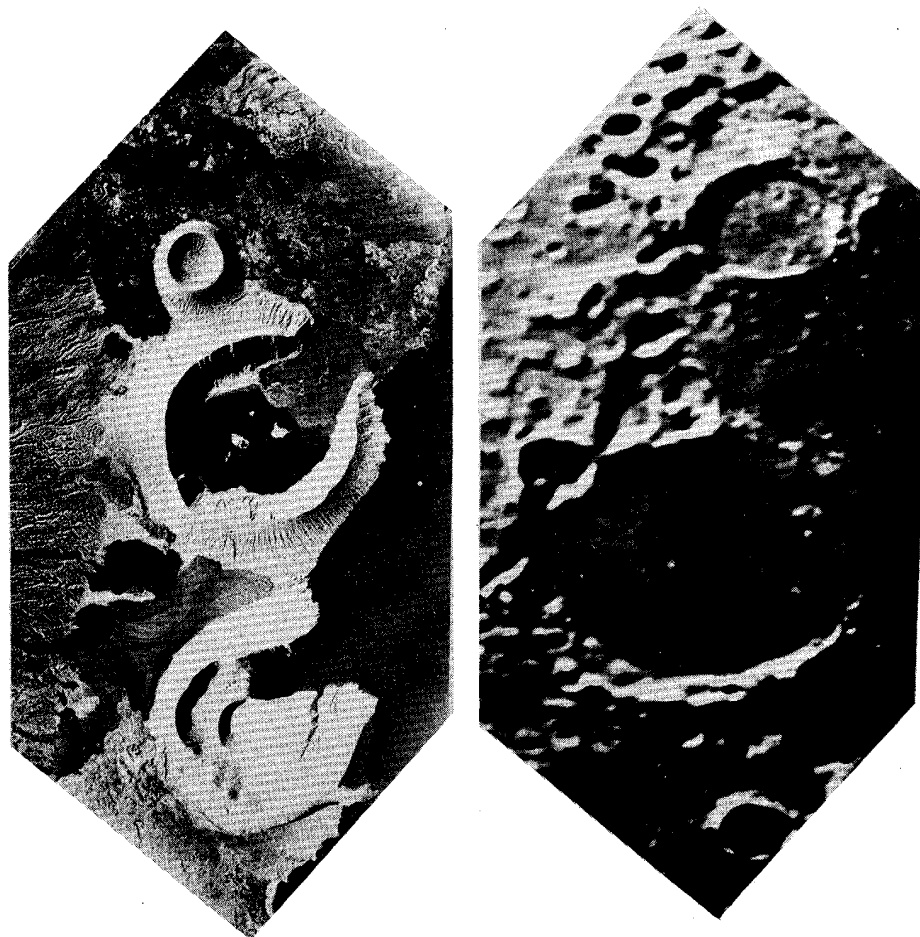


Fig. 1 - Comparison of invaded Galapagos Island craters with Frascator and Beaumont on the moon. Galapagos Island photograph released by the government of Ecuador through the U. S. Air Force. Lunar craters about thirty times larger than terrestrial ones.

Other lines of evidence lead to the considered opinion that most of the lunar craters we see are volcanic in origin. However, a special type of volcanism is envisaged. Three mechanisms may be operative. On the moon, bubbles in a molten rock column would nucleate six times deeper than on earth. As the bubbles would rise through a longer bubble-entrained column they would expand. This second "bubble-expansion" mechanism would tend to cool the upper portions of the magma column and produce a more viscous cap over a longer bubble-entrained magma column. The result of mechanism 1 and 2 would tend to produce a more explosive type of volcanism. The third mechanism would take place after degassing this longer bubble-entrained magma column by a resulting collapse much more extreme than in the relatively surficial conduits on earth. The combination of these three effects may tend to produce calderas of much larger extent than on earth. Figure 2 is the closest approach to an identity in scale of lunar and terrestrial craters.

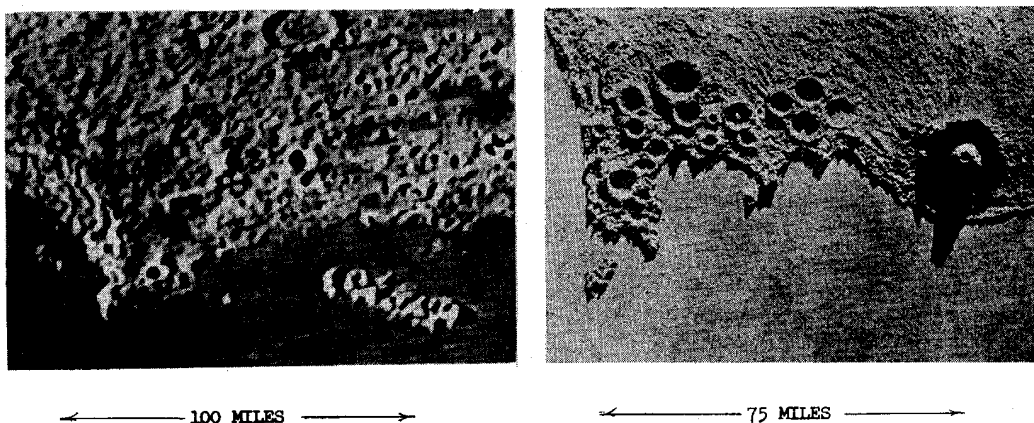


Fig. 2 - Comparison of cratered area near LaPlace Promontory on the moon with that bordering the Bay of Naples. Photograph of Bay of Naples area (Phlegraean Fields) taken from Nasmyth and Carpenter (1885). See also Wolff (1914, p. 670 and Brinkmann (1956, p. 188).

With respect to surface textures, extrusion of rock melts into vacuum would probably produce a more extreme degree of surface rock froths--deeper and of greater lateral extent. Rock froths of the types thought to be present are illustrated in Figure 3. Probably the vesicles could be an order of magnitude larger on the moon.

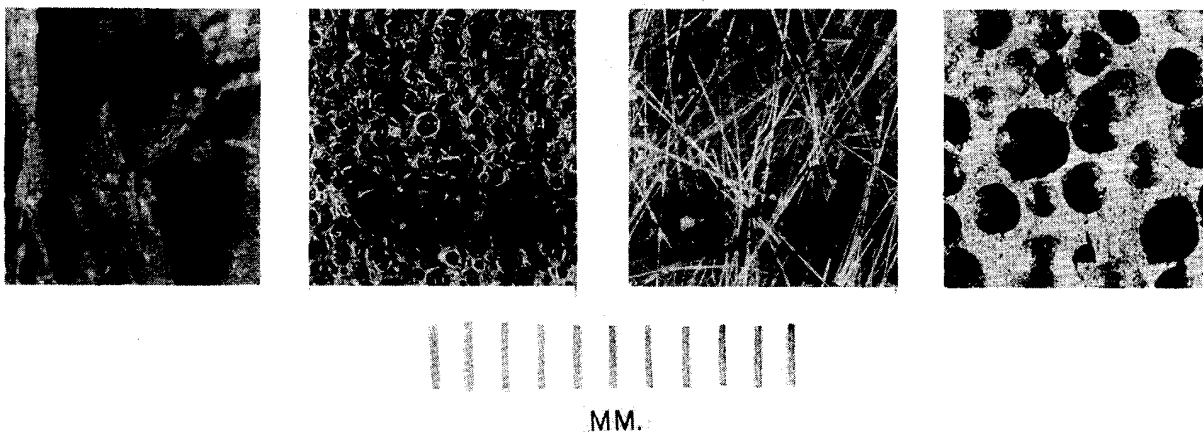


Fig. 3 - From left to right; pahoehoe near Mexico City; threadlace scoria; Pele's hair; and scoria; all from Kilauea. Hawaiian samples furnished courtesy of the Columbia University petrology department.

Aside from texture, the more important aspect of lunar exploration is the distribution of elements expectable there. On the basis of impact, the elements present might be those found in iron, stony-iron, and stony meteorites and unknowns from possible cometary impact. More specific inference may be drawn if defluidization is deemed the dominant process. On earth the excess volatile material in the present atmosphere, and sedimentary rocks are, in order of abundance, H<sub>2</sub>O, C as CO<sub>2</sub>, Cl, N, S, H, and the group B, Br, Ar, and F (Rubey, 1955, p. 633). However, because of the small mass of the moon (1/80th that of the earth) elements and compounds of high vapor pressure would soon evaporate. Regarding the prospects of finding these elements and compounds on any portion of the moon exposed to sunlight, we would probably be correct in striking H<sub>2</sub>O, CO<sub>2</sub>, Cl, N, H, and F from the list. The fugacity and photo-decomposition of ammonia and methane would also preclude their concentration on the lunar surface. However, the writer believes the elements shown in Table 3 will be enriched in the lunar terrain relative to the average terrestrial sedimentary rock. Those above the solid line form soluble compounds which are greatly enriched in sea water. Those below the horizontal line, although not enriched in sea water, are found in volcanic terrains. There is no space here to discuss the significance of the high neutron capture cross section elements other than to mention the need for research in nuclear prospecting techniques.

TABLE 3  
Enrichment factors and neutron capture cross sections of elements possibly enriched on the lunar surface.

ELEMENT	PPM SUPPLIED TO SEA WATER FROM IGNEOUS ROCKS*	PPM IN SEA WATER**	TRANSFER PERCENTAGE	NEUTRON- CAPTURE CROSS SECTION
Cl	138	19,000	13,800	33
Br	1.1	65	6,000	66
Ar	0.024	0.6	2,500	0.6
S	540	900	170	0.49
Se	0.006	0.004	67	13
B	(1.8) 7.8	(4.6) 4.8	(256) 62	755
I	0.24	0.05	21	6.3
<hr/>				
F	396	1.3	0.33	0.010
Sb	0.2	< 0.0005	< 0.28	5.5
Rn	4 x 10 <sup>-12</sup>	9 x 10 <sup>-15</sup>	0.25	-
As	1.2	0.003	0.25	4.3
Cd	0.078	0.00011	0.14	3,300
Hg	0.036	0.00003	0.083	350
Pb	10	0.003	0.03	0.17
Zn	48	0.01	0.021	1.10

\* Abundances in igneous rocks taken from Vinogradov (1956, p. 44-45)

\*\* After E. D. Goldberg (personal communication)

Note: Boron abundance values in parentheses are taken from Rankama and Sahama (1950, p. 295)

Four boundary conditions may control lunar mineralization. First, the mineral must be able to form as a sublimate in an environment poor or lacking in oxygen. These would correspond to the "closed tube" sublimate of determinative mineralogy tests. Such sublimate includes sulfur, cinnabar, realgar, and many others. The second condition is that if we are to assume these minerals to exist in sunlight, they must not photodecompose. Thus, we would be obliged to strike realgar (arsenic monosulfide) from our list because it will decompose under sunlight to orpiment and arsenolite. Thirdly, we should discard the possibility of those minerals that would melt under

sub-solar temperatures on the moon. Sulfur may be a borderline case with its melting point of  $125^{\circ}\text{C}$ . However, the ability of vaporized sublimates to migrate is reason to believe that mineralization may concentrate in eternally shadowed zones. The final consideration for lunar mineralization is vapor pressure. The only mineral with potential for persistence in sunlight on the moon is cotunnite ( $\text{PbCl}_2$ ), which incidentally has dating significance. Most of the other minerals which fulfill the requirement of formation in absence of oxygen have vapor pressures that predict their existence in unknown quantities in eternally shadowed zones (see Fig. 4).

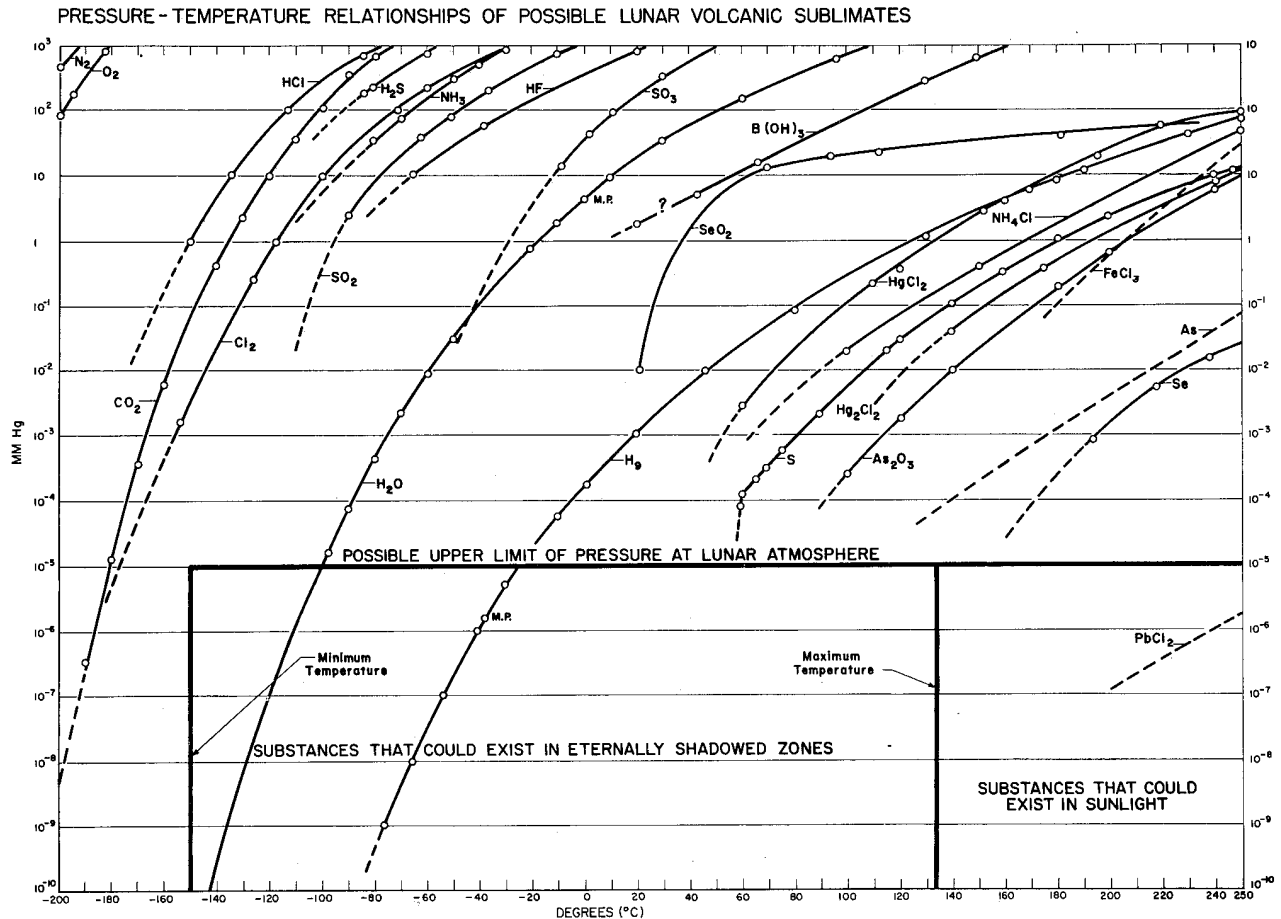


Fig. 4 - Pressure-temperature relationships of possible lunar volcanic sublimates.

Volcanism on the moon would also admit of conditions which would permit use of natural materials. Sulfur is the most abundant volcanic sublimite and volcanic ash is the most abundant comminuted rock product. Mixing the two makes for a practical fracture seal, cable insulator, waterless cement, and molded forms. These sulfur-volcanic ash briquettes have rather high crushing strengths.

A greater degree of explosivity and collapse may be inherent in lunar volcanism, which may explain the large size of lunar craters. Admitting volcanism to have been the dominant process in shaping the moon's surface, then we can intelligently predict what minerals to expect, where to expect them, and most importantly, what tools are needed to seek them out.

## BIBLIOGRAPHY

- Baldwin, R. B., 1949, *The face of the moon*: Chicago, Univ. of Chicago Press, 239 pp.
- Brinkmann, R., 1956, *Abriss der Geologie*, v. 1: Ferdinand Enke Verlag, Stuttgart, 286 p.
- Green, J., 1959, Geochemical implications of lunar degassing: *Proceedings of Lunar and Planetary Exploration Colloquium*, V. 1 (4), p. 6.
- Nasmyth, J. H., and J. Carpenter, 1955, *The moon: considered as a planet, a world and a satellite*: 3rd ed., Scribner and Welford, New York, 213 p.
- Rubey, W. W., 1955, Development of the hydrosphere and atmosphere with special reference to probable composition of early atmosphere: *Crust of the Earth* (A. Poldervaart, editor), *Geol. Soc. Amer. Special Paper* 62, p. 631-650.
- Wolff, F. von, 1914, *Der Vulkanismus*, v. 1, Ferdinand Enke Verlag, Stuttgart, 711 p.

## BOOK REVIEWS

PHYSICS AND GEOLOGY, by J. A. Jacobs, R. D. Russell, and J. Tuzo Wilson. xii + 424 pages. McGraw-Hill Book Company, Inc., New York, 1959. \$9.75

PHYSICS AND GEOLOGY has been written by three geophysicists, one of whom has had the additional training of a geologist, the second that of a mathematician, and the third that of a chemist. This is a very happy combination, because the book clearly fulfills its two purposes, 1) to give geology students an introduction to earth physics, and 2) to provide scientists in other fields with some information on the interrelationships between geology and geophysics. There is no doubt that not only students but advanced geologists will benefit greatly by a study of the book, inasmuch as it is completely up to date in its discussion of all of its diverse topics, incorporating for the first time much modern information previously contained only in scientific journals.

Following an introductory chapter on the universe and the solar system, the authors explore in the next two chapters the structure and composition of the earth. In Chapter 4, gravity and the figure of the earth are treated, and this is followed by a discussion of the earth's thermal history and of geomagnetism. Physics of the upper atmosphere is the topic of Chapter 7, and the next two chapters are entitled respectively Geochronology, with an emphasis on radioactive age determination methods, and Isotope Geology. Chapter 10 treats the mechanical behavior of earth materials. The next three chapters deal with the oceans: 11--methods of investigation of ocean floors, 12--descriptions of the floors, and 13--the mid-ocean ridges.

The next three chapters emphasize tectonics. Chapter 14 deals with island arcs and mountains, 15, inactive mountains in continents, and 16 discusses the origin of the earth's surface features. The last chapter is on glaciology. There are six appendixes: Derivation of Velocity-Depth Curves from Travel-time Tables, Clairaut's Theorem, Motion of Single Charged Particles in Earth's Magnetic Field, Isotopic Equilibria, The Dynamics of Faulting, Crevasses and Crevasse Patterns. There is a Name Index, a Geographic Index, and a Subject Index.

As can be seen from this brief listing, the diversity of topics is enormous, and if the book has any fault it lies perhaps in its organization. Each of the subjects discussed is so broad and fundamental that it is difficult to incorporate all of them into a well integrated whole, and the book impresses one more as a series of essays. Despite this minor point geologists, geophysicists, and geochemists universally will benefit by studying it.

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PROPERTIES OF MATTER, 3d edition, by F. C. Champion and N. Davy. xvi + 334 pages. The Philosophical Library, Inc., 15 E. 40 St., New York 16, N. Y., 1959. \$10.00

The fact that after 22 years Champion and Davy have published a third edition of PROPERTIES OF MATTER attests to its success. Their book is a model of classical treatment for the selected topics, despite the fact that these topics seem to be selected at random.

The first chapter, on Units and Dimensions, contains a very clear discussion, with numerous examples, of dimensional analysis. In the second and third chapters, the determination of the gravitational acceleration,  $g$ , and Newton's gravitational constant,  $G$ , are considered. Chapter 4 covers the elasticity of isotropic bodies, with a brief mention of the elastic behavior of cubic crystals. Compressibility is the subject of Chapter 5, followed by a chapter on seismic waves. Chapter 7, the longest in the book (65 pages), is devoted to capillarity. After Chapter 8, surface films, a chapter on the kinetic theory of matter is given. This is followed by three sections on osmotic pressure, diffusion, and viscosity. The final chapter is Errors of Measurement; Methods of Determining Planck's Constant.

Because of the diversity of the topics and thoroughness of their treatment, the book should be of interest to investigators and serious students in a variety of fields.

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MINERALOGY, Concepts, Descriptions, Determinations. By L. G. Berry and Brian Mason, illustrated by Roger Hayward. 612 + vi pages, 256 illustrations. W. H. Freeman and Company, San Francisco, 1959. \$8.75.

MINERALOGY, Concepts, Descriptions, Determinations, is divided into three parts, as suggested by the sub-title. The first part, Concepts (278 pages), covers in an up-to-date manner not only crystallography, chemistry, and physics as applied to mineralogy, but also has a chapter on mineral genesis, one on determinative mineralogy (including blowpipe analysis), and one on the systematic aspects of the study of minerals, namely species, classification, and naming. About 200 minerals are described in 276 pages. In a number of instances several closely related isomorphous minerals are considered as a unit. The determinative tables, part 3, comprise 28 pages. In an appendix, in alphabetical order, the atomic number, atomic weights, and ionic radii are given for the chemical elements.

Some noteworthy features of the book are the use of the Groth-Rogers nomenclature of crystal forms, the section on the graphical determination of the axial elements of orthorhombic crystals, the discussion of twinning, the chapter on the chemistry of minerals, and the genesis of minerals. Selected readings and a number of exercises and problems are presented at the ends of several chapters. A brief section on mineralogical literature lists some of the major journals as well as reference books.

The descriptions of minerals are excellent. The closely related properties of mineral groups are tabulated together. Crystallographic data include the crystal class, axial elements, cell dimensions, and cell content. Major crystal forms are listed along with important interfacial angles. The determinative tables are based first upon luster, metallic and nonmetallic, followed by hardness and other properties. Since luster is primarily a qualitative property dependent upon index of refraction and absorption coefficient, it is of first order importance in the "sight" identification of minerals. It is unfortunate, in the reviewer's opinion, that luster was confined only to two categories. Division of non-metallic luster into adamantine and vitreous, perhaps with submetallic, would give a workable three- or four-fold basis for the primary property in the table.

The many illustrations are uniformly of the high quality that readers have learned to expect from the pen of Roger Hayward. An unusual and commendable feature of the crystal drawings is that each is framed in a set of three mutually perpendicular reference planes in which the intersections of the reference axes with these planes and their opposites are shown. The net result is one of enhanced clarity of presentation.

Drs. Berry and Mason state in the preface that "This book is designed to satisfy the requirements of an undergraduate course in mineralogy." The reviewer feels that the design will prove to be a most successful one.

R. M. Denning

CHEMISTRY OF NUCLEAR POWER, by J. K. Dawson and G. Long. 208 pp. Philosophical Library Inc., 15 E. Fortieth St., New York 16, 1959. \$10.00.

This interesting book, which describes the roles played by chemists in the development of nuclear power installations, gives a general account not only of the place of the chemist in the atomic energy industry but also of his part in the development of raw materials, particularly of their separation from ores, the processing of fuel elements, the multifarious chemical reactions involved in the handling of radioactive materials and the construction, operation, and maintenance of reactor systems. A final chapter deals with the chemical aspects of the disposal of radioactive wastes.

The book is not only well written but highly informative and interesting to anyone who has had but a fringe acquaintanceship with atomic energy developments. The impact of the field of atomic energy upon chemistry is best illustrated by a brief paragraph on page 6 of the book:

In general, there are very few elements which do not hold some interest for the worker in the field of atomic energy. The lighter elements (H, Be, C) are suitable neutron moderators; most of the elements near the centre of the Periodic Table appear as fission products; the heavier elements are either potential nuclear fuels or are produced by neutron capture in the fuel during operation of a reactor. Many of the transition metals make suitable constructional or container materials for nuclear reactors, and many elements, such as fluorine, as  $UF_6$ , find a unique application in the industry.

Geochemists will generally benefit by reading the book. It is an excellent summary of established practice, present lines of thinking and procedure, and descriptions of problems requiring further elucidation in the chemistry of nuclear power.

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DETERMINATION MICROSCOPIQUE DES MINERAUX DES SABLES by Solange Duplaix. 2d rev. ed. vii + 96 pp, 69 figures. Librairie Polytechnique Ch. Beranger, 15, Rue des Saints-Peres, Paris, 1958. 1700 fr.

This paper-bound book is a concise description of the optical characteristics of most of the important "sand-grain minerals." The first edition appeared in 1947, and the book has been popular ever since. The introductory part deals with the preparation of sands and the separation of heavy and light fractions, mounting of minerals in Canada balsam, and a brief enumeration of the significant optical properties of detrital grains. The remainder of the book, about 80 pages, gives descriptions of the various species, of which there are 59. There are also tables of the specific gravities, the medium index of refraction, the maximum birefringence, and listings of the minerals in isotropic and anisotropic groups, the latter being subdivided further by color.

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CLAYS AND CLAY MINERALS. Proceedings of the 6th National Conference on Clays and Clay Minerals, Berkeley, California, August 19-23, 1957. Edited by Ada Swineford. 411 pp. Pergamon Press, Inc., 122 E. 55th St., New York 16, N. Y. \$8.50.

This is Monograph No. 2 of the Earth Science Series of Pergamon Press, under the general editorship of Earl Ingerson. This volume of the Proceedings of the 6th National Conference on Clays and Clay Minerals, which was sponsored by the Committee on Clay Minerals of the National Academy of Sciences - National Research Council and the University of California, continues the high quality of content and presentation set forth in its five predecessors. The annual conference Proceedings of the 2d, 3rd, 4th and 5th conferences held respectively in 1954, 1955, 1956 and 1958, are all available from the Publications Office of the National Academy of Sciences - National Research Council, 2101 Constitution Ave., Washington 25, D. C. The Proceedings of the First Conference were published as Bulletin 169 of the California Division of Mines.

The book contains, in addition to a Preface and a description of a field trip to the Ione Clay Area, California, 28 articles under 38 authors. The topics are highly varied and embrace all fields of clay mineralogy, structure, petrology, and genesis. Workers in the field of clay mineralogy and geology will find this an excellent collection of significant modern papers in their fields.

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#### PUBLICATIONS RECEIVED

Photostat copies of any of the publications listed below, with the exception of the trade journals which are not kept on file, may be obtained by any reader who wishes to pay for the cost of their reproduction. Cost of the negative is 50 cents per page; cost of the positive is 90 cents per page. A check made out to E. Wm. Heinrich, Editor, Geochemical News, Department of Mineralogy, The University of Michigan, Ann Arbor, Michigan, must accompany the order. Members of the Society are invited to send reprints for possible listing.

- BULLEN, K. E. Earthquakes and related sources of evidence on the earth's internal structure. Smithsonian Report for 1958, pp. 319-332. Publ. 4360, Smithsonian Institution, Washington, D. C., 1959.
- ✓ CERNY, P. Orientovany Srust Pyrrhotinu a Sfaleritu (Oriented growth of pyrrhotite and sphalerite). Casopis Moravskeho Musea, Acta Musei Moraviae, XLIII, pp. 59-62, 1958.
- ✓ CERNY, P. Propylitické Rudní Žily a Jejich Nerosty od Komne u Bojkovic (Propylitic ore veins and their minerals from Komne near Bojkovic). Geologický Sborník Slovenskej Akad. Vied IX, 2, pp. 300-323, Bratislava, 1958.
- ✓ ČERNÝ, P. Zapadomoravske desilikovane pegmatity, I. -Drahonin u Tisnova (Desilicated pegmatites of western Moravia, I. -Drahonin near Tisnov). Prace Brněnské Zakladny Česko. Akad. Ved, XXX, 5, pp. 161-202, 1958.
- CLAYTON, R. N. Oxygen isotope fractionation in the system calcium carbonate-water. Jour. Chem. Phys., 30(5), 1246-50, 1959.
- CLIFFORD, T. N. A note on kyanite in the Moine Series of Southern Ross-shire, and a review of related rocks in the Northern Highlands of Scotland. Geol. Mag., XCV(4), 333-346, 1958.
- HARRIS, P. G. Spectrochemical determination of germanium in silicates. Analytical Chem., 26, pp. 737-38, 1954.
- KOBAYASHI, J. Chemical investigation on river waters of southeastern Asiatic countries, Rpt. 1, The Quality of waters of Thailand. Berichte des Ohara Inst. Landwirts. Biol., XI(2), 167-233, 1959.

- MILLOT, G., and BONIFAS, M. Transformations isovolumétriques dans les phénomènes de lateritisation et bauxitisation. Bull. du Service de la Carte Geol. d'Alsace et de Lorraine, T. 8, f. 1, 20 pp., 1955.
- DE OLIVEIRA, H. V. Estudo petrográfico de carvoes do Pejao. Museu e Lab. Mineral. e Geol. da Fac. de Ciências do Porto, Publ. No. LXXII, 3a Ser. 35 pp., 1956.
- QUIRING, H. Kontinentdrift and Erdmagnetismus. Forsch. und Fortsch., 31(7), 193-96, 1957.
- QUIRING, H. Schalenbau der Erde und spharogene Erze. Cong. Geol. Internat., Compt. Rend. 19th Sess., Alger, 1952, Sec. XIII. Fasc. XV, pp. 431-38, 1954.
- QUIRING, H. Ursprung der algonkischen Eisenquarzite und Eisenschiefer (Itabirite). Neues Jb. Mineral., Mh. 8/9, pp. 234-39, 1952.
- QUODLING, F. M. Tapiolite and the tri-rutile structure. Jour. and Proc. Royal Soc. of New South Wales, XCI, pp. 197-208, 1958.
- RAMDOHR, P. Entwicklung der Mineralogie während der letzten 50 Jahre in Deutschland und in der Welt. Fortschr. Miner., 37(1), pp. 27-35, 1959.
- ROY, R. Silico O, a new common form of silica. Zeit. für Krist., 111, 3, pp. 185-89, 1959.
- SADRAN, G., MILLOT, G., and BONIFAS, M. Sur l'origine des gisements de bentonites de Lalla Maghnia (Oran). Publ. du Serv. de la Carte Geol. de l'Algérie (Nouvelle Ser.), Bull. 5, Travaux Collaborateurs 1954, pp. 213-34, 1955.
- SANTOS PEREIRA, J. Rochas endogénicas assinaladas em Aregos (Viseu). Mus. e Lab. Mineral. e Geol., Fac. de Ciências do Porto, No. LXXIII, 3a Ser., 19 pp., 1956.
- STRUNZ, H. Tsumeb, seine Erze und Sekundärminerale, insbesondere der neu aufgeschlossenen zweiten Oxydationszone. Fort. Min. 37(1), 87-90, 1959.
- STRUNZ, H., and GIGLIO, M. Ein Hexahydroxogermanat. Naturwiss. 16, 489-90, 1959.
- VITANAGE, P. W. Geology of the country around Polonnaruwa. Geol. Surv. of Ceylon, Memoir No. 1, 75 pp., 1959.
- ZBYSZWESKI, G., and de Andrade, M. M. As rochas eruptivas do "Vale tifónico" das Caldas da Rainha. Mus. e Lab. Mineral. e Geol. da Fac. de Ciências do Porto, No. LXXI, 3a Ser., 21 pp., 1956.
- ANNUAL REPORT OF THE HUNGARIAN GEOLOGICAL INSTITUTE OF 1955 AND 1956. Budapest, 1959. 494 pp. Articles are in Hungarian with French and Russian summaries. There are some 37 articles, including many on clay minerals and clay deposits as well as others on the general geology of specific areas in Hungary and descriptions of such various rocks as diatomite, basalt, andesite, sandstones, dolomite, coal. Other papers are on tectonics, hydro-geology, and manganese deposits.

## CALENDAR

March

- 24-26 GSA: Southeastern Sec. Mtg., sponsored jointly by Univ. of Kentucky Geol. Dept., Kentucky Geol. Survey, and Kentucky Geol. Soc., Lexington, Ky.

Apr.

- 1-2 Alabama Acad. of Science, Geol. and Anthropol. Sec., Huntingdon College, Montgomery, Alabama.
- 3-8 1960 Nuclear Congress, sponsored by EJC, New York Coliseum, New York.
- 6-9 Fifth International Mineral Processing Congress, Westminster, London. Secretary, Inst. of Mining and Metallurgy, 44 Portland Place, London, W. 1, England.
- 11-13 Fifth Ann. Mining, Minerals and Petroleum Conference, sponsored by Alaska and Southwest Alaska Secs., AIME, and Univ. of Alaska, College, Alaska.

Apr.

- 18-23 Assn. Amer. Geographers, Ann. Mtg., Dallas, Texas  
 21-23 Southwest Metals and Minerals Conf., AIME, Los Angeles, California.  
 25-27 CIM Ann. Mtg., Royal York Hotel, Toronto, Canada.  
 25-28 AAPG-SEPM: Ann. Mtg., Chalfonte-Hadden Hall, Atlantic City.  
 28-30 GSA: Rocky Mountain Sec., Regional Mtg., School of Mines and Tech., Rapid City, South Dakota.  
 28-30 AGU: 41st Ann. Mtg., Washington, D.C. Tentative date.  
 28-30 AIME: 13th Ann. Pacific NW Metals and Minerals Conf., Sheraton Hotel, Portland, Oregon.

July

- 25-Aug 6 International Union of Geodesy and Geophysics, Helsinki, Finland. Program in Vulcanology, Geochemistry and Petrology being organized. Symposia on Geochronology, High Pressure Chemistry, Isotope Geology, Atmospheric Chemistry July 24-July 28.

## GEOCHEMICAL COMMISSION ELECTS OFFICERS

At its Munich meeting August 26 and 27, 1959, the Commission on Geochemistry of the International Union of Pure and Applied Chemistry elected the following officers for terms beginning 1960:

President	C. W. Correns
Vice President	A. P. Vinogradov
Secretary	Earl Ingerson

L. H. Ahrens and K. Sugawara were elected members of the Commission, and the following new observers were elected: S. Landergren, N. I. Khitarov, K. B. Krauskopf, W. A. Deer, J. L. Kulp, K. H. Wedepohl and H. S. Yoder; G. Carobbi was re-elected as observer and the following retiring members were retained as observers so that the Commission could continue to profit from their broad experience: T. F. W. Barth, M. Fleischer, S. I. Tomkeieff.

## ION EXCHANGE COLUMN

A recent communication to K. B. Krauskopf informs the Society members that the cost of back numbers of Geochimica Acta has been reduced from \$24 to \$7 per volume for members of the Society. We presume this means \$21 per year to Society members.

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Dr. J. F. Lovering (Department of Geophysics, Research School of Physical Sciences, Australian National University, Canberra) has accepted the Council's invitation to become Regional Vice-President for Australia, succeeding William S. Fyfe who has moved to Berkeley.

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Owing to the inadvertant omission of several lines in No. 20 of the Geochemical News, there has appeared an error concerning two series of publications. The correction is as follows: The Pergamon Press issues two series of volumes dealing with the earth sciences. The Physics and Chemistry of the Earth Series is edited by Ahrens, Press, Rankama and Runcorn, and each volume consists of a series of more or less unrelated papers. Volume 3 of this series was issued in 1959 and sells for \$15.00. The Sokoloff translation of Ginsburg's "Principles of Geochemical Prospecting", however, which has been announced but has not been published, is in an entirely different series. It is in the Pergamon International Series of Monographs on Earth Science. Ginsburg's book will be Volume 3 in this series.

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The Union Internationale de Cristallographie has published the second edition of "Repertoire de Materiel Cristallographique" ("Index of Crystallographic Supplies"), prepared under the direction of Dr. A. J. Rose. Copies of the book are being distributed free of charge to crystallographers throughout the world and to every manufacturer listed. Additional copies may be purchased by sending a bank check for \$2.50 made out to the order of Societe Francaise de Mineralogie et de Cristallographie (I.U.Cr.), 1, rue Victor-Cousin, Paris 5<sup>e</sup>, France.

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The School of Mineral Sciences Newsletter of Stanford University, in its December 1959 number, includes a concise summary on "A new analytical tool--the electron microprobe analyzer."

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#### Sand-in-the Gears-of-Learning

Culled from papers by embryonic physiographers:

"Pressure falls out of the pipe and onto the ground."

"The mechanics of stream erosion are stream velocity and slight bends in the stream."

"The lake will cut down through the present deposits (if the dam is removed)."

"The load has eroded some of the stream away."

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This issue includes another "first" for the Geochemical News, inasmuch as we are publishing our initial reproductions of photographs, thanks to the cooperation of Jack Green. The editor would be delighted to receive more general articles that would be of service to all geochemists in acquainting them with new techniques and new fields of research. Communications toward such contributions are invited.

E. Wm. Heinrich  
Editor

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