terminal disease may not indicate the underlying disease; and third, the underlying disease may in itself result from some pathological condition. Thus an individual with arteriosclerosis might develop nephritis and die with terminal pneumonia. We have taken this into account and feel that these inaccuracies do not alter our general conclusions. Whatever the mistakes in diagnosis may be (within group A or group B) the values of k will not be affected provided the same mistakes are made at all ages. The consistency within each group indicates that this is the case and that cross-diagnosis between the groups does not play a large role (except after the age of 80).

Senile debility is not as easily measured as the death rate is. However, a composite measure of both physical and mental debility is given by the data on male unemployment. We admit that this is only a crude measure of debility, but feel that most of the complicating influences affect the value of P_o rather than the value or constancy of k. It was found that in 1930 the probability of male unemployment followed equation (1) after the age of 50, with k equal to 0.115 (and approximated this equation from 40 years up). The data in 1920 are consistent with the 1930 findings. These values are for unemployment from all causes. Data on "Unemployment Class C" (admittedly unable to work) in six northeastern states also follow equation (1) but with a lower value of k (0.032). The unwillingness of older people to admit disability may make this value less reliable. Nevertheless, the agreement with equation (1) is significant.

Thus there is a statistical correlation between senile debility and senile death rate. This suggests that the progressive debility in old age is caused by an alteration of the same (Q and R) functions which control the death rate.

This brief report is preliminary to a more detailed treatment of the data which will be submitted to another journal. The author hopes that these findings may help define the problem of senescence, and that the equations may serve as a tool in determining whether or not observed changes with age are primarily correlated with senescence. This is determined as follows: The logarithms of the observed values are plotted against numerical age. If the change is correlated with senescence, a straight line curve will be found in middle life and old age. The slope of the line gives the value of k which can be compared with $k_Q = 0.048$ and $k_R = 0.06$ (on a natural logarithm basis). Experimental prolongation of life of animals may be considered to affect senescence only if there is a decrease in the value of k for known causes of death of mature adults, rather than a reduction in deaths through a lowering of the value of P_o for certain diseases. The author feels that superficial characteristics, such as the condition of the hair and skin, are unsatisfactory criteria of senility. More knowledge concerning the physiology of death and the physiology of arteries is needed in order to clarify the mechanism of senescence.

These findings also show that for the most part no disease can be called a "senile disease" more than another in the same group. The high death rate in old age is the result of changes which make us succumb more readily to all diseases, although the change is faster for the vascular diseases. Nearly four deaths out of five after the age of 30 are due, not to a greater prevalence of disease, but rather to the change in the Q and R functions which increases the death rate from the same diseases which affect young people.

The theory that senescence results from a random accumulation of degenerative changes is not supported by these findings. A random accumulation should follow a linear equation rather than the exponential equations (2) to (4). It is perhaps correct to say that there is an accumulation of degenerative changes, but that the process follows a definite mechanism such that the rate of change at any age depends upon the amount of accumulated change. Why this mechanism should be followed remains to be determined.

As was mentioned above, there seems to be more popular concern about senile debility than about senile death rate. Should we be correct in our assumption that these are both caused by the same physiological alterations, then it is to be expected that any mitigation of these alterations will prolong the vigor of youth as well as delay death in old age. This would mean a prolonged middle life with a relatively smaller portion of life spent in dependency.

OBITUARY

LETA S. HOLLINGWORTH

DR. LETA S. HOLLINGWORTH, member of the staff of Teachers College, Columbia University, since 1916 and a world-renowned authority on the psychology and education of exceptional children, died on November 27, in the Columbia-Presbyterian Medical Center in New York City. She was the wife of Dr. H. L. Hollingworth, professor of psychology in Barnard College, Columbia University.

Professor Leta S. Hollingworth was born in Chadron, Nebraska, the daughter of John G. and Margaret D. Stetter. She received her B.A. degree from the University of Nebraska in 1906, in the same class with her husband. Together they were honored for distinguished contributions to science and education by their alma mater, which conferred on them the degree of doctor of laws in June, 1938.

After her graduation Mrs. Hollingworth taught

English in Nebraska high schools for two years. Coming to New York City in 1908, she was married to Mr. Hollingworth, and shortly began her graduate study in psychology and education. She received the M.A. degree from Columbia and was appointed clinical psychologist at the Post-Graduate Hospital in 1913. A year later she joined the staff at Bellevue Hospital. Having continued her graduate study during these years, she received the Ph.D. degree from Columbia in 1916 and was immediately appointed instructor in educational psychology at Teachers College. She served continuously as a member of the staff of Teachers College until her death, advancing to the rank of assistant professor in 1919, associate professor in 1922 and full professor in 1929.

Professor Hollingworth's first field of specialization was the area of mental and emotional abnormality. In her approach to this field, she combined research and professional experience. In addition to her dissertation, a study of the mental and emotional effects of functional periodicity in women, she published many reports of laboratory investigations and clinical studies. For nearly twenty years she conducted classes at Teachers College in clinical psychology. She was co-author of an important treatise, "The Problem of Mental Disorder," published in 1934. During a period characterized by diversities and frequently extravagance of theory, Professor Hollingworth's practice and writings were distinguished by their soundness, astuteness and complete freedom from contagion by the parade of "isms."

Upon taking her post at Teachers College, Professor Hollingworth entered with her characteristic zeal and insight into three other related fields: the psychology of special talents and defects; the psychology and education of intellectually subnormal children and the psychology and education of gifted children. In each of these areas she quickly achieved a position of leadership which steadily grew more pronounced and was at the zenith at the time of her death—at 53 years of age.

In her investigations of special abilities and disabilities, Professor Hollingworth explored spelling, reading, drawing, painting, music and other activities. One of the earliest studies was reported in a monograph, "Psychology of Special Disability in Spelling," 1918, and in her volume "Special Talents and Defects," first published in 1923, she presented a comprehensive survey of the whole field.

Professor Hollingworth's investigations established her early as the leading authority in the psychology and education of subnormal and delinquent children. Her "Psychology of Subnormal Children" has been a standard text since its publication in 1920. She was responsible for the establishment of special classes for subnormal children in many communities and served as adviser to the officers in charge of this type of education in New York and many cities, states and foreign nations.

The field in which Professor Hollingworth worked with the greatest enthusiasm and vigor is the psychology and education of the gifted child. Early in her career she arranged with Dr. Jacob Theobald and other officers of the New York City schools for the selection and segregated education of a group of intellectually gifted children. She worked zealously with these pupils from the time they formed a public-school class of pupils less than ten years old until her death twenty years later. A stream of articles, monographs, dissertations and books poured from her work, combined with that of graduate students attracted by her during these years. As in other areas, her book "Gifted Children," published in 1926, became the standard text for schools of education. In her "Psychology of the Adolescent" (1928), she wrote what is doubtless the most penetrating analysis ever offered of the characteristics, problems and educational needs of all types of individuals, normal and unstable, bright and dull, talented and defective, during the teens.

Recognizing the importance of her work with exceptional children, the Board of Education of New York City and the administrative staff of Teachers College established in February, 1937, with Professor Hollingworth as executive officer in charge of research, an experimental school, known as P.S. 500, the Speyer School, for five years of further investigation. In this school, new curricula were put into effect, and an extensive array of researches was inaugurated under her direction. To these projects she devoted herself with intense enthusiasm. Although many reports have been published, it is stark tragedy that death came to her at a time when the most important investigations were still a year from completion.

Professor Hollingworth's work with exceptional children gave expression to the fundamental traits of her character and personality. Her decisions and opinions were based on cold facts; she was a staunch and courageous opponent of all forms of educational wishful thinking. Although her judgment was always impervious to the appeal of sheer sentimentality, which she despised, she was capable of the deepest affection for human beings and intense devotion to human welfare. The subjects of her studies were never human guinea pigs to her; they were the individual objects of her deepest concern. A fact, not widely known, is that she remained continually on intimate terms with all the members of her various experimental groups of gifted children, visiting them, encouraging and advising them and in a great many cases supplying tangible necessities for the pursuit of education through elementary, high school and college and graduate study. She lived to see and help her earliest group arrive at adult status; keen must have been her regret

if she realized during her illness that her most recent group of more than fifty gifted children, gathered exclusively from financially poor homes and now averaging about twelve years of age, must carry on without her. This intense interest in and devotion to the living individual, undistorted by sentimentality, and coupled with the clear-eyed vision of the scientist, of whose tools she was a master, account for the unique scientific validity and practical value of Professor Hollingworth's work.

Professor Hollingworth cherished a deep faith in the power of honest scientific work to promote human welfare. Her faith was well expressed in an address given before an audience of educators and laymen a year ago under the title, "What We Know About the Early Selection and Training of Leaders," from which a paragraph is quoted.

"All this knowledge has been gleaned since 1900, and it is a goodly amount. It is enough to modify education and social-economic procedure radically, if it becomes generally disseminated and accepted. These facts would be epoch-making, if applied to the limit of their power to apply. For a long time people will not believe them, will be afraid of them, will not know what to do with them, but in the end the truth will be admitted and utilized, as everything is finally utilized that has power to bring order to human life."[1]

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RECENT DEATHS

DR. WILLIAM SNOW MILLER, professor emeritus of anatomy at the University of Wisconsin, died on December 26. He was eighty-one years old.

DR. CHARLES DAVID MARX, professor emeritus of civil engineering at Stanford University, died on December 31. He was eighty-two years old.

DR. GEORGE EMERSON BREWER, professor emeritus of surgery at the College of Physicians and Surgeons of Columbia University and surgical director of the Presbyterian Hospital, New York City, died on December 24. He was seventy-eight years old. In recent years he had been research associate in somatic anthropology at the American Museum of Natural History.

Nature records the death of Sir William Prout, authority in tropical medicine, at the age of seventy-seven years; of P. H. Grimshaw, keeper of the department of natural history in the Royal Scottish Museum; of Professor Anton Freiherr von Eiselsberg, the Vienna surgeon, at the age of seventy-nine years; of Dr. Richard I. Meyer, professor of inorganic chemistry at Berlin, at the age of seventy-four years; of Dr. F. Y. Loewinson-Lessing, director of the Petrographical Institute of Moscow, at the age of seventy-eight years, and of Sir Ernest Scott, emeritus professor of history in the University of Melbourne and president in 1939 of the Australian and New Zealand Association for the Advancement of Science, aged seventy-one years.

SCIENTIFIC EVENTS

OCCURRENCE OF A DEPOSIT OF TRONA

OCCURRENCE of a thick deposit of trona at a depth of about 1,600 feet on government land in Sweetwater County, Wyoming, is announced by the Geological Survey, Department of the Interior. The mineral, which is composed of sodium carbonate, sodium bicarbonate and water and which contains when pure the equivalent of 70.35 per cent. sodium carbonate, was found in the core of the John Hay, Jr., oil and gas well drilled by the Mountain Fuel Supply Company.

The drill log of the well indicated that a deposit of a crystalline sodium salt streaked with greenish gray clay extended from a depth of 1,590 feet to a depth of 1,612 feet, and that a dark oil shale containing sodium salt crystals extended from a depth of 1,612 feet to a depth of 1,620 feet.

Sections of the core obtained between the depths of 1,590 feet 3 inches and 1,619 feet 9 inches and between 1,653 feet 2 inches and 1,659 feet 3 inches were subsequently identified as trona and analyzed in the chemical laboratory of the Geological Survey with the following results:

Depth				*Equivalent sodium carbonate*
Ft.	*inches*	*to ft.*	*inches*	*per cent.*
1590	3	1591	6	69.27
1592	6	1600	4	67.38
1617	6	1619	9	69.05
1653	2	1654	8	64.45
1654	10	1659	3	68.64

The analytical results indicate the presence of relatively pure trona, which is soluble in water. The insoluble material associated with the trona included clay, 3.9 per cent.; shortite, 1.4 per cent., and one fourth of 1 per cent. of pyrite.

The core obtained between the depths of 1,185 feet and 1,820 feet is estimated by the survey to contain about 15 per cent. of the mineral shortite, a double salt of sodium carbonate and calcium carbonate, which mineral was discovered in this well. Pure shortite contains 34.6 per cent. of sodium carbonate.

Two other rare minerals, northupite and pirssonite, have been identified in the core in small quantities. This is the second known occurrence of northupite, a

[1] *The Teachers College Record*, 40: 579, April, 1939.