with other tissues or secretions, of carbohydrate metabolism in the organism.

S. W. BRITTON
H. SILVETTE

UNIVERSITY OF VIRGINIA

THE "SPREAD" OR "SCATTER" OF THE INFLUENCE FROM A REWARD, IN RELATION TO GESTALT DOCTRINES

IN SCIENCE of February 10, I reported the discovery of the "spread" or "scatter" of the influence of a reward, and especially the significance of the phenomenon as an independent proof of the so-called law of effect. Circumstances prevented a prompt reply to Ogden's criticisms (SCIENCE, March 3) and the need has perhaps vanished as a result of Boring's ingenious *modus vivendi* for Gestaltists and connectionists (SCIENCE, March 24). But I venture to note the following:

The "whole process" in my experiments consists of 40 words chosen at random said by the experimenter, to each of which the subject responds by a number from 1 to 10, or of equally arbitrary multiple choices. An announcement of "Right" after one of the 40 word-number units in the experiments certainly does not strengthen or confirm the whole process equally. An announcement of "Wrong" seems to the observers to be as "final" or as "consummatory" of, the connection it follows as an announcement of "Right." Certainly any difference in this respect is very small, but the difference in strengthening of the connection is enormous. And this enormous difference uniformly goes with the satisfyingness of the after-effect.

My note in SCIENCE presented evidence for these conclusions: (1) The strengthening of the connection which the reward immediately follows and to which it belongs does not occur indirectly by reason of repetitions or rehearsals of the connection or by way of memories that such and such a number was right, or successful, or rewarded for such and such a word, because the announcements of "Wrong" have no negative influence comparable to the positive influence of the announcement of "Right."

(2) The reward does not have to search out the "right" or "successful" act by any mysterious power and attach itself to it, as Peterson has objected. It strengthens whatever its physiological equivalent influences in the neurones.

(3) The reward strengthens chiefly the connection which immediately precedes it and of which it is (by sophisticated humans) felt to be the after-effect. But it also strengthens the connections one and two steps further back or forward, though these were definitely punished and most emphatically did *not* belong to the reward in the Gestalt's meaning of "belong" if I understand them. Each belongs to its punishment. Nothing happening to the subject equally near the time of the reward could belong to it much less in the sense of forming with it a "perfectly integrated unit."

In the very different sense in which I use the word, the reward may belong to these preceding and succeeding connections, though rather tenuously and indirectly, as neighboring tasks related only by the conditions of the experiment.

I can guarantee this. Let any Gestaltist choose a hundred multiple-choice tasks as "discrete and independent" one from another as he can find or make, each composed of a situation and n responses from which choice is to be made such that the situation and the responses are as "discrete and independent" from each other as he can find or make, and let him choose rewards and punishments as "discrete and independent" from anything in the tasks as he can find and make. Then the situation-response connection which has a reward attached to it utterly arbitrarily by the experimenter will be strengthened thereby, so long as it is a satisfying after-effect of that connection to the learner. And the influence of the reward may, and often will, spread or scatter so as to strengthen other connections in the physiological neighborhood.

EDWARD L. THORNDIKE

TEACHERS COLLEGE
COLUMBIA UNIVERSITY

STRATIGRAPHIC NOMENCLATURE

IN SCIENCE (Vol. 76, p. 489) Professor G. D. Harris, of the Paleontological Laboratory, Cornell University, writes: "Perhaps others as well as the writer have often been at a loss for a concise, logical and self-explanatory term for indicating all that portion of the geologic sequence (or geologic time) below or antedating the Cambrian system (or time). Strangely enough, the embarrassment becomes more acute if one searches for a term to include the Paleozoic, Mesozoic and Cenozoic."

I want to make the statement, that in my "Textbook of Geology" (*Lehrbuch der Geologie,* Wien, 1924) I introduced the term "Euzoische Schichtfolge" (Euzoic sequence), which includes the Paleozoic, Mesozoic and Cenozoic.

F. X. SCHAFFER

NATURHISTORISCHES STAATSMUSEUM
WIEN

FREQUENCY OF VERTEBRATE FOSSILS IN RIVER DEPOSITS

THE following observation, dated "Monday 17, 1805," taken from "History of the Expedition of Captains Lewis and Clark,"[1] is of more than usual interest

[1] Vol. I, p. 352, New Amsterdam Book Company, New York.

to vertebrate paleontologists. The scene was at the great Falls of the Missouri.

There are vast quantities of buffalo feeding on the plains or watering in the river, which is also strewed with the floating carcases and limbs of these animals. They go in large herds to water about the falls, and as all the passages to the river near that place are narrow and steep, the foremost are pressed into the river by the impatience of those behind. In this way we have seen ten or a dozen disappear over the falls in a few minutes. They afford excellent food for the wolves, bears, and birds of prey; and this circumstance may account for the reluctance of the bears to yield their dominion over the neighborhood.

ELLIS W. SHULER
SOUTHERN METHODIST UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

APPARATUS FOR SLIDE TECHNIQUE

THE apparatus illustrated in the following figures has been found very practical and a great time-saver in the preparation of slides. The small cost of materials and time required for construction are negligible, compared with the efficient service they render.

WARMING PLATE FOR SPREADING PARAFFIN SECTIONS

The warming plate shown in Fig. A is practically

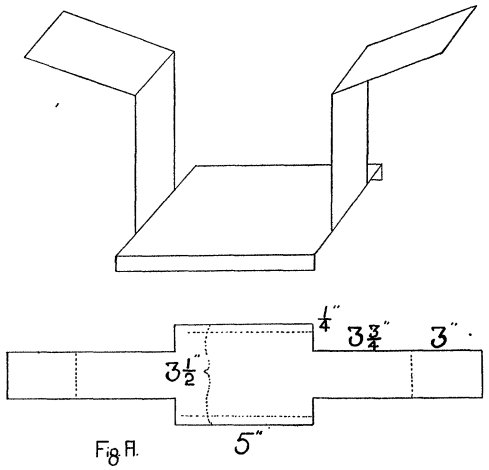

Fig. A.

self-explanatory for its use in spreading paraffin sections. It is made from a single sheet of thin copper and heated by conduction from alcohol flames under the wing tips. By placing bits of paraffin, having the same melting point as that used in preparing the tissue, on the ends of the stage, the best working temperature can be determined and controlled by moving the flames closer to or farther away from the wing tips. The small diagram gives the dimensions and shows the shape of the sheet before being bent. The height of the wings could be changed to compensate for the lamp to be used.

SLIDE DRYING CABINET

In preparing a large number of slides for study, it is advantageous to hasten the drying of the balsam after the covers are in place. The slide drying cabinet in Fig. B is a very efficient piece of apparatus for

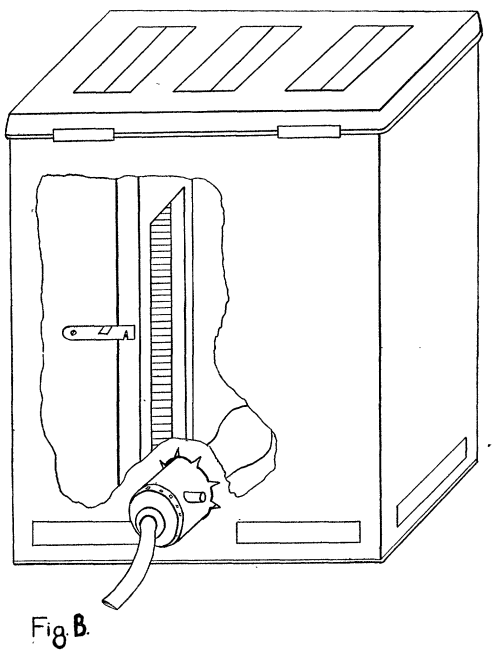
Fig. B.

this purpose. It was made from a cracker can, two slide boxes, a small sheet of copper and a light socket with several feet of cord.

The light socket was placed in the rear wall so that the bulb would just clear the bottom and give room for a slide box to stand on end on either side. A 25 watt clear bulb furnishes sufficient heat for good circulation of air without having a temperature over 50° C. The air enters through the openings at the bottom, passes over the slides and goes out through the openings in the lid. A copper slide, supported beneath the lid, makes it possible to close the openings if a higher temperature is desired.

Through the opening in the back of the cabinet a slide box can be seen in position. The lids and bottoms were cut out, leaving just enough edge to hold the slides. Catches on the sides hold the lids firmly in place. After 48 hours in the drying cabinet slides are ready for their final cleaning and polishing.

EMORY S. JAMES
OHIO WESLEYAN UNIVERSITY