The use of microorganisms in industrial processes directly related to agriculture as in the manufacture of alcohol and of vinegar, the preparation of sauer kraut and silage, and in the retting of flax is discussed in the fourth part.

The fifth part includes a chapter on resistance against parasitic bacteria. Tuberculosis is discussed in some detail. Only fourteen pages are devoted to the other transmissible diseases of animals and fifteen pages to the parasitic diseases of plants.

The last part presents 39 laboratory exercises designed to supplement the text.

The second edition was marred by many mistakes, both in fact and statement. Many of these have not been corrected in the present edition. Errors in fact are illustrated by the statement that ordinary soils contain 0.1 to 0.2 per cent. of nitrate (p. 53); that H_2S may unite with water to form sulphuric acid (p. 78); that the sulphur appears within the cells of sulphur bacteria as minute reddish dots, and because of the color produced by the sulphur the bacteria are frequently called the "red bacteria" (p. 124). In fact the reddish color noted in some of the sulphur bacteria is not due to sulphur but to a pigment, purpurin. If the red color were due to sulphur, all bacteria that store sulphur would be red. Such is not the case.

It is stated that any product that contains much sugar is more likely to undergo alcoholic fermentation than putrefaction. A true statement as far as it goes, but likely to create confusion in the mind of the student, for a product containing much sugar practically never undergoes putrefaction and an alcoholic fermentation only when the product is so acid as to prevent bacterial development. In sugar containing liquids, the reaction of which will permit bacterial growth, an acid fermentation is constantly noted as in milk, maple sap, beet juice, etc.

The construction is often loose and in error, one part of a sentence being written in the present tense and another in the past, *e. g.*, "But the bacteria which are isolated from such soil by ordinary methods showed no power of nitrification" (p. 65). Errors in spelling are frequent, *e. g.*, volitization (p. 80), seradella (p. 112), urase (p. 60).

An example of the use of an incorrect word is found on page 63 where it is stated that "The addition of another atom of nitrogen to the nitrate, giving a nitrate," etc. The formulæ used in this connection are correct.

The reader of the present volume will find the essential facts concerning the relation of microorganisms to agricultural processes presented in a most interesting manner.

E. G. HASTINGS
UNIVERSITY OF WISCONSIN

BIRTH STATISTICS IN THE REGISTRATION AREA OF THE UNITED STATES: 1916

IN the recently established birth-registration area of the United States—comprising the six New England states, New York, Pennsylvania, Maryland, Michigan, Minnesota and the District of Columbia, with an estimated population of 33,000,000, or about 32 per cent. of the total population of the United States—818,983 infants were born alive in 1916, representing a birth rate of 24.8 per 1,000 of population. The total number of deaths in the same area was 486,682, or 14.7 per 1,000. The births thus exceeded the deaths by more than 68 per cent. For every state in the registration area, for practically all the cities, and for nearly all the countries, the births exceeded the deaths, usually by substantial proportions. The mortality rate for infants under one year of age averaged 101 per 1,000 living births. The foregoing are among the significant features of the report. "Birth Statistics in the Registration Area of the United States: 1916," soon to be issued by Director Sam. L. Rogers, of the Bureau of the Census Department of Commerce, and compiled under the supervision of Dr. William H. Davis, chief statistician for vital statistics.

The birth rate for the entire registration area fell below that for 1915 by one tenth of 1 per 1,000 population; while the death rate exceeded that for 1915 by seven tenths of 1 per

1,000. The excess of the birth rate over the death rate for 1916, 10.1 per 1,000, was thus a little less than the corresponding excess for 1915, which was 10.9 per 1,000. If the birth and death rates prevailing in the later year were to remain unchanged, and if no migration were to take place to or from the area to which they relate, its population would increase annually by about 1 per cent. This rate, compounded for a decade, would yield a decennial increase of a little more than 10 per cent., or about half the rate of increase in the population of the country as a whole between the last two censuses, 21 per cent.

Of the total number of births reported, 799,817, or 24.9 per 1,000, were of white infants, and 19,166, or 22.8 per 1,000, were of colored infants. The death rates for the two elements of the population were 14.5 and 24.4 per 1,000, respectively. The deaths reported for the colored races (comprising all nonwhites) thus exceeded the births reported; but it is probable that the registration of births is less nearly complete among the colored than among the white population, and that therefore the rate shown for the former class is too low, whereas in the case of death rates there is probably not so great a margin of error.

Some indication of the fecundity of the native and foreign elements of the population may be obtained from a comparison between the proportion which the number of white foreign-born mothers formed of the total number of white mothers to whom children were born in 1916, and the proportion which the white foreign-born married women, aged 15 to 44, formed of the total number of white married women of corresponding ages in 1910.

From the table following, it appears that many more births occur to white foreign-born women, proportionately to their number, than to native women. In Connecticut, approximately 46 per cent. of white married women aged 15 to 44 in 1910 were of foreign birth, but about 62 per cent. of the white mothers to whom children were born in 1916 were natives of foreign countries.

The infant-mortality rate—that is, the number of deaths of infants under one year of age per 1,000 born alive—throughout the registration area as a whole was 101 in 1916, as against 100 in 1915. This is equivalent to saying that of every ten infants born alive one died before reaching the age of one year. Among the 11 states these rates ranged from 70 for Minnesota to 121 for Maryland; and for the white population separately the lowest and highest rates were 69 for Minnesota and 115 for New Hampshire. The high rate for the total population of Maryland was due to the presence of a larger colored element in that state than in any of the others, the rate for the whites alone being only 101.

State	1916	1910
	Per Cent. which Foreign-born Mothers Formed of Total White Mothers	Per Cent. which Foreign-born Married Females 15 to 44, Formed of Total White Married Females, 15 to 44
Connecticut	61.63	46.36
Maine	27.23	21.89
Maryland	14.82	13.11
Massachusetts	56.32	48.87
Michigan	32.80	26.45
Minnesota	26.80	33.99
New Hampshire	41.69	32.69
New York	52.84	42.71
Pennsylvania	37.65	27.77
Rhode Island	57.37	49.94
Vermont	24.04	18.11

The infant-mortality rates vary greatly for the two sexes and for the various nationalities.

With an infant-mortality rate of 101 for the registration area as a whole, the rate ranges for white children from 68 where mothers were born in Denmark, Norway and Sweden, to 148 where mothers were born in Poland, while negro children have a rate of 184. The range of rates among white males is from 74 for children of mothers born in Denmark, Norway and Sweden, to 171 for those of mothers born in Poland, while negro males have a rate of 202. The corresponding rates for females were 62, 124 and 166, respectively.

The following table shows, for the birth-registration area, by states and by cities having more than 100,000 inhabitants in 1910, the number of births in 1916, the per cent. of ex-

cess of births over deaths, and the infant-mortality rate. Figures for the white and colored elements of the population are shown separately for those areas in which colored persons constitute more than one tenth of the total population.

EXCESS OF BIRTHS OVER DEATHS, AND INFANT MORTALITY: 1916

Area	Number of Births	Excess of Births Over Deaths (Per Cent.)	Deaths of Infants Under 1 Year of Age per 1,000 Living Births
Registration area	818,983	68.7	101
Registration states			
Connecticut	35,351	74.2	101
Maine	16,033	32.5	108
Maryland, total:	33,631	49.7	121
White	27,305	63.9	101
Colored	6,326	6.0	209
Massachusetts	93,497	65.1	100
Michigan	86,840	88.1	96
Minnesota	55,459	127.1	70
New Hampshire	9,664	35.4	115
New York	241,456	58.8	94
Pennsylvania	217,449	74.7	114
Rhode Island	14,634	53.5	111
Vermont	7,768	37.2	93
Registration cities having more than 100,000 inhabitants in 1910			
Connecticut:			
Bridgeport	4,598	94.8	106
New Haven	5,106	100.6	88
Maryland:			
Baltimore, total	14,542	36.5	122
White	12,278	54.1	104
Colored	2,264	−16.6[1]	219
Massachusetts:			
Boston	19,577	53.3	105
Cambridge	2,691	76.3	91
Fall River	3,689	68.8	173
Lowell	3,287	67.6	146
Worcester	4,941	70.2	101
Michigan:			
Detroit	24,289	121.6	112
Grand Rapids	3,131	100.0	75
Minnesota:			
Minneapolis	8,793	95.2	82
St. Paul	5,242	87.6	68
New York:			
Albany	2,280	11.4	97
Buffalo	13,088	73.3	114
New York	137,923	77.0	93
Rochester	6,816	82.6	86
Syracuse	3,853	63.2	100
Pennsylvania:			
Philadelphia	40,360	45.7	105
Pittsburgh	16,406	62.6	115
Scranton	3,623	71.5	131
Rhode Island:			
Providence	5,981	48.7	110
District of Columbia:			
Washington, total	7,201	11.2	106
White	4,979	25.3	83
Colored	2,222	−12.2[1]	158

[1] Per cent. by which births fell below deaths.

SPECIAL ARTICLES

NOTE UPON THE HYDROGEN ION CONCENTRATION NECESSARY TO INHIBIT THE GROWTH OF FOUR WOOD-DESTROYING FUNGI[1]

THE importance of hydrogen (and hydroxyl) ion concentration as a factor in physico-chemical and biochemical studies of living organisms is being recognized. A careful study of this factor has not been made heretofore due largely to the lack of ready means for making the determinations. The indicator method was not seriously developed until about a decade or so ago, and the hydrogen electrode was not applied to such problems until recently, due partly, undoubtedly, to the fact that biologists did not realize its possibilities.

Consequently no exact information is at hand concerning the behavior of fungi, in general, toward varying degrees of hydrogen ion concentration. This remark applies especially to wood-destroying fungi. Information which is available is usually given in a rather vague manner with the use of such terms as "alkaline," "slightly acid," "strongly acid" or as percentage of acid (or base) added.

The expression, P , is now widely used as a means of stating hydrogen (or hydroxyl) ion concentration. The term is used and explained in the literature sufficiently often to make its explanation here unnecessary.

The four fungi studied in this investigation are: *Lenzite sepiaria, Fomes roseus, Coniophora cerebella* and *Merulius lachrymans*. Synthetic and malt extract media were used. The data obtained showed that their growth is not inhibited until a surprisingly

[1] This note is a brief statement of the results presented in a paper on the same subject in partial fulfillment of the requirements for the degree of Ph.D. at the New York State College of Forestry at Syracuse University. A considerable part of the work was done in the office of Forest Pathology, Bureau of Plant Industry, at the Forest Products Laboratory, Madison, Wis. Detailed data will be published soon.