distribution. On one occasion in the Western Pacific a dozen of each of these species were separated out by means of pipettes and put into separate globes of pure filtered sea water. In the evening, when the water was disturbed, about a dozen spots of very brilliant phosphorescence were observed in each of the globes; no difference could be observed in the light from the two species. They ceased to give out light when disturbed three or four times in succession, but after an hour's rest light was given off as brilliantly as at first."[1]

Coccospheres and Rhabdospheres.—The nature of these organisms is very obscure, as from their minute size accurate observations are extremely difficult. They are abundant in all surface and subsurface waters of tropical and subtropical regions away from the influence of coast waters, and are most frequently observed entangled in the protoplasmic matter of pelagic Foraminifera and Radiolarians, in the stomachs of *Salpæ*, of Crustaceans, and other pelagic animals; they can, however, with difficulty be collected floating free in the water. They were not observed in the Southern Ocean south of the latitude of Kerguelen, nor were their broken down parts found in the deposits south of that latitude. Rhabdospheres are almost exclusively met with in water above a temperature of 65°, while Coccospheres are frequently found in water as low as 45°; indeed the Coccospheres are larger and more numerous outside of the tropics. Rhabdospheres are never

FIG. 339.—A Coccosphere; 1000 times the natural size.

[1] Mr. J. T. Cunningham says :—"The specimens of *Pyrocystis noctiluca* preserved in glycerin were mostly collapsed, the membrane or outer capsule being wrinkled, but on the addition of water they at once became spherical. Addition of iodine dissolved in potassium iodide on a slide produces no effect either on the membrane or cell contents beyond tinging them slightly yellow. When a drop of sulphuric acid has been added previously, dilute iodine solution produces a very marked effect; a number of the cells become a beautiful deep transparent blue, but some become reddish purple. Occasionally one specimen is partly blue and partly purple. When strong sulphuric acid is added to some specimens on a slide, they remain unchanged for some time, then gradually the membrane becomes thinner and to a great extent is dissolved away. Even after twenty-four hours there was left a residue of the membrane very small in quantity, retaining to a slight extent the shape of the membrane, and consisting of very minute granules. After boiling a large number of specimens in a watch-glass with nitric acid for some minutes I could find no residue at all of any kind. When burned on platinum each specimen leaves a circular stain.

"As compared with the capsule of *Ceratium*, the membrane behaves under the influence of iodine in exactly the same way, but it resists to a much greater degree the action of strong sulphuric acid. The capsule of *Ceratium* in the acid breaks up into pieces and disappears in less than a minute. The complete disappearance of the membrane of *Pyrocystis* in boiling nitric acid makes it improbable that there is any silica present; if there be any it must be in very small quantity; it certainly does not form a continuous skeleton. It is most probable that the membrane is composed of a peculiarly resistant form of cellulose, closely similar to the modification which forms the capsule in *Ceratium*."