the name 'neon,' or 'the new one,' has been given, is, as in the cases of helium and argon, $1\frac{2}{3}$; like them, too, it resists combination with other elements, and possesses a brilliant and characteristic spectrum.

This account of the fulfilment of a prediction has, I am afraid, been somewhat elaborate for the general reader; but it is interesting as a case of discovery, where many lines of evidence, founded on the work of many different observers, have led to the foreseen conclusion. It possesses, to my mind at least, some of the qualities of a scientific poem—an orderly arrangement of ideas, drawn from many different sources, each throwing light on the other, and all tending towards a final event. It is true that the subject is not one to which poetical diction can be applied with advantage; the details are too complicated, too unfamiliar, and to be expressed only in language which has not received the impress of poetical tradition; but to enlarge on this would open a wide field of discussion, in which æsthetics, a subject not as yet reduced to accurate formulation, and perhaps hardly susceptible of treatment by scientific methods, would form the chief theme.

In epic poems the 'argument' usually precedes the matter. Here it may be convenient to reverse the order and to sum up the preceding pages by the argument. We have seen, then, that the discovery, by Lord Rayleigh, of a discrepancy in the density of atmospheric nitrogen has resulted in the discovery of a new constituent of air—argon; its discovery has led to that of a constituent of the solar atmosphere, helium; speculations on the ultimate nature and motion of the particles of which it is believed that gases consist has provoked the consideration of the conditions necessary in order that planets and satellites may retain an atmosphere, and of the nature of that atmosphere; the necessary existence of an undiscovered element was foreseen, owing to the usual regularity in the distribution of the atomic weights of elements not being attained in the case of helium and argon; and the source of neon was, therefore, indicated. This source, atmospheric air, was investigated, and the missing element was discovered. A new fact has been added to science, and one not disconnected from others, but one resulting from the convergance of many speculations, observations and theories, brought to bear on one another.

William Ramsay.

ON SOME ANALOGIES BETWEEN THE PHYSIOLOGICAL EFFECTS OF LACK OF OXYGEN, HIGH TEMPERATURE AND CERTAIN POISONS.

One of the striking characteristics of vital phenomena, from a chemical standpoint, is the comparatively low temperature at which oxidations take place. Among the more commonly accepted theories which try to account for this fact is that of Hoppe-Seyler. Hoppe-Seyler found that in case of putrefaction reducing substances, such as nascent hydrogen, are formed. These reducing substances, if atmospheric oxygen is present, attack the molecule of oxygen, taking one atom to themselves and setting free one atom. This free atom of oxygen, being in an active state, is able to bring about the oxidations characteristic of living organisms.

According to Hoppe-Seyler's theory similar fermentations take place in all living matter whereby reducing substances are formed. In case of lack of oxygen it is clear that, while fermentation may go on, the oxidation of the reducing substances comes to a standstill. In this case the reducing substances may attack other substances in the animal body, instead of oxygen, and form compounds which may act as poisons.

It is a well-known fact that an increase of temperature up to a certain limit increases fermentation. Suppose the temperature of a cold-blooded animal be raised to 35 or 40°C. Fermentation will be enormously increased; in fact, it may become so great that all the reducing substances formed are not able to find sufficient oxygen for oxidation. Hence, the same condition may obtain as in lack of oxygen. To show this similarity of death by lack of oxygen and heat, we made, at the suggestion of Dr. Loeb, the following experiments upon the protozoan, *Paramecium Aurelia.* A great number of these little organisms were placed in small glass dishes and either subjected to a temperature of 35–40° or to lack of oxygen. First, a lot of *Paramecia* were placed in distilled water and the length of time necessary to kill them by lack of oxygen was noted. Next, two more lots were placed in a weak solution of alkali (NaOH) or acid (HCl). It was found that, compared with pure water, acids in concentration even as low as 1/876% decreased the time necessary to kill *Paramecia* by lack of oxygen; while alkalies of even 1/800% increased the time by 75–175%.

What has been said concerning lack of oxygen and the effects of acid and alkali may be repeated for high temperature. Acid decreases the time needed to destroy *Paramecia* by high temperature. Sodium hydrate, on the other hand, increases the time as much as from 20 to 80%. The similarity in these two cases, *i. e.*, lack of oxygen and high temperature, is, therefore, very striking.

How can we explain these facts? Why is it that alkali increases the resistance power of Paramecia against heat and lack of oxygen?

We stated that in case of lack of oxygen fermentation goes on, but that the oxidation of the reducing substances is diminished and finally stopped, and that these reducing substances may act destructively upon the organism. Now we may suppose that alkalies act either upon the reducing substances themselves or upon the injurious substances formed by them so as to render them inert.

The same course of reasoning applies in regard to the behavior of alkali in case of high temperature.

To prove this we have still another test. Claude Bernard and Geppert have found that in an animal poisoned by potassium cyanide the blood remains arterial and the tissues have lost the power to take up oxygen. In other words, such an animal really dies because of lack of oxygen. If, then, our theory is correct that alkali is beneficial in lack of oxygen we might also expect alkali to prolong the life of Paramecia poisoned by potassium cyanide. In order to prove this we made the following experiments.

One drop of 1% KNC solution was placed in a dish containing 10 drops of water and one drop of culture containing Paramecia was added. The length of time taken to destroy all the animals was noted. The same experiment was repeated, but instead of water a weak solution of sodium hydrate (1/200–1/2000%) or of acid was used. In all cases the acid shortened the time; salt solutions (1/200–1/2000%) had no effect; alkali increased the length of time from 50 to 300%.

The same results were obtained in case of poisoning by atropin. When it is remembered that solutions of KNC and atropin are alkaline in reaction, it is evident that the beneficial effect of sodium hydrate is not due to its antagonizing these poisons directly.

This is still better seen in the experiments with Sulphate of Strychnia. As the strychnia solution employed had a decidedly acid reaction, *a priori*, we should expect that here alkali would show its beneficial action most signally. Yet both acid and alkali decrease the power of resistance of Paramecia against this poison. Neither has alkali a favorable action in case of poisoning by veratrin, although this, like KNC and atropin, has an alkaline reaction.

We thus see that our theory also stands this test successfully. As alkalies and not acids have this property, it seems possible that the destructive substances formed by fermentation are acids. Whatever may be the real explanation, the fact remains true that Paramecia are able to endure lack of oxygen, high temperature and the action of poisons like KNC and atropin for a longer time in weak alkali solutions than in neutral or acid solutions.

WILLIAM ZOETHOUT.
HULL PHYSIOLOGICAL LABORATORY,
UNIVERSITY OF CHICAGO.

LEIDY'S GENUS OURAMŒBA.

HISTORY.

AT a meeting of the Dublin Microscopical Club, February 15, 1866, Mr. William Archer exhibited specimens of *Amœba villosa* (Wallich), calling special attention to the presence of "a large and numerous tuft of very long prolongations issuing from just behind the villous patch. * * * He thought it could readily be seen that these curious fasciculi were not composed of foreign bodies either issuing from or penetrating into the *Amœba*, but were really linear prolongations of the sarcode itself. * * * This observation, *quantum valeat*, seems possibly to point to a still greater differentiation of parts than has yet been observed in this remarkable form."*

After nearly eight years, October 23, 1873, Mr. Archer again drew the attention of the Dublin Microscopical Club to the same condition in *Amœba*. He still considered the projections from the posterior end to be prolongations of the body substance, though the behavior (as regards flow of contents, locomotion, etc.) was quite that of an *Amœba villosa*.*

In May of the year following, Dr. Joseph Leidy, of the University of Pennsylvania, found in the vicinity of Philadelphia a singular amœboid creature carrying tufts of caudal filaments, and gave a brief description of it in the *Proceedings of the Academy of Natural Sciences of Philadelphia*, bestowing upon it the name *Ouramœba*, in allusion to its tail-like filaments, and distinguishing several forms.† An abstract of this paper published in the *Monthly Mic. Journal*, November, 1874, brought from Mr. Archer the citation of his original notice of 1866, both observers reaching the conclusion that they had lighted upon the same creature.‡ An illustrated notice of the form by Dr. Leidy appeared in the Philadelphia *Proceedings* of 1875.§ In 1879 the *Fresh-water Rhizopods of North America* was issued under the auspices of the U. S. Geological Survey. Dr. Leidy's final treatment of *Ouramœba* occurs in that sumptuous volume. The points which bear directly upon the thesis of the present paper may be briefly summarized:

1. The caudal filamentous appendages alone excepted, Leidy remarked no difference between *Ouramœba* and *A. proteus;* while Mr. Archer regarded the form observed by him as identical with *A. villosa*, the filaments excepted.||

2. "The mode of fixation of the caudal filaments is difficult to comprehend. In a detached tuft the root appeared to be continuous with a ball of homogeneous protoplasm."¶

Quart. Journ. Micr. Soc., 6:190.

*Idem, 14:212.

† Proceed. Acad. Nat. Sci. Phila., 1874, p. 78.

‡ In 1874 Mr. Archer doubted the validity of the proposed genus *Ouramœba*, although he thought the filaments retractile. See *Quart. Jour. Mic. Soc.*, 15: 203; but compare Idem, 16: 337.

§ Idem, 1875, p. 126 f.

|| Fresh-Water Rhiz. N. Amer., p. 68.

¶ Idem, p. 69.