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THE MATHEMATICAL WAY OF THINKING[1]

By Dr. HERMANN WEYL

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BY the mathematical way of thinking I mean first that form of reasoning through which mathematics penetrates into the sciences of the external world—physics, chemistry, biology, economics, etc., and even into our everyday thoughts about human affairs, and secondly that form of reasoning which the mathematician, left to himself, applies in his own field. By the mental process of thinking we try to ascertain truth; it is our mind's effort to bring about its own enlightenment by evidence. Hence, just as truth itself and the experience of evidence, it is something fairly uniform and universal in character. Appealing to the light in our innermost self, it is neither reducible to a set of mechanically applicable rules, nor is it divided into watertight compartments like historic, philosophical, mathematical thinking, etc. We mathematicians are no Ku Klux Klan with a secret ritual of thinking. True, nearer the surface there are certain techniques and differences; for instance, the procedures of fact-finding in a courtroom and in a physical laboratory are conspicuously different. However, you should not expect me to describe the mathematical way of thinking much more clearly than one can describe, say, the democratic way of life.

A movement for the reform of the teaching of mathematics, which some decades ago made quite a stir in Germany under the leadership of the great mathematician Felix Klein, adopted the slogan "functional thinking." The important thing which the average educated man should have learned in his mathematics classes, so the reformers claimed, is thinking in terms of *variables and functions.* A function de-

[1] Address delivered at the Bicentennial Celebration Conference of the University of Pennsylvania, September 17, 1940.

may be filled with plaster, wax or fine lead shot. Arrange a permanent black wooden mounting and adjust two screws to run through the plaster body sagitally so as to hold the finished specimen in the position desired. See Fig. B.

Set artificial eyes (beads or glass pin heads) in their depressions on the head of the plaster body. Wash the skin in water. Dry it with paper towels. Slip the skin over the plaster body and sew up the one longitudinal and two cross-slits.

Brad the feet to their proper positions. In life such regions as ears, eyelids and toes are pink, due to the presence of subcutaneous blood vessel distribution. These areas may be tinted lightly with red ink mixed with water to produce the appropriate shade.

Adjust eyelids, nose, ears and feet from time to time until the finished specimen hardens.

Two great advantages of this method aside from its simplicity are, first, that each individual retains its individuality of form and, second, that each specimen may be caused to assume any one of a great variety of possible poses.

CLYDE E. KEELER

WISTAR INSTITUTE

A MICROPHOTOGRAPHIC CAMERA

IN the May 24 issue of SCIENCE[1] Abrahamson described "An Inexpensive Microphotographic Camera." For those interested in making an occasional photomicrograph a very simple method was described and illustrated by Turrell.[2]

The microscope is focused and a cheap vest pocket kodak, fitted with a yellow filter, is placed on the eyepiece, being kept in position by its own weight. Exposure is made with a cable release. If a focusing camera is used the focus should be set for infinity and the lens diaphragm should be wide open. When using a 10× ocular, the image circle does not fill the entire negative area, but it can be enlarged.

CHARLES GOOSMANN

CINCINNATI

AUTOMATIC MERCURY VALVE

THIS simple valve arrangement will prevent the forcing or accidental spilling of mercury from an open tube, yet offers negligible resistance to the flow or oscillation of the mercury.

The stainless steel ball "B" and the constriction "A" (ground to a 45° angle) will form a valve that will stop the falling (Fig. 1) or rising (Fig. 2) mercury column "C" at "A."

With a valve (as shown in Fig. 1) located on the citrate side of a mercury manometer such as is used for direct blood pressure recording, it is impossible for excessive pressure to expel the mercury.

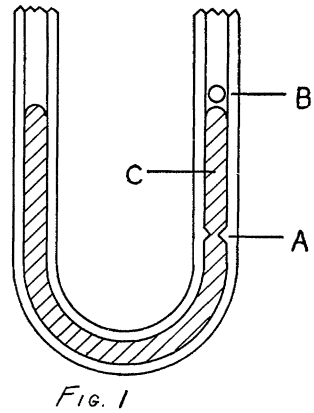


FIG. 1

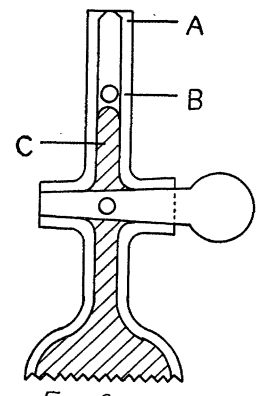


FIG. 2

FIG. 1. Mercury manometer (Pyrex).
FIG. 2. Air sampling tube (Pyrex).

Air sampling tubes equipped as in Fig. 2 will permit rapid positive evacuation without the usual overflow of mercury.

HUGH B. MCGLADE

THE OHIO STATE UNIVERSITY

BOOKS RECEIVED

The Cooper Union for the Advancement of Science and Art. *81st Annual Report, 1940.* Pp. 141. The Cooper Union, New York.

First Scientific Expedition to Manchoukuo. June–October, 1933. Section V, Division I. Reports. Arachnida of Jehol. Illustrated. *Insects of Jehol.* Illustrated. *Section II, Part IV. Geology.* Illustrated. *Section VI, Part III. Anthropology.* Illustrated. Waseda University, Tokyo.

Japanese Journal of Geology and Geography: Transactions and Abstracts. Pp. vii + 157 + 39. Illustrated. National Research Council of Japan, Tokyo.

JEANS, SIR JAMES. *An Introduction to the Kinetic Theory of Gases.* Pp. 311. Cambridge University Press, Macmillan. $3.50.

MORGAN, ALFRED. *Things a Boy Can Do with Electrochemistry.* Pp. xiii + 198. Illustrated. Appleton Century. $2.00.

MÜLLER, ERICH. *Elektrochemisches Praktikum.* Pp. xvi + 276. 90 figures. Theodor Steinkopff. Leipzig. RM 11.25.

Oceanographic Works in Japan, Records. Vol. XI, No. 2. Pp. 81–139. Illustrated. *Vol. XII, No. 1.* Pp. 116. Illustrated. National Research Council of Japan, Tokyo.

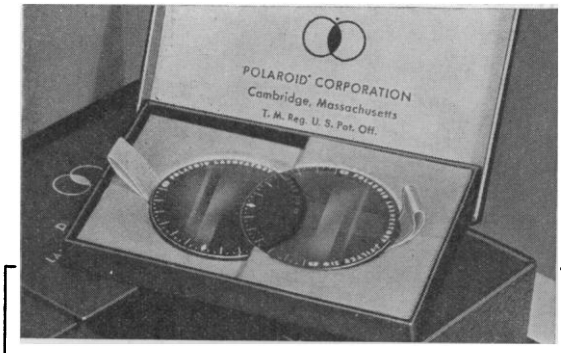
Papers in Physical Oceanography and Meteorology. Vol. VIII, No. 1; Preliminary Report on Long-Period Variations in the Transport of the Gulf Stream System C. O'D. ISELIN. Pp. 40. Illustrated. $0.75. *Vol. VIII, No. 3. Report on an Experiment in Five-day Weather Forecasting.* Pp. 94. R. A. ALLEN and others. 42 figures. $1.00. Massachusetts Institute of Technology and Woods Hole Oceanographic Institution.

STANDLEY, PAUL C. and JULIAN A. STEYERMARK. *Studies of Central American Plants.* Pp. 221–321. Field Museum. $0.75.

TABER, CLARENCE W. *Cyclopedic Medical Dictionary.* Pp. xiv + 1488. Illustrated. Davis, Philadelphia. $3.00.

Virginia Geological Survey, Virginia Conservation Commission: Bulletin 51, Contributions to Virginia Geology —II. Pp. xi + 179. Illustrated. The Survey, University, Virginia.

[1] SCIENCE, 91: 509, 1940.
[2] F. M. Turrell, Trans. Am. Micros. Soc., July, 1933, 267.



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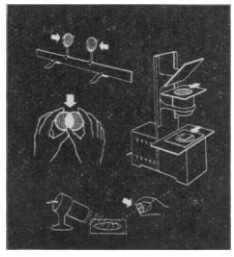

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NEW BOOK AND INSTRUMENT CATALOGUES

BAKELITE CORPORATION, New York. *Bakelite Review, October, 1940.* Pp. 19. Illustrated.

BELL AND HOWELL COMPANY, Chicago. *Filmo Visual Review, Autumn, 1940.* Pp. 8. Illustrated.

CENTRAL SCIENTIFIC COMPANY, Chicago. *Cenco News Chats, October, 1940.* Pp. 26. Illustrated.

DUPONT DE NEMOURS AND COMPANY, E. I., INCORPORATED, Wilmington, Delaware. *The Neoprene Notebook 27; Facts about Neoprene for the Engineer.* Pp. 121–128. Illustrated.

LITTLE, ARTHUR D., INCORPORATED, Cambridge, Massachusetts. *Industrial Bulletin, October, 1940.* Pp. 8.

PENNSYLVANIA PRESS, UNIVERSITY OF, Philadelphia. *Fall Books, 1940.* Pp. 12.

PITTSBURGH PLATE GLASS COMPANY, Pittsburgh. *Pittsburgh Plate Products, September–October, 1940.* Pp. 23. Illustrated.

QUARITCH, LTD., BERNARD, London. *Catalogue No. 580; General Natural History Including a Selection on Hawking, Hunting, Shooting.* Pp. 38.

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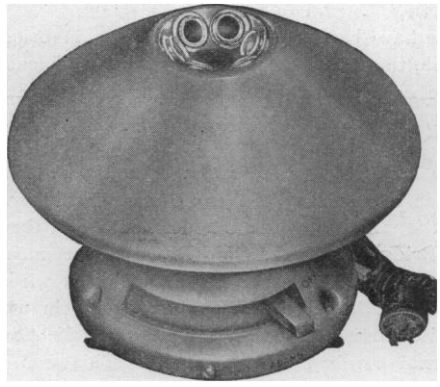

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