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.

the Central States. At the present time it has been reported to be permanently established only at Ames, Iowa.[1]

Up to the present, the only record of this flea in Ohio is based on several specimens collected in Youngstown, reported by Ewing and Fox (1938).[2] Apparently no other infestation has been reported in the state.

In the winter and spring of 1940, several hundred specimens were collected from a feed box in the basement of the Botany and Zoology building at the Ohio State University. The fleas were apparently coming in with the feed, which was procured from the University Farm, located across the river from the campus.

In the fall of 1940, an examination was made of 25 rats which were caught in the residential section of Columbus in the vicinity of the university campus. Fifty-one specimens of *Xenopsylla cheopis* were recovered from 18 rats, varying from one to six per rat. No other species of fleas were encountered. This information would seem to indicate that the oriental rat flea is probably established in Columbus.

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SCIENTIFIC BOOKS

MATHEMATICAL ANALYSIS

A Course of Analysis. By E. G. PHILLIPS. viii + 361 pp. Cambridge: the University Press. 1939. $4.00.

THIS text is an introduction to mathematical analysis based on the author's lectures to honors students in mathematics at the University College of North Wales. The reader is assumed to possess a working knowledge of the calculus, and the present treatment provides precise arithmetic definitions of most of the basic concepts, and a rigorous justification for many of the processes of the differential and integral calculus as applied to the functions of one or more real variables.

Of the included topics, besides those to be expected from their appearance in elementary calculus, the following deserve special mention. The discussion of the number system is preceded by a brief outline of Russell's definition of number based on logical notions. A well-written chapter on inequalities includes that of Jensen, as well as those of Hölder and Minkowski and a proof which illustrates the notion of "a best possible constant." Functions of bounded variation are discussed in connection with the rectifiability of plane curves.

Complex numbers are defined, and the possibility of extending a few results to them is mentioned. However, the author makes no attempt at any systematic treatment of complex values, not even defining $\sin z$. The limitation to real values seriously handicaps him in the treatment of Taylor's series and necessitates the omission of the justification for several expansions in Taylor's series which occur in the examples.

Definitions of the elementary functions for real values are given. That of $\log x$ and e^x in Chapter X is based on integration, while that of $\sin x$ and $\cos x$ in Chapter XII is based on power series. To provide enriched illustrations at an earlier stage, the author summarizes the properties in Chapter IV, referring ahead for the proofs, and stating that these functions will not be used in any general theorems forming the foundation of analysis.

For the most part, the author sets himself and maintains a high standard of precision but the reviewer noticed a few exceptions. On page 72 and elsewhere in uniformity arguments he seems to imply that the $\eta(\varepsilon)$ such that $|f(x') - f(x)| < \varepsilon$ if $|x' - x| \leqq \eta$ is uniquely defined. Again, several of the statements in section 4.2 on infinitesimals require revision. Finally in the theorem on functional dependence on p. 267 the conclusion that the functional relation is the same for all values is erroneous, as Bôcher pointed out.

In a few cases the statements of theorems are likely to mislead a beginner who fails to read carefully the notes in fine print interpreting them, as on pages 73 and 292.

The author's style is concise, and there are very few misprints.

The book provides an additional not too formidable reference for the student making his first acquaintance with rigor in analysis.

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THE ENDOCRINE FUNCTION OF IODINE

Endocrine Function of Iodine. By WILLIAM T. SALTER. Pp. xviii + 351. Cambridge, Mass.: Harvard University Press. 1940. $3.50.

THE text is divided into eleven chapters as follows: 1. Iodine balance and endocrine balance; 2. Iodine stores in body tissues; 3. Iodine compounds of biological importance; 4. Circulating iodine; 5. Thyroid activity; 6. Endocrine balance; 7. Iodine and the pituitary-ovarian axis; 8. Neurological influence; 9. Iodine balance; 10. Radioactive iodine; 11. Clinical problems. Eighty-five tables and charts are incorporated in the text.

The value of several of the chapters, particularly 2, 4, 7 and 9, depends on the critical analysis and evaluation of data obtained largely by microchemical methods for iodine estimations. These data in turn are dependent upon the accuracy of the methods used. The author is fully aware of the shortcomings of the best

[1] R. L. Roudabush, SCIENCE, 89: 79, 1939.

[2] H. E. Ewing and I. Fox, SCIENCE, 88: 427, 1938.