been amended in such manner as to protect the public, without hampering the use of steam. A special type of engine, with vertical cylinders, carried well up above the axles (to secure them from injury by mud and dust, and to make them readily accessible), and fitted with long connecting-rods, coupled directly to the leading axles, has been applied to the street-cars. All four wheels are connected by coupling-rods, as in the locomotive, and the exhaust steam is concealed by various expedients. The surface-condenser was considered more economical than superheating, to produce efficiency, and air-condensers were thought practicable. Engine and passenger-car were often combined, — a method used in various American systems, — in one of which (Rowan's) the engine can be removed, and another substituted, in a few minutes. Depreciation was allowed for at 10 %. Depreciation on the line alone was taken as 3 %. The cost of operation was stated at 2.28 pence per mile, while the total of all expenses was given at 9.33 pence per mile, and every penny per mile above this figure should give 2.2 % in dividends. The line intended for such steam-traffic should be very substantially built, and large cars and moderate fares were advised.

Mr. Shellshear gave an account of the street-railways of Sydney, New South Wales, all of which are worked by the ordinary railway system. The number of passengers carried in 1882, on twenty-two miles of road, was 15,269,100, or about 200,000 per mile; and the earnings were over $40,000 per mile, or about 2 % per mile. The gauge was 4 feet 8½ inches, and the number of motors employed was 57, including several American (Baldwin) tank-engines, which work more smoothly than the English or home-made engines. The government is having other steam-cars, on the American system, built by the Baldwin works. The result has proved that horse-traction must yield to mechanical power.

MORTILLET'S CONCLUSIONS REGARDING EARLY MAN IN EUROPE.

1. During the tertiary age, there existed a being intelligent enough to produce fire and to fabricate stone implements.

2. This being was not yet man: it was his precursor, — an ancestral form, to which I have given the name of the *man-ape*.

3. Man appeared in Europe at the beginning of the quaternary period, at least 230,000 or 240,000 years ago.

4. Our first human type was that of Neanderthal. This type, essentially autochthonous, was slowly modified and developed during the quaternary period, resulting in the type of Cro-Magnon.

5. His industry, very rudimentary at first, developed progressively in a regular manner, without shocks. This proves that the progressive movement went on upon the spot, without the intervention of propagandism and invasion from abroad. It was therefore really an autochthonous industry.

6. The regular development of this industry has enabled me to divide the quaternary period into four epochs, — first, the *chellean*, anterior to the glacial period; second, the *mousterian*, contemporaneous with it; third and fourth, the *solutrian* and the *magdalenian*, posterior to it.

7. Quaternary man, mainly a fisherman, and especially a hunter, was acquainted neither with agriculture nor with the domestication of animals.

8. He lived in peace, entirely destitute of religious ideas.

9. Towards the end of the quaternary period, in the *solutrian* and the *magdalenian* epochs, he became an artist.

10. With the present condition of things, there have come invasions from the east which have profoundly modified the population of western Europe. These have brought thither ethnic elements entirely new, and in great part brachycephalic. To the simplicity and the purity of the autochthonous dolichocephalic race, there have succeeded numerous crosses and mixtures.

11. The industry is found to be profoundly modified. Religious ideas, the domestication of animals, and agriculture have made their appearance in western Europe.

12. This first invasion, which took place at the Robenhausen epoch, set out from the regions of Asia Minor, Armenia, and the Caucasus.

PARKER'S TEXT-BOOK OF DISSECTION.

THIS book is well printed, and presents an attractive appearance. Of the seventy-four woodcuts, all are good, some excellent. The plan of the book is similar to that of Huxley and Martin's 'Elementary biology,' and, like it, is designed as a course of laboratory instruction. Our author deals with the anatomy of the lamprey, skate, cod, lizard, pigeon, and rabbit. It will be seen that the anatomy of a representative form of each of the vertebrate classes except the Amphibia is taken up. A type of this latter group was evidently omitted with purpose, since Huxley and Martin's 'Biology' takes up the anatomy of the frog. The anatomy of the types selected is considered from an independent point of view, and the author makes no attempt whatever to give a detailed or complete account of their structure. He dwells on the more important points, taking up the anatomy in quite as detailed a manner as desirable, and perhaps more fully than can be compassed by the student in most of our laboratories. General directions are given as to instruments, methods of dissection, and preparation, followed by more detailed instructions about dissection of the types con-

A course of instruction in zoötomy (Vertebrata). By T. JEFFERY PARKER, B.Sc., London professor of biology in the University of Otago, New Zealand. With seventy-four illustrations. London, *Macmillan & Co.*, 1884. 23+397 illustr. 8°.

sidered; as, for example, how and where to cut to make out the anatomy of the special parts, and their relations to one another. The directions are clear and concise, and the student will have no trouble either in dissecting or identifying the various parts. We think the introduction of clear woodcuts an important and legitimate aid to the student, and a great improvement thereby over Huxley and Martin's 'Biology.'

The book, in short, is admirably adapted for laboratory work, and furnishes to the student who will take specimens in hand, and dissect with care, a sufficient guide in making out the essential points in vertebrate anatomy.

RECENT PHYSIOLOGICAL TEXT-BOOKS.

HUTCHISON'S physiology has been before the public for some time, and apparently has met with considerable success as a school text-book. The revised edition that is now offered has but few changes. The book as a whole is commendable as a collection of facts, physiological, anatomical, and hygienic, a knowledge of which will be useful to people of all callings in life. But it is questionable whether it is a book that a thoughtful physiologist would like to see generally introduced into schools as a text-book. No chemist at the present time would wish to have an elementary text-book of chemistry merely a collection of facts or receipts, however interesting and useful such facts might be. The demand is being made in that branch of science for text-books of a higher order, which shall make the facts presented, as far as possible, illustrations of the more important general laws of chemical action. Some such reform should be attempted in elementary text-books of physiology. Physiology is worthy of being taught, in part at least, as a branch of human knowledge, or for the sake of mental training, and not simply for the purpose of preserving health, or enabling a person to conduct himself properly in case of an accident.

The remarks upon personal hygiene in the book are in the main well chosen and to the point; but, in regard to the action of alcohol, the author's prejudices, or desire to do good, have evidently biassed his statement of facts. The book contains a number of errors which should be corrected; such as, "sugar changes to fat in the body," "the acidity of the gastric juice is due to lactic acid," and the rather incomprehensible statement that albumen gives 'smoothness and swift motion' to the plasma of the blood. Another error common to both books under review is, that the proteids of the blood are spoken of as albumen and fibrine. There is no such thing as fibrine in circulating blood; and, if it is necessary to mention at all the chemical constituents of the plasma, something a little more in accord with what is actually known might be given.

Tracy's book aims to be a more scientific presentation of the facts of physiology and hygiene than is usually met with in elementary text-books; but whether the result has fulfilled the author's expectations is one of the things that might be doubted. It is scarcely scientific, for instance, to speak of alcohol as a 'rank poison,' without any qualification whatever. While such language is expected from a temperance orator, it is somewhat out of place in an elementary book supposed to give generally accepted facts. Quite enough can be said truthfully against the use of alcohol without making statements which are not borne out by the facts of physiology.

The book has some serious defects, such as the failure to say any thing at all of the function or structure of the kidneys, except in a purely incidental way. It contains also numerous errors or badly emphasized statements; such as the origin of lymph (p. 88), the action of the sympathetic nerves (p. 175), the mechanism of the reflex secretion of saliva (p. 178), the statement that all bones are at one time cartilaginous, etc. Some of the chapters — that on respiration, for instance — are well written, in clear and accurate language; and the remarks on hygiene form, probably, the best part of the book. But, as far as its physiology is concerned, the book bears evidence of having been written by one not thoroughly conversant with the subject.

A treatise on physiology and hygiene. By JOSEPH C. HUTCHISON, M.D., LL.D. New York, *Clark & Maynard*, 1884. Illustr. 8°.

The essentials of anatomy, physiology, and hygiene. By ROGER S. TRACY, M.D. New York, *Appleton*, 1884. Illustr. 8°.

A TEXT-BOOK OF PHYSICAL GEOLOGY.

THE author of this small volume has made a step in the right direction, for the plan of his book involves the wise omission of historic geology and paleontology, — subjects into whose full meaning the beginner makes but little real progress. The book would have been further improved by the omission of much of the sec-

The student's handbook of physical geology. By A. J. JUKES-BROWNE. New York, *Scribner & Welford*, 1884. 12 + 514 p., illustr. 8°.