

stitution at his disposal, but by an apothecary in a small German town. It was no doubt isolated previously by a French apothecary, but he did not understand its alkali-like nature, and ascribed its reaction to admixture with alkalis. This apothecary, Serturmer, in the small German town—one might almost say village—not only separated the alkaloid but described its basic properties, recognized its likeness to ammonia, and described the acid—meconic acid—with which it is combined in the poppy. Ever since this discovery the number of alkaloids isolated from plants has been steadily increasing. But of late years chemists have not been content with simply obtaining new alkaloids from plants. They have set to work to make them artificially. Perhaps they have not been quite so successful as had been anticipated, but in the effort to make them numerous bodies have been manufactured, which are becoming of very great use in medicine, so numerous, indeed, are they, and so fast are they increasing, that it is becoming very hard work to keep one's knowledge of them abreast with the times, and a list of new remedies not very many months old is already antiquated.

But great as this department of chemistry is, there is another equally important, which appears to be just coming to the front. I mean the formation of alkaloids in the bodies of animals and of men. We know already that plants frequently contain more than one alkaloid, and that these sometimes have an antagonistic physiological action. Jaborandi, for example contains two alkaloids, pilocarpine and jaborine, which in their action almost completely antagonise each other, so that one might possibly obtain a specimen of jaborandi having little or no physiological action, and yet containing abundance of alkaloid. Others again, such as nuxvomica, contain two alkaloids which, like brucine and strychnine, have a similar action and will assist each other. New alkaloids appear to be formed in the animal body, and these have not always the same physiological action. It would appear, for example, that during the day substances having a morphine-like action are formed more quickly than they are excreted, so that towards night the accumulation of these narcotic bodies tends to produce slumber, and so the individual goes to sleep for the night. But during sleep a different set of substances is produced which have a stimulant action, and as these go on accumulating while the narcotic substances are being excreted, the sleep becomes lighter and lighter, until at last the stimulant action gets the upper hand, and the person awakes. Now it is evident that just as the alkaloids derived from plants may antagonize each other, so the alkaloids formed in the body may more or less completely antagonize the action of alkaloids given as medicines, and indeed experience by the bedside has long ago shown that the best time to give a narcotic is in the evening, when sleep would naturally occur of itself. We have

been accustomed hitherto to look far too exclusively to the action of a drug, forgetting altogether that the result which it produces in a living body is the reaction between the drug itself and the organism. We have to deal not with one factor but with two, and just as the result may be varied by altering the remedy administered, so it may also be changed by altering the body of the recipient. In cases of uremia or of approaching diabetic coma one must always be careful how one gives opium or morphine, because a dose which would otherwise be harmless may tend to bring on profound coma. A great deal has been written lately in the medical papers about death from anaesthetics, and especially from chloroform, and the utmost care is now used to obtain anaesthetics free from impurity, because impurities have been looked upon, and probably rightly, as being responsible for some deaths. But it is quite possible that the impurity, if we may so term it, is not always to be found in the chloroform administered, but actually exists in the body itself in the form of alkaloidal substances which, in combination with chloroform, tend to produce death. Lately Professor Poehl, of St. Petersburg, was visiting this country, and he informed me that in Russia they are now beginning to pay much attention to this subject, and they are now able, by analysing the urine beforehand, to tell whether the administration of chloroform will be dangerous in any case or not. If the quantity of alkaloidal substances which they can precipitate from it is great, the administration of the anaesthetic will almost certainly be risky, whereas if the alkaloidal substances are scanty, the anaesthetic can be administered with perfect safety. In a tolerably large proportion of the deaths recently recorded, the anaesthetic had previously been taken by the same persons with perfect safety. Why death should occur in such persons after a second or third administration has hitherto been a mystery, but it can now be readily understood on the supposition that from indigestion, imperfect action of the liver, or some other cause, the alkaloids were more abundant at the time of the fatal administration than they were on the previous occasions. The idea which is now being worked out in Russia occurred to me several years ago, and therefore some of the experiments made by the Hyderabad Chloroform Commission, of which I was a member, were made with the object of ascertaining whether disease of the kidneys induced by cantharides, or the alteration in tissue change generally which is induced by phosphorus, would render the administration of chloroform more dangerous. The number of these experiments was too small to lead to any positive result, and at that time there was no good method of quickly determining the amount of alkaloidal substances in the urine, although this can now be done with considerable rapidity and approximate accuracy.

Rich fields of new investigation, rich harvests of practical usefulness in reliev-

ing disease and in prolonging life, are rapidly opening out, but how are these to be utilised? In Germany, pharmacological institutes connected with the different universities are fully equipped, and the salaries of the professors and assistants are paid by the State. These institutions contain departments for the chemical investigation of crude substances, of isolated alkaloids, or of manufactured products, and also for the experimental investigation of the physiological action of these substances. It has not unfrequently happened that all the results obtained in an experimental research have been discredited because the drug which the experimenter used was not pure, and a great deal of confusion in regard to the physiological action of the alkaloids of opium has probably been due to various experimenters having worked either with impure alkaloids or with substances which, although bearing the same name, were in reality perfectly different. All this is avoided in Germany by the conjoined action of the chemical and experimental departments in a pharmacological laboratory, but in this country there existed until recently almost no means by which a pharmacological experimenter could be sure that he was really dealing with a pure substance, or even with the substance at all which he supposed himself to be employing. Some years ago, when wishing to demonstrate upon myself the action of nitrite of amyl, I was amazed to find that I inhaled from the bottle which was labelled "Nitrite of Amyl" for several minutes without experiencing the least physiological effect, the reason being that although the drug had been bought as a specimen of nitrite of amyl, it did not contain a single particle of the nitrite. Now, thanks to the liberality of the Pharmaceutical Society, guided by the wisdom of the President and Council, a Research Laboratory has been established which has already done most excellent work, and gives promise of still more in the future. That complicated subject, the alkaloids of aconite, is being unravelled, and Professor Dunstan has prepared pure specimens of the different nitrites which have been tested physiologically by Professor Cash. One great disadvantage under which pharmacological workers in this country previously lay, as compared with those in Germany, is being removed by the formation of a Research Laboratory by the Pharmaceutical Society, and in it men will no doubt be trained who will not only greatly benefit pharmacy, but may supply the want which may ere long be felt of ascertaining the susceptibility of a patient to the action of a drug before its administration. This may no doubt be done, to a considerable extent, by medical men themselves, but medical men are often too busy to give the requisite time. Many of them have not got, and cannot during the intervals of a busy practice acquire, the requisite chemical knowledge, and even when they have the knowledge and the time they may not always have the apparatus or the reagents at their hand, and it will thus, in many instances