

than half a million of offspring. During twenty-one days as egg, larva, pupa, the infant bee resides in the comb, fed by its older sisters on a paste of brood-food or chyle, to which in the case of workers honey is added after the first three days. For a week after emergence the young bee remains at home in order to secrete wax, which is detached from the wax pockets by others; it is then promoted to the office of nurse; for a fortnight or three weeks afterwards it gathers honey, spends its maturity in the difficult work of comb-building, dies at the end of six or seven weeks, unless winter hibernation arrests its labour and prolongs its life. The moral of its unique biography has been pointed by many writers; the social lesson of its communistic orderliness, the industrial ideal flowing from its co-operative toil and profit, the political example impressed by the curious completeness with which, at once a red republican and an ardent cavalier, it combines extremest democratic sturdiness with devoted personal loyalty.

The common hive bee, as distinguished from the Bumble, Carpenter, Mason, and other bees, belongs to the genus *Apis*, of which one species only, *A. mellifica*, is indigenous to Britain. During the last few years the Ligurian, Carniolian, and Syrian bees have been largely introduced, from amongst which the cross known as Syrio-Carniolian bears the palm for fecundity, docility, honey-gathering, and hardiness through the winter. With a swarm of these and a ten-frame hive the tyro may begin bee-keeping. In manipulating he must not wear gloves; they make the fingers clumsy, and the sting, painful at first, causes diminishing inconvenience on each successive infliction, till the system is inoculated by the acid, and the sting is harmless. In creating their new home the bees require assistance; one or two frames of brood-comb from the parent hive, with a limited number of drone cells, must be inserted. As the frames fill, the master, utilizing the fact that honey is always stored above the brood, places "supers" over the frames, removing them as fast as they are filled, while the full-charged combs from below are placed in an extractor and the liquid honey is withdrawn. As much as 100 pounds of honey have sometimes been thus obtained in one season from a single hive. The honey harvest begins with the blooming fruit trees in early spring, and slackens after the lime trees fade, but in heather districts a rich autumn store is raised, and Scottish bee-keepers, having reaped the early crop from bean and clover, send their hives by rail or boat to a considerable distance, to be placed upon the heath-clad moors in early August. When an unfavourable winter has depopulated the hives, it is possible to build up one strong colony out of two or more weak stocks, retaining only the youngest and most prolific queen. The bees will resent the coalition, and a general fight will impend; but if sprinkled with thin syrup and with flour their power of discerning Trojan from Tyrian is cancelled by the identity of appearance and odour.

"Just so the prudent husbandman, that sees
The idle tumult of his factious bees,
Powers them o'er, till none discern his foes,
And all themselves in meal and friendship lose.
The insect kingdom straight begins to thrive,
And all work honey for the common hive."

Mr. Samson does well to press the economic value of bees not only as honey-makers, but as fruit-setters. In

cold sunless springs their agency is essential to the fertilization of the bloom; in districts adjoining a large apiary the fruit trees are invariably laden with heavy crops, deteriorating as we remove further from its neighbourhood; and instances are well authenticated from the cider counties in which a general destruction of bees by a long and variable winter has been followed by the loss of the apple crop. Both fruit and honey are at present for the most part imported from abroad; if fruit is to be largely cultivated in the small holdings of the future, it must be sustained and enriched by bee-keeping.

In this, as in other industries, there are occasional difficulties baffling to all but experts. Queens will refuse to be reared, supers will remain unfilled, stocks will need stimulation in the spring and building up in early winter, foul brood, deadliest of bee maladies, will infect the hive. In all such complications and for many more Mr. Samson offers full and clear instruction. Portable in form and cheap of cost, his book should form part, along with "smoker," bee veil, queen cage, "driving irons," and "doubling box," of every bee-keeper's equipment.

W. TUCKWELL.

A NEW COURSE OF CHEMICAL INSTRUCTION.

A New Course of Experimental Chemistry, with Key.
By John Castell-Evans, F.I.C. (London: Thomas Murby.)

THE basis of the course of instruction here put forward consists in making the student perform an experiment with a definite object in view. The result of the experiment is carefully withheld, and must be discovered by the student himself. In this way he is led to acquire knowledge by his own exertions, and theoretically at least such a method has more to recommend it than any other. In practice, however, the time required to rigorously carry out this system is no doubt an obstacle to its general adoption.

If with the author we lay down the law that "the student must not be allowed to use any chemical name or term until he has discovered for himself the thing or process represented by it," to acquire but a moderate knowledge of the chemistry of to-day appears well-nigh an impossibility. It was thus a matter of interest to see how a work based on this system could be comprised within reasonable limits of space. The author, however, does not seem to intend the above restriction to be literally enforced. To go no further than the first lesson, we find the student employing the ordinary chemicals, phosphorus, ammonium nitrite, potassium chlorate, &c., things which he makes no attempt to discover; only in the case of the more important processes and substances usually met with in a chemical course is any such attempt made.

The book consists of two parts. The first part contains a series of experiments and problems; the latter being set upon a course of lectures which are intended to be given concurrently with the laboratory instruction, and which deal more especially with the physical aspect of the subject. Outlines of these lectures, results of the experiments, and full solutions of the problems are to be found in the Key, which may be obtained separately or bound up with the

two parts. The experiments start off with the commonly occurring phenomena of combustion, and lead up to the laws of chemical combination, the determination of chemical equivalents, vapour densities, &c.

Part II. consists of qualitative and quantitative analysis taken together, no attempt being made to separate the two. The results of the experiments are here carefully withheld from the student, and are given in the Key. A useful table for the detection of the positive radicles is published separately, and may be used in connection with this part.

The book can be recommended as a trustworthy one, and, apart from the novelty of the system adopted, as a storehouse of knowledge useful to the chemist, it will be appreciated by many a teacher.

The problems are actual examples met with in the laboratory, and appear to be free from the artificial exercises so common in text-books. It is also noteworthy that they, as well as the lectures, are concerned to a considerable extent with the energy changes as well as with the material changes which constitute chemical phenomena.

In glancing at the tables of physical constants to be found as answers in the Key, it is frequently noticeable that these magnitudes are given to an accuracy which is altogether fictitious. For example, to express heats of vaporization or absorption coefficients to one part in thousands of millions, or to give a boiling point such as that of bromine to one thousandth of a degree Fahrenheit, tends to create an erroneous idea of the accuracy with which such determinations can be made. In one or two instances the information is not quite up to date. Hydrofluoric acid, for instance, is still formulated H_2F_2 , and Bunsen's values for the absorption coefficients of hydrogen and oxygen are still given, although they have been superseded by the observations of Winkler and Timoféef. Van der Waals's work might have been included in the otherwise serviceable account of the kinetic theory of gases, and it is somewhat unfortunate that the author insists upon the narrow view that specific gravity has no other meaning than that which is perhaps more correctly attributed to relative density.

The printing and the woodcuts are hardly up to the standard usually attained in books of this kind.

J. W. R.

OUR BOOK SHELF.

Die Pflanze in ihren Beziehungen zum Eisen. Von Dr. Hans Molisch. Iron in its Relations to Plant-life. 8vo, 119 pages, with one coloured plate. (Jena: Gustav Fischer, 1892.)

AN interesting essay on the presence, function, and form of iron in plants, embodying the results of previous investigators and of the author's experiments and researches extending over several years. Though the outcome of much labour, Dr. Molisch regards it as preliminary to more extended inquiries, and the whole subject as being yet in its infancy. He discusses the determination of the presence in the vegetable cell of iron in loose combinations and in dense combinations, or what he terms the masked condition. He then describes the occurrence and distribution of iron in plants in loose and dense combinations, and enters somewhat fully into the description of a new method he claims to have discovered

for proving the existence of iron in the masked condition, even when it is present only in infinitesimally small quantities. This is done by soaking the objects one or more days or weeks in saturated aqueous liquor potassæ, and then, after quickly washing them in pure water, subjecting them to the usual reagents. He further claims to have proved that iron is not one of the constituents of chlorophyll. There is also a short chapter on healing vegetable chlorosis by the use of chloride of iron, sulphate of iron, and other salts of iron. W. B. H.

Up the Niger. By Captain A. F. Mockler-Ferryman (London: George Philip and Son, 1892.)

SEVERAL years ago complaints were made about the conduct of various British subjects in the territories placed under the Royal Niger Company. The British Government accordingly sent Major Claude Macdonald to inquire into the matter. He was accompanied by Captain Mockler-Ferryman, who in the present volume gives a full account of the proceedings of the Mission. During the entire journey, which extended over more than 3000 miles, nothing "of a blood-curdling nature" occurred, so that any one who is attracted to books of travel mainly by the chance of finding them full of sensational narratives, need not trouble himself with Captain Mockler-Ferryman's pages. On the other hand, those who like to read about remote regions and their native inhabitants, will find in this book much to interest them. The author is an accurate observer, and notes in a clear and unpretending style the facts by which his attention has been most strongly attracted. His descriptions of the native tribes of the Niger country, so far as he himself observed them, are particularly good, and will not only please the general reader, but be of service to ethnologists and anthropologists. A capital chapter on music and musical instruments, prepared from materials collected by the members of the mission, is contributed by Captain C. R. Day, and the value of the volume as a whole is much increased by a map and illustrations.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Density of Nitrogen.

I AM much puzzled by some recent results as to the density of nitrogen, and shall be obliged if any of your chemical readers can offer suggestions as to the cause. According to two methods of preparation I obtain quite distinct values. The relative difference, amounting to about $\frac{1}{1000}$ part, is small in itself; but it lies entirely outside the errors of experiment, and can only be attributed to a variation in the character of the gas.

In the first method the oxygen of atmospheric air is removed in the ordinary way by metallic copper, itself reduced by hydrogen from the oxide. The air, freed from CO_2 by potash, gives up its oxygen to copper heated in hard glass over a large Bunsen, and then passes over about a foot of red-hot copper in a furnace. This tube was used merely as an indicator, and the copper in it remained bright throughout. The gas then passed through a wash-bottle containing sulphuric acid, thence again through the furnace over copper oxide, and finally over sulphuric acid, potash, and phosphoric anhydride.

In the second method of preparation, suggested to me by Prof. Ramsay, everything remained unchanged, except that the first tube of hot copper was replaced by a wash-bottle containing liquid ammonia, through which the air was allowed to bubble. The ammonia method is very convenient, but the nitrogen obtained by means of it was $\frac{1}{1000}$ part lighter than the nitrogen of the first method. The question is, to what is the discrepancy due?