

NUTRITION-CHEMISTRY

# Discovery of Two New Essentials To Life Reported by Chemists

## Studies on Rats Show That Lack of Magnesium Causes Death and That Factor in Milk Protein is Necessary

**T**HE DISCOVERY of two new essentials to life was reported before the meeting of the American Society of Biological Chemists in Montreal last week. These substances are the metal, magnesium, and a hitherto unknown constituent of the protein of milk.

A new kind of starvation due to lack of magnesium and a hitherto unsuspected relation between the adrenal glands of secretion and magnesium as a constituent of the diet were revealed for the first time in the paper presented by Dr. E. V. McCollum and Dr. Elsa Orent of the Johns Hopkins School of Hygiene and Public Health, Baltimore. Convulsive death results from the magnesium lack.

Dr. McCollum, a pioneer in the study of vitamins, has thus demonstrated another essential to life itself. Magnesium is familiar as a metal, lighter in weight than aluminum. It also is a part of many chemicals. It is contained in the drugs, milk of magnesia and epsom salt. A very small amount of magnesium is a necessary part of the normal diet. How necessary it is and why has only just been disclosed.

Eleven days of a diet wholly lacking in this element causes convulsions and death in the majority of rats. Drs. McCollum and Orent found. On the third day of a magnesium-free diet white rats developed bright red ears and tails. In fact, wherever the skin showed through the hair, it was seen to be very red instead of the usual color. Apparently the outlying blood vessels were wide open so that all the blood flowed to the ends of the vessels just beneath the skin.

On about the tenth day of this diet, never later than the eleventh, the rats behaved very strangely. Ordinarily they pay no attention to what is going on about them and are undisturbed by noise. But after ten days of the diet, the slightest noise, such as the rattling of a piece of paper, or a shadow falling across the cage, agitated the rats so greatly that they whirled around two

or three times and collapsed in a clonic spasm. Their breathing was disturbed, their eyes protruded, and at the same time the blood rushed away from the vessels just under the skin so that the ears and tails were blanched. The blood rushed to the heart, the small blood vessels contracted, and since the heart could not pump the blood out again it became enormously enlarged.

Over four-fifths of the rats, 85 per cent. of them, died in this spasm, the remaining 15 per cent. lived on indefinitely, some for as long as 90 days, a long period in the life cycle of a rat.

When magnesium is omitted from the diet, calcium and phosphorus are drained out of the body, so that not enough is left to make an X-ray of the rat's skeleton. This is the only way known to decalcify the body.

### Dr. McCollum's Explanation

The explanation for all this, Dr. McCollum thinks, is that there is much the same relation between the adrenal glands and magnesium as there is between the thyroid gland and iodine, or the parathyroid glands and calcium. In the convulsions of parathyroid tetany, the nervous system can be quieted by administration of calcium. The symptoms of magnesium deprivation seem to be exaggerations of the adrenal glands' response to fear or anger.

Here is evidence that two more endocrine gland systems are tied up with two inorganic structures. No relation between them has been known before, Dr. McCollum pointed out, referring to the magnesium study and to his previous study on the effect of manganese on the body. Absence of this substance affects propagation and rearing of the young, even wiping out such a powerful emotion as maternal solicitude, he reported.

The new essential to life contained within the protein of milk was announced by Dr. W. C. Rose of the University of Illinois. (Turn to Page 255)



TERRIBLE LOOKING BUT HARMLESS

ENTOMOLOGY-ETYMOLOGY

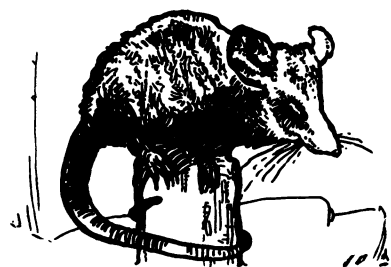
### Panamanian Bug is Genuine Bugbear

**T**HE WORD "bug" originally meant a specter, or ghost, or some other terrifying apparition. Only after it began to be popularly used to designate one order of insects (the *hemiptera*), and, less correctly, all insects and small creeping things in general, did "bug" become archaic in its first sense. The ghost of the original "bug" still survives in such words as "bugbear", "bugaboo" and "bogie".

The terrifying monster shown in the illustration was captured on Barro Colorado Island, in Gatun Lake. Panama Canal Zone, by naturalists from the American Museum of Natural History. He was given the benefit of considerable photographic enlargement, as may be seen from the veins of the leaf on which he is standing. But with his portentous hind legs, he is a most formidable-appearing bug, in both senses of the word.

*Science News Letter, April 18, 1931*

More than a fourth of the distance around the earth at the equator is the record set by a drifting bottle reported by the U. S. Hydrographic Office. The bottle was set adrift by Second Officer J. A. Lerch, of the American steamer *Chilbar*, off the coast of Peru in December, 1929, and was picked up on the other side of the Pacific, among the Solomon Islands, having drifted about 7,650 miles.



### Mouse-Size Opossum

ONE OF the favorite forms of natural-history interest in almost any community is the finding of live things in bunches of bananas. It is a poor grocery store that cannot have its annual tarantula scare, and sometimes other creatures even more strange come as stowaways on the little steamers that ply between our Atlantic and Gulf ports and the fruit lands of the Caribbean.

Once in a rare while one of these stowaways will be no insect or other many-legged ogre, but a tiny, blinking, somewhat scared mammal about the size and color of a mouse. Probably such visitors are more frequent than the records show, but are killed and given to the store cat as mice and therefore familiar pests.

As a matter of zoological fact, however, such a tiny furred visitor is apt to be one of the rarest prizes a northland naturalist can capture. If you are ever so fortunate as to see a mouse-sized animal clinging to a bunch of newly-unpacked bananas, examine it critically. It may look like a miniature opossum, with slightly rumped fur, wide, inquisitive ears, clinging tail and all the other marks of the traditional Down-South Darky's favorite "eatment." If it does, it is a real opossum, the smallest of all opossums. The species lives in the jungles of tropical America and nowhere else, and wanders out into the banana plantations occasionally as its bigger relative up here raids cornfields and truck patches. And once in a long while one goes on an involuntary ride and never gets home again.

*Science News Letter, April 18, 1931*

A new process of making carpets uses goat hair for the pile and dispenses with the use of a loom.

### NUTRITION-CHEMISTRY

## Two New Essentials

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At present its identity is hidden in the complexity of the brownish, somewhat crystalline powder that Dr. Rose's laboratory records describe as the "active fraction" of casein, the protein contained in milk.

Extensive feeding experiments upon white rats led Dr. Rose and his co-workers, Dr. Ruth H. Ellis, W. Windus, and Miss Florence Gatherwood, to the finding of the new life essential.

The protein portions of the food given these animals was replaced by highly purified amino acids, which are known to be the chemical building blocks out of which nature constructs the necessary proteins in food. Proteins make up one of the classes of foods in our diet, and they are contained most extensively in meats, milk products and other such foods.

### Thyroid Not Always Necessary

All the twenty known amino acids were used in the diets of the rats. If these twenty chemical compounds were all that make the proteins of natural food satisfactory for growth and maintenance, then Dr. Rose's rats should have grown well and waxed fat. But they did not. They were not getting something that they needed in their amino acid substitutions for protein.

Starting the search for the unknown food essential, Dr. Rose added small amounts of casein from milk, gliadin from wheat and gelatin from meat to the rodent menus, in order to find where the new essential occurs in nature. The casein helped the rats to grow. By chemical processes this protein was split into pieces until finally a fraction was found that caused the animals to grow normally when just five per cent. of it was added to their purified amino acid meals. This fraction is obtained from the casein by butyl alcohol extraction under appropriate conditions.

Dr. Rose cannot yet assign his hitherto unrecognized food factor to a proper place among the vital food essentials, such as vitamins and amino acids. More research will be necessary before this can be done. It may prove to be an amino acid, of which twenty are known to science. Four out of these twenty are known to be absolutely essential to life. These are cystine, tryptophane, lysine and histidine.

*Science News Letter, April 18, 1931*

### HORTICULTURE

## Soil In Seed-Beds Electrically Heated

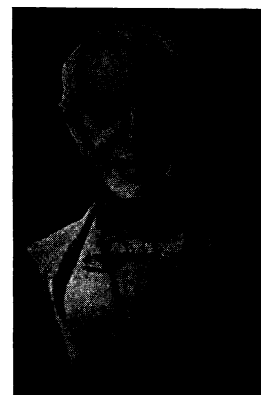
HEATING the soil in seed-beds by electricity, to hasten sprouting and early growth of plants in early spring, has been tried on an experimental scale in Sweden and Germany and is considered economically promising by Oskar Schwenninger, a Berlin engineer.

The heating units are cables of suitably high resistance, insulated and buried about a foot under the surface of the ground. It has been found possible to maintain a good germinating temperature in the soil when the air temperature is near freezing.

*Science News Letter, April 18, 1931*

Ancient inhabitants of Peru obtained wool for weaving from the alpaca, the llama, the guanaco, and the vicuna.

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### Announcement!

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