The penetration of light into the sea.

When the sun's rays fall on the surface of the sea, some of them are reflected, and the rest penetrate into the water, though in a somewhat altered direction. The direction is not much altered when the sun is high in the heavens, as at noon in the tropics. When the sun is just above the horizon its rays are most strongly deflected, the few rays penetrating into the water forming an angle of about 42° with the surface. As the sun rises and the light becomes more intense, the deflection from the course in the air gradually decreases, so that the rays do not penetrate so deep as might be expected, even if the angle with the surface increases. When the sun is 60° above the horizon, the refraction in the water is about 8°, the angle between the surface and the penetrating rays then being about 68°, and when the sun is at its zenith, the rays are not bent at all, but proceed perpendicularly into the water.

Absorption of light rays.

The rays making their way into the water are, however, gradually absorbed, some quickly, others more slowly, according to the wave-length of the ray and the limpidity of the water. The sun's light, of course, consists of many different kinds of rays: the dark heat-rays, imperceptible to the eye, lie beyond the red end of the spectrum, and are therefore called ultra-red rays; then comes the visible spectrum with the colours in the well-known order—red, orange, yellow, green, blue, indigo, and violet; beyond the violet end are the ultra-violet rays, remarkable for their chemical action, but having no effect on our senses. These different rays are refracted and absorbed in different degrees. The red rays are refracted somewhat less than the blue and violet rays, and are much more quickly absorbed. The dark heat-rays are absorbed in the very uppermost water-layers. The light rays also convey some heat, and they penetrate deeper before disappearing—the deeper the nearer the blue end of the spectrum is approached. Light at a certain depth in the sea has not the same composition as on the surface of the earth, there being fewer of the red rays and more of the blue, which proportion becomes gradually more pronounced with increasing depth.

Intensity of light at different depths.

Attempts have been made to determine the intensity of the light at different depths, especially in the Mediterranean, by means of the action of the rays on photographic plates. Ordinary plates are most influenced by the rays at the blue end of the spectrum, and by the ultra-violet rays, and only slightly by the red.

Fol and Sarasin.

Fol and Sarasin, working off the Riviera, traced an effect on the plate as far down as between 465 and 480