of the meeting period, which is to be Saturday for the second Nashville meeting.

11. During the deliberations of the Committee on Award, and until public announcement is made by the permanent secretary, the utmost secrecy is to be maintained. Even slight hints regarding possible prize winners are not to be released in any way before the award is announced. Announcement is made to all news agencies at once, by the permanent secretary through the news manager for the meeting.

The Committee on the Award of the Nashville prize consists of the members named below:

William H. Roever, *chairman;* professor of mathematics, Washington University, St. Louis, Mo.

Roger Adams, professor of chemistry, University of Illinois, Urbana, Ill.

William Duane, professor of biophysics, Harvard University, Cambridge, Mass.

Charles Schuchert, professor of paleontology, Yale University, New Haven, Conn.

Robert J. Terry, professor of anatomy, Washington University, St. Louis, Mo.

BURTON E. LIVINGSTON,
Permanent Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN AGAR MEDIUM FOR PLATING L. ACIDOPHILUS AND L. BULGARICUS

EXPERIENCE has demonstrated that *L. acidophilus* grows poorly in ordinary peptone sugar agar and that many strains of typical *L. bulgaricus* will not develop at all in this medium. Rettger and Cheplin[1] (1921) employed whey agar in their experiments. The addition of galactose to this medium has been found[2] (1922) to increase its value. The author[3] (1924) developed a casein-digest, milk powder-digest, galactose agar which proved to be quite satisfactory for colony study.

Further investigation has indicated that some strains of *L. acidophilus* and *L. bulgaricus* attain the best colony development in whey-galactose agar, while others reach their optimum growth in digest-galactose medium. As a rule, *L. bulgaricus* grows best in digest galactose agar. In order to insure satisfactory results, it has been necessary to employ both kinds of media in the study of *L. bulgaricus* colonies.

From the standpoint of the dairy laboratory, or of any laboratory, where occasional platings of these species are carried out, some objection has been raised to both the whey and the digest media because their preparation is rather difficult. A more simple medium and one which is easily prepared has appeared quite desirable.

While studying the effect of tomato juice upon the growth of different bacterial species, the author found that the addition of tomato extract to whey-galactose agar brought about a marked increase in the size of *L. acidophilus* colonies grown on the medium, and that it accentuated the x type colony characteristic. Further investigation showed that a medium containing tomato juice, peptone and agar fostered the development of as good colony growth as the more complicated media.

Experiments were carried out with the object of determining what proportions of peptone and tomato juice were necessary for optimum colony development.

The tomato juice was secured by filtering the liquid portion of canned tomatoes through filter-paper. Media were prepared containing 0.5 per cent. and 1 per cent. peptone and varying proportions of tomato juice.

The agar was prepared in the following manner:

Formula:

Difco peptone
Tomato juice
Water to make 1,000 cc.
Adjustment to pH 7.0
Agar—10 grams

Autoclave to dissolve agar; filter through a thin layer of absorbent cotton; distribute in desired containers, and sterilize by autoclaving at 15 lbs. steam pressure for 15 minutes. The reaction of the finished product is about pH 6.5.

Comparative platings were made, employing 24 hour-old milk cultures of 12 strains of *L. acidophilus* and 8 strains of *L. bulgaricus.* All agar platings were incubated in an atmosphere containing approximately 10 per cent. CO_2[4] (Kulp, 1926) for 48 hours. Whey-galactose and the digest-galactose agar platings of the same species were carried along under the same conditions as controls.

The results of this experiment and several others of like nature indicate the following:

1. Agar plating of *L. acidophilus* and *L. bulgaricus* made with an agar containing the proper concentra-

[1] Rettger, L. F., and Cheplin, H. A., 1921, "The Transformation of the Intestinal Flora, with special reference to the Implantation of Bacillus Acidophilus," Yale University Press.

[2] Rettger, L. F., and Kulp, Walter L., 1922, "A Note on the Choice of Culture Media for the Study of Lactobacillus, with special reference to the Carbohydrates employed," *Abstracts of Bacteriology,* Vol. 6, p. 24.

[3] Kulp, W. L., and Rettger, L. F., 1924, "A Comparative Study of *L. acidophilus* and *L. bulgaricus,*" *Jour. Bact.* 9, 357–394.

[4] Kulp, W. L., 1926, "The Determination of Viable Lactobacillus Acidophilus," SCIENCE, Vol. 64, pp. 304–306.

tion of tomato juice bring out the optimum colony development of these two species. In all cases, this medium is as acceptable as whey-galactose agar or digest-galactose agar, and as a rule it is preferable since the colonies of many strains on the tomato agar are decidedly larger and more characteristic than on either of the other media.

2. Incubation in an atmosphere containing approximately 10 per cent. CO_2 is desirable for agar platings of both species.

3. Two hundred to four hundred cc. tomato juice per liter plus 1 per cent. Difco peptone produces the most satisfactory medium.

4. Agar platings of *L. bulgaricus* strains which are very exacting in their growth requirements should be incubated for 72 hours.

No satisfactory explanation can be offered for the growth-stimulating effect of tomato juice upon *L. acidophilus* and *L. bulgaricus* unless it be in the light of an "accessory substance or substances."

Both of these species require carbohydrate for growth. The amount of sugar in tomatoes varies from two to four per cent.; it is made up chiefly of hexoses. Two hundred to four hundred cc. of tomato juice per liter fully satisfy the carbohydrate requirements of these organisms.

However, *L. acidophilus* develops poorly in ordinary nutrient agar containing added hexoses, and many strains of *L. bulgaricus* will not grow at all in such a medium, no matter what sugar is present. There must be some other factor in tomato agar, therefore, in addition to the carbohydrate, which stimulates the growth of these organisms.

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SPECIAL ARTICLES

THE ORIGIN AND DISTRIBUTION OF SCIENTIFIC MEN

THE fourth edition of the Biographical Directory of American Men of Science, which will be published in December, contains an appendix describing the methods that were used to select the scientific men who are designated in the book as those whose contributions to science have been of the greatest value. There were added in the third and fourth editions (1921 and 1927) 601 names to the thousand first selected in 1903 and reselected in 1909. In the book there will be given a statistical study of the origin and distribution of these scientific men, and it may be worth while to print in SCIENCE some of the data.

In the production of the 601 scientific men New York leads with 67, followed by Ohio with 49, Massachusetts with 48, Illinois with 45 and Pennsylvania with 41. The group of states next following consists of Iowa 27, Wisconsin 24, Missouri 21. The position of the North Central States is noteworthy, and is further emphasized by the situation in states having a productivity between 10 and 20, namely, Indiana 18, Connecticut 16, Minnesota 14, Maryland 13, Michigan 13, California 11, Kansas 11. The number of scientific men coming from the South Atlantic, South Central and Western divisions is small, though there has been some gain since 1903.

Of the leading thousand scientific men selected in 1903, Massachusetts produced 134 and Connecticut 40. At the time of their birth Boston was the intellectual center of the country. New York in proportion to its population had then produced about half as many scientific men as Massachusetts and Connecticut, the North Central States about one third as many. The situation had changed for the list of 1910. Reduced to comparable figures the birth rate of leading scientific men per million of population had fallen in Massachusetts from 109 to 85, in Connecticut from 87 to 57. In Michigan it had increased from 37 to 74, in Minnesota from 23 to 59, in Wisconsin from 45 to 54. The intellectual fecundity of the North Central States, as compared with New England, has now further increased, extending westward and southward to Iowa, Missouri and Kansas.

If the 601 scientific men are increased to 1,000 proportionately distributed, which is approximately the result that would have been obtained if 1,000 had been selected, the gains or losses of each state may be found. The situation in New England is ominous for the future. Every state has lost and it appears that the rural population is becoming intellectually sterile. Of the thousand leading scientific men in 1903, Maine had produced 29, of whom 19 ranked in the first 500. Of 601 scientific men mostly born less than 50 years ago, the state has produced six; if a thousand had been selected the most probable number would have been ten. It has consequently lost 19, two thirds of its productivity. Massachusetts has lost 54. Analogous conditions obtain in all the New England States and southward along the Atlantic. The losses of New York, New Jersey and Maryland, in spite of, or it may be because of, their enormous increase in wealth, are startling. Pennsylvania and Delaware remain nearly stationary; there are small gains in most of the South Atlantic and South Central States.

The losses of the eastern states are counter-balanced by the gains of the central states, notably Illinois, Minnesota, Iowa, Missouri, Kansas and Nebraska. All the central states have gained except Michigan,