But, if this objection be received, it is then plain that there is not the slightest reason for preferring any monograph executed with "strict regard for the rules of botanical nomenclature and the type concept" to the usual supposedly imperfect texts by which priority is determined.

Behind Wheeler's proposal clearly stands the tacit assumption that modern perfection can take the place of age-old weakness, modern *names* thus having to be riveted upon the planks of history *per omnia saecula.* Behind this proposal also stands the belief that we can do something *to-day* that will last forever with slight probability of change. It is manifest that these assumptions disregard the historic and psychological angle under which science must be considered in any broad view of its needs and possibilities. These assumptions will elicit a smile on the lips of generations unborn which will wonder how it could ever come to the mind of somebody in 1939 that all that had been done before that year was neither perfect nor absolute.

Against hopes and attempts to seek certainty in science, be this certainty and its attending stability in the field *of concepts or of names,* must be stated aloud the truth that science is knowledge in organized evolution and part of man's live experience. As such, science must be accepted together with its attending evils and imperfection, everything about it being borne with patience and forbearance and—even more—with a mind open to the light that from time to time shines upon the path of the persistent inquirer.

Wheeler's preoccupation with stability is interesting as the symptom of a whole state of mind, which is much apparent to-day in the field of general botany. An almost morbid and ecstatic faith is being placed to-day in any formula, proposal or school of thought that promises "certainty" and assures of "stability." The success of the "typological approach" to morphology and to phylogeny in our midst is conditioned by this faith. It leads, as one would expect, to all the errors which always accompany a mystic and semi-religious approach to problems of knowledge.

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THE RATE OF SEASONAL DEPOSITION OF PEARL ARAGONITE

ALTHOUGH the formation of pearls represents an exceedingly interesting example of periodic biological function, analogous to the annual rings in trees, it has received little scientific attention. Except for a few restricted cases, not even the rate of growth of molluscs has been extensively investigated.[1]

As a result of the writer's study, made in connection with the work of the Bureau of Natural Pearl Information, it was found that a number of natural pearls, when thin-sectioned, showed groups of laminae which are believed to represent seasonal growth. The data presented herein have been interpreted on that supposition. Between the major growth rings it is possible also to discern still other rings, of faint outline, which probably represent evidence of minor physiological changes that had taken place within the seasonal growth period.[2]

Two natural pearls in particular yielded valuable growth information. One, a fresh-water pearl of 6.12-grain weight, on thin-sectioning revealed measurements of the following order:

1st	year's	growth	2.30 millimeters
2d	"	"	0.38 "
3d	"	"	0.46 "
4th	"	"	0.27 "
5th	"	"	0.35 "
6th	"	"	0.32 "
Partial 7th	"	"	0.04 "

An annual average growth rate, after the first year and exclusive of the partial seventh, is 0.357 millimeter.

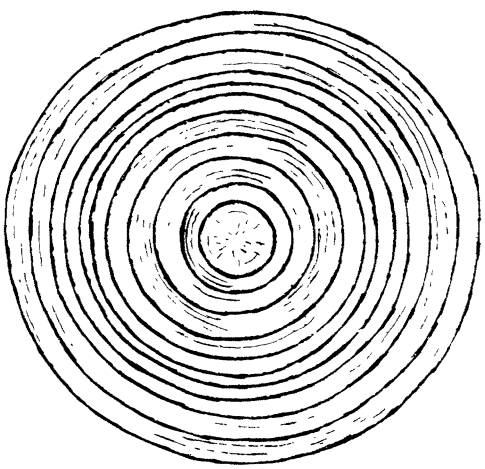

FIG. 1. Cross-section of a natural pearl, *M. margaritifera* (?), showing seasonal growth rings (x 14).

The second pearl, of 3-grain weight, which had been taken from *Margaritifera margaritifera* (?), disclosed eleven seasonal growth rings on thin-sectioning (Fig. 1). The growth measurements on this specimen were found to be as follows:

1st	year's	growth	1.60 millimeters
2d	"	"	0.18 "
3d	"	"	0.18 "
4th	"	"	0.18 "
5th	"	"	0.13 "
6th	"	"	0.14 "

[1] F. W. Weymouth, *Bull. Calif. Fish and Game Comm.,* 7: 120, 1923.

[2] A. E. Alexander, *Sci. Am.,* 160: 4, 228–229, 1939.

7th	"	"	0.15	"
8th	"	"	0.21	"
9th	"	"	0.12	"
10th	"	"	0.15	"
11th	"	"	0.15	"

The annual average growth after the first year is 0.159 millimeter. This particular natural pearl possessed almost perfect crystalline structure, both in the radial arrangement of the aragonite and in the concentric arrangement of the growth rings. This kind of pearl is not to be confused with the true oriental gem of commerce, and more properly should be classed as a calcareous concretion.

It should be kept in mind that the temperature of the water, the state of health and age of the mussel or mollusc, as well as the mineral content of the water, are but a few of the factors that determine how much calcium carbonate will be deposited and over what length of time. Also, the kind of irritant that initiated the secretion of aragonite is certainly another significant factor, because a sharp object of either organic or inorganic origin will most assuredly result in the rapid formation of mineral matter of a thickness that is commensurate with the degree of irritation originally set up within the pearl-oyster.[3]

In conclusion, it should be pointed out that many natural pearls, of either salt- or fresh-water origin, display no evidence of growth rings whatever. All the laminae of sub-microscopic thinness literally fuse into one another throughout the whole gem. This fact is not necessarily evidence of continual deposition; but perhaps represents ideal conditions of environment, coupled with perfect health on the part of the mussel or mollusc.

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THE "SMUT" DISEASE OF GLADIOLUS

WE have recently been asked to investigate a core-rot disease of gladiolus corms. The somewhat dry brown rot extends from the base of the corm upwards and may follow laterally the vascular strands to the surface, ending in dark-brown sunken lesions. Moore[1] studied a similar disease in England and believed it to be caused by a species of *Botrytis*. Nelson[2] has also described a core-rot disease in Michigan. He attributes the disease to a species of *Fusarium*.

Among the fungi found associated with this core-rot disease in New York was one that we first thought to be *Urocystis gladioli*, the organism regarded as the cause of gladiolus smut. Wernham[3] has recently reported the first occurrence of gladiolus smut in the United States. He cultured the fungus isolated and observed that it could mature spore-balls readily in culture and that it was similar to *Urocystis cepulae* in the method of germination of the cells of the spore-balls. He, therefore, considered it to be a true *Urocystis*, probably *U. gladioli*. His figures would certainly suggest, however, that his fungus is a species of the form genus *Papulaspora*.

Smith,[4] who originally described *Urocystis gladioli*, questioned, among other things, whether the fungus might not be a *Papulaspora*. He decided, however, that it must be a *Urocystis*, especially as Brefeld and Magnus, who examined his preparations, said that they believed the spore-balls belonged to a *Urocystis*. All those who have reported the fungus subsequently have also accepted this view, although Liro[5] would place it in the smut genus *Tubercinia*.

In our cultures the bulbils or spore-balls, which are identical in appearance to those figured by Smith and by Wernham, are produced in abundance within a week's time. They are borne on lateral branches of the hyphae and originate from close spirals. The mycelial characters indicate very much an ascomycetous connection. In germination, the cells of the spore-balls send out hyphae directly, no intervening structure being formed which can be interpreted as a promycelium. On the corms masses of bulbils may develop superficially from a mat of mycelium which is sometimes found extending over the diseased areas; in no case, as was also noticed by Smith, were they found to be enclosed in a definite sorus membrane so characteristic of smuts. Furthermore, no one has proved by adequate inoculation experiments that the fungus previously called *Urocystis gladioli* can produce a smut disease.

In view of these facts, it is evident that further work on this organism occasionally found in connection with diseased gladiolus corms is urgently needed. Further studies of core rot will be reported elsewhere.

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OCCURRENCE OF THE ORIENTAL RAT FLEA IN COLUMBUS, OHIO

THE oriental rat flea, *Xenopsylla cheopis* (Rothschild), is the most important species occurring in our fauna, due to its medical importance as a transmitter of bubonic plague and endemic typhus. Considerable attention has been given to its distribution and abundance in the United States. Originally found only in seaport cities, it is now known to occur in the interior of the country, having been reported from several of

[3] A. E. Alexander, *Am. Jour. Sci.*, 237: 920–922, 1939.
[1] *Min. Agric. Fish., London*, 117: 113–116, 1939.
[2] *Mich. Agr. Exp. Sta. Bull.* 149: 43–46, 1937.
[3] *Phytopath.*, 28: 598–600, 1938.
[4] *Gard. Chron.*, 40: 420–422, 1876.
[5] *Ann. Univ. Fennic. Aboens.* A.1: 1–153, 1922.