intervals indefinitely small compared to a wave-length of light. This suggestion was worked out by Cauchy between 1830 and 1835, and for a long time was supposed to complete the undulatory theory of light. But during the last few years the theory has undergone a very active critical revision by physicists, prompted by two capital discoveries; namely, the extraordinary relations between the electrical and optical properties of bodies, and the anomalous dispersion of light. Students of physics are well aware that these two discoveries are prompting rapid developments in two distinct lines, — the electro-magnetic and the molecular theories of light.

This book by Dr. Ketteler is a very important contribution to the subject from the stand-point of molecular dynamics, the problems proposed and solved being much the same as those treated by Sir William Thomson in his lectures at Baltimore in 1884. Starting with Sellmeier's paper of 1872, on anomalous dispersion (which establishes certain differential equations closely allied to Bessel's differential equation of the motion of a pendulum in air), the author passes in review the theories of Helmholtz, Meyer, and Lommel, and then develops his own, which differs from the others in its assumptions as to the nature of the reaction of the molecules of matter upon the ether. It is well known that the essential feature of these theories is that the molecules of gross matter have, in general, definite periods of vibration comparable to the periods of light waves, and also (since Sellmeier) that they are subject to a 'damping' effect. As in this treatment the absorption of the medium becomes of equal physical importance with its refractive power, Ketteler proposes to define as the law of dispersion the equation containing complex variables, expressing both the curve of refraction and the curve of absorption.

With this basis, the author derives a law of refraction for transparent bodies and those having a single symmetrical absorption band, which contains only four constants, and which satisfies observations remarkably well. Even for the flint glass for which Langley has given indices corresponding to wave-lengths from 2.36 to 0.34 (i.e., for relative wave-lengths varying from one to seven), the formula seems to be wholly adequate. This must certainly be regarded as a remarkable feat; but, as the author concludes (p. 445) that he has accounted for all the phenomena of light except phosphorescence and fluorescence, this alone does not establish the claim of the book to unqualified praise. It is true that his treatment leads to the accepted solutions of Fresnel for the phenomena of reflection, refraction, and double refraction; but whether the processes are strictly legitimate may perhaps rest under some suspicion, in view of the fact that no one, before him at least, has succeeded in establishing a satisfactory theory for all of these phenomena on the basis of molecular dynamics. Even Sir William Thomson, in the Baltimore lectures, who approaches the problems from a stand-point not unlike that of Ketteler, except that he dispenses with terms involving viscosity as unphilosophical, emphasizes the statement that double refraction does not yield to the method.

It is a curiosity worth noting, that the author's theory explains the enormous dispersion of bisulphide of carbon, not by the great 'dispersive power' as defined by the second constant in Cauchy's equation, but by the exceptionally great wave-length of its absorption band, which is calculated as equal to 0.220.

The discussion of the electro-magnetic theory of light is suggestive, and, did it not demand too much space, some of it might well be quoted. This closes the first part of the book. The second part, of about two hundred pages, is devoted to the discussion of the author's experiments to test his theories: they, of course, largely relate to the phenomena of anomalous dispersion.

THE ROTIFERA.

WE have the pleasure of reviewing a very excellent work, which will be as welcome to the amateur and microscopist as serviceable to the professional zoölogist; for, to judge by the two parts already issued, the monograph of the Rotifera, by Mr. Hudson and Mr. Gosse, will be excellent throughout. The work is to be in two volumes of three parts each, with over thirty double plates, of which nearly all are to be colored. Its aim is to monograph the known species of the class, giving an improved classification, and including such anatomical observations as can be made upon the living specimens.

In accordance with this aim, the first chapter is an outline of the anatomy of the group Brachionus rubens, serving as type of the class; the descriptions, which are clear, being helped out by a plate of fairly good anatomical figures. The chapter is satisfactory, except that Mr. Hudson has indulged in the freak of describing the excretory apparatus, or, as it is often called in view of its homologies, the segmental organs, under the head of 'vascular system.' This is the same surprise to us that it would be to find the kidney

The Rotifera; or, Wheel animalcules. By C. T. HUDSON, assisted by P. H. GOSSE, F.R.S. Parts i. and ii. London, *Longmans*, 1885. 8°.

described under circulatory organs. Perhaps the author meant only that the excretory organ consists of branching tubes or vessels, and is vascular, according to the etymological, though not to the technical, meaning of the word. Odd, too, is his designation of the ciliated funnels as 'vibratile tags.'

Chapter ii. gives a succinct, well-prepared and instructive history of the literature of the subject. Chapter iii. discusses the classification, and, after reviewing the previous systems, advocates a new one, which is more convenient than its predecessors, but, like them, artificial and arbitrary. The new system may stand for the present, but only as a convenient makeshift, pending the establishment of the permanent and natural classification upon a true morphological basis. Chapter iv. is devoted to sketchy notes on the haunts and habits. It concludes the first part.

The second part is entirely concerned with the monograph proper, and deals with the Flosculariadae and Melicertidae. The British species are figured and described with considerable detail, and several new ones are added. Concerning most of them numerous and valuable observations on the anatomy are also recorded, both in word and picture; for the authors have embodied results from their own original investigations so largely as to give their work importance as a contribution to zoölogical knowledge. The foreign species are also described, and in most cases figures of them are reproduced. It results that an urgent need is well met, for it is about quarter of a century since the last general revision of the rotifers was published in Pritchard's 'Infusoria.'

The plates have the figures on quite a large scale, and are partly colored. The drawings represent characteristic appearances, and are instructive. The lithographer has done his work quite, though hardly very, well. The printing of the text is good, and several fonts are so employed as to essentially facilitate the consultation of the pages.

To still further characterize the work, it must be added that the style is simple, direct, and of a distinctively literary quality. It is pleasant to reflect that most English scientific writers avoid both the pompous prolixity of the French and the uncouth cumbrousness of the Germans.

The morphologist will miss much from Hudson and Gosse's treatise, for it is essentially descriptive even when it touches upon anatomical matters. We have found no indication that the authors have considered the affinities of rotifers, nor the remarkable demonstration by Hatschek of the fact that they are the living representatives of the ancestral form common to worms, mollusks, and bryozoans, — the ancestral form which is still preserved to us in veligers, Lovèn's larvae, etc. There can be little question that nearly all bilateral animals, except the Echinodermata, are derived from rotifer-like ancestors. It is this conclusion which renders the investigation of the wheel animalcules so important at present, and which causes régret that Mr. Hudson does not apparently include the morphological significance of the class within his range of study. C. S. MINOT.

PROPER NAMES.

THE subject of proper names, on which we have an extended scientific literature, has so far not had the good fortune to fall into the hands of a writer possessed of both philological training and the talent for making his subject popular. The author of the present work disclaims all pretensions to have produced a philological treatise: indeed, the specialist would very soon remark, that, for such a task, Dr. Kleinpaul is hardly well enough versed in the principles of the modern school of philologians, if he makes such observations as this one: "Es fragt sich nur ob *sosor* ein *t* eingebüsst oder *schwester* ein *t* eingeschoben hat" (p. 51). *Sosor* (later *soror*) cannot have lost a *t*, because *st* is about the most persistent combination of consonants to be found anywhere, and the *t* is never lost in Latin.

Leaving out of the account a number of 'philological' excursions of this character, which the author might have very well dispensed with, as they have little or no bearing upon the subject, we must admit that Dr. Kleinpaul has produced an extremely readable book, based in its details, in the main, upon the latest and best authorities on etymology, with the exception of a few words where the author adheres to antiquated derivations (cf. *daughter*); while the general treatment and classification of the subject-matter are decidedly interesting and original. The book is not, like some others of similar pretensions, merely a dictionary of curious names, like the puritan What-ever-may-contrive-those-which-are-to-you-contrarious-praise-God Pimpleton, or the aristocratic Von-der-Decken-vom-Himmelreich-zum-Kuhstall, although such are also treated of in their proper places; but it is an attempt at a logical, not a philological, classification of proper names according to their origin; and while, of course, the list of names must necessarily be incomplete, it seems that the author has overlooked no important source from which names for in-

Menschen- und völkernamen. Etymologische streifzüge auf dem gebiete der eigennamen. VON RUDOLF KLEINPAUL. Leipzig, *Reissner*, 1885. 8°.