λ	Int.	Term combination
1576.5	6	$^2P_2 - {}^4P_3$
1540.8	6	$^2P_2 - {}^4P_2$
1488.6	8	$^2P_2 - {}^4P_1$
1633.6	10	$^2P_1 - {}^4P_2$
1575.0	9	$^2P_1 - {}^4P_1$
1449.9	3	$^2P_2 - {}^2P_1$
1582.4	8	$^2P_1 - {}^2P_2$
1531.9	7	$^2P_1 - {}^2P_1$

the ionization potential of approximately 12.2 volts for the neutral atom. This value is checked by interpolation from the known ionization potentials of Ga, Ge and Kr.

Both Kimura[3] and Hori[4] have published observations of the complex structure of Br lines. We have used the Fabry-Perot interferometer in observing the Br spectrum and we confirm their findings as to the fine structure of numerous lines.

The details of this investigation will appear in an early number of the Bureau of Standards *Journal of Research.*

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ON THE BIOLOGICAL EFFECTS OF X-RAYS

THE object of this note is to record briefly the results of experiments upon *Saprolegnia ferax* carried out during the summers of 1925 and 1926 at Woods Hole. It was to be expected that with modern radiation apparatus and a knowledge of the technique as applied to *Drosophila, Saprolegnia* with its extremely sensitive behavior toward chemical changes and its various modes of reproduction would provide changes under the action of X-rays which could be treated statistically. Except for a possible stimulus to nuclear division in the mycelium under the influence of X-rays, extensive experimentation on the rate of growth in culture media, on the formation and liberation of zoospores, the formation of oogonia and oospores, and the movement of protoplasm, failed to produce any results which could be attributed to the action of X-rays. The amount of radiation was enormously greater than had been employed with *Drosophila.* A dosage of 50,000 volts at 2.5 m.a. for twenty minutes with a standard Coolidge tube, and the material at 12 cm from the tungsten target (in our method of recording represented by 32D),[1] had been sufficient to cause complete sterility in *Drosophila* for two days and partial sterility for ten days. Applications as high as 75,000 volts at 10 m.a. for forty-five minutes at a similar distance from the tube failed to produce any results in *Saprolegnia.* The material radiated was exposed in water in small petrie dishes, duplicate material being kept as a control. The entire life cycle of *Saprolegnia* may be carried out in from two to three days. These experiments were so conducted that samples of the radiated material could be removed for study or staining without disturbing the remaining material. It was desirable to keep a large amount of material permanently, and after experimentation with many stains it was found that gentian violet for eighteen to twenty-four hours, destained by xylol, would show chromosomes in the mycelium and the oogonia without recourse to sectioning. The chromosomes, however, are minute.

As regards *Drosophila,* the writer does not presume to say that mutations can not possibly be induced by X-rays, but a series of carefully planned and extensive experiments carried out in 1922–1924 by the writer with the cooperation of Dr. Mavor, having as one of the primary ideas the possible production of mutations by X-rays, failed entirely to produce any physical mutations which could be detected. In these experiments, with special reference to three characters of the second chromosome, black, purple and curved, under various dosages of X-rays, some 120,000 individuals were individually examined in four repeated experiments, one half the number being controls. In no case could mutations be detected in greater numbers than appeared normally in the stock. Crossovers from the "recovery period," *i.e.,* the period of greatest percentage of crossover after X-ray treatment, were bred in numerous auxiliary experiments; in one of these the increased crossover percentage was clearly demonstrated as not inherited,[2] and there was no sign of mutations.

From these experiments the writer believes that X-rays tend to show the extraordinary resistance of the germ-plasm to change by experimental means. Either the organism is killed, *i.e.,* by lethal rays during maturation divisions in the egg, resulting in complete or partial sterility; or the changes in percentage of crossing-over which accompany the recovery period disappear in the succeeding generation.

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CONTROL OF THE COTTON BOLL WEEVIL BY INSECT ENEMIES

PRIOR to the use of poisons for the control of the cotton boll weevil (*Anthonomus grandis* Boh.), the attention of many entomologists interested in the

[3] Memoirs, College of Science, Kyoto, 4: 139. 1920.
[4] Memoirs, College of Science, Kyoto, 9: 307. 1926.
[1] J. W. Mavor and H. K. Svenson, *Genetics,* 9: 588–608 (1924), and previous papers.
[2] *Am. Nat.,* 58: 311–315. 1924.