tance. The infant mortality of the Hopi children under two years of age after the summer rainy season is very great. I have no exact figures, for the Hopi agent and the Indian Bureau keep no vital statistics, but in 1934 nearly all the children under two years of age died of infantile dysentery at Shungopavi and also at First Mesa. (The agent blames the deaths on too much watermelon.)

I want to stress this difference between the sanitary conditions of families that live in independent houses and the conditions under which people live in city "slums." There is a good deal of evidence that the people of cities, up to very recently, did not reproduce themselves and were it not for immigrants from the country, cities would dwindle in population. If this applies to cities in so-called civilized countries, why would it not be more true of the Hopi, who is living under much the same conditions as the population of a European city lived two hundred years ago as pictured by Lowie.[8] Indeed in 1890 the author visited the German cities along the Rhine. At that time sewage flowed in the streets, and they were more odoriferous than any Hopi town. It is only by modern sewage disposal and sanitation that modern cities hold their own. In my youth the annual loss in Philadelphia of adults by typhoid and of children by infantile dysentery was terrific. I can remember the headlines in the papers when the annual September typhoid epidemic was reported. All statistics show that from the point of view of population increase, it is better to live in a farm house than in a city flat.

Various ethnologists of the early days, including Sir John Lubbock,[9] have recorded the density of populations of primitive hunting tribes. If we select from these data tribes that were living under semi-arid conditions, such as in Patagonia and Australia, we find that 100 square miles will support by hunting from one to five persons. Hinsdale[10] has shown that the game is dependent on the vegetation, and very fertile regions will support more vegetation, hence more game, hence more hunters. Using these data we can gain some idea of the population of northern Arizona before the days when agriculture was introduced. From an inspection of the curve of population increase from 600 A.D. to 1000 A.D. (Fig. 1) this event does not appear to have occurred in the very dim past. Although the curve of growth might appear to be in an almost straight line, yet from a study of fruit-flies raised in a closed environment, Pearl[11] has shown that such curves are really letter S's. While the country is thinly inhabited the curve increases rapidly until the limit of available food supply begins to be felt and then rounds off. Newly introduced factors will affect the curve, so in the case of the pueblo population, when the change of housing methods occurred between 1050 and 1100, the curve was affected so that the curve began to fall.

We can infer that before the introduction of agriculture the population probably rose and fell as game was scarce or abundant, forming a wavy line. This wavy line probably ranged from two to four persons per 100 square miles. When agriculture was introduced, the population began to increase. Sir Arthur Keith considers that agriculture would support a population in a very fertile country of as much as 20,000 per 100 square miles, whereas in the same rich region without agriculture fifty persons might eke out a very miserable existence. I think, by the application of the formula of Pearl's logistic curve[12] it might be possible to determine the approximate time when agriculture was introduced into the Southwest. This is a tool that has not yet been used.

Our studies show us that the population of northern Arizona increased seven fold between 600 A.D. and 1100 A.D. This was possible by the introduction of agriculture, together with the custom of families living in isolated houses.

During the next eight hundred years, when urban communities such as Wupatki grew up, the population decreased. This decrease was equal to the previous gain. We do not have to postulate nomads, we do not have to postulate drought. The mere fact that people lived in crowded tenements under bad sanitary conditions, and so could not raise their children is a sufficient explanation to account for a loss of population.

Until the Hopi adopt sanitary measures in keeping with the crowded conditions of city life, they will never compete in numbers with the wandering Navajos. This is a lesson taught by a study of northern Arizona's prehistoric population. Without sanitation country life is better than city life.

[8] R. H. Lowie, "Are We Civilized?" p. 74, 1929.

[9] Sir John Lubbock, "Prehistoric Times," p. 585, 1913.

[10] W. B. Hinsdale, Occasional Papers from the Museum of Anthropology, University of Michigan: No. 2, p. 6.

[11] Raymond Pearl, *Proceedings Nat. Acad. Sci.*, Vol. 6, No. 6, p. 282, 1920; also Vol. 8, No. 7, p. 212, 1922.

[12] Pearl, *op. cit.*

OBITUARY

JUSTUS WATSON FOLSOM

DR. JUSTUS WATSON FOLSOM, entomologist in the Division of Cotton Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, died at the infirmary at Vicksburg, Miss., on September 24, after an illness of several weeks following heart attacks.

Dr. Folsom was born at Cambridge, Mass., on September 2, 1871. He received the degree of bachelor of science in 1895 and that of doctor of science in 1899 from Harvard University. For one year (1899–1900) he was professor of natural science at Antioch College, Yellow Springs, Ohio. In 1900 he went to the University of Illinois as instructor in entomology. He was associate in entomology from 1906 to 1908 and assistant professor from 1908 to 1923. He came to the Bureau of Entomology in 1925 as associate entomologist. During his entire service in this bureau he was located at the Tallulah, La., laboratory of the Division of Cotton Insect Investigations.

Dr. Folsom was interested in many phases of entomology and his publications include papers on the anatomy, physiology, embryology and ecology of insects. He had an international reputation as an authority on Collembola and Thysanura and published numerous systematic papers on these groups. Much of his earlier economic work was with alfalfa insects. During recent years his economic studies have been devoted to cotton insects. His text-book, "Entomology with Special Reference to Its Ecological Aspects," has been widely used during the past twenty-five years. The fourth revision, published in 1934, was revised by Professor R. A. Wardle, and appeared under the joint authorship of Folsom and Wardle.

Dr. Folsom was a fellow of the American Association for the Advancement of Science and of the Entomological Society of America. He was president of the latter association during 1931. He was a member of the American Association of Economic Entomologists, serving as vice-president during 1932, being the chairman of the Cotton States branch. He was also a member of the Ecological Society of America and of the Cambridge Entomological Club, serving as president of the latter organization in 1900. Many of the well-known entomologists of the United States were among his students at the University of Illinois.

A. S. H.

RECENT DEATHS

DR. HENRY BENJAMIN HEDRICK, until his retirement in 1932 chief ballistician at the Aberdeen Proving Grounds of the Army Ordnance Department, previously astronomer at the U. S. Naval Observatory and at Yale University and mathematician of the Department of Terrestrial Magnetism at the Carnegie Institution of Washington, died on October 7 at the age of seventy-one years.

JOHN ENGLISH MCWHORTER, assistant professor of surgery at the Columbia Medical School, died on September 19 while at work in the laboratory of the Englewood, N. J., Hospital, of which he was consulting pathologist. He was sixty-one years old.

THE sudden death is reported of M. Camille Sauvageau, correspondent in the section of botany of the Paris Academy of Sciences.

MISS CORNELIA CLARKE, nature photographer, died at Grinnell, Iowa, on September 29.

A CORRESPONDENT writes: "Dr. Elba Emanuel Watson, an instructor at Michigan State College, died suddenly on September 27 at the age of sixty-five years. He graduated from the University of Michigan and taught German for many years in a high school in Greater New York. He returned to the University of Michigan as a student in botany and received his M.S. in that subject in 1918 and was an assistant for a year. He was at the New York Botanical Garden for a year and an instructor at Rutgers College for a year. He entered the Graduate School of Michigan State College in 1922 and completed a monograph of the genus Helianthus as a Ph.D. thesis in 1926. Since that time he has been an instructor (in German) at that institution although maintaining his interest in the genus Helianthus."

SCIENTIFIC EVENTS

PLANT BREEDING EXPERIMENTS IN SWEDEN

THE agricultural correspondent of the London *Times* gives an account of the celebration of the jubilee of the Svalöf Plant Breeding Station in Sweden. Many experts concerned with this branch of science from different countries visited Svalöf for the occasion. The Crown Prince of Sweden and the Prime Minister were among the guests, demonstrating the high value that Sweden sets on the work being done at Svalöf.

The correspondent writes:

In the development of her commercial life Sweden has contrived to keep a healthy balance between urban industry and farming. A productive and prosperous agriculture is recognized as an asset of first importance to the nation.

We know some of the Svalöf varieties in England, such as Victory and Star oats, Swedish Iron and Steel wheats, and Weibulls Standard wheat bred at Weibullsholm. There are other new varieties in the making at Svalöf which may prove useful on highly farmed land in Britain. In Skåne, the southernmost province, where most of the wheat is grown, the level of farming is high, comparing well with East Anglia and the Lothians.

When cross-breeding work on winter wheat was started the direct purpose was to combine the high yielding power