A consideration of the growth processes and growth rates of reef-forming organisms will do much to give us a realization that there truly has been order and constancy in the development of reefs and other structures during the past ages.

To many people the term "coral" means only a piece of rock of a particular shape, or an ornament which has been fashioned from a piece of coral skeleton. Actually a coral animal is a small, cylindrical living creature, similar to a sea anemone. An individual coral animal is usually called a "coral polyp." It lives in a small cup of calcium carbonate skeletal material which it forms for its protection. Small arm-like structures called tentacles extend out to, or beyond, the rim of the cup to bring in food. The process by which the skeletal cups are formed is called "secretion," and involves the removal of calcium ions and carbonate ions from the sea water, to form the hard calcium carbonate. The mineral ions are first taken into the cells of the animal, and then secreted to the exterior, where the mineral hardens to form the cup and the base underneath it. Most kinds of coral are colonial in growth habit. That is, the coral polyps grow together in groups, cementing their skeletal cups one to another to form a solid mass. (See Figures 4 and 5 for photographs of living and fossil coral colonies.)

There have been several careful, systematic studies of the growth rates of reef-forming corals in various parts of the world within the past sixty years. One of the most recent of these is the study by J. E. Hoffmeister and his associates off the coast of Florida.[4] Hoffmeister made careful observations on the growth rate of the most dominant reef-building coral in the Florida-Bahama area, Montastrea annularis,[5] by marking many specimens in their under-water habitats, and then observing and measuring them over a period of years. The rate of growth of course varies somewhat, just as the growth rate of larger animals varies within the limits of the governing physical laws, which can not be violated. The fastest growth rate of these corals which Hoffmeister and his associates found was 10.7 millimeters (about two-fifths of an inch) per year in height.[6] This would produce one foot of coral rock in 28.5 years if its growth were not interrupted or slowed down. However, there are numerous influences which directly interfere with the growth processes of the coral animals. Some of these factors as observed by A. G. Mayor during a four-year Carnegie expedition to the Samoan Islands were: (a) silt and mud washing over and smothering coral colonies, (b) high temperatures due to hot sun during low tides, (c) drenching tropical rains which not only smothered and killed many coral colonies by the resulting mud, but diluted the sea water to such a low salt content that the coral polyps could no longer live in it.[7]

At this point we will consider some other examples of the fastest--and also average--growth rates of reef-building corals, as observed in various waters. There is a fundamental difference in the growth rates of the non-branching ("massive") corals, and those of the kinds that are highly branched. The polyps of some kinds, for example the members of Genus Acropora, arrange themselves on the colony in such a way that the skeleton of the colony will be a highly branched,