of utility, upon the elaborate engravings published several years ago by Stilling, and which were so entirely thrown into the shade by Mr. Clarke's method of rendering his sections transparent, yet they are not devoid of interest as examples of one more of the applications of photography to science.

REVIEW IV.

Metamorphoses of Man and the Lower Animals. By A. DE QUATREFAGES, Membre de L'Institut, Professeur au Muséum D'Histoire Naturelle de Paris, &c. Translated by HENRY LAWSON, M.D., Professor of Physiology in Queen's College, Birmingham, &c. London, 1864, pp. 284.

THE subject of this volume, assuredly one of the most interesting within the scope of zoological science, has been treated in a very able manner by its distinguished author. The work is not merely a digest of what has been done by others, it is much more and of a higher character; it contains the results of the professor's own widely extended researches. What very much adds to its value is, the simple, lucid and animated style in which it is written; and, fortunately, owing to the ability of its translator, it does not lose this charm in its English dress. In its commendation, too, we must not forget to mention another of its merits; this is, the historical notices which accompany the details, in which ample justice is done to the inquirers by whose patient labours one of the most obtruse and difficult portions of biology has been elaborated and brought to its present advanced stage.

The general conclusions which the author arrives at from a large induction of facts accompanied by much critical discussion, displaying great acumen and an admirable method, are the following: first, and chief, a confirmation of the great law, the dictum of Harvey, of *omne vivum ex ovo*; next, that the preservation and perpetuation of species are effected only by the congress of the male and female, or by the action of the male generative element, the spermatozoon, on the female element, the ovum, or in the instance of vegetables, on its analogue, the seed; and that offspring without such a congress, whether by buds, germination, or by slips, fissuration, have only a limited power of production, and no internal principle of perpetuity. The cycles of reproduction in animals and also in plants, to use his own words, "commence by the development of an ovum, or a fertile seed, embrace a certain number of generations, and

terminate in the reappearance of truly seminal individuals. No matter how numerous the generations comprised by a cycle may be, all individuals, animal or vegetable, sexual or neutral, which comprise them, are still the direct or indirect product of the same ovum, or the same seed. All therefore are the mediate or immediate offspring of the male and female parents which produced and fecundated the primary germ." The term male and female parent, thus used, imply the male and female sexual apparatus, whether distinct or combined in the same individual.

Different terms have been employed by different authors to express the phenomena of the successive phases of development to which living beings, animal and vegetable, are subject. M. De Quatrefages uses chiefly two, *Geneagenesis*² and *Metamorphosis*; the latter applicable to the alterations which creatures undergo in attaining their mature growth, of which certain insects and batrachians are striking examples, not excepting man himself;—the former applicable to new individuals, the result of gemmation from or division of the parent-being, examples of which are afforded in the marvellous histories of other insects, such as the aphides, and of many of the marine mollusca and radiata. This term, *geneagenesis*, he prefers to that of *parthenogenesis*, invented by Mr. Owen, to express the same organic births; and he gives it the preference inasmuch as in the majority of instances, an ovum, a true ovum, is not concerned in the process; and, also in opposition to Mr. Owen, he considers organic reproduction in all its varieties simply a phenomenon of growth—"the individualisation of a certain portion of the parent." In both these particulars, *i.e.*, in rejecting the term *parthenogenesis* and in the explanation of the non-sexual germ-production, he has adopted very closely the views of Dr. Carpenter, published in this our Review, the volume for 1848-49, to which we beg to refer those of our readers who are specially interested in the subject, and of which our author, as he states, had only a knowledge through the writings of Mr. Owen. To Dr. Carpenter, we think, it must be no small gratification to find that his early conclusions have the approval and the support of so weighty an authority.

Besides what relates to the main subject of this little volume, there is much in it of value incidentally introduced; observations here and there which arrest attention and give rise to thought. Of this kind are his distinctive marks of organic and inorganic nature; the one sexual, the other non-sexual; the one the seat of constant changes, the other in a state of absolute rest; these changes attended, according to him, invariably with

¹ From *γενεά*, and *γένεσις*, literally the reproduction of generations.

loss of weight, or, rather, we would remark, with such a loss in the majority of instances.¹ It is with this latter proposition that he begins his work, and he concludes it, maintaining the doctrine hardly now in favour with our most advanced physiologists, that organization, that vital functions and metamorphoses depend on a special vital force—"a vital vortex." We cannot, we think, do better than transcribe what he advances on this subject. The passage is a good example of his animated style, and should it not have approval, we feel confident that it will have the respectful consideration due to it both on account of the deservedly high reputation of the author, and the great obscurity of the problem, so well indicated by the words with which the quotation ends.

"It (the *vital vortex*) alone enabled us to comprehend metamorphosis; it alone explained the far more complex phenomena of geneagenesis. It is impossible to avoid seeing a fundamental law, and in some measure also an immediate cause of the development and completion of living beings in the exercise of this twofold movement of arrival and departure. Notwithstanding the assertions of some naturalists, who desire to arrest their inquiries at this stage, it is necessary to refer this fact to some higher cause; for matter, which is of itself inert, can only be set in operation by the impulse of some force or agent. Every material operation is at first an *effect* before in its form it becomes a *cause*. What, then, is the agent which is here at work in matter? Shall we, like some physiologists, invoke the six or eight forces admitted by chemists and natural philosophers, in explanation of the phenomenon occurring in inorganic matter? Long ago we gave the following reply to this question.² Yes; in organised beings we find the phenomenon of heat, light, and electricity; chemical affinity and capillary attraction are momentarily manifested, and possibly we may also find in them processes analogous to those of catalysis and epipolism. But these phenomena are accomplished, and these processes carried on, under the influence of a far higher power, whose existence it is in truth impossible to deny. Electricity, heat, and chemical affinity, operate in living beings, and are certainly engaged in the production of the *vital vortex*. Nevertheless they labour only under the control and regulation of a superior force—life, which modifies all brute forces, and causes them to produce muscle and blood instead of ammoniacal salts; bones instead of phosphate of lime; and plants and animals, instead of mere inorganic lifeless masses.

¹ An exceptional case appears to be that of an hybernating animal, the marmot, which, according to the experiments of Professor Sacc of Neufchatel, as reported by MM. Regnault and Reiset, gains weight during its period of winter-sleep, which they account for from the circumstance that whilst torpid more oxygen is consumed than there is carbonic acid formed.

² In my "*Souvenirs d'un Naturaliste*;" and in many articles in the "*Revue des deux Mondes*."

"All force is blind, and must necessarily be directed. In order to produce certain determinate species and not a kindred one, in order to avoid being lost amid the various paths of metamorphosis and geneagenesis, it is requisite that even life itself should be placed beneath the control of something superior. This something is the specific nature of each being—that which each plant and animal has received from its ancestors—through the intermediation of the seed or ovum from which it was produced, and which it will transmit to its descendants by the intermediation of the germs which it gives rise to in its turn. If we could go back for generations and ages we should still find the same questions presenting themselves, and invariably similar facts would give rise to like replies. In order to explain organic nature, it would be necessary to refer to the very origin of all things.

"But here, observation and experiment, those two guides which human science ought never to lose sight of, are absolutely unavailing. The true philosopher feels compelled to pause, lest he should set his foot in a land of hypotheses and conceptions, where it is so easy to wander from the proper path, and where truth itself—supposing it to be attainable—cannot be distinguished by any certain test." (p. 282—4.

REVIEW V.

Statistical, Sanitary, and Medical Reports of the Army Medical Department. Vol. V. For the year 1863. 8vo, pp. 648.

Statistical Report on the Health of the Navy. For the year 1862. 8vo, pp. 316.

THESE reports, published last year, fully sustain the high character of their predecessors in point of interest and instructiveness. As we have more than once had occasion to remark, the large and varied amount of information which they contain on the topographical and geographical prevalence of many diseases, and on the influence of climate, locality, and so forth, as well as on the effects of the observance or neglect of hygienic and sanitary precautions in their development and severity, ought to secure for such volumes the attentive perusal not only of all military and naval medical men, but also of the enlightened physician in civil life. We begin with the army.

The results for 1863 are very satisfactory, as they show the admissions into hospital to have been 100, and the deaths 3·5, per 1000, under the average of the three preceding years, while there has been also a trifling decrease in the proportion