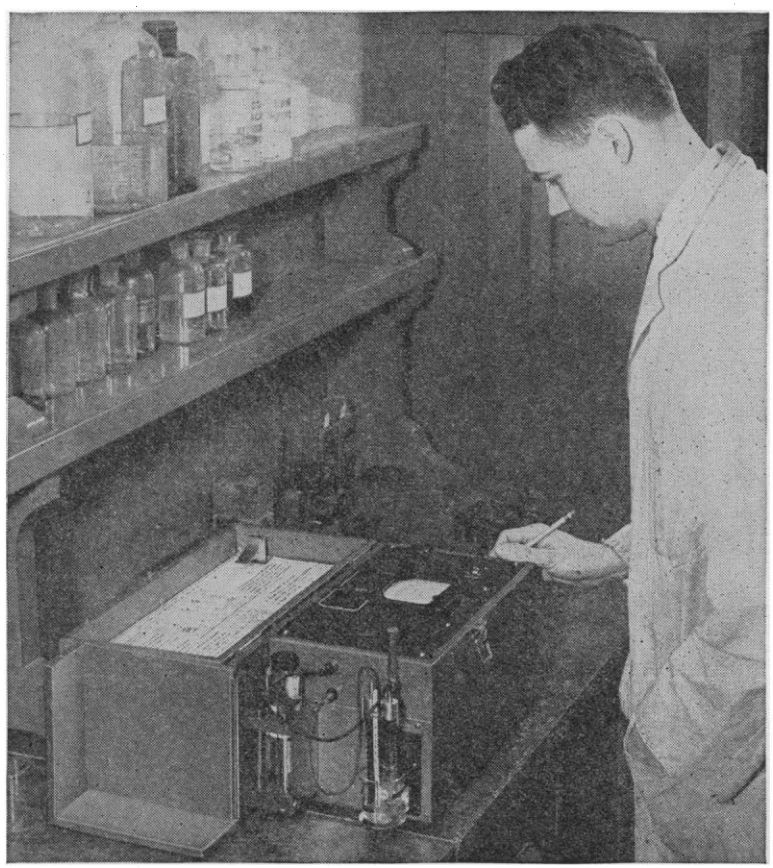
SCIENCE

NEW SERIES
VOL. 94, No. 2428

FRIDAY, JULY 11, 1941

SUBSCRIPTION, $6.00
SINGLE COPIES, .15

Science: published weekly by The Science Press, Lancaster, Pa.
Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.



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Each Indicator is sent complete with supply of chemicals and operating directions. The catalog number is 7662-Al; price, $160.00.

Speedomax Vs. The North Atlantic

Few scientists, in search of a laboratory in which to operate sensitive instruments, would pick the cabin of a coast-guard cutter. And, if they picked one, they'd probably like to tie up in a sheltered harbor.

But the Weather Bureau needs facts which can't always be gotten by working under shelter. When the nasty weather of the North Atlantic is studied, for example, someone must go where that weather is. And that "someone" often uses as a laboratory a tiny stateroom, in a Coast Guard cutter which may roll through 70 degrees, pitch like a broncho, and in general behave with unscientific violence.

This kind of work is, of course, hard on any kind of instrument, but it's especially hard on recorders. And yet the observer's task is greatly simplified if he can have at least one recorder, fast and accurate enough to jot down the temperature and other facts radioed by the stratosphere balloons which he sends up from time to time, and agile enough to operate in almost any position excepting upside down.

The Weather Bureau had had no experience with recorders for such acrobatic duty, but it set about finding such a machine. They considered the problem from every angle—accuracy, sensitivity and speed of response, as well as ability to resist *mal-de-mer*. Finally they took a Speedomax thyratron-tube recorder, set its back against a bulkhead, and welded its feet to the deck.

And that was that. Riding, as it were, the coat-tails of the Storm God, the Speedomax dutifully records the conditions which so excite that deity. In accomplishing this task, the instrument operates calmly and efficiently—requires no more attention than is needed by its fellows ashore.

We'll be glad to send technical facts about Speedomax for a specific use. In writing, please give full details.

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SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

MATHEMATICS AND THE SCIENCES[1]

By Professor C. V. NEWSOM

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A CLOSE inspection of the history of mathematics and that of physical science reveals the mutual dependence of the two fields of thought. At times mathematical development has been definitely stimulated by the needs of science; at other times scientific progress has been extremely rapid because of the availability of the necessary mathematical devices. It is interesting to observe, however, that serious reflection upon the actual relation of mathematics to the sciences has awaited the twentieth century. Such consideration, stimulated by a better understanding of the nature of mathematics, needs greater publicity, for it is the immediate cause of the mathematizing of parts of science previously untouched by mathematical treatment. This paper, then, will briefly review some of the factors which are of importance in any attempt to understand the relation of mathematics to the sciences. Implicit in the discussion is a broad definition of mathematics; my only apology for such a point of view is that it is the modern one.

Certainly it is true that a natural science originates with inductive procedures. The inspection of many similar situations in an effort to perceive those constant principles to be designated as laws must always remain fundamental. However, a time comes in the life history of a science when such methods are no longer adequate. Lapicque[1] has expressed the thought in the following words:

[1] Address of the retiring president of the Southwestern Division of the American Association for the Advancement of Science, Lubbock, Texas, April 30, 1941.

[1] L. Lapicque, "L'orientation actuelle de la Physiologie," in *L'orientation actuelle des sciences* (Paris, 1930). The translation employed here was given by C. N. Moore in SCIENCE, v. 81: p. 31, 1935.

a coat approximately 1/16 of an inch thick was placed on the insects. When the abdomen was injected with 2 per cent. formaldehyde there was a slight fading, but recently, at the suggestion of Dr. C. E. McClung, ordinary white Karo syrup has been injected into the abdomen and so far there has been no fading. Every color is life-like and natural. As the methacrylate resin dries, however, there is a slight shrinkage. Wings of grasshoppers may be pinned out and painted with the resinous solution, adding successive coats until the desired thickness is obtained. Each coat must be thoroughly dry before the next coat is applied or the succeeding coat will soften the previous coat and allow the wing to fold. The wings may be allowed to dry for two or three days in a stretched position and then painted or they may be painted immediately after stretching if due care is taken to prevent the wings from being cemented to the stretching board or pins. In order to do this, best results were obtained by painting the dorsum of the body and the medial halves of the superior surfaces of the wings, allowing these areas to dry and then painting the lateral halves of the superior surfaces. After that coat was dry the ventral surfaces of the body and wings were painted. Then alternate coats were applied to the dorsal and ventral surfaces until they had a coating about one sixteenth of an inch thick.

Butterflies have been preserved in this manner. Except for the fact that the opaque scales are rendered translucent, the color pattern is preserved perfectly, and they may be examined with almost complete disregard for their fragility; in fact, several of the butterflies have been worn as ornaments, their glass-like finish giving them the appearance of imitations.

Frogs up to six inches in length have been preserved by dipping them in the resinous solution. Best results have been obtained by injecting the coelomic spaces and the muscles of the thigh and calf of the frog with a solution of sodium benzoate (one part saturated solution of sodium benzoate to three parts distilled water), then soaking them for fifteen minutes in a 2 per cent. formaldehyde solution before dipping them in the methacrylate solution. If the frogs are alternately dipped and dried until they have a coating from one sixteenth to one eighth of an inch thick there is no appreciable shrinkage. Good results have also been obtained by using 2 per cent. formaldehyde for injection purposes.

Each particular kind of material has to be treated in a manner suitable for its own needs. Leaves dried under pressure for two days and then dipped in this plastic solution have kept their color without distortion. Furthermore, fragile bones soaked in a solution of isobutyl methacrylate polymer have been strengthened until they can be handled without undue danger of damage.

M. D. WHEATLEY
THE STATE UNIVERSITY OF IOWA

A SIMPLE IMPROVEMENT IN THE FROG WEB CIRCULATION DEMONSTRATION

So often is the demonstration of the circulation in the web of the frog's foot used in biology classes that a simple improvement in the usual technique is worthy of mention here.

Recently we found it necessary to take photomicrographs of the melanophores in the frog web to record changes in size and shape. In order to produce a plane field such that the edges of the preparation would be in focus simultaneously with the center the idea was conceived of using a small plate of glass placed under the web between two toes. An ordinary microscope slide was cut into triangles, the apices of which were angles varying from 40° to 60°. By cutting diagonally across the slide these triangles had an altitude of one inch. The sharp edges were then rubbed smooth on a piece of emery cloth.

After the frog's toes were spread apart in the usual manner across an opening in the frog board a glass triangle was slipped between two toes and under the web. The glass triangle adheres tightly to the lower surface of the web once it comes in contact with it and the result is a plane surface which lends itself ideally for microscopic observation. Photomicrographs can be made of an area of the web with the entire optical field in focus. Observations of the blood flow are greatly improved. Also it has been found that the web does not become too dry if left in this condition for at least an hour which obviates adding water to the surface which in turn changes the focus of the microscope.

The simple addition of a glass triangle (which is very easily made) so improves the aspect of the web circulation that it is well worth trying by any one having to set up such a preparation.

WM. A. HIESTAND
PURDUE UNIVERSITY

BOOKS RECEIVED

BRANSON, E. B. and W. A. TARR. *Introduction to Geology.* Second edition. Pp. ix + 482. 447 figures. McGraw-Hill. $3.75.

CROSS, J. C. *An Introduction to Biology.* Pp. xviii + 507. 331 figures. Mosby. $1.90.

HOGG, JOHN C. and CHARLES L. BICKEL. *Elementary General Chemistry.* Pp. ix + 603. Illustrated. Van Nostrand. $2.12.

LYNN, ELDIN V. *Organic Chemistry; with Applications to Pharmacy and Medicine.* Pp. 410. Lea and Febiger. $4.50.

QUINE, WILLARD V. O. *Elementary Logic.* Pp. vi + 170. Ginn. $2.25.

TURNER, C. E. and ELIZABETH MCHOSE. *Effective Living.* Pp. x + 432. 164 figures. Mosby. $1.90.