crested. Second hybrid generation includes both crested and crestless birds.

Series II. Inheritance of plumage color: Green canaries crossed with yellow canaries give mottled offspring. Descendants of these mottled offspring include some yellow and also some green birds.

Demonstration of Œnothera (evening primrose) and its mutants.

Demonstration of branching and branchless sunflowers.

Demonstration by Miss Lutz of variability of chromosomes in Œnothera and its mutants.

Demonstration by Mr. F. E. Lutz of inheritance of abnormal wing venation in the vinegar fly, Drosophila.

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Further studies of the effects of the exposure of sperm to X rays.

By **CHARLES R. BARDEEN.**

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Eggs of *Rana pipiens* fertilized by sperm exposed to Roentgen rays for one hour all develop abnormally. The abnormalities begin to appear during the gastrulation period. Cases of spina bifida are not uncommon. Out of a lot of several hundred eggs, nearly all of which were fertilized, only one specimen survived two weeks. This was much stunted in growth and very abnormal in shape. Out of 80 eggs of the common toad exposed only 15 minutes to the Roentgen rays but 4 larvæ have survived one month. Most of the larvæ were markedly abnormal in shape. Of the survivors, two are large and apparently normal and two are undersized. Only one individual out of 150 eggs fertilized by sperm exposed 37 minutes to the rays has survived one month and this individual is but half the normal length and breadth. Out of 250 eggs fertilized by sperm exposed to the Roentgen rays for an hour and ten minutes, all exhibited marked abnormalities of development and the least abnormal larva and longest survivor died a week after the eggs were fertilized.

The susceptibility of sperm of anura to the X rays is in marked contrast to that of paramecia. Exposure of paramecia for 12

hours to rays of the same intensity caused no visible effects on form, rate of division or process of conjugation.

I have exposed the sperm of the toad to heat at 50° and 65° C. for from 15 to 20 minutes. This exposure destroys the fertilizing power of most of the spermatozoa but the few eggs fertilized by such sperm develop normally. Sperm exposed for from 15 to 20 minutes to the following solutions: $\frac{1}{40}$ per cent. formol, 12.5 per cent. ethyl alcohol, 1 per cent. NaCl, $\frac{1}{32}$ per cent. HCl and $\frac{1}{32}$ per cent. KOH, has the power of fertilizing toad eggs. Practically all of the resulting larvæ which have been preserved appear normal at the end of one month after fertilization of the eggs. Sperm exposed to stronger solutions of the same substances for 15 to 20 minutes seems to lose power of fertilizing. No abnormal larvæ have developed from the few eggs thus fertilized.

The short breeding season of the toads prevented as extended a series of experiments along these lines as had been planned.

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On the absorption of toxins by the nerves.

By **CYRUS W. FIELD.**

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In an article published in the *Archiv für experimentelle Pathologie und Pharmakologie*, Vol. 49, Meyer and Ransom stated as a result of their experiments that tetanus toxin enters the central nervous system through the motor nerves, and moreover that it passes to the cord by way of the axis cylinder. Since that time Meyer (1905) has demonstrated that diphtheria toxin after injection into the experimental animal, could be demonstrated in the peripheral nerves. In a large number of experimental animals injected with both tetanus and diphtheria toxin, I have been able to show that the toxin could be demonstrated in the peripheral nerves leading from the inoculated area, and by the use of the right dose, and at a certain time, free toxin could be demonstrated in the cord, and yet the other tissues of the body including the blood, liver, spleen and kidneys showed no free toxin.