

cession of improvements by which errors due to colour and indistinctness—the chromatic and spherical aberrations—were removed. In the middle of the century the influence of some eminent botanists, notably of Hugo von Mohl and Nägeli, in perfecting micrometric processes was considerable; whilst the last twenty years have witnessed quite a new departure in the theory of optical images, in that of microscopic vision, in the improvement of optical glass, and in the investigation of the possible limit of the magnifying powers. The most eminent physical authorities—such as Stokes and Lord Rayleigh in England, Helmholtz in Germany—have taken up one or more of these points; but the whole subject is associated with the name of Prof. Ernst Abbe¹ of Jena, who, through his connection with the well-known firm of Carl Zeiss, has been able to put into actual practice many of the suggestions which resulted from his theoretical investigations. As the historians of zoology

¹ The labours of Abbe go back to the year 1873. Simultaneously and independently, Helmholtz attacked the theory of microscopical vision and the question of "resolution"—i.e., of the possible limit to the resolving power of any optical arrangement. Airy had attacked the same subject on purely dioptrical lines. Helmholtz and Abbe went a step farther, taking into account the physical nature of light as a wave-motion, subject to interference phenomena, notably those caused by inflection, where objects with very fine markings are concerned. Abbe's methods were for a long time only imperfectly known. The publication, however, of his theories

by Czapski ('Theorie der optischen Instrumente nach Abbe,' Breslau, 1893) made the whole subject better known, and has been followed by two masterly papers by Lord Rayleigh and Prof. Johnstone Stoney in the 42nd vol. of the 'Philos. Mag.' (1896). The latter paper especially gives several interesting examples of the use of recent microscopic appliances and the means of avoiding errors in handling very delicate and minute objects. It seems that the instrument cannot any longer be used without a theoretical knowledge of its optical construction, which enables the observer not only to see, but also to criticise and to interpret.