thioctic acid per molecule of retinene. The immediate effect of light on rhodopsin then might well be the splitting of the —S—S— bond of 6-8 thiocitic acid with the formation eventually of 2 SH groups/molecule of retinene liberated. If this scheme is correct one would expect rhodopsin preparations to contain quantities of lipoic acid. We hope to be able to test this idea and its consequences in the near future.

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References

1. WALD, G., and BROWN, P. *J. Gen. Physiol.*, **35**, 797 (1952).
2. CALVIN, M. *Chem. Eng. News*, **31**, 1735 (1953).
3. REED, L. J., and DEBUSK, B. *J. Am. Chem. Soc.*, **75**, 1261 (1953).

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Frozen Mushrooms for Class Study

THE problem of presenting acceptable class material of the fleshy fungi is one that is well known to teachers of elementary botany and mycology. Specimens of these plants, when dried or bottled in the usual fluid preservatives, present a display that can hardly be expected to inspire the beginning student. They are not suited for identification or for study in more advanced classes.

It occurred to me last summer that freezing might result in much more satisfactory class material. Following up this thought, I froze about 15 genera of agarics as well as several species of *Boletus* and *Clavaria*. The agarics included the following genera: *Amanita, Lepiota, Tricholoma, Cantharellus, Lactarius, Russula, Mycena,* and *Cortinarius.*

The specimens were packaged in ordinary quart containers, cellophane bags tightly secured with an elastic, and enclosed in a light-weight cardboard carton. These were placed in an ordinary home freezer; the fungi froze in about an hour. In my own case the specimens were packaged in central New Hampshire and shipped in Dry Ice to St. Louis. If such shipping is necessary, the fungi should be well packed in the containers to prevent breakage of the smaller and more delicate specimens.

The material thus packaged in August was opened for class work the following February, and the specimens were then as colorful and generally fresh looking as when collected. When defrosted, the specimens vary considerably, those with a high water content tending to become quite mushy after half an hour on the laboratory benches. Consequently, for purposes of student identification, the frozen mushrooms were distributed in large laboratory finger bowls with a small piece of Dry Ice in each.

Since one of our primary objectives was to demonstrate to elementary students the diversity of form and color in the fleshy fungi, many were exhibited in wooden boxes lined with Celotex insulation. The boxes used were approximately 30 in. long, 14 in. wide, and 10 in. deep. The fungi were arranged in these boxes with about 4 cakes of Dry Ice and kept for several hours—a considerable part of the time with the lid removed.

The fungi were so lifelike and the results so encouraging that we intend to make this a regular phase of our teaching procedure in the elementary botany class.

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Fashions in Science

WHILE the development of fashions in nonscientific pursuits is well known, difficulties in determining what constitutes a fad have obscured such tendencies in the sciences. Recently a rather complete bibliography on a closely delimited subject (*1*) has provided data on the development and decay of a scientific fashion. The object of this fashion was the biological effects of deuterium compounds. Figure 1 shows the number of

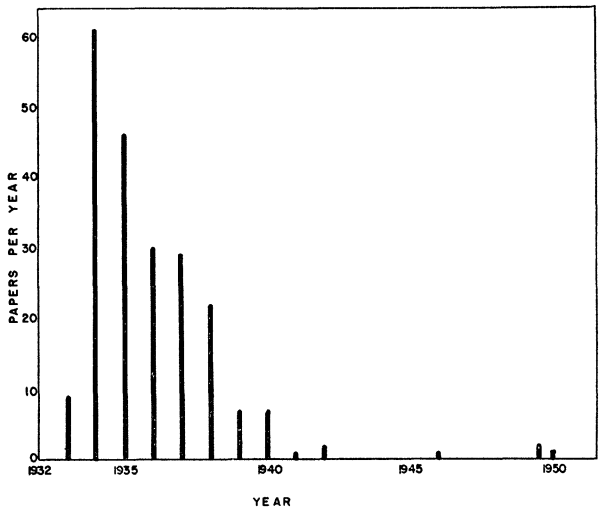

FIG. 1.

papers published per year, on the above mentioned subject, as a function of time. Beginning with the discovery of deuterium in 1932 there was a rapid rise followed by an almost exponential decay, which already had fallen to a low level before war interrupted work of this character.

It is interesting to note the almost complete decay of interest in the subject in spite of the fact that our understanding of the biological effects of deuterium is still very incomplete. The very sudden rise and fall of interest may then be viewed as a fad, a desire for quick and easy results, followed by rapid abandonment of the subject when it was realized that a large amount of work would be necessary to understand the observed effects.

While the data are insufficient to generalize on the occurrence of fads in scientific research, in some cases fashion apparently has a function in directing the

choice of scientific endeavor. A treatment of the history or philosophy of science should perhaps include a discussion of the effects of fashion upon scientific progress.

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Reference

1. MOROWITZ, H. J., and BROWN, L. *Biological Effects of Deuterium. Natl. Bur. Standards Rept.* 2179 (1953).

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Histamine in Tissue Mast Cells

THE granular basophil cells of the tissues were first clearly described by Paul Ehrlich (*1*) and named "mast cells" in the belief that the characteristic metachromatic granules develop in certain mesenchymal cells under conditions of hypernutrition (*2*). As Ehrlich observed, the cells are common in the loose connective tissues, especially near small blood vessels.

Sixty years later Scandinavian workers showed that the metachromatism of the mast cell granules is due to heparin (*3*), a finding that has since received substantial support from the high anticoagulant activity of pathological tissues abnormally rich in mast cells (*4, 5*). It thus seemed that "one of the old problems of histologists, the riddle of the metachromatic granules in the mast cells of Ehrlich" has been solved (*6*).

One curious anomaly remained. It had been known for long that in certain shock states in the dog not only heparin (*7*) but also histamine (*8*) is released in quantity from the liver. With this in mind a series of investigations was undertaken to re-examine the status of the mast cell in relation to the tissues and to determine what, if any, is its role in the elaboration and release of histamine.

It was first observed (*9*) that the granules in some of the mast cells of the rat stain positively for alkaline phosphatase and the suggestion was made that the enzyme may be concerned in the formation of the metachromatic material by which mast cells are generally recognized. A further study of conditions in the rat (*10*) supports the idea that these phosphatase-positive mast cells are young cells whose chief source of origin is from undifferentiated mesenchymal precursors in the adventitia of small blood vessels. However, in the rat such vessels often have one or more muscle coats and as the mast cells mature they tend to migrate away from the vessels into the tissues and there slowly lose their granules. Any secretion from the mature cells must thus permeate the tissues before it enters the blood.

The effects of histamine liberators on the mast cells of the rat were next examined (*11*) and it was observed that following rapid intravenous injection of a lethal dose of the fluorescent histamine liberators, stilbamidine or 2-hydroxystilbamidine, fluorescent diamidine can often be demonstrated in the cytoplasm of peritoneal mast cells. If the same dose is given slowly the initial trapping of the diamidine is missed, the mast cells having undergone vacuolization and disruption. Similar though less violent disruption of mast cells follows the injection of agar-activated rat serum, the so-called "anaphylatoxin" of Bordet (*12*). The disruption caused both by diamidines and anaphylatoxin can be prevented by premedication with an antihistamine drug.

These findings so clearly imply that the mast cells are themselves concerned in the phenomenon of histamine release that pharmacological assays for histamine were made on a large series of normal and pathological tissues which varied widely in their content of mast cells (*13*).

Preliminary studies (*14*) indicated that there exists a strong positive correlation for histamine, mast cells, and heparin in those tissues for which values for heparin are available (*6*). Holmgren and Wilander (*3*) found their highest content of mast cells and heparin in ox liver capsule but it now appears that ox pleura is an even richer source of mast cells and this material also gave the highest value for histamine (200–280 μg/g tissue) of any normal tissue so far examined (*15*). The Scandinavians did not estimate the heparin content of lung in view of possible interference from chondroitin sulphate. However, through the kindness of S. W. Stroud, Boots Pure Drug Company Limited, Nottingham, beef lung pleura and parenchyma were assayed for heparin. It is, therefore, of some interest that he finds considerably more heparin in beef pleura (24,000 units per lb) than in the underlying parenchyma (16,000 units per lb). Thus the high mast cell content of ox pleura reflects both the amount of heparin and the amount of histamine which it contains.

Since the strongest evidence for the role of the mast cells as "heparinocytes" rests on the exceptionally high heparin content of mast cell tumours (*4*) it was clear that the present hypothesis of the mast cell as a "histaminocyte" would likewise stand or fall on the findings for histamine in mast cell tumours. After a search extending over some years no less than four mast cell tumours were recently encountered. Two were from children and two from dogs. All four tumours were extremely rich in histamine, a pleomorphic mast cell tumour from a child yielding the unprecedented value of nearly 1 mg (1000 μg) histamine per gram of tissue (*13, 15*). There thus appear to be some grounds for the belief that not only do tissue mast cells contain heparin: they are also rich in histamine.

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References

1. EHRLICH, P. *Arch. mikroskop. Anat.*, **13**, 63 (1877).
2. ———. *Arch. Anat. u. Physiol.*, **3**, 166 (1879).
3. HOLMGREN, H., and WILANDER, O. *Z. mikroskop.-anat. Forsch.*, **42**, 242 (1937).
4. OLIVER, J., BLOOM, F., and MANGIERI, C. *J. Exptl. Med.*, **86**, 107 (1947).