more than "a convenient empirical formula for interpolation" (p. 273). This summary dismissal may eventually prove to be unnecessarily severe; nevertheless, it should operate as a warning for those writers who have been using the formula indiscriminately without cautioning their readers that the dielectric parameter has at present little or no physical significance.

The Gronwall-La Mer solution of the Poisson-Boltzmann equation, which disposes of the absurd result of "negative ion diameters"—frequently encountered in applying the original theory to high valence ions or low dielectric solvents—is presented in detail for practical application. The close relationship between the Gronwall-La Mer treatment and the Bjerrum hypothesis of ion-association is set forth rather more clearly than has been customary at the hands of some of the recent converts to the modern theory of electrolytes. The problem of "true" degree of dissociation for high concentrations is discussed in this chapter in the light of refractometric and Raman effect data, while Bronsted's "Principle of Specific Interaction" is accorded a highly appropriate presentation.

A conspicuous feature is the judicial attitude which the author assumes in presenting the work of other workers, even when they differ radically from his own views; also the complete nature of the literature references to date of publication (May, 1932). For example, the several possible interpretations of the existing e.m.f. and calorimetric data on the heats of dilution and heat capacities are presented in the light of their obedience to the limiting law and incomplete dissociation. Considering the difficulties inherent in so comprehensive an undertaking, the translator has succeeded in most instances in incorporating the more significant additions to the close of 1933.

At that time only Onsager's masterly criticism of the statistical foundations of the theory ("Symposium on Electrolytes," *Chemical Reviews,* August, 1933) was available. Since then conflicting papers by Halpern, by Kirkwood and by Fuoss dealing with the question of integrability conditions, fluctuation terms, etc., have appeared in the *Journal of Chemical Physics.* The theory is certainly not unassailable from a critical statistical view-point, yet the general excellent agreement with experiment makes it appear highly probable that these statistical weaknesses may not prove serious, after all. Under the circumstances, the author and translator undoubtedly acted wisely by deleting R. H. Fowler's earlier critique and reserving judgment on these vexing questions, even though it is done at the expense of disappointing the expert.

The reviewer has found no serious errors or misprints. The printing and format conform to the high standards of the Oxford Press. However, it is a pity that the editors of the Physics Series do not insist that their authors include an adequate subject and author index. The abridgement from the 7-page author and 4-page subject index of the German edition to the inadequate single page subject index will seriously interfere with the full use of this well-documented book as a convenient source of reference.

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REPORTS

THE ELIHU ROOT LECTURES OF THE CARNEGIE INSTITUTION OF WASHINGTON

THE establishment of the Elihu Root Lectures by the Carnegie Institution of Washington provides an opportunity for a broad outlook on science. Dedicated to a distinguished statesman well known for his appreciation of scientific research, these lectures focus attention on the influence of science upon human thought and upon our attitude toward life. For these lectures speakers will be selected from those who are eminent in their respective fields and have themselves contributed to the development of scientific thought.

The first lecture was delivered by Dr. James R. Angell, president of Yale University, on December 4. The subject was "Popular and Unpopular Science." The speaker presented an analysis of the reasons why the modern social order so readily accepts the superficial and the incorrect, and fails to appreciate or utilize the truly significant advances of science. In discussing the connection between science and the dominant forces of society Dr. Angell stated:

> . . . If science in any important sense is to affect the intellectual fabric of civilization, then through education it must be woven into the essential fabric of our culture. To do this will require at best several generations and not a few profound changes in educational method and objectives.
>
> Among other things, it will certainly mean a wide-ranging program of continuing adult education, for science grows so rapidly and its changes are so kaleidoscopic, that in no other way can adult intelligence keep abreast of its discoveries. To be sure, many individuals have intellectual limitations which will leave them inevitably strangers to the intrinsic implications of science. But limitations of this kind face all educational systems and at every level. In any case, what is really important is not so much the prevalence of accurate, up-to-date scientific knowledge as it is the ingraining, deep in the habits of thought of the people, of a careful, critical—even skeptical—scrutiny and analysis of every situation,

and with a correspondingly conservative process of inference and generalization, so that intelligence may have really free play to make its fullest contribution to the changing social order.

And in conclusion:

. . . Nor should it be forgotten that many of the highest and purest values in life lie within the area of feelng and emotion. Beauty is not the child of science, and neither its creation or its enjoyment waits upon scientific methods. The world of ethics and religion and spiritual insight is also beholden in part only to science. To impregnate our culture through education with a genuinely scientific spirit should therefore exercise no malign influence on these other integral elements of a civilization.

The second lecture was delivered on December 11, also at the U. S. National Museum, by Dr. H. A. Spoehr, chairman of the Division of Plant Biology of the Carnegie Institution, on "The Nature of Progress in Science." Dr. Spoehr illustrated the methods of scientific research by describing the steps taken in investigating the process whereby green plants under the influence of the sun's rays convert inorganic compounds into substances used by man and contrasted the mode of thought employed in the field of science and that which prevails in the field of social endeavor, saying:

Intrinsically there is no reason why there should be any difference in fundamental development in different fields of human endeavor, such as appear to be in the fields of social activity and those of natural science. They are the products of the same culture, of the same human stock and of the same stage of development. This, however, seems certain, that natural science has been tremendously stimulated by the realization that continuous change must be expected of all things and that such change is not unrelated to past experience.

He emphasized especially the necessity, in attacking any problem, of analyzing the various factors that are involved and of attempting to define these in terms of existing knowledge. To quote Dr. Spoehr:

. . . This is frequently the most difficult and discouraging stage of the scientific approach to a problem and involves a laborious and time-consuming period of fact finding and sifting of data. . . . The first step is frankly to recognize that there is a problem. This in itself involves a large element of intellectual honesty and avoids much haphazard guessing and fumbling opportunism.

Moreover, in speaking of one of the most characteristic and fortunate aspects of the development of scientific thought, Dr. Spoehr said:

The immensity of its problems has been very generally recognized by its adherents. The constitution of matter, the forms of energy, the nature of life are all subjects about which we wish to know more. But science has attacked these problems in a stepwise manner. It does not hope to arrive at ultimate truth by one master move or a single brilliant idea. It has long realized that the development of concepts is a matter of evolutionary development and it has planned its attack accordingly. One small and carefully planned advance has secured a position from which another advance could be made and so on, step by step, the development has been secure and remarkably rapid.

F. F. B.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ON d-XYLOMETHYLOSE (5-DESOXYXYLOSE)

OUR laboratory has been engaged for a considerable time in the study of methyloses. In view of a very recent publication by Swan and Evans[1] on the preparation of l-arabinomethylose (l-5, desoxyarabinose), we wish to report on the synthesis of d-xylomethylose (d-5, desoxyxylose). The sugar itself has not yet been obtained in crystalline form. The syrup, however, has the correct composition.

Calculated .... C 44.75, H 7.5.
Found .... " 44.52, " 7.5.
$[\alpha]^{20}_{D} = -2.16°$ (in ethanol).

Of this syrupy sugar three derivatives were obtained, two of which were crystalline.

(1) *Mono-acetone Xylomethylose.*
Specific rotations: $[\alpha]_D = -20.99°$ (water, c, 3.047).
$[\alpha]^{24}_{D} = -18.22°$ (U. S. P. chloroform, c, 3.046).
Melting point, 69–70°; boiling point, 86–87°/0.2 mm.
Analysis: Calculated .... C 55.17, H 8.1.
Found .... " 54.88, " 8.1.

(2) *3-Acetyl Mono-acetone Xylomethylose.*
Specific rotation $[\alpha]^{24}_{D} = +2.55°$ (U. S. P. chloroform, c, 3.136).
Boiling point, 79–80°/0.2 mm.
Analysis: Calculated C 55.55, H 7.4, CH_3CO, 19.91.
Found ...... " 55.47, " 7.8, " 20.70.

(3) *d-Xylomethylose p-Bromphenylhydrazone.*
Specific rotation, $[\alpha]^{20}_{D} = -26.05°$ (dry pyridine c, 2.38).
Softens, 65°; melting point 69–70° (with foaming).
Analysis: Calculated .... C 43.58, H 5.0, N 9.24, Br 26.37.
Found .... C 43.78, " 5.1, " 9.05, Br 26.21.

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[1] *Jour. Am. Chem. Soc.*, 57: 200, 1935.