

Butter of zinc, obtained by distilling to dryness the muriate of zinc, was found to consist of exactly equal parts of the two ingredients.

The fuming butter of arsenic was found to contain nearly 60 chlorine to 40 arsenic. This compound has the property of dissolving phosphorus when gently heated, but to part with it on being cooled. It also readily dissolves sulphur when warmed, and yields crystals of sulphur by cooling. It likewise dissolves resins, oil of turpentine, or olive oil; and in these respects resembles the compounds of sulphur or phosphorus with chlorine, which have the same property of entering into combination with fixed and volatile oils.

In this respect also the butter of antimony was found to agree with the same compounds; and in the proportion of its constituent parts, to be as nearly as possible the reverse of the preceding.

It is remarked concerning these compounds, in general, of metals with chlorine, that their volatility or fusibility are in no degree correspondent to the qualities of the metals of which they consist. One of the compounds of iron, for instance, is volatile; but those of bismuth, zinc, and lead, are even less fusible than the metals themselves.

In order to correct the preceding analysis, the author has had recourse to the general analogy of definite proportions; and since one of hydrogen unites with 7.5 oxygen, or with 33.6 chlorine, the compounds of chlorine have been compared with the oxides of the same metals; and in the instances of copper, iron, zinc, and arsenic, have been found to agree correctly with the analyses of oxides by other chemists; and where such agreement has been wanting, it has been obtained by new analyses of the oxides of tin, lead, antimony, and bismuth.

In making similar comparisons of the compounds of the same metals with sulphur, four instances of correspondence were found in tin, lead, antimony, and bismuth; but others were observed not to accord with the proportions assigned.

The author concludes with observing the degree of analogy that subsists between the oxides of metals, and their compounds, with chlorine; horn silver, resin copper, horn lead, and corrosive sublimate, being each soluble in excess of muriatic acid, although the last is even less soluble in nitric or sulphuric acids than in mere water.

*Further Experiments and Observations on the Action of Poisons on the Animal System.* By B. C. Brodie, Esq. F.R.S. Communicated to the Society for the Improvement of Animal Chemistry, and by them to the Royal Society. Read February 27, 1812. [*Phil. Trans.* 1812, p. 205.]

In the description of the author's former experiments on the same subject, he entered more into the detail of particular occurrences than he now thinks necessary. He was formerly apprehensive that the operations of the same poison might not be always the same, and was

therefore careful to relate all the circumstances. But he now finds extremely little difference in the action of the same poison, even upon different animals; and in those of the same species no difference but what may be referred to difference of quantity of poison, or age, and power of the animal. He consequently does not enter minutely into the particulars of his late experiments, but gives a general account of those which appear to be of most importance, with regard to the inferences that may be drawn from them. The greatest part of them relate to the action of mineral poisons; but since, on the former occasion, his trials of woorara had been left imperfect for want of a sufficient quantity of that poison, he states the results of two experiments made after obtaining a fresh supply, for the purpose of endeavouring to recover animals that had been apparently killed by it.

A young cat was the subject of the first experiment. In four minutes after the application of woorara to a wound in her side, she appeared to be dead, but the heart continued to act 140 times in a minute. Mr. Brodie then inflated the lungs, and repeated the artificial respiration forty times in a minute. At the end of forty minutes the pupils of the eyes were observed to contract by an increase of light upon them; but in other respects she was motionless and insensible. At the end of an hour further symptoms of life began to appear, and there was an effort to breathe occasionally. There were also various involuntary motions. The efforts to breathe became gradually more frequent, and after two hours had elapsed, the spontaneous efforts were repeated as often as twenty-two times in a minute.

The artificial respiration being then discontinued, she lay as if in a profound sleep for about forty minutes, when she suddenly awoke, and gradually recovered from all the effects of the woorara.

A second experiment, of the same kind, performed on a rabbit, was not so successful; for though the action of the heart was continued strong and regular for more than three hours by means of artificial respiration, there never was the least appearance of returning sensibility; and the pulse from that time began to subside, and ultimately ceased altogether.

The mineral poisons here examined by Mr. Brodie, are arsenic, muriate of barytes, emetic tartar, and corrosive sublimate.

When arsenic is taken internally, it is observed that some appearance of inflammation of the stomach is usually found after death; and the general opinion is, that this inflammation is caused by the local application of the arsenic to the coats of the stomach; and secondly, that this inflammation is the cause of death.

To these opinions Mr. Brodie objects, that in many cases the appearances of inflammation are too slight to warrant such an opinion; and in most instances of animals killed by arsenic, death takes place in too short time for it to be considered as the result of inflammation.

The author observes also, that the inflammation does not depend on the local application; for it has been remarked by Mr. Hunter and Mr. Hume, and Mr. Brodie has confirmed the observation by new experiments, which have satisfied him, that inflammation of the

stomach is more violent and more immediate, in consequence of application of arsenic to wounds, than when it is taken into the stomach itself. The symptoms first produced are paralysis of the hind legs, and other parts of the body; convulsions, dilatation of the pupils, and general insensibility, indicating disturbance of the functions of the brain. Secondly. A feeble slow intermitting pulse, from disturbance of the functions of the heart. Thirdly. Pain in the abdomen, sickness, vomiting, &c. from the action of this poison on the stomach and intestines.

From such general affection of such different organs, from the order in which they are affected, and from the analogy with vegetable poisons, which from Mr. Brodie's former experiments appeared not to act till they had entered the circulation, he infers that arsenic also, in whatever way administered, does not produce its effects even on the stomach till it has been received into the blood. And although it might be supposed that blood containing arsenic would equally destroy the vitality of every part, there are various circumstances which show that this is not the case; for even to the instant of death, in consequence of the full effect of arsenic on the brain, heart, and bowels, various secretions continue apparently unimpaired; and even after death the muscles remain excitable to powerful contractions by means of electricity.

From such trials as Mr. Brodie has made of muriate of barytes, it has appeared to act principally on the brain, but in some degree on the heart also; for although the heart always continued to act after respiration had ceased, in consequence of the affection of the brain, nevertheless the pulse was feeble and intermittent; and although artificial respiration was made with the greatest care, in the hope of keeping up the circulation, it could rarely be maintained more than a few minutes. In some instances, in which the artificial respiration had been pursued with apparent success for a greater length of time, there were some signs of restoration of the functions of the brain, with occasional returns of voluntary respiration; but though the greatest care had been taken to preserve the temperature also by external means, the pulse notwithstanding continued to diminish in strength and frequency, and ultimately ceased. It was found, however, that the heart, the intestines, and the muscles, in general, were excitable to contraction by means of electricity, although insensible to the stimulus of blood poisoned by muriate of barytes.

The stomach likewise is affected by this poison with some degree of inflammation, but less so than by arsenic. And though in some instances it operates as an emetic, the author considers the inflammation to be independent of the local application, and to arise through the medium of the general circulation.

The effects produced by emetic tartar are very similar to those of the preceding poisons; but it much more frequently occasions vomiting. The symptoms enumerated are paralysis, drowsiness, and at last complete insensibility. The pulse becomes feeble, but still the heart continues to act after apparent death; so that its action

may be increased by artificial respiration, but never longer than for a few minutes. Its principal action is conceived to be upon the brain; but it appears to act upon the heart also. The stomach sometimes bears marks of inflammation; but the author has seen no instance of the intestines being inflamed.

The experiments of Mr. Brodie on corrosive sublimate, have led him to conclusions very different from the preceding respecting its mode of action. When applied to a wounded part, it produces a slough, without any affection of the general system; and when taken internally, its effects, he thinks, may be best explained by its local action on the stomach alone, unconnected with any absorption of it into the circulation.

When a solution of corrosive sublimate is taken into the stomach, the mucous membrane is found of a dull grey colour, having lost its texture, so as to be easily separated from the muscular coat; and as this precludes the idea of absorption into the circulation, Mr. Brodie conceives that its deleterious effects depend entirely upon its chemical action on the stomach, and that the brain and heart are thence affected by nervous sympathy.

*Observations of a second Comet, with Remarks on its Construction.* By William Herschel, LL.D. F.R.S. Read March 12, 1812. [*Phil. Trans.* 1812, p. 229.]

The tendency of Dr. Herschel's observations is to point out a difference between this second comet and the former, of which he lately gave an account to the Society.

The latter appeared to him as a nucleus about 5" in diameter, surrounded by a very faint chevelure. Since this appearance on the two first days of observation was not well defined, Dr. Herschel was in doubt whether to consider the nucleus as corresponding to the head of the former comet, or to the bright planetary body that he had observed in its centre; being extremely small in comparison to the head, and as much too large to be supposed of a planetary construction. But on two subsequent days of observation, the nucleus was pretty well defined, even with a power of 170; and the author was led to consider the latter as the more probable opinion. On the fifth day of observation (which was the last time that it could be seen, by reason of the interference of the moon's light), Dr. Herschel attended carefully to the magnitudes of the body, as it appeared to different magnifiers; and by subsequent comparison on the following morning of objects of known diameter with his recollection of these magnitudes, he determined the measure of the nucleus to have been 5".2744.

Since the distance of this comet from us was at that time rather greater than that of the sun, the real magnitude of the diameter thus measured is estimated at 2637 miles.

As the light of the chevelure was too feeble to be seen at this time, on account of the light of the moon, its greatest extent, in a direc-