on the effects of the application of stimulants — mechanical, electrical, and chemical — are described. The action of poisons upon jelly-fishes shows a wonderful resemblance to that of the same on higher animals. Many conclusive experiments are given to prove that the fatal effects of transferring medusae from salt to fresh water is not due to a difference in density of the two media. A medusa artificially frozen into a solid block of ice, so that ice-crystals are formed in its body, is not killed by the operation.

The observations on the star-fishes and sea-urchins are recorded in a single chapter; yet they are in many respects as interesting as those on the jelly-fishes in the preceding nine chapters. The author points out the different methods adopted by star-fishes and sea-urchins in righting themselves when turned upon their backs. The 'geometrical regularity' of these animals, in their nervous system as in their form, leads to a "very pretty instance in physiology of the physical principle of the parallelogram of forces." If two stimuli are applied simultaneously at opposite extremities of an axis passing horizontally through a round sea-urchin, the Echinus moves off 'in a direction at right angles' to a line connecting these points.

The author finds, that, by cutting off the eye-spots from several star-fishes and sea-urchins, they do not seek the light thrown into the dish, as is invariably their habit when these organs are intact. He also finds that an excised ray of a star-fish makes its way to the beam of light as if it were an entire animal. A star-fish, with all the eye-spots but one removed, crawls to the light.

Romanes ascribes to the star-fish a sense of smell from the following experiments: a star-fish is kept fasting for several days. A piece of shell-fish is then placed in the tank with the animal. He immediately crawled toward it. "Moreover," says the author, "if a small piece of the food were held in a pair of forceps, and gently withdrawn as the star-fish approached it, the animal could be led about the floor of the tank in any direction, just as a hungry dog could be led about by continually withdrawing from his nose a piece of meat as he continually follows it up." To determine the region of the body where the supposed sense of smell is located, the experimenter removed the eye-spots, and the hungry star-fish moved in the direction of its food. He varnished the whole upper (aboral) surface of the body, and still the acuteness of the sense was not diminished. He concludes that the sense is not localized, except that it is "distributed over the whole of the ventral or lower surface of the animal."

These last-mentioned experiments can be easily tested by any one without elaborate apparatus. Certainly one great value of all the experiments is their great simplicity; and the book has this strong recommendation to contribute to make it, what the author expresses a wish that it should be, a "book of service to the working physiologist."

The work of Romanes is certainly one of the most valuable contributions to the physiology of the primitive nervous system which have been published, and it is the only book on this subject which has yet appeared in America. Yet, much as there is to praise in this book, there are several statements which an anatomist cannot accept; but these do not detract from the excellence of the work, as far as the main questions are concerned.

MINOR BOOK NOTICES.

PROFESSOR JOHNSON'S little book on curve-tracing is more clearly arranged than Frost's treatise, and seems much better suited to the wants of readers who need only a general knowledge of methods, and do not wish to go into refinements of approximation which they may seldom or never have occasion to use. Students rarely think it worth while to spend much time in curve-tracing after they have once acquired a little knowledge of analytic geometry; but every man who means to devote his attention specially to mathematics needs to have some facility in interpreting equations geometrically, and this he can best get by studying some such book as the present one. Professor Johnson treats the analytical triangle in a way which will recommend itself, we feel sure, to mathematicians, and introduces it so early that a person who has time for no more can read the first half of the book to advantage. In a few instances the addition of a short clause would make clear sentences which are now rather obscure.

Pettit's little book gives in a concise form a brief account of nearly all the more important

Curve-tracing in cartesian co-ordinates. By WILLIAM WOOLSEY JOHNSON, professor of mathematics at the U. S. naval academy. New York, *Wiley*, 1884. 6+86 p. 16°.

Modern reproductive graphic processes. JAMES S. PETTIT. New York, *Van Nostrand*, 1884. (Van Nostrand sc. ser., No. 76.) 4+127 p. 16°.

Comparative physiology and psychology. A discussion of the evolution and relations of the mind and body of man and animals. By S. V. CLEVENGER, M.D. Chicago, *Jansen, McClurg, & Co.*, 1885. 6+247+10 p. 8°.

Elements of zoölogy. By C. F. HOLDER and J. B. HOLDER, M.D. New York, *Appleton*, 1884. (Appleton's sc. text-books.) 10+385 p., illustr. 8°.

modern methods of illustration. Its purpose is to give a general popular knowledge of these processes, rather than to give those explicit directions which would enable one to carry them out in practice. In one or two places the description is not quite clear, as in the account of Mr. Eckstein's process, on p. 45. Again: under 'Instantaneous photography,' the statement of some of the optical phenomena is incorrect. But, with these trifling exceptions, the book is an admirable one, and well adapted, in connection with a course of lectures, to serve as a text-book in our colleges and high schools.

In the preface to Clevenger's 'Comparative physiology,' the author states that "Faraday, Huxley, and Tyndall, in chemistry, biology, and physics, with the host of workers in nerve phenomena, have afforded the materials for the author's work. Darwin and Spencer have taught him how to make use of them." The book shows that the writer reads widely, and thinks about what he reads. But to publish the quotations which have impressed one, with the ideas they have awakened, even if those ideas are apt and original, is hardly wise. The work contains some careful observations which have a bearing upon the doctrine of evolution; but these are presented in such a fragmentary way, and in such an anxiously defensive tone, that it is difficult to appreciate their force. The defect in the book is owing to a lack of power of analysis and synthesis. It has no method of arrangement, and it has no easy grouping of analogous fact. Some pages read like a series of proverbs, each one complete, but out of relation to all the rest (pp. 125–129): hence it is difficult to become interested, as the attention is not held. If one has worked out a system of philosophy which reconciles all the facts of physiology and psychology, it should be carefully digested and arranged before being placed before the world, and then its acceptance will largely depend upon a style which attracts, and a confident power of persuasion which convinces.

The plan laid down by the Holders in the preface to their 'Elements of zoölogy' is excellent. Each branch, class, and order is to be plainly defined, and its difference from preceding ones shown. Available examples are to be chosen, and the student encouraged to personal investigation. The specimens described are, as far as possible, available. But the first promise is almost entirely disregarded. Indeed, the author seems to have such a fear of classification, that the book is a mass of facts, without any apparent system of arrangement. The descriptions of the lower invertebrate classes are so meagre and unsatisfactory, that it is sometimes impossible to tell exactly what group is intended without reference to the heading of the section, or to the cuts, which are generally excellent. Much less could the average student take any given normal specimen, and, by reference to the text, locate it in its proper class, and find there a clear description of its anatomical structure. Why do nearly all our elementary text-books devote from a third to a fourth of their space to mammals and birds, to the neglect of more available, but rather less familiar groups (e.g., insects), which would furnish an inexhaustible mine of material easily accessible to the student's investigation? The notes on the economic importance of different groups form a new and interesting feature; and the bibliography is excellent, in referring almost altogether to works which should be within reach of every teacher and student.

NOTES AND NEWS.

It is announced that a serious revolt against the Turkish power has arisen in Morocco. Six provinces, or confederated bodies of population, are implicated. The situation is grave, though such matters are not rapidly disposed of in that country. Practically, all that part between the 6th and 7th degrees of west longitude from Paris is to-day independent of the sultan; and the Berâber, indomitable and ferocious, have, both in the north and south, revolted against an authority to which, by the way, they were never entirely submissive. Part of this tribe are mountaineers, like the Kabyles; the rest, equally fierce nomads. Together they can muster twenty or thirty thousand rifles in war-time. Morocco for a long time has contained three large regions which maintained their independence. In the quietest times, only about one-half the area denominated Morocco on the best maps has acknowledged the temporal authority of the sultan. The Berâber, moreover, are the clients and religious adherents of the princely family of Sheik Walad Sidi of Algeria, whose head, long resident in Paris, is now the declared enemy of France, and one of the foremost soldiers of the Sénousian confraternity. From these facts, it is evident that serious consequences might flow from the present disturbances.

—Serpa-Pinto writes from the Mozambique coast, at Port Bocage, that he is about to lead an important scientific expedition into equatorial Africa for Portugal. He will not visit the Kongo, as has been erroneously reported. He will be assisted in astronomical matters by Lieut. Cardozo and Paul Mapp (photographer), a hundred Zulus armed with modern rifles of the best kind, and four hundred porters. His mission is to study the country between the upper