ratio from bottom yeast by that amount. Hence, it is probable that each preparation is a mixture of enzymes among which are a sucrase and a β-D-furanofructosidase, but not in the same proportion. It is, of course, by no means certain that "invertases" of top and bottom fermentation yeast from any other source would have the same composition or activity as that used here. Plant physiologists were warned as early as the first quarter of the present century that commercial invertase preparations may split other polysaccharides (*i.e.* melibiose) than sucrose and raffinose (Hudson, and Hudson and Harding. *J. Amer. chem. Soc.*, 1914, **36**, 1570; 1915, **37**, 2193–2198). Thus, after treatment with commercial invertase, unless the other possibilities are disposed of, a reducing power may be found and reported as sucrose or raffinose, when actually the sugar reported may not be present at all (cf. McRary and Slattery. *J. biol. Chem.*, 1945, **157**, 161–167). That this effect is due to the presence of more than one enzyme is indicated by the present work and by that of Zechmeister, Tóth, Fuerth, and Bársony (*Enzymologia*, 1941, **9**, 155), Adams, Richtmeyer, and Hudson (*J. Amer. chem. Soc.*, 1943, **65**, 1369–1380), and Pigman (*J. Res. nat. Bur. Stand.*, 1943, **30**, 159–175).

The top and bottom invertases used in the experiments were purchased from the Wallerstein Laboratories, 180 Madison Avenue, New York 16, New York. (HAMILTON P. TRAUB, E. L. GREEN, and M. C. SLATTERY, *Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture.*)

Schizophrenia strikes 1 or 2 per cent of the population of the United States, mostly those between 15 and 35 years of age. (An exact figure of the incidence of schizophrenia in the general population has not been obtained. Kallman uses .85 per cent. But, as he states that 20 institutions in the state of New York in 1945 had 72,252 patients, of which 47,929 were schizophrenics and 12,316 new admissions, and as a report by Pollock, Malzberg, and Fuller (*Hereditary and environmental factors in the causation of manic-depressive psychoses and dementia praecox.* Utica, N.Y.: State Hospital Press, 1939) indicates that some 4.5 per cent of the population will be hospitalized some time in their lives because of mental disease, it seems not unreasonable to suppose that the incidence of schizophrenia in the general population may reach 2 per cent.) A large proportion of these 1,400,000 to 2,800,000 unfortunate people require care in public institutions for the remainder of their lives. What causes all this misery? Does it arise from external causes or from within?

A great deal of light is thrown on these questions by two studies which are not likely to come to the attention of *Science* readers by reason of their places of publication. These studies were made by Franz J. Kallman, using the "Twin Family Method." The first of these is a book of nearly 300 pages (*The genetics of schizophrenia.* New York: J. J. Augustin, 1938). That it has not received the attention it deserves may be due to the large amount of pertinent accessory material, which tends, nevertheless, to discourage perusal. The second is of recent publication (*Amer. J. Psychiat.*, 1946, **103**, 309).

Both studies have been made with meticulous care. The first is on 1,087 schizophrenics and their relatives, covering in all 13,851 persons. The second is based on 174 pairs of monozygotic (one-egg) twins and 517 pairs of dizygotic twins and 4,394 other relatives. The material is, therefore, statistically reliable. Together they present a thoroughly comprehensive picture of the role of heredity in the etiology of schizophrenia, by showing that the incidence of schizophrenia among relatives of schizophrenics increases directly as the degree of biological relationship increases. Thus, the incidence of schizophrenia among step-sibs—which usually are not biologically related to the schizophrenic—is 1.8 per cent; in half-sibs, 7.0 per cent; in full sibs, 14.3 per cent; and in dizygotic twins, 14.7 per cent. (The incidence of schizophrenia in the co-twins of dizygotic pairs of the same sex is 17.4 per cent for males and 17.6 per cent for females, as against 10.3 per cent for twins of opposite sex. This may perhaps be referred to differences in environment associated with sex.) In monozygotic twins it rises to 85.8 per cent.

In examining these statistics, it is to be understood that the question answered is: Given a schizophrenic, how many schizophrenics are found among relatives of a given degree of biological relationship? Thus, in the case of twins, there being only one relative of the degree named, the question becomes: What proportion of the co-twins develop schizophrenia? The contrast in the incidence of schizophrenia in the co-twins of schizophrenic monozygotic twins and those of schizophrenic dizygotic twins is plain evidence of the predominating part played by inheritance in the etiology of schizophrenia. This contrast can arise only because both twins of a monozygotic pair are guided in their development by identical sets of genes, while the genes of dizygotic twins differ in exactly the same way that the genes of ordinary sibs differ.

The failure of a small proportion of the co-twins of the monozygotic twins to develop schizophrenia indicates that, under favorable circumstances (environment), a person with the inheritance for schizophrenia may not reach the clinical or hospitalization stage. Nevertheless, with a single exception, all co-twins in Kallman's series of monozygotics showed evidence of their schizophrenic constitution by those personality characteristics which are called schizoid by psychiatrists. All in all, then, it appears that schizophrenia develops only in persons of a certain genetic constitution. (H. D. GOODALE, *257 West Main Street, Williamstown, Massachusetts.*)

In connection with the 4th Microbiological Congress being held in Copenhagen this month, Michael Heidelberger, president, American Association of Immunologists, has forwarded to *Science* a letter written by Ludwik Hirszfeld of Wroclaw to Thorvald Madsen of Copenhagen. According to the letter, during the German occupation 2,000 Polish scientists and physicians were murdered, many of them having died as a result of experimental operations; two of the leading bacteriologists, Prof. Fleck and Privatdozent Mayzel, "were obliged to work in the laboratory of concentration camps"; and Polish universities were closed for the duration of the occupation, most of the books and apparatus having been removed to Germany with the assistance of German professors. Prof. Hirzfeld, who himself survived the occupation by hiding under a foreign name, concludes: "And so we hope that the Danish scientists will understand that we have no right and no intention to forget and that we don't wish to meet those whom we consider as actively or passively responsible for these crimes."