

sunlight disappear, viz. *Chimæra mirabilis* and *Macrurus æqualis*. Brown, blue, and violet are the principal colours of the abyssal fishes; very often the pupil of the eye is yellow, as in *Chimæra*. But has any eye at all the power of perceiving colours in the abyssal region? Is any other light present there than the light produced by the animals themselves?

In what has been said above I have compared the conditions of light and the colours of animals at various depths, and in every case we have had to acknowledge that there is some connection between the colours of the fauna and the light-intensity in the surrounding water. On the other hand it is in many cases difficult to show that the colours are actually protective colours, and many scientists have relinquished the idea that the colours are protective. The indisputable connection between light-intensity and peculiarities of colouring has been explained as resulting from a purely physiological process of assimilation. An interesting attempt in this direction has been made by Doflein,<sup>1</sup> who says: "In normal life certain gland-shaped organs in the higher decapod crustacea form pigments. The formation of these pigments is influenced by light. Feeble light is sufficient for the formation of red pigment. Under the influence of light and of still unknown processes of assimilation, the red pigment may be transformed into yellow or even into white pigment. Very little is known of the nature of the yellow and white colour substances, which may perhaps arise from a union of the pigment and other constituents of the body of the crustacean, for instance, the lime salts. The blue pigment is derived from the red under the influence of light, and dissolving passes into the tissues where it becomes colourless and disappears, evidently through the chemical processes into which it enters. The destruction of blue pigment occurs also under the influence of light, this substance thus being of a temporary nature, visible only when produced in great quantities, but under other conditions destroyed as soon as formed. This would explain the presence of red pigment in crustaceans living in deep water, and the lack of pigment in many pelagic crustacea, as well as the blue colours of oceanic forms. In the surface layers of the ocean the formation and destruction of pigment, under the influence of light, are in equilibrium. Small quantities of pigment indeed prove to be present in nearly transparent forms, but in the

Pigmentation  
a physiological  
process.

<sup>1</sup> F. Doflein, "Lebensgewohnheiten und Anpassungen bei Decapoden Krebsen," *Festschrift für Richard Hertwig*, Bd. iii., Jena, 1910.