order, which is indicated by panting breath and alternately opening and closing its beak; afterwards it becomes motionless, assumes the shape of a ball, refuses food, and seems overcome with drowsiness, as is the case with chickens affected with the disease. There is this difference, however, that the chicken wakes up at the least noise. This sleep lasts about four hours, after which the chicken wakes up, looks as well as usual, eats and cackles as if nothing had happened to it.

I have repeated this experiment several times and have always observed the same facts. Before injecting the extract above mentioned, I took, in every case, the precaution of injecting an extract of the pure chicken broth, which does not cause analogous phenomena. I have, by this means, acquired the conviction that, during the life of the parasite, a narcotic is formed, and that it is this narcotic which causes the morbid symptom of sleep so characteristic of the disease which we are studying.

By the acts of its nutrition the germ of the disease causes grave disorders and brings on death. The germ, being aerobian, absorbs during its life large quantities of oxygen, and burns up many of the elements of its medium of cultivation. This may be seen by comparing the extract of the broth, before the development of the germ, with the extract of the liquid in which the development has taken place. Everything seems to show that it is from the globules of the blood that the oxygen necessary to its existence is derived by absorption through the tissues. While the chickens are still alive, even when death is still far off, their combs assume a violet tinge at a time when the germ of disease is so little diffused through the blood that it escapes microscopical examination. This species of asphyxia is one of the most curious traits of the disease we are studying. Death is caused by the grave disorders brought about by the development of the parasite in its body, by pericarditis, by serous extravasations, by alterations of its internal organs, by asphyxia, but the sleep characteristic of the disease is caused by a product formed during the life of the germ, which acts on the nervous centres. The independence of these two effects in the symptoms of this disease is further established by the fact that the extract from a filtered cultivation of the germ acts as a narcotic on chickens which have been submitted to the *maximum* degree of vaccination.*

These facts will, doubtless, be found worthy of the meditations of pathologists.

Although I have taken already much of its time with this subject, the Academy will allow me to call its attention to some other characteristics of the disease called *chicken cholera*. We know that this disease is rapidly fatal, particularly if caused by a direct inoculation of its germ. It must then appear extraordinary that it sometimes presents itself in the chronic state, as in the case of inoculated chickens; which, after being severely ill, do not die, but seem to get relatively better. They eat, however, very little; they become anæmic, as shown in the discoloration of their combs; they continue to lose flesh, and finally die, after lingering for weeks or months. This fact would not be of primary importance if, at the death of the chicken, the germ of the disease was not, in most cases, found in its body, which conclusively proves that the parasite has been present since the last inoculation, always active, although in a mild form, for it brings on death slowly. Doubtless, the germ was placed in some *vaccinated* portion unfavorable to its cultivation. Vaccinnated chickens are most apt to present this form of disease, which is of very rare occurrence. We might be led to believe that, in this case, the virulent virus is changed into the attenuated, but this would be an error. In cases of this kind the virulence of the germ of the disease seems, on the contrary, to be aggravated. This may be easily seen by cultivating it artificially, so as to separate it from the blood, and inoculating it on fresh chickens.

Facts of this kind help us to understand the possibility of those long incubations of virus, such as that of rabies, for instance, which, after existing a long time in the body in a state which may be called latent, suddenly manifest their presence by the most marked virulence and by death. Do not these facts also throw light on human pathology?

Alas! how often we see virulent diseases, such as scarlatina, measles, typhoid fever, followed by serious disorders of long duration, which are frequently incurable? The facts to which I have called attention are of the same nature, only here we can put our finger on their true cause.

I will conclude by pointing out another peculiarity, which is not less worthy of the attention of the medical profession.

In chickens in perfect health which have been thoroughly vaccinated there often occurs an abscess full of pus on some portion of the body, which does not seem to have any injurious effect on the health of the animal. It is a remarkable circumstance that this abscess is due to the germ of chicken cholera, which remains in it as in a closed vessel, and it cannot propagate, doubtless, because the chicken has been vaccinated. This germ may be withdrawn by artificial cultivation, or it may be directly inoculated on fresh chickens, which it kills in the usual manner after an abundant development. These facts recall the abcesses on guinea-pigs, which I have mentioned in the first communication on this subject, and they furnish a rational explation of what happens in these abcesses. In all likelihood the muscles of the guinea-pig cultivate the germ more slowly and with greater difficulty than those of chickens; the disease is limited to an abscess, and recovery becomes possible.

I will now conclude this statement, as I have no wish to wear out the patience of this Academy. This subject is, however, so vast and so fruitful that I will ask its permission to bring the subject before it again. I have other observations to present than these. I will add those which will present themselves in the investigations I am now making.

"We would give nothing to the public," said Lavoisier, "if we waited until we reach the end of our researches, as these become broader and more extended the farther we advance."

* I should, however, try to isolate the narcotic, and see whether a sufficient quantity could cause death, and whether, in this case, the internal disorders would be the same as those of the disease itself.

THE NEW CHEMISTRY.

Lieut.-Col. W. A. Ross, who has done so much to advance our knowledge of blowpipe analysis, and whose original chemical investigations are of the greatest interest, in speaking of Prof. Cooke's "New Chemistry," indicates as follows, that much more radical changes, at all events as regards anhydrates, will shortly demand the attention of philosophical chemists, in consequence of the following facts:

FACT 1. 5mgrs. of pure caustic lime are carefully fused into a bead of pure boric acid before the blowpipe, the bead boiled in distilled water, and the transparent calcium borate ball thus extracted, weighed. The weight will invariably be exactly 20mgrs.

FACT 2.—The above-mentioned ball is now fused into a second bead of boric acid, the transparency of which it does not in the least degree affect, and when again boiled out it has the same weight—viz., 20mgrs.

FACT 3. —5mgrs. of calcium hydrate are now fused into a boric acid bead similarly to (1), when it is observed that the borate ball formed is at first opaque white; then, as it becomes transparent B B, that an enormous amount of opalescent matter is emitted from the ball into the bead; and finally, that the extracted ball weighs only 15mgrs.

FACT 4.—The calcium borate ball (2) is now held as a bead *per se* on platinum wire, and 2.5mgrs. of pure silica, or of rock crystal, dried at red heat, dissolved in it B B: after which the silicious ball is weighed, and added B B to a boric acid bead, which it NOW *renders opaque with opalescent matter;* finally, the extracted ball, when weighed, showed, in an average of three assays, an increase in weight of 42 per cent.

FACT 5.—5mgrs. of pure "anhydrous" silica (SiO_2) are carefully taken up on a bead of pure boric acid, and observed to be absolutely unalterable there, B B. A weighed ball of anhydrous calcium-borate is now added B B to this bead, when the silica is gradually decomposed—the weight of the ball being unaltered—not into silicon and oxygen, but into really anhydrous silica (*which possesses extraordinary electrical properties*), and some compound of hydrogen, which makes the bead opalescent. After boiling, only 2mgrs. of residue are obtained.

Now these five facts, and more especially the immense increase in weight of the silicious calcium-borate ball (4), notwithstanding the great loss of matter causing opalescence, show that there is an enormous percentage, nearly half, of SOME COMPOUND OF HYDROGEN, not eliminable as gas, existing in what has been hitherto supposed to be an anhydrous substance, which has escaped even the closeness of modern chemical analysis, for the simple reason that the water solutions of acids and alkalies used to analyse, themselves contain this very compound of hydrogen.

Many confirmatory proofs of this startling truth have been afforded, but cannot be detailed here, because the details form part of the subject of a competitory essay, and cannot yet be published.

Hydrogen, however, in this solid form, can now be proved to be an almost omnipresent component—of all so-called "anhydrous" minerals, of most artificial as well as natural inorganic productions, of many so-called "elements," and, to my mind, of the galvanic "currents" themselves.

Thus it is seen that the beautiful and immaculate theory of combining proportions, first enunciated in 1777 by the illustrious Wenzel in his "Lehre Von der Verwandschaft der Körper," relates entirely to hydrates, and that a new chemistry, the chemistry of anhydrates, now requires to be studied.

Let us hope that some future Wenzel and Dalton will apply proportional and atomic theories to this anhydrate chemistry, and now that the first dawning of the truth has at last been published in Germany and America as well as here, we cannot doubt that this will soon be done.

It remains, now, an unpleasant part of my duty to point out that, although I supposed, by the discovery of the above mentioned facts, I had laid the first foundation of what must, sooner or later, be adopted as a new and essential study by everyone who aspires to the title of a philosophical chemist, I found I had been anticipated in my most important deductions by no less a man than Joseph Priestly.

That unfortunate genius—in repeating one of whose experiments with a more powerful electric battery, Sir Humphry Davy discovered potassium—has been so utterly misrepresented by the modern school of chemists, which has elevated Lavoisier in his place as the founder of the chemistry of hydrates, that it would take more time than you and I can afford, to adduce in proof, a quarter of their misrepresentations.

I will give just one instance. Prof. Cooke, in the book called "The New Chemistry," says (p. 98): "Iron, in rusting, gains in weight, 'Hence,' said Lavoisier, 'it has combined with some material.' 'No,' said such men as Cavendish, Priestley, and Scheele, 'it has only lost phlogiston, which differs from your gross forms of matter in that it is specifically light, and, when taken from a body, increases its weight.' We smile at this idea," etc.

Now what does Priestley himself say?—See p. 249, Vol. I., "Experiments and Observations," sect. IV., "In flammable Air."—"It was even asserted by some that phlogiston was so far from adding to the weight of bodies, that the addition of it made them really lighter than they were before, on which account they chose to call it the principle of levity!" Priestley says here, that he "discovered phlogiston to be hydrogen by direct experiments."

Then follow those celebrated experiments—so much neglected and concealed by modern chemists—in which Priestley converted a certain quantity of lead oxide into a certain quantity of lead "by throwing the focus of a burning-lens upon it through a glass receiver filled with a certain quantity of "inflammable air"—or hydrogen.

It may be fashionable now to "smile at the ideas of such men as Cavendish, Priestley and Scheele"; but it seems to me much more reasonable to smile at the ideas of Lavoisier and his disciples, who did not seem able to understand the possibility of a compound losing (by means of heat or other factor in the operation) an extremely light constituent, and taking up, instead of it, another surrounding constituent sixteen times as heavy, whereby the aggregate weight of the compound would, of course, be increased by the coefficient fifteen.

In precisely the same way I have proved, by my humble experiments, that a ball of calcium-borate, having silica (for instance) dissolved in it, increases enormously in weight by treatment in boric acid B B, although it obviously loses a large quantity of hydrogenous matter, which renders the whole bead opaque white; simply because the compound acquires, instead, a much heavier constituent—viz., boric acid.

We invite those who are interested in the blow-pipe analysis who desire any information on the subject to address a letter to "SCIENCE," as Col. Ross is one of our subscribers, and appears always ready to aid those who require instruction. A letter to "SCIENCE" will doubtless receive prompt attention.

THE AMERICAN CHEMICAL SOCIETY.

The March meeting of the American Chemical Society was held on Monday evening, the 7th inst., Vice-president Squibb in the chair. The resignations of the following gentlemen were read and accepted. Messrs. Elihu Root, H. G. Smith, F. Alexander, J. T. O'Connor, and also, in consequence of its interference with his business, the Recording Secretary Dr. A. H. Gallatin, tendered his resignation from office. Mr. Theodore Tonnelé and Mr. J. G. Mattison were nominated for membership. The reading of papers followed, the first of which "A New Specific Gravity Bottle" by William H. Gregg, was read by Dr. A. Behr. The essential difference between the ordinary bottle and the one devised by Mr. Gregg consists in that the latter has an expansion or bulb just above where the stopper is, in the regular form. A thermometer serves as a stopper passing through the bulb sealing it at both extremities. The advantage of this improvement is that the liquid cannot run over or volatilize (in the case of essential oils, etc.,) for it will be retained in the bulb which is stoppered at each end by the thermometer.

The second paper was by Dr. J. H. Tucker, "On the solvent action of carbonic anhydride in solution upon various bodies under different conditions as to temperature and pressure." The methods of manipulation were first detailed, after which the effect upon the "various bodies," these being chiefly mineral, was described. Mr. Casamajor followed with some observations upon the difficulty that he had experienced in obtaining hydrogen sulphide from impure iron sulphide. After some experimenting he found that upon adding a little zinc amalgan, alopians evolution of the gas ensued. By this method he was successful in obtaining excellent results with galena, orilcopyrite and pyrite.