A CHAPTER IN MICROSCOPY.

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(*Concluded from Page 212.*)

Optical Errors.—Errors of interpretation frequently arise out of certain well-known optical phenomena, and are less easily guarded against, because less expected. "Seeing is believing," says the old saw; but in optics seeing must very frequently be *not* believing. One of these phenomena we have already glanced at in the case of the oil, air and water globules. A very similar case is that of the lacunæ in bone, so long mistaken for opaque radiating solids. Not unlike, also, are the cases of the concavity of the blood-corpuscle, the so-called tubular structure of the human hair, and the so-called hexagonal areolation of the valves of certain *Pleurosigmæ*. One rule may serve as guide here. Carefully alter the focus in the way we have just described. If the portion of the structure under view appears brightest when the distance between the objective and itself is *greatest*, and darkest when that distance is least, it may, with tolerable safety, be concluded that it is a superficial elevation. The rule is, of course, modified if the particular portion of the structure possess a different refractive power from its surroundings; but making allowances for this (any variation in this respect may be detected by altering the direction of the illuminating pencil), the rule may be relied upon with safety. The student may practise upon the eyes of insects, provided they be carefully mounted. We would recommend him to secure a really good specimen of the eye of a beetle (one in our possession, mounted by Mr. J. F. Barnett, of Tottenham, is exquisitely done), human hair mounted dry and in balsam, and a slide of *Pleurosigma formosum*, and to carefully study these under all possible conditions as regards the direction of the illuminating pencil. But, after all, the most perplexing phenomena are those due to diffraction. Perhaps, without plunging into mathematics, we may, in a few words, explain the cause of these phenomena before we attempt to discover a safeguard from their misleading tendencies.

These phenomena appear to have been first noted a little more than two centuries since by Grimaldi, of Bologna, but it is only within modern times that they have been thoroughly investigated. They are due to the fact that a ray of light is, under certain circumstances, inflexed in passing the margin of an object. The phenomena may be easily observed if a diverging pencil of light be permitted to enter a dark room through a narrow aperture, and a knife-edge be held in the path of the pencil just above its point of divergence. The shadow of the object will be split down the centre by a bright line bordered with fringes of colors in harmonic progression; or, a grating of fine wires may be arranged so that no light shall enter the