Lithium in Saratoga Mineral Water and Cryptozoon,"[8] for the first time in the history of the geological studies of the Saratoga basin, an isotope of an element in solution, namely, K^{41}, has furnished a direct indication of the origin of the water. The result of the work of Brewer and Baudisch shows an appreciable concentration of K^{41} in the mineral water and a small concentration in the Cryptozoon formations. The overlaying shale, however, does not differ appreciably in its content from that normally present in rocks of this type.

The abundance ratio of mineral waters is 13.85 ± 0.1; of Cryptozoon, 13.95 ± 0.1.

Brewer has first published the most important and spectacular discovery that isotopes can be enriched by life processes.[9] In the last or fourth stage of evolution, we may consider that the processes of concentration of elements of the earth's crust are due to the action of living organisms. Many such processes are well known to science. For instance, certain marine organisms concentrate iodine up several hundred thousand fold as compared with sea water. According to Brewer's investigations, kelp and agar, in comparison to ocean water, possess an appreciably higher concentration of K^{41}. These marine organisms in fact concentrate the heavy potassium out of the ocean water, a most spectacular life process. By further investigations, Brewer and Baudisch demonstrated also that the marine organisms of the Cambrian Age—the Cryptozoon algae—have concentrated the heavy potassium in an appreciable amount. We find most of the potassium leached out of the Cryptozoon limestone into the water of Saratoga.

The hypothesis of the *marine origin* of the water based on this discovery is now more than mere speculation. Since we are now on solid ground and know that the Cryptozoon reefs and the Saratoga water have a direct correlation to each other and that the minerals in solution are derived at least in part from this source, we are able to say something about the appearance of barium ions in the water.

The remarkable concentration of barium by marine algae (*Fucus vesiculosus*) has been discovered in recent years.[10] While the ocean water contains only 0.02 per cent. of Ba, in the marine algae this element is concentrated several hundred fold. Among the primary rocks which contain only very small amounts of barium, the syenite with 0.2 per cent. BaO is quite outstanding. It seems to be no accident that much syenite is found in the vicinity of the Saratoga basin and barium in the Saratoga waters.

Since we find in all the different mineral springs small amounts of barium chlorid, naturally we can not expect any sulfates in the waters. Through the enrichment of barium by the life process of growing algae, the sulfur in these marine organisms must have been chemically bound to this element during geological time. Some of the sulfur is found in the Cryptozoon in the form of pyrite. In studying the constituents of Cryptozoon limestone by spectral analysis,[11] we found the following elements: Ca, Na, K, Li, Rb, Mg, Sr, Si, B, Mn, Fe, Cu and Ag. We did not find even traces of barium in the samples investigated. It is conceivable that the salty water in course of time has leached out all the barium from the Cryptozoon rocks.

The concentration of different elements and their isotopes in marine organisms of ancient and modern times furnishes a striking example of the ability and selective power of living organisms in obtaining constituents necessary for their existence.

The further study of Saratoga water and its constituents should be of scientific value not only for geochemistry but also for medicine.

OBITUARY

FRANK NELSON BLANCHARD

HIS colleagues record with a sense of intimate personal loss the untimely death of Frank Nelson Blanchard, associate professor of zoology in the University of Michigan, after an illness of two months of bacterial endocarditis, on September 21, 1937. He was forty-eight years old. His passing leaves a conspicuous gap in the personnel of his institution.

Dr. Blanchard was born on December 19, 1888, of New England stocks which began their career in America in 1639 and 1643. Son and grandson of printers and publishers and editors, young Frank showed no inclination to follow in the ancestral footsteps. In grade school he showed great interest in batteries and other electrical devices. In high school his chief passion was for chemistry, and he fitted up a laboratory in the home cellar and busied himself in it for several years. Because of city residence, the only indication in early years of his later interest in natural history was his devotion to gardening. That devotion persisted throughout his life. In a diary which he began at the age of sixteen, and in which thereafter never a day's activities failed to be recorded,

[8] Brewer and Baudisch, *Jour. Am. Chem. Soc.*, 59: 1578, 1937.

[9] A. K. Brewer, *loc. cit.*

[10] Wolf von Engelhardt, "Chemie der Erde," Vol. 10, 187, 1936.

[11] Oskar Baudisch, *Arkiv Kemi, Min. och Geol.*, Bd. 12B, No. 9, Stockholm (Sweden). (1935.)

notes on the weather and the planting, cultivation and harvesting of plants in his vegetable garden were of regular recurrence.

It was not until he attended Tufts College that his attention was turned to biology. First planning to be a forester, he came under the influence of Professor F. D. Lambert and became interested in the algae, to the extent of describing two new species during his senior year. He also studied zoology under Professor J. S. Kingsley.

The death of his father during his last college year prevented Frank's immediate entrance upon graduate work. An opportunity to teach zoology at Massachusetts Agricultural College in the summer of 1913 turned the tide of his biological interests finally in favor of zoology, rather than forestry or botany. In the vicinity of Amherst he had his first opportunity for extensive field work, and the three years spent there cast the mold of his later career.

In the spring of 1916 he was awarded a fellowship at the University of Michigan. Beginning his studies at the Biological Station of the university that summer, he received the degree of doctor of philosophy in 1919—the first Ph.D. earned under Professor, now President, A. G. Ruthven.

His interests had gradually centered upon snakes, their distribution, natural history and taxonomy. This trend was fostered by his assistantship in the natural history course given by Professor J. E. Reighard, and by his first position after completing his graduate work, that at the U. S. National Museum, where he was associated with Dr. Leonard Stejneger during the year 1918–1919.

Dr. Blanchard returned to Michigan as an instructor in 1919, and some years later, on the retirement of Professor Reighard, he took charge of the vertebrate natural history course, which has long been a unique part of the training in zoology at Michigan. His keen interest in accurate and significant observation in this course and in his own research attracted to him an enthusiastic group of graduate students. A number of those who earned the doctorate under him are now carrying on to the best of their several abilities along the lines of true scientific inquiry which he had so earnestly charted for them.

The research productivity of Dr. Blanchard was marked by its continuity. From the date of his doctorate, no year passed without a publication from him. There are at least fifty of these contributions, which range from critical reviews to important books. The large work, an illustrated "Manual of the Snakes of the United States, Canada and Lower California," on which he was engaged up to the time of his last illness, in collaboration with his student, Dr. Howard K. Gloyd, remains to be completed by his associate. The papers of Dr. Blanchard are largely on snakes, but there is a long series on the four-toed salamander, *Hemidactylium scutatum,* which show the same insistence on accuracy and relation to other things which characterizes all his other work.

One of the high lights in his scientific life was the sabbatical year 1927–1928, which he spent with his family in New Zealand, Australia and Tasmania. His recovery of the "lost frog of Tasmania," *Crinia tasmaniensis,* which for fifty years after its description was known only from the type specimen in the British Museum, and his study of its life history, with that of other Tasmanian frogs, was responsible for his only paper on foreign forms.

A later sabbatical semester enabled Dr. Blanchard to travel in the Southwest, with Dr. Gloyd, to gather material for their projected "Manual." If this excursion, because of the unfavorable time of the year, netted fewer reptiles than he had hoped, it yielded a surprisingly large crop of amateur herpetologists and other naturalists. Probably no zoologist has so assiduously sought out the non-professional workers and beginners in his field. He went far out of his way to visit them, carrying encouragement, and at the same time profiting from their efforts.

Though Dr. Blanchard published nothing on birds, he enthusiastically taught courses in ornithology both at Ann Arbor and at the Biological Station on Douglas Lake. Characteristically, he carried into this field the same extreme care which he so strongly evinced in his herpetological work. It is evidenced by the extensive series of notes which he left at the Biological Station and by the quality of his graduate students who have become accomplished ornithologists.

Shortly before his death Dr. Blanchard learned that in the forthcoming revised edition of "American Men of Science" his name was to be accompanied by the coveted star, which would mark him as one of the approximately one thousand leading scientific men of this continent. His colleagues feel a keen satisfaction in this confirmation of their judgment of him by the vote of his peers the country over. He is survived by his widow, Dr. Frieda Cobb Blanchard, assistant director of the botanical garden of the University of Michigan, and their three children.

A. FRANKLIN SHULL

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HAROLD BENJAMIN FANTHAM

THE untimely death from septicemia of Professor H. B. Fantham, Strathcona professor of zoology and head of the department at McGill University, Montreal, Canada, in his sixtieth year has removed from among us a zoologist of great research ability, an inspiring