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THE ADVANCEMENT OF LEARNING IN THE UNITED STATES IN THE POST-WAR WORLD[1]

By Dr. JAMES B. CONANT

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IT is a great honor to have the privilege of giving the Franklin Medal lecture. The subject I have chosen is highly academic, but for this I offer no apologies to a distinguished audience. The matters which I shall treat are primarily of concern to scholars, yet, as I shall attempt to demonstrate, their implications affect the lives of all the citizens of this republic. And conversely, the attitudes and actions of the lay public will determine to no small degree the future of the world of scholarship. In short, my remarks to-night are in the nature of a footnote—an American footnote—to a discussion of the problem of the relation of society to scholarship, or, if you will, of the scholar to the nation.

[1] Franklin Medal lecture, given at the American Philosophical Society, Philadelphia, November 19, 1943, in a Symposium on the Organization, Direction and Support of Research. *Proceedings*, Am. Philos. Soc., Vol. 87, No. 4.

I

It is clearly impossible to discuss the advancement of learning in the United States without making some assumption as to what these United States will be like in the next two decades. For example, if by some miracle Hitler should succeed in forcing a stalemate, the omens would not be auspicious for the advancement of learning or for many other human activities—quite the contrary. We should be living in an armed camp, the authority of the Federal Government would be paramount and the national policy would be largely determined by military necessity. Except in certain specialized fields, knowledge would not advance. Similarly, if a period of social crisis were to be followed by a highly regimented society, the advancement of learning would soon fail to prosper. Under such conditions, whether the strong arm of govern-

by cautious use of heat. The simplest technic may be summarized as follows:

(1) Dissolve benzoyl peroxide in ethyl methacrylate, in the proportion of .2–.3 per cent.

(2) After adding a porous clear boiling chip, bring a sufficient amount of this mixture to boil over a hot plate. Avoid an open flame, as the material is inflammable. Boil the material (approximately 115° C.) for about one minute and then cool immediately with running water to about 50° C. Polymerization is an intensely exothermic reaction, and cooling must be done rapidly, otherwise the heat production will be so intense as to cause boiling over and solidification in the form of an opaque mass. Allow the ethyl methacrylate to remain in a closed receptacle (avoid rubber) at plus 50° C. until complete solidification is obtained. About 20 per cent. shrinkage in the volume of the material occurs during polymerization and allowance must be made for this loss.

(3) Remove the piece of tissue saturated with ethyl methacrylate from the liquid monomer, place it upon the base of "Plexiglas" thus prepared, and immediately cover with the ethyl methacrylate-benzoyl peroxide mixture which has been polymerized previously to a syrupy consistency. Polymerization to syrupy consistency is accomplished exactly as outlined under 1 and 2, but the process is stopped when the proper viscosity is obtained. The trapping of air bubbles during this procedure should be carefully avoided. If this occurs, remove by means of a vacuum in a desiccator as previously outlined.

(4) Close the container and place at about 50° C. and allow polymerization to proceed until the mass is thoroughly solid. Polymerization occurs more rapidly at higher temperatures, and more heat may be applied gradually until a temperature of about 70° C. is reached in two to three days. It is desirable, when polymerizing at temperatures higher than 40–50° C., to reduce the height of the layer of the liquid monomer to about 10 mm. Successive layers may be added as desired.

(5) The glass receptacle is then broken and the mass of solidified acrylic resin containing the imbedded tissue is removed. The block is generally clear enough for viewing the specimen without further work. It may, however, be readily cut and polished so as to obtain a more finished product. For large flat slices of organs, a form can easily be obtained by properly binding plates of thick glass with parchment paper.

Any object made by casting an acrylic resin may "craze" unless it is given an annealing treatment. This "crazing" is seen initially as an iridescent effect on the surface of the material and may eventually result in a network of fine cracks extending some distance into the solid mass. In order to prevent "crazing," after any cast object has been machined to the approximate finished shape, we recommend that it be subjected to a temperature of 100–115° C. for one-half hour.

The organs thus imbedded have the original size and shape and retain the normal texture to a remarkable degree. The color is somewhat less brilliant than it was originally, but if the period of polymerization is not too long, it may be satisfactorily preserved. The color has been found to be permanent in mounted specimens even on continuous exposure to sunlight for several months.

Fatty tissues are not so suitable for this type of imbedding. Some organs, such as the liver, have a tendency to release pigment, which causes the imbedding mass to have a slight discoloration. This does not seem, however, to interfere with the general appearance and preservation of the specimen. If the tissue is thin, a certain degree of transparency is attained, which in many cases is desirable.

This process offers what appears to be a most promising method of preservation of normal and pathological specimens for teaching and museum purposes.

Further studies on this procedure are in progress. For the present, the method outlined appears most applicable for the preservation, without shrinkage or loss of color and texture, of small organs, embryos, little animals, fleshy insects and tissues with delicate structure.

We are indebted to Dr. D. S. Frederick, Dr. H. T. Neher and Mr. Hiltner of the Rohm and Haas Company for their helpful assistance in carrying out this work.

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BOOKS RECEIVED

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FREUD, ANNA and DOROTHY T. BURLINGHAM. *War and Children.* Pp. 191. International University Press. $1.50 paper cover; $2.00, cloth cover.

KOEHLER, W. A. *Principles and Applications of Electrochemistry.* Pp. v + 573. Illustrated. John Wiley and Sons. $5.00.

STROUD, ROBERT. *Stroud's Digest on the Diseases of Birds.* Illustrated. Pp. ix + 483. L. G. Marcus and Company. $5.00.

SUTER, CHESTER M. *The Organic Chemistry of Sulfur.* Illustrated. Pp. v + 858. John Wiley and Sons. $10.00.

The Harvey Lectures. Series XXXIV. 1938–1939. Illustrated. Pp. 279. The Williams and Wilkins Company.

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