

the cerebral organisation are specially well done, and contain the best exposition yet published of our knowledge of that part of the Primate organisation. Special prominence is deservedly given to the brilliant work of Prof. Elliot Smith. There can be no doubt, too, that this work will lead to a renewed vigour in the search for evidence bearing on the origin and relationships of the higher Primates.

A. K.

*CHEMISTRY FOR YOUTHS: MRS. MARCET REDEVIVA.*

*Die Schule der Chemie.* By W. Ostwald. Zweiter Teil—Die Chemie der Wichtigsten Elemente und Verbindungen. Pp. viii + 292. (Brunswick: Vieweg and Son.) Price 7.20 marks.

ABOUT a year ago, the first volume of Prof. Ostwald's dialogues on chemistry was noticed in these columns. We have now the second volume, written in as lively a strain as the first, and conveying the author's views, which bid fair to become in the main everybody else's views, as regards the presentation of the elementary facts of chemistry. It would be wrong to say that in this volume, consisting of 292 pages, there is more system; but in it we come to a discussion of chemical facts and theories which are generally treated in school text-books. The pupil is introduced to chlorine, its preparation and properties; its behaviour with water; acids and bases, and elements; combining weights, and multiple proportions; the atomic hypothesis, and the laws of volume combination; electrolysis and salts. Chlorine is again considered as regards its compounds with oxygen, and then follow bromine and iodine; sulphur and its compounds; nitrogen, ammonia, phosphorus, and so on through the commoner elements and their compounds.

Throughout the volume we find neat remarks which sustain interest, at least, when it is glanced through, for I do not think that anyone who is already a chemist will read the volume as carefully as he may have read the first volume. For example, on the first page is an aphorism, too often neglected, but none the less true:—"When much has been learnt, time must be given for digestion." In English "cramming doesn't pay in the long run."

Everyone knows that Prof. Ostwald does not hold by the atomic theory. Yet he does not escape from it. His presentation of it is, however, ingenious, as indeed are all his methods. Discussing the facts of multiple proportion he gives the following illustration:—

"Think of a collection of coins, where German marks, English shillings, French francs, Russian roubles, and other coins are to be found. You can combine these coins in twos and threes; each combination, however, has the value of the sum of the individual value of the coins, and you cannot obtain any other values, combine them as you will. Similarly, no other compounds can be formed but those obtained by bringing the elements together according to their combining weights."

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The pupil then draws the required conclusion:—

"That is as if each element consisted only of equal pieces, just as all francs or marks are equal among themselves." "Yes," answers the teacher; "that is the picture which has represented the state of affairs to men's minds for long. It is supposed that each element consists of minute particles, named atoms," and so on. When the boy asks, "Is all this true?" the teacher replies, "No one has seen an atom, nor weighed one. This is therefore a hypothesis, but a very convenient one, because the various applications of the laws of combining proportions can be better realised (merken) when the picture of atoms is simple and clear." "But we can do without it!" says the pupil. "Certainly," says the teacher. "But just as you found it easier to count on your fingers than in your head, so it is easier to think of atoms, than of the abstract and general laws of combination." So we have to teach by means of atoms. Indeed, few of us would go further, especially in these later days, when even atoms are failing us. The hypothesis is, however, ignored a little later, when it is stated that "the rule has been made never to write fractional parts of combining weights." The doctrine of the indivisibility of atoms would appeal more readily to a young mind. Yet in fairness, it must be acknowledged that the writer makes the pupil suggest that each chemical symbol stands for an atom, and acknowledges, in the mouth of the teacher, that "the atomic theory can be easily grasped" ("etwas sehr eingängliches hat").

When electrolysis is discussed, the author's ingenuity in devising analogies is at its best. The pupil has difficulty in picturing a positive and a negative current going in opposite directions through the same wire. He is reminded of waves crossing each other in a pond, and of the upper and under parts of a driving-belt travelling in opposite directions.

Heats of combustion, discussed under the heading "carbon," are measured in kilojoules, instead of calories. This is perhaps logical, but it appears to the reviewer that the older unit might have been retained until a later stage. It is easy to make the reduction when required; and it is easier to realise heat as heat than as work, at first, at least.

While acknowledging that the subject of chemistry is here well treated, and that the author has maintained his lively style and faculty of lucid presentment, it may be questioned whether this method of discussing chemistry should have precedence over the ordinary text-book. A youth who advances so far as to grasp the contents of volume I., will, I think, tire of the plan of question and answer. Yet perhaps there are some who prefer to take their food, as they do medicine, in spoonfuls, and to whom the form of dialogue has its attractions. In old days "Pleasant Pages" was widely read, and no doubt conveyed valuable lessons. And at any rate, teachers of chemistry may learn much from this volume in hints as to how best to present the very numerous facts of the science to their students, whose digestive powers are as a rule limited.

W. R.