

accommodated as promptly as possible. The limited number of plates available will of course cause more or less delay in complying with many requests. A prompt return of each plate is to the interest of all. A self-addressed envelope with four cents in postage affixed should accompany each application.

Failure to observe the phenomenon can only result from an insufficient resting of the eyes. Half an hour in subdued light such as lamp-light, followed by four or five minutes in *absolute* darkness is the *sine qua non* of success.

The magnifying glass employed should have a power of five or six diameters. A Coddington lens, or Hastings triplet is suitable.

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SPECIAL ARTICLES.

THE OCCURRENCE OF ZINC IN CERTAIN INVERTEBRATES.

IN the course of an investigation on the chemical physiology of certain invertebrates, undertaken under the direction of Dr. Lafayette B. Mendel, it was found that the ash of the hepato-pancreas of the large carnivorous gastropod, *Sycotypus canaliculatus*, contained an element hitherto unobserved in such connection, namely zinc. So far as the writer is aware, this element has never been observed as a normal constituent of the tissues of any animal, vertebrate or invertebrate. The reaction by which zinc was first suspected was the ordinary ferrocyanide test for ferric iron in acid solutions. Not only was iron present, as indicated by the blue color, but some other metallic element as well, giving a marked slimy precipitate. Further investigation showed the presence of a heavy metal having all the characteristic chemical properties of zinc.

Quantitative separations were made difficult by the presence of very large amounts of phosphoric acid, and the basic-acetate method was resorted to. The well-known limitations of the latter make it, however, scarcely more than of qualitative value. By this method samples of ash from *Sycotypus canaliculatus*

gave approximately eleven per cent. and twelve per cent. respectively of ZnO.

Further separations have since been made by means of Hampe's well-known method (slightly modified),* depending upon the precipitation of ZnS from a formic acid solution of sufficient strength to prevent the precipitation of the iron. By this method concordant results have been obtained as shown in the table below. At the same time qualitative examinations were made of specimens dredged from various parts of Long Island Sound about New Haven, and in all cases zinc was found in large quantities in the ash of *Sycotypus* and *Fulgur carica*.

Copper was estimated electrolytically in each case; in one sample by the rotating cathode method of Gooch and Medway. Iron was determined by permanganate titration in the usual way. Blanks were run through to detect the possible presence of zinc in the reagents, and great care was exercised throughout to prevent any contamination.

Other tissues besides the hepato-pancreas were incinerated and examined, and other gastropods and crustacea dredged from the same localities were also tested. With the exception of the blood of *Sycotypus*, no further occurrence of zinc has yet been detected.

The following table of ash analyses summarizes the result of the investigation as far as it has been carried.

	Samples Obtained.	Fe.	Cu.	ZnO.
<i>Sycotypus</i> (hepato-pancreas.	May, 1903	Present	Present	Present
<i>Sycotypus</i> .	May, 1903	"	8.57%	11.97%
<i>Sycotypus</i> .	May, 1903	"	8.17%	10.81%
<i>Sycotypus</i> .	Sept., 1903	"	8.47%	19.00%
<i>Sycotypus</i> .	Sept., 1903	"	7.83%	23.38%
<i>Sycotypus</i> .	Nov., 1903	0.84%	18.80%
<i>Sycotypus</i> .	Nov., 1903	0.84%	18.60%
Blood of <i>Sycotypus</i> .	Nov., 1903	Present	Present	Present
<i>Fulgur</i> .	May, 1903	"	"	"
<i>Fulgur</i> .	Sept., 1903	"	"	"
<i>Fulgur</i> .	Nov., 1903	"	"	"

The following other marine forms have been examined for zinc, with negative or doubtful results in all cases: *Urosalpinx cinerea*, *Mytilus edulis*, *Modiola plicatula*, *Argina*

* W. Hampe, *Chemiker Zeitung*, IX., 543 (estimation of zinc).

pezata, *Eupagurus pollicaris*, *Ostrea virginiana* and *Cancer irroratus*.

The significance of this unique occurrence of zinc in the economy of *Sycotypus* and *Fulgur* is still to be determined, as is the nature of the combination in which it exists. These points, together with the distribution of the element in other marine forms about the sound, are at present being investigated and will be reported upon later.

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ATMOSPHERIC NITROGEN FOR FERTIL- IZING PURPOSES.

OF much interest to scientific students of agricultural economy is the report of the United States Consul-General Mason, at Berlin, Germany, on a new method of producing nitrogen from the atmosphere for soil fertilization, as announced in the daily 'Consular Report,' No. 1804, issued by the Bureau of Statistics, Department of Commerce and Labor.

The gradual but ultimately inevitable exhaustion of the known nitrate deposits of South America, the report states, lends a growing interest to the methods which have been devised for obtaining a supply of nitrogen for fertilizing purposes from the inexhaustible storehouse of the air. That this can be done as a scientific process has long been known. The first method was by passing a current of air over red-heated copper, whereby the oxygen combined with the metal to form oxide of copper, leaving the nitrogen free. At first the nitrogen thus produced was fixed by combination with calcium carbide to form nitrate of lime (Kalkstickstoff) or calcium cyanimide, a combination of lime carbon and nitrogen, which had all the essential properties of a nitrate fertilizer. But as the use of calcium carbide rendered the product unduly expensive, a method was sought which would employ a substitute for that material, and this was found by Dr. Erlwein, who brought the nitrogen into combination with a mixture of powdered charcoal and lime in an electric furnace. The product of this combination is

a black substance containing, besides the lime and carbon, ten to fifteen per cent. of nitrogen, in perfect condition to be used as a fertilizer. From the experiments thus far made with this new artificial nitrate—which is known in commerce as calcium cyanimide—it appears that its nitrogen acts upon plants quite as effectively as that contained in a proportionate quantity of nitrate of potassium or sodium nitrate (Chile salt-peter). The scientific problem of obtaining nitrogen for fertilizing purposes from the atmosphere would seem, therefore, to be satisfactorily solved. Whether it can be done on a very large scale and at a cost which will make it economically available for general agricultural purposes remains to be demonstrated by practical experience.

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MISSOURI LEAD AND ZINC REGIONS VISITED BY THE GEOLOGICAL SOCIETY OF AMERICA.

At the close of the St. Louis meeting of the Geological Society of America, January 2, an excursion to the Missouri lead and zinc regions was given by the Missouri Bureau of Geology and Mines to the members of the society whose work would allow them time for the journey. In the company several universities were represented—Alabama, Dartmouth, Kentucky, McGill, Missouri, Northwestern, Rochester, Springfield and Toronto, and several members of geological surveys were present—Geological Survey of Canada, Missouri, Ontario, West Virginia and the United States. The excursion allowed of a view of the Missouri geological scale from the St. Louis formation (of the sub-Carboniferous), through Devonian, Ordovician, Cambrian to the Algonkian, and many phases of geology, from *peneplain* to paleontology, had their share of attention. However, the chief place in the thought of the visitors was occupied by the mineral resources of the famous lead and zinc localities. A day and a half was spent in the eastern lead region—the classical locality for lead production in the Mississippi valley. A number of mines and mills at Bonne Terre and Central were visited, and the facts obtained there, when combined with those ob-