India, which was probably its original home, to Egypt about a dozen years ago in cotton seed.

The Department of Agriculture has undertaken strenuous measures to prevent the introduction of the pink boll worm from Mexico. The introduction of cotton seed and of baled cotton which often carries scattered seeds has been prohibited, and Congress has made a special appropriation under which very thorough work in enforcing quarantine measures can be done on the Texas border.

It is interesting to note the recent experience of Brazil with the pink boll worm. In 1913 the Brazilian government paid considerable attention to the encouragement of the culture of Egyptian cotton in that country. An agent was sent to Egypt and large quantities of seed were shipped to Brazil. This seed was distributed throughout the republic by a branch of the Ministry of Agriculture. This branch has inspectors in every state capital. Each one of these received quantities of the seed and distributed it free to all applicants. A more thorough method of dissemination of an insect in a new country could hardly be devised. Early in 1914 a careful survey of the cotton belt of Brazil was made by an American who was engaged in the encouragement of cotton culture in the republic. He found no indications of the cotton boll weevil for which he was looking especially or of any other insect pest attacking the seed or bolls. Late in 1916 he made another trip over the same territory and found that the pink boll worm was generally and thoroughly established. In fact the pest was so numerous that the yields of certain fields were reduced by half. Naturally the situation attracted great attention and many suggestions were made about relief measures. Some of the legislators suggested the passage of a law compelling the burning of all cotton fields in Brazil. Of course it is too late to stamp out the insect by any such means, but the whole episode emphasizes enormously the importance of quarantine measures to prevent the introduction of pests which in all probability can never be exterminated when they have once become established.

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SPECIAL ARTICLES

THE EFFECT OF RETARDATION OF GROWTH UPON THE BREEDING PERIOD AND DURATION OF LIFE OF RATS[1]

During the course of our experiments on nutrition we have had a number of rats which were stunted for various periods of time. With respect to these animals the question has frequently been raised as to whether this retardation of growth tended to prolong their life beyond the average span; that is, whether physiological age is a function of time alone or also of growth. The inquiry then becomes pertinent as to what may be considered the average length of life of a rat.

Donaldson[2] states that "a rat three years old may be regarded as corresponding to a man ninety years old." Slonaker[3] has reported that one of his rats reached an age of 45 months; and recently one of our rats, although fed on a uniform experimental diet since it was 6 weeks old, reached the age of 40 months —the longest life yet recorded for our colony. In an attempt to find out how long our rats might be expected to live, we have at various times set aside a number of stock rats to be kept under our ordinary laboratory conditions during their entire lifetime. Out of 91 such animals, 17 (19 per cent.) died under one year of age; 48 (53 per cent.) died between one and two years of age; and 26 (29 per cent.) lived more than two years, the oldest one reaching an age of nearly 34 months. From these figures it is evident that less than a third of the rats in our colony may be expected to live to be more than two years old.

Considering the wide variations in the ages of these rats it was thought that possibly a more definite, although an indirect answer to the question of the effect of stunting upon the length of life might be obtained by determining the age to which stunted females remain

[1] The expenses of this investigation were shared by the Connecticut Agricultural Experiment Station and the Carnegie Institution of Washington, D. C.

[2] Donaldson, H. H., "The Rat," Memoirs of the Wistar Institute, No. 6, Philadelphia, 1915.

[3] Slonaker, J. R., *J. Animal Behavior*, 1912, II., 20.

Rat	Stunting Period Began at		Growth Resumed at		Brood I			Brood II			Brood III			Brood IV			Brood V			Brood VI			Death	
	Age	Weight, Gm.	Age	Weight, Gm.	Age	No. in Litter: Born	No. in Litter: Survived	Age	No. in Litter: Born	No. in Litter: Survived	Age	No. in Litter: Born	No. in Litter: Survived	Age	No. in Litter: Born	No. in Litter: Survived	Age	No. in Litter: Born	No. in Litter: Survived	Age	No. in Litter: Born	No. in Litter: Survived	Age	Cause
2031 ♀	1 mo. 13 da.	48	17 mo. 21 da.	108	23 mo. 19 da.	4	4	25 mo. 21 da.	5	5	28 mo. 5 da.	3	2										32 mo. 18 da.	Lung disease
2339 ♀	1 mo. 8 da.	48	13 mo. 0 da.	104	17 mo. 17 da.	8	6	19 mo. 23 da.	9	9	22 mo. 11 da.	8	8	28 mo. 9 da.	1	0	29 mo. 20 da.	6	6	31 mo. 25 da.	2	0	32 mo. 15 da.	Lung disease
2369 ♀	1 mo. 15 da.	79	12 mo. 15 da.	103	16 mo. 23 da.	12	12	19 mo. 2 da.	7	6	21 mo. 7 da.	12	12	25 mo. 9 da.	2	2							27 mo. 17 da.	Lung disease
2446 ♀	1 mo. 13 da.	90	6 mo. 4 da.	90	16 mo. 0 da.	7	7	18 mo. 0 da.	3	1	20 mo. 19 da.	10	9	25 mo. 9 da.	5	0							26 mo. 10 da.	Lung disease

fertile. According to Donaldson[2] the menopause normally occurs at the age of 15 to 18 months, although he reports one female which, mated at the age of 22 months, produced a litter of one. The young was not reared, however.

Four of our stunted females were mated at various times. The results are summarized in tabular form. Data regarding their early stunting and subsequent resumption of growth have been published elsewhere.[4] In every case the female was not remated until some time after the birth of a litter, as the maximum number of broods which she could bear was of much less interest than the final age at which she was capable of producing young. Although none of these rats began breeding until they had reached an age when normal rats are commonly believed to be approaching the menopause, they produced from three to six litters of young and successfully reared all but a few of them. Their young were apparently as vigorous as those born of younger mothers. Hence the menopause has been postponed long beyond the age at which it usually appears. In view of this, and the added fact that less than one third of our stock rats have reached an age of more than two years, whereas all of these stunted females lived longer, it appears as if the preliminary stunting period lengthened the total span of their life.

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THE MATHEMATICAL ASSOCIATION OF AMERICA

THE second annual meeting of the Mathematical Association of America was held at Columbia University, New York City, on Thursday, Friday and Saturday, December 28–30, 1916, in affiliation with the American Association for the Advancement of Science. There were 184 persons present at the various meetings, including 141 members of the association. The first meeting was a joint session

[4] Osborne, T. B., and Mendel, L. B., *J. Biol. Chem.*, 1915, XXIII., 439; *Am. J. Physiol.*, 1916, XL., 16.