represented by adding together the properties of oxygen and hydrogen. Suppose, then, that the assumed combination of material and ideal in God give a new set of properties: are they given recognition in this treatment by partition? We are not impugning in any way Professor Alexander's conclusion, but simply stating some objections that have occurred to us as to his method of reaching it.

The concluding chapter, on the 'Doctrine of cause and effect,' is both the longest and most finished in the book. It is a concise and admirable summary of the historical aspect of the doctrine of causation from the pre-Socratic philosophers to Mill and Spencer, and a profoundly suggestive indication of the true theory of cause and effect. All of Professor Alexander's work is thoroughly well done, and we regret to see that not a few typographical errors have crept into an otherwise model piece of book-making. We trust that the book will have a wide circulation, for it will be found an excellent mental tonic as well as an emphatic protest against the philosophical dilettantism now so current. N. M. B.

A NEW EDITION OF JUVENAL.

AN edition of Juvenal that should be sufficiently practical for the college class-room, while embodying the latest results of classical research and criticism, has for several years been greatly needed. It is therefore with interest that one turns to the present work in the hope of finding a happy medium between the too fine-spun commentary of Simcox and the too rudimentary treatment adopted by Hardy.

Apart from the typography, the book is a disappointment. The notes contain nothing whatever that is new, being too evidently condensed and simplified from Mayor, and are so desultory and ill-assorted as not even to deserve credit for judicious selection and arrangement. Moreover, real difficulties, both of syntax and exegesis, are passed over, while an inordinate amount of space is given to the elucidation of matters that ought to be familiar to any intelligent school-boy. How meagre are the grammatical notes, may be seen from the fact that on the 171 lines of the first satire there are but two; on the 322 lines of the seventh, with its fourteen pages of commentary, there are but two; and on the 365 lines of the tenth there is only one. When the editors do venture to elucidate some syntactical peculiarity, it is always one that would seem to need no comment whatsoever: as, for instance, the vivid use of the imperfect subjunctive in vii. 69, 70; or the by no means extraordinary employment of the indicative in x. 123; while peculiarities like the metrical *quis* in xii. 48, and the implied *ut* from *ne* in xvi. 9, are still untouched. But, on the other hand, there is a superabundance of commentary like the following on xvi. 14: — "*Grandes magna ad subsellia*: the bench had to be ponderous to support its huge occupant."

An important feature of this edition is the professedly idiomatic translations sprinkled through every page. These are not intended to be paraphrases, for they are enclosed in quotation-marks; and, besides, a paraphrase is elsewhere prefixed to each satire. One instance of this extraordinary rendering will probably suffice. Satire vii. 36 is *translated*, "Now hear the rich man's tricks. To avoid subscribing to you, he poses as a fellow-poet, and trusts to the maxim that 'dog does not eat dog.'"

The editors have very commendably refrained from the absurd expurgation that disfigures so many college editions of Juvenal. Excessive expurgation only excites prurient curiosity; while it so emasculates the author as to make it quite impossible for the reader to claim any real acquaintance with Juvenal as he is, or to understand the bitterness and the motive of his *saeva indignatio*, from the perusal of these fragments of the scattered poet.

The introductions, the summary of a paper by Professor Nettleship, and a brief account of the Codex Pithoeanus, are interesting; but why discuss the Codex Pithoeanus in a work of so elementary a character as this last edition of Rome's greatest satirist? H. T. PECK.

Thirteen satires of Juvenal: with introduction and notes. By C. H. PEARSON, M.A., and HERBERT A. STRONG. M.A., LL.D. Oxford, Clarendon pr. 12°.

EDWARDS'S DIFFERENTIAL CALCULUS.

A NEW text-book on the differential calculus comes from the press of Macmillan & Co. It resembles, in size and appearance, the well-known works of Todhunter and Williamson. An exceedingly satisfactory introductory treatment is secured by a close adherence to one point of view, that of limiting ratios. The symbols dy and dx are not used apart, nor the meaning of such a use explained, until the formulas of partial differentiation in chapter vi. prevent any further postponement. In this way, however, there is lost the advantage of exhibiting the variety of original conception and breadth of foundation distinguishing this branch of mathematics, — an advantage,

Differential calculus, with applications and numerous examples. By JOSEPH EDWARDS, M.A. New York, Macmillan. 8°.

indeed, much more frequently sought than obtained. The language is plain, and the geometrical illustrations are numerous and good. The serious faults of the book are sins of omission. We look in vain for the customary chapter on the change of the independent variable, and we find a strange limitation in the treatment of the important subject, 'maxima and minima.' The author here contents himself with the discussion of functions of a single variable. The use of symbolic methods, involving the extension of the mathematical laws for the combination of quantity to the symbols of operation, is necessary in the modern differential calculus. In this work the principle introduced is explained in an excellent manner, but a fuller exemplification of its legitimate outgrowth is desirable. More illustrations should be given, especially of the symbolic method of extending Taylor's formula to several variables. The chief strength of the book lies in the chapters relating to the theory of plane curves. In not a few cases we find greater detail and thoroughness than in the corresponding chapters of its predecessors. On the whole, while no decided novelty of treatment is shown to those acquainted with the best works hitherto published, the production is a creditable, useful treatise, without other faults than those mentioned above.

THOMAS S. FISKE.

THE ALKALI LANDS OF CALIFORNIA.

THE term 'alkali soil' is used in California, and the western states generally, to denote any soil which contains an unusual amount of soluble salts, particularly when they render their presence manifest by an efflorescence on the surface. These salts may be simply an excessive amount of the neutral salts found in minute amounts in all soils, or, in those soils more properly designated as alkaline, they may consist in part of carbonate of soda.

By the natural processes of evaporation at the surface and capillary rise from below, these salts tend to accumulate near or at the surface, thus producing the efflorescence above noted, and also destroying or injuring the crop by their corrosive action on the root-crown.

In the actually alkaline soils, i.e., in those containing carbonate of soda, another injurious effect is also observed. The alkali prevents what is known as the 'flocculation' of the clay contained in the soil; that is, it keeps in the finely divided condition seen in 'puddled' clay. Such a soil can never be brought into proper tilth; even the most thorough cultivation only succeeds in breaking it up into larger or smaller clods, and leaves it in a condition entirely unsuited for the growth of crops.

These alkali soils are somewhat abundant in California, notably in the otherwise extremely fertile San Joaquin valley; and the characteristics outlined above have been tolerably familiar for years. It was not, however, until it was discovered that the process of irrigation, so essential in the dry climate of that region, was serving to extend the area of these alkali soils, and even developing them where they did not exist before, that the magnitude of the problem which they present was generally appreciated.

The pamphlet under review is a summary of investigations carried out at different times at the College of agriculture of the University of California, and in connection with the U. S. census of 1880 by Prof. E. W. Hilgard, than whom there is probably no one more eminently qualified to deal with the question scientifically and practically.

According to Professor Hilgard, the immediate source of the alkali is usually to be found in the soil-water, though it would appear, that, in some cases at least, the lower strata of the soil itself may contain either these salts or compounds which readily yield them by weathering. When reached by digging, the soil-water is not necessarily perceptibly salty or alkaline; but as it evaporates at the surface, and is supplied from below, the soluble salts are concentrated in a very shallow layer at the surface, the solution becoming strong enough to kill crops, or even depositing the solid 'alkali.'

It is thus evident that the most important factor in determining the amount of alkali which accumulates at or near the surface of the soil is the amount of soil-water brought up from below by capillary action and evaporated; and any thing which increases the evaporation will tend to increase the amount of 'alkali' deposited, and to make its presence perceptible in spots where before it was not present, or present in such minute amounts as to produce no harmful effects. This, irrigation, as ordinarily practised, does. If the irrigation-water is used somewhat sparingly, so that it all finally evaporates from the surface, two effects follow: first, the greater amount of water passing first downward, and then upward through the upper strata of the soil, tends to exhaust it more thoroughly of its alkali, concentrating all of it at the surface; second, by irrigation the soil is moistened to a greater depth than it was by the rainfall only, and thus a greater amount

Alkali lands, irrigation, and drainage in their mutual relations. By E. W. HILGARD. Sacramento, State. 8°.