duced from the outside, but from viruses which originated as mutants in the tissues involved in the spots.

It was pointed out in an earlier paper[1] that plants having pure yellow mosaic are rarely observed in commercial tobacco and tomato fields, and they were rarely seen among the many mosaic-diseased *Nicotiana glauca* plants growing in the Canary Islands. These observations are now explained on the basis that the common-mosaic virus greatly restricts the size of the yellow-mosaic mutation spots and also the amount of the yellow-mosaic virus, thus decreasing the chances for its spread to other plants. A relatively large amount of the common-mosaic virus is thus maintained in the infected plants and this virus prevents the establishment of tobacco yellow-mosaic virus which might enter these plants from the outside.

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IODINE THERAPY AND GOITRE

MAY I add a mite[1] with respect to the early history in the use of iodine in the successful treatment of (endemic) goiter. I refer to Moses Gunn's (1822–1891) famous prescription, which every Rush Medical College graduate is quite familiar with.

Dr. Moses Gunn went to Rush Medical College Chicago, Ill., (from Ann Arbor, Michigan), in 1867, as head of the department of surgery and as the successor to Dr. Daniel Brainard.[2] Finding a high incidence of goiter in the Chicago area he prescribed his now famous "three eight" mixture, as follows:

℞

Iodi	gr. viii
Potassii iodidi	ʒ viii
Syrupi sarsaparillae ad f	℥ viii

No doubt the supposedly "alterative" action of iodine was uppermost in the mind of Dr. Moses Gunn. At any rate, this early practitioner noted the beneficial effects of iodine therapy in the treatment of hyperplastic goiter. And, it should be noted, long before Marine (1907) put iodine therapy for this condition on a truly scientific basis!

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SPECIAL ARTICLES

THE EFFECT OF ALTERATION ON THE LEAD-URANIUM RATIO AND THE CALCULATED AGE OF WILBERFORCE, ONTARIO, URANINITE

IN order to determine the effect of leaching on the lead-uranium ratio of uraninite, a determination of the lead, uranium and thorium content of three zones of a single crystal of Wilberforce, Ontario, uraninite has been made. Instead of grinding a large specimen of the mineral to uniformity and analyzing the then homogeneous material, as is usually done in age determinations, a method of carefully removing successive layers from the crystal was used, followed by analysis of the outermost layer, middle layer and innermost layer or core.

A crystal weighing about twenty-four grams was selected. It was apparently altered to some extent, as the color was reddish brown, although the cubo-octahedral structure of the crystal was still intact, this in spite of the great age of the mineral and the large amount of lead which had been generated in the crystal since its formation.

The crystal, which had previously been cleaned from any superfluous material, was weighed, treated with dilute nitric acid until approximately one third of the mass was removed, washed, dried and reweighed. The remainder of the crystal was gently treated with acid until another third was dissolved. Finally, the core was dissolved. Aliquot portions of each of these resulting solutions were analyzed for lead, uranium and thorium by methods which will be described in a later paper.

The outside section included all of a shell, perhaps from one to two millimeters thick, of highly altered material which covered the entire surface of the crystal and some of the black material which constituted the remainder of the crystal. All the middle layer and core appeared homogeneous and pure black in color.

From the data obtained from these analyses, the "lead ratio" and the corresponding age of each section of the crystal could be calculated by means of the formula:

$$\text{Approximate age} = \frac{\text{Pb}}{\text{U} + 0.36\ \text{Th}} \times 7600 \text{ million years}$$

The age as calculated by this approximate formula is somewhat higher than that given by the more exact logarithmic formula, but is used here in order that it may be compared with the results of earlier investigations of the age of this mineral.

The average results of several analyses of each section are given in the following table:

[1] McCay, SCIENCE, 82: 2128, 350, 1935; McClure, SCIENCE, 82: 2129, 370, 1935.

[2] "History of Medicine and Surgery and Physicians and Surgeons of Chicago, 1803–1922," p. 61. The Biographical Publishing Co., 133 W. Washington Street Chicago, Ill., 1922.

Section of crystal	Lead Per cent.	Uranium Per cent.	Thorium Per cent.	$\frac{Pb}{U+0.36\,Th}$	Approximate age in million years
Outside layer	9.74	37.85	8.36	0.238	....
Middle layer.	11.93	58.48	14.09	.188	1,427
Core	11.87	60.70	8.05	.187	1,418
Whole crystal	11.13	47.73	9.55	.218	....

From the results it seems that, in the long process of alteration, uranium has been removed faster than lead. This is in agreement with the general belief that ages based on analyses of altered minerals are too great.

A study of the composition of the two inner layers, both of which were apparently unaltered, and certainly were both of the same geologic age, is most interesting. The lead content is nearly constant. The fact that the thorium content of the core is considerably less than that of the middle layer is surprising. It is possible that, during the formation of the crystal which probably required only a comparatively short time, the concentration of the thorium increased in respect to uranium. If that be true then the low value for thorium in the outside layer must be attributed to leaching.

The value of the "k factor," which converts the thorium content to an equivalent amount of uranium in lead-producing capacity, must be such that the ratio calculated for minerals of the same age but with varying amounts of uranium and thorium will be the same. Since the thorium and uranium contents are not the same in the two inner sections of this mineral, all of which must be of the same approximate age, the value of this "k factor" can be calculated from the analytical data.

$$\frac{Pb\ (middle)}{U\ (middle) + k\ Th\ (middle)} = \frac{Pb\ (core)}{U\ (core) + k\ Th\ (core)}$$

Substituting the values for Pb, U and Th from the table, k is found to be 0.42. This is somewhat higher than 0.36, which is commonly accepted as the most probable value for this constant. Due to the lack of proof that alteration has not affected the composition of these inner layers, little weight can be given this calculated value of k.

It has been suggested by Professor Alfred C. Lane[1] that, if, during the formation of the crystal in the pegmatite, there was a transfer of uranium into veins where we find it as botryoidal pitchblende uniformly free from thorium, we might expect a greater proportion of thorium in the middle layer of the crystal, and this would, perhaps, account for the higher k factor and slightly higher lead ratio than was found for the much larger crystal of Wilberforce uraninite analyzed by Wells and used by Baxter and Bliss[2] for atomic weight determinations of lead.

[1] Private communication.

CONCLUSIONS

From the data at hand, the following conclusions are suggested.

In the alteration of uraninite, lead is lost less rapidly than uranium and thorium.

In order to calculate accurately the age of a mineral by the so-called lead method, it is necessary to have analytical data on fresh, unaltered specimens.

Since most uraninites and pitchblendes are altered to some extent, the calculated ages are likely to be too great.

The Th/U ratio in different zones of a single crystal of uraninite may vary. This, in the case of unaltered uraninites, may be due to a change in concentration, during the growth of the crystal, of these elements in the medium in which the crystal was produced.

Assuming no alteration in the two inner zones of the specimen analyzed, the lead-uranium ratio leads to a value of about 1,420 million years for the age of this mineral. This is only slightly higher than the results of other investigators for the age of Wilberforce, Ontario, uraninite.

A method is suggested for calculating the relative lead-producing power of uranium and thorium from the analytical data on sections of single crystals of minerals in which the Th/U ratio varies, due to some other process than alteration.

Further study of the effect of alteration on the lead ratio of radioactive minerals is in progress by one of the authors.

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APPARENT INTOXICATION IN POULTRY DUE TO NITROGENOUS BASES

DURING a series of experiments upon commercial protein supplements we observed a condition in poultry which we believe to be an intoxication induced by nitrogenous bases. The diet upon which the symptoms were observed contained yellow corn 64, wheat 20, functionally low sulfur fish meal 10, dried yeast 1, calcium carbonate 1.1, tricalcium phosphate 0.4, and sardine or cod liver oil 1 part. It will be noticed that this ration is similar to the one employed by Holst and Halbrook[1] in their studies upon "scurvy-like" disease in chicks, with the exception that the concentration of the protein supplement is here within normal limits for growing chicks.

[2] Baxter and Bliss, *Jour. Am. Chem. Soc.*, 52: 4851, 1930.

[1] W. F. Holst and E. R. Halbrook, SCIENCE, 77: 354, 1933.