Brooks, Dunn; Hopkins: Sonneborn; Illinois: Ackert; Iowa State College: Irwin; Michigan: Okkelberg; Pennsylvania: McIndoo; Princeton: Butler; Stanford: Irving; Washington (St. Louis): Schmidt, F. O.; Berlin: Mayr; Freiberg: Hamburger; Geneva: Schotte; Paris: Ephrussi; Tokyo: Kudo. (No Ph.D., 4.)

Collegiate:

Cornell: Adelmann, Gordon, Schmidt; Amherst: Young; Bates: Pollister; Bowdoin: Irving; Chicago: Park; Columbia: Tyler; Emory: Kirby; Fairmount: Beams; Haverford: Dunn; Hopkins: Sonneborn; Illinois: Ackert; Indiana: Kennedy, McIndoo; Iowa State College: Irwin; Massachusetts College: Brooks; Michigan: Barth; Minnesota: Okkelberg; Missouri: Hibbard; Ohio (Athens): Buchanan; Ohio Wesleyan: Turner; Nebraska: Beadle; New York City College: Friedmann; Park: Light; Stanford: Dice, Ferris; Syracuse: Butler; Washington (St. Louis): Schmidt, F. O.; Wisconsin: Boyden; Germany: Hamburg, Mayr; other foreign 3; no college reported 2.

Birthplaces:

New England 2, New York 4, Pennsylvania 2, New Jersey 1, Illinois 4, Indiana 2, Iowa 1, Kansas 3, Michigan 1, Minnesota 1, Missouri 1, Nebraska 1, Ohio 2, Wisconsin 1, Maryland 1, Virginia 1, Georgia 1, Canada 1, Russia 3, Germany 2, Japan 2.

ZOOLOGISTS STARRED 1932–1944

Distribution:

Columbia 7, Stanford 6, California 5, Michigan 5, Chicago 4, Harvard 4, Rochester 4, Cornell 3, Northwestern 3, Princeton 3, California Institute of Technology 2, Illinois 2, Indiana 2, Minnesota 2, New York University 2, Oberlin 2, Ohio 2, Yale 2. With 1 each (in addition to those having a man starred in 1943): Clark, Connecticut College, Holyoke, Missouri, Sarah Lawrence, St. Louis, Trinity, Tulane, Western Reserve. Also American Museum of Natural History 3, Carnegie 1, U. S. National Museum 2.

Doctorate:

Harvard 16 (10 in 1932), Columbia 12, Cornell 12, Chicago 9, Illinois 7, California 5, Wisconsin 5, Yale 5, Bryn Mawr 2, Hopkins 3, Michigan 3, Princeton 2, Stanford 2.

Collegiate:

Cornell 8, Stanford 5, Amherst 4, New York City College 4, Chicago 3, Columbia 3, Indiana 3, Missouri 3, Bowdoin 2, Dartmouth 2, George Washington 2, Harvard 2, Illinois 2, Michigan 2, Minnesota 2, Rutgers 2, Syracuse 2; 1 each from about 30 others.

Birthplaces of all starred zoologists:

New England 73, Middle Atlantic States 99, East North Central States 82, West North Central States 47, South Atlantic 22, South Central 6, Mountain States 3, Pacific States 3, Canada 8, Germany 11, Russia 7, Britain 5; other Europe 8.

STEPHEN S. VISHER

INDIANA UNIVERSITY

ERGOSTEROL FROM SOME SPECIES OF PENICILLIUM

IN a recent communication Zook, Oakwood and Whitmore[1] reported the presence of approximately 1 per cent. of ergosterol in the dry mycelium of *Penicillium notatum.*

Data have been collected in our laboratory over a period of time on the ergosterol content of *P. notatum, P. chrysogenum* and *P. citrinum* as cultivated under various conditions. We have found that ergosterol is present only in surface culture material. The ergosterol was determined by spectrographic quantitative analysis and in several instances confirmed by isolation of the sterol, determination of its physical properties and preparation of derivatives.

A *P. notatum* surface culture strain, obtained from penicillin production batches, yielded ergosterol: by direct extraction and isolation, 1.06 to 1.09 per cent. of the dry mold; by spectrographic analysis, 1.10 per cent. The mold in this case had been cultivated on a lactose medium. Cultivation on a starch medium yielded a mycelium containing 1.05 per cent. ergosterol by spectrographic analysis.

A *P. notatum* submerged culture strain, obtained from production batches, yielded no ergosterol by direct extraction, and only traces were indicated spectrographically.

A strain of *P. chrysogenum,* grown as a surface culture, showed 1.0 to 1.1 per cent. of ergosterol.

P. citrinum, the mold which produces citrinin, contained 1.1 to 1.3 per cent. ergosterol as determined by direct isolation.

It will be observed that several species of Penicillium show consistently about 1.1 per cent. ergosterol in the dry mold when cultivated as a surface culture. Submerged fermentation appears to be unfavorable for ergosterol production.

C. J. CAVALLITO

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SOLUTION OF THE CUBIC EQUATION

IN view of the many valuable features of the recent "Webster's Biographical Dictionary" (1943) and its wide usefulness in the schools it may be desirable to note here that it fails to give due credit to H. Cardan in regard to the progress in the solution of the general cubic equation as developed in his noted "Ars Magna" (1545). Under the name of Tartaglia in the present work it is said that he is credited with the discovery of the solution of the cubic equation, later published by G. Cardano as his own; and under the name of Cardano it is asserted that he gave as his own the cubic solution which he had obtained from Tartaglia, the discoverer.

[1] Zook, Oakwood and Whitmore, SCIENCE, 99: 427, 1944.

These statements are in accord with the common views in regard to Cardan about twenty years ago and are supported by many references in more recent mathematical text-books. It is, however, easy to verify that they are untrue since Cardan's publications relating to the solution of the cubic equation are still extant and have been extensively quoted in recent literature. In particular, Cardan referred to the work of Tartaglia in his "Ars Magna" as well as to that of an earlier worker along the same line who made substantial contributions. Much earlier steps towards the solution of the cubic equation by the ancient Babylonians were noted by O. Neugebauer in his "Geschichte der Antiken Mathematischen Wissenschaften" (1934).

Both the solution of the general quadratic equation and the solution of the general cubic equation are dependent on the theory of complex numbers and there is no evidence that Tartaglia was familiar with this theory. Hence he could not have solved the general cubic equation in the modern sense of the term. It is also true that H. Cardan could not have solved this equation even if he made slight formal use of complex numbers in his "Ars Magna." The history of the development of the number concept furnishes the key to many other inaccurate assertions in the history of mathematics. It also simplifies this history by uniting many related advances. In particular, the reputation of H. Cardan has greatly improved as a result of recent studies.

G. A. MILLER

UNIVERSITY OF ILLINOIS

IMPROBABILITY AND IMPOSSIBILITY

THE statistical determinism which, around the beginning of the century, replaced the rigid determinism of Laplace, led to the replacement of the word "impossible" by the words "highly improbable." Practically, it is admitted that the two terms convey the same meaning. But only practically. Theoretically, the scientist must always remember that they are not identical, and that such "impossible" feats as the freezing of water on a gas stove, or the spontaneous rise of a brick are conceivably possible, although highly improbable.

Unavoidably, such an attitude affected our philosophical ideas. When Heisenberg introduced his "Principle of Indeterminacy," the old determinism received its death blow and became theoretically defunct. But this theory restored the significance of the word "impossible," with all its force. It was no longer a question of high improbability which affected our complete knowledge of both the speed and the position of an electron. It became a matter of absolute impossibility, owing to the influence of the observation on the phenomenon, which does not enter into play in classical mechanics.

Of course this indetermination affects only sub-atomic particles. But, statistically, it also affects phenomena on our scale of observation, so that it had to be taken into account in wave mechanics. However, on our scale of observation, in our macroscopic world, it is still difficult to think of an observation which would be at the same time practically and theoretically impossible. Yet there is at least one, which can be worded in the following way: "What is the color of the emulsion of an unexposed photographic plate?"

The answer is that we can not know it, and that it will never be experimentally checked.

Naturally it must be borne in mind that this question merely tends to emphasize the parallelism between a sub-atomic and a macroscopic phenomenon, namely, the influence of the observation on the phenomenon and the impossibility of the observation. The writer is well aware that the term "color" involves the sensitivity of the retina and that a substance is devoid of "color" in the dark. Shall we then say that an unexposed photographic film is colorless? But what is the exact meaning of the word "colorless"? Does it qualify only the receptor (the eye) or does it correspond to an actual quality of the object expressing some of the specific properties (absorption, reflection) of the molecules which manifest themselves on our scale of observation by our physiological reaction? We know that electronic rearrangements take place as soon as photons hit the emulsion, and that these changes can be detected by an appropriate chemical treatment. But that is all. And, if nothing more, this simple observation may lead to an accurate definition of the term "colorless."

The writer would be much interested in any comments on this subject.

LECOMTE DU NOÜY

ECOLE DES HAUTES ETUDES, PARIS

DISTRIBUTION OF DUPLICATE PLATES FROM THE DEAN MEMORIAL VOLUME

THE completion of the "Bashford Dean Memorial Volume: Archaic Fishes" has left on my hands considerable numbers of plates left over from making up the various articles in the volume. Desirous of placing these where they will be appreciated and used, I shall be glad to send them gratis to teachers and students of embryology and comparative anatomy who may wish them.

Address requests to:

E. W. GUDGER,

Editor, Dean Memorial Volume

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