area covered by the storm, several thousand birds must have been killed or injured.

A few birds were apparently injured through the nervous system, as several of these birds were brought into the laboratory alive and with no visible anatomical injury, but yet were absolutely unable to fly or run. While some of these birds, notably a Virginia cardinal, seemed to recover to the extent of eating normally, they apparently never regained their power of flight, although kept for some little time.

An interesting note in respect to the scarlet tanagers is the fact that the captive birds seemed to adjust themselves to their environment within a cage very readily and quite completely, behaving like cage-raised birds almost from the start of their captivity.

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ON THE STRUCTURE OF THE ANTHOCEROS PLASTID IN REFLECTED LIGHT

IN a number of recent papers the writer[1] has spoken of the living plastid as being composed of a more or less visually homogeneous chlorophyll impregnated cytoplasm in which there appeared one or more starch-containing cavities. In addition it seemed possible from Zirkle's[2] account of plastid structure that a system of canals might be present. No attempt has been made to understand the submicroscopic structure of the plastid cytoplasm or the chlorophyll-cytoplasm relationship.

The fixed plastid may appear as a honeycomb structure[3] or it may be transversed by definite and regular plates.[1] More usually it appears as a homogeneous cytoplasm in which starch grains and pyrenoids are embedded.[4]

Due to the appearance of the living plastid and to the more common appearance of the fixed plastid it was concluded that the platework structure was an artifact in the sense that fixation brought into prominence a structure not visible in the living cell. Since, however, in many cases of apparently good fixation this platework is an extremely regular structure it was concluded that it must represent surfaces of physiological activity.

Through the kindness of the Leitz Company I have recently been enabled to study the appearance of the anthoceros plastid with the reflected light of the ultropak. My study has of necessity been rather superficial but it nevertheless has yielded certain results which because of their bearing on the nature of plastid structure seem worthy of publication. It has further clearly demonstrated the need of examining material by reflected as well as transmitted light before attempting to definitely decide upon the structure of living bodies. It is hoped that laboratories equipped with the ultropak may in the near future undertake studies upon living material.

Two rather different but interlocking appearances of the same anthoceros plastid may be obtained with the ultropak depending to a certain extent upon the shadows cast by the metal disks interposed between the light source and the objective. The plastid may appear as an aggregate of green vesicles. If one adds to the preparation an alcoholic solution of iodine the vesicular appearance disappears. The plastid now seems to be a homogeneous mass of differentiated cytoplasm in which blue staining starch grains may be observed. Apparently each one of the vesicles of the living plastid is a starch grain surrounded by its own mass of starch-elaborating, chlorophyll-impregnated cytoplasm.

With other shadows cast by rotating the metal disk the spaces separating the vesicles become the more prominent structure in the plastid. We now have what appears to be homogeneous green mass, in which one clearly distinguishes narrow canals or plates of some darker green substance marking out regular patterns in the lighter green ground cytoplasm. The picture thus obtained coincides well with the fixed and osmicated haematoxylin stained platework.

In the center of many plastids the region of pyrenoids is clearly visible. In some this region is quite filled with something, in others it appears quite empty, while still other plastids show regions of bright spots not at all understood.

Not considering the pyrenoid region, it appears that the starch-containing region of the anthoceros plastid is composed of starch grains surrounded by their own individual mass of chlorophyll impregnated cytoplasm. These individual vesicles are separated from each other by a space of cytoplasm apparently differentiated from that surrounding the starch grain. We may define the anthoceros plastid as a localized region of chlorophyll impregnated cytoplasm, in which small vesicles of starch-elaborating cytoplasm are separated from each other by regions of yet differently formed cytoplasm.

Just what influence this concept of the plastid will have upon the writer's ideas of the similarity between the plastid and the golgi zone is as yet too early to say. Some recent personal communications with Dr. Severinghaus may, however, be of interest. It seems that from the work of Bowen, Nassonov and Severinghaus the animal secretion may arise in little vesicles of cytoplasm so differentiated from the remainder of the cell that it reduces the osmium tetroxide. If this

1 T. E. Weier, *Biol. Bull.*, 62: 126–139; *Am. Jour. Bot.*, 19: 659–672, 1932.

2 C. Zirkle, *Am. Jour. Bot.*, 13: 301–341, 1926.

3 B. M. Davis, *Bot. Gaz.*, 28: 29–109, 1899.

4 McAllister, *Am. Jour. Bot.*, 14: 246–257, 1927; R. A. Harper, personal communication.

be true the correspondence of plastid and golgi region would be even closer than at present supposed.

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ON THE GENERA CTENOGOBIUS AND RHINOGOBIUS GILL, TUKUGOBIUS HERRE, AND DROMBUS JORDAN AND SEALE

ON my trip to the Philippines in 1931 I obtained 997 species of fishes, a wonderful testimonial to the richness of aquatic life in the waters of that favored group of islands. In studying such a large number of species it was necessary to reexamine closely numerous genera; this was especially true in studying the 88 species of gobioid fishes secured.

In 1858 Gill imperfectly defined the genus *Ctenogobius* from a Trinidad species and there has never been a satisfactory limitation of the genus since. The latest characterization by Koumans in 1932 is the best yet written, but is too inclusive and overlooks important characters.

In 1859 Gill described *Rhinogobius similis* from Japan, but he never published a description of the genus. Ever since authors have confused *Ctenogobius* and *Rhinogobius,* although an examination of the type species will show good generic differences.

In 1927 I described *Tukugobius* from the Philippines, largely on the character of the ventrals.

Recently I have examined a large series of *Rhinogobius similis* Gill, from Japan, and the related species from Japan and Formosa, and have compared them with the three species of *Tukugobius* described by me from Luzon. They are all very closely related and are all evidently true *Rhinogobius.* In all of them the ventrals are very short, forming a nearly circular powerful adhesive disk, with a characteristic thick bilobed or deeply crenate frenum. They are very much like the ventrals of the genus *Sicyopterus* and closely related genera of the *Sicydiini,* except that they are free and not adherent to the belly, as in *Sicyopterus.*

Tukugobius Herre is therefore an exact synonym of *Rhinogobius* Gill.

Ctenogobius Gill has the ventrals of the ordinary goby type, and we may refer to it most of the species given by authors under *Rhinogobius,* which have a truncate or emarginate tongue and naked opercles and cheeks.

In 1905 Jordan and Seale created the genus *Drombus* to receive a new Philippine goby, but their generic distinction was not well drawn. It is, however, a valid genus, distinguished chiefly by having 6 to 9 rows of teeth in each jaw, and having the nape scaled to the eyes.

Rhinogobius, Ctenogobius and *Acentrogobius* have been used as dumping grounds and more or less interchangeably for divers sorts of gobies. By limiting the name *Rhinogobius* to those gobies agreeing with *Rhinogobius similis* in the peculiar formation of their ventrals we can eliminate at least a part of the confusion. If gobies were two feet long, Dr. Jordan once said, they would be well known. As it is, few people are willing to scrutinize them closely enough to work out their real similarities and differences.

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BIOLOGY AND THE PRINCIPLE OF REPRODUCIBILITY

IF a discipline is a science, *i.e.,* if the phenomena which it considers may be treated logically by the scientific method of experimentation, prediction and confirmation by further experiment, these phenomena must be reproducible. That is, if two undisturbed systems of the type being considered are at any time identical, they must remain identical through all time, or until one of them is disturbed. Furthermore, there must be a correlation between systems displaced with respect to each other in time. If system A at time t_1 is identical with system B at time t_2, then system A at a later time $(t_1 + T)$ must be identical with system B at time $(t_2 + T)$.

The phenomena of the inorganic world are reproducible in this sense, although the results of simultaneous identical experiments on identical systems are not necessarily identical. The famous indetermination principle of Heisenberg states that, if a great number of identical systems be divided into two groups, then the results of simultaneous measurement of a certain quantity on each member of a group will be distributed about a mean value: this mean and the distribution will be identical for the two groups. It states further certain relations between the widths of the distributions arising from the measurement of certain pairs of quantities. The actual uncertainty in the result of a single observation is appreciable only for systems of molecular dimensions, and in macroscopic systems the reproducibility is of the rigid type known as causality. It is well to remember, however, that an uncertainty of this type is only a necessary, and not a sufficient, condition for inferring supernatural intervention.

It is obviously of prime importance to know whether biological phenomena are reproducible. The answer of the uncompromising vitalist is "No!", the uncompromising mechanist answers "Yes: Causally so." Adherence to the extreme vitalistic view-point makes the scientific study of biology logically impossible, since the course of an event observed in the past