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SCIENTIFIC RESEARCH, THE HOPE OF THE SOUTH[1]

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I WISH, first, to discuss the importance of scientific research to the nation as a whole; second, to contrast the scientific research done in the North and the Far West with that done in the South; and third, to suggest ways of building up scientific research organizations in the South or in any other region.

We all know about the "Report on Economic Conditions of the South" prepared by the National Emergency Council for President Roosevelt, and his statement that "The South presents right now the Nation's number one economic problem." This report emphasizes our poor ranking in education, housing facilities, etc., but barely mentions our low ranking in the field of scientific research. This is all the more remarkable since we now know that the present status of the United States as the leading nation is due primarily to the *unbeatable combination of business and scientific research,* backed by our great resources.

Big business to-day is exploiting the fruits of our scientific research laboratories—our last remaining frontiers, our so-called "inner frontiers"—as during the past century it exploited our exterior—or geographical—frontiers. There is one big difference now—we shall never run out of "inner frontiers." Success in one field of scientific research immediately presents many new and worth-while fields.

It is this scientific research, chiefly in the fields of applied chemistry and physics, backed by excellent industrial organizations, which has enabled us gradually to forge ahead of all other countries. Our nation

[1] Address of the retiring president of the Alabama Academy of Science, Birmingham, Alabama, March 29, 1940.

repetition of this procedure on several days, left them unchanged. The effects of sunlight, weak acids and weak alkalies are very slight.

The plastic is obtained in sheets which can be cut in such a way that their size and shape are the same as those of cover glasses. These slips are kept covered on both sides with sheets of tissue paper. They are, as a rule, clean, but if cleaning should be necessary, they may be dipped in 50 per cent. alcohol, one at a time, and dried immediately. Thick, paper-filtered Canada balsam serves as mounting medium. The use of an excessive amount of xylol should be avoided.

The most objectionable feature in the use of plastic in the place of cover glasses is their tendency to "curl" during the process of drying. If the slips are kept in the oven overnight at a temperature of 37° C., from three to five per cent., sometimes even a larger number, of the cover slips may pull away at the edges. To overcome this difficulty as much as possible it is necessary, after mounting, to dry the slides slowly at room temperature for five to six days, in order that the Canada balsam may be well hardened before placing the slides into slide boxes. In this way as a rule a fairly satisfactory result is obtained, although the smoothness of the plastic is not always equal to that of cover glasses.

After the appearance of the article by H. O'Brien,[3] we substituted isobutyl methacrylate polymer for Canada balsam. The solution found suitable was approximately 1 part of isobutyl methacrylate polymer[4] to 2½ parts of xylol. These experiments are still in an early stage, but it seems that this change improves the results. Under these conditions the drying requires not more than one day and, so far, no curling of the plastic cover slips has occurred.

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ERRATIC POTENTIALS OF ELECTRODES SEALED IN GLASS TUBING

OUR attention has been drawn to the erratic potentials that are observed in the potentiometric titration of dilute solutions in which platinum electrodes, sealed in glass tubing, are used. These erratic potentials were particularly obnoxious near the end point of a titration. We have noted them specifically in the potassium dichromate-stannous chloride and the thallous chloride-potassium iodate titrations. Complete elimination of this erratic behavior was obtained by removing the glass tubing from the electrode, or, by allowing only the wire (electrode) to touch the solution being titrated or the electrolyte of the cell being studied.

[3] Harold C. O'Brien, SCIENCE, 91: 412, 1940.

[4] The isobutyl methacrylate polymer prepared by du Pont Company.

A general investigation has indicated that the erratic behavior of electrodes sealed in glass tubing is much more prevalent than one would normally be led to believe is true. Apparently most observers have attributed the erratic potentials to some peculiarity of the reaction involved rather than to the physical structure of the electrode assembly. Particularly does this seem to be a source of trouble in the erratic behavior of certain E.M.F. cells built for special purposes. This phenomenon may be crucial in these cases, for not only are fluctuation or drifts introduced but the induced potentials may be large (300 mv) and irreproducible.

The cause of this trouble has not been entirely established. It may be due, partially or entirely, to strains in the electrodes as a result of the glass-metal seal. This may result in a variable junction potential as a result of the solution being in contact with the same metal in different standard states; this could be reduced to a constant value or eliminated by a very careful annealing process. The disturbance is definitely in the region of the glass-metal-solution interface. Elimination of this interface seems to eliminate the source of trouble. In potentiometric titrations, where the electrodes must be subject to frequent cleaning by burnishing in a flame or treatment with hot aqua regia, we have found it highly desirable to eliminate the glass casing for the electrodes or to construct the electrode in such a manner that the solution does not come into contact with the metal-glass interface. This may also be necessary for many other types of cell measurements. Our recent experiences with this phenomenon have been such that we are certain that it is of a general nature and requires consideration where cell data are being obtained.

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BOOKS RECEIVED

BAITSELL, GEORGE A. *Human Biology.* Pp. xv + 621. 259 figures. McGraw-Hill. $3.75.

BOUCHER, PAUL E. *Fundamentals of Photography.* Pp. xi + 304 + lii. Illustrated. Van Nostrand. $3.00.

CHAPMAN, JOHN M. and others. *Commercial Banks and Consumer Instalment Credit.* Pp. xxiv + 318. National Bureau of Economic Research. $3.00.

FEARON, WILLIAM F. *An Introduction to Biochemistry.* Second edition. Pp. xii + 475. Mosby.

HESSEL, F. A., WELLFORD MARTIN and M. S. HESSEL. *Chemistry in Warfare.* Pp. x + 164. Illustrated. Hastings House, New York. $2.00.

SHRINER, RALPH L. and REYNOLD C. FUSON. *The Systematic Identification of Organic Compounds.* Second edition. Pp. xi + 312. Wiley. $2.75.

SMILEY, DEAN F. and ADRIAN G. GOULD. *A College Textbook of Hygiene.* Third edition. Pp. xiii + 539. 131 figures. Macmillan. $2.50.

STEEDS, W. *Mechanism and the Kinematics of Machines.* Pp. xi + 319. 379 figures. Longmans, Green. $5.00.