Effect of X-rays on Seeds.

THE effect of X-rays on growth and development is a subject which has always caused considerable interest. It can be studied most easily in plants where cell division takes place so rapidly that daily growth can be observed.

We irradiated various kinds of seeds, chiefly broad beans, barley, and mustard, the effects on these forms being dissimilar although the conditions and the dosage were exactly alike. It would appear, therefore, that a specific dose is required. We used approximately three times the dose of X-rays which would cause the human skin to redden, at 120 kilovolts. In every case the seeds were covered with black paper to protect them as much as possible from the light and heat from the tube.

The broad beans gave the most rapid and striking results. Seeds which had been planted for different lengths of time, varying from one week to a few hours, and also dry seeds, were employed, an equal number of seeds in each case being used as controls. Stunting followed irradiation in all those which had been growing for more than 24 hours. The changes were not observable for some days (two or three) and were first seen in the oldest seeds, but beans which had been growing for 48 to 72 hours appeared to be most sensitive. In addition to being stunted the roots appeared to become slightly bulbous at the tip. In most cases the shoots appeared later than in the controls, but sometimes failed altogether. Side roots never appeared in the stunted X-rayed specimens.

In mustard seedlings the only detrimental result was the failure of the side roots to develop, and that only in the seeds which had been growing for more than 72 hours before they were irradiated. An extremely small dose (about $\frac{1}{20}$ of above) appeared to cause more rapid growth.

Little alteration was found in the roots of the barley, as in this plant the shoots were most radiosensitive and showed very much less growth than the controls.

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Local Extinction of a Recently Abundant Lamellibranch.

THE Lamellibranch *Spisula subtruncata* (Da Costa) is reported in various old records as occurring abundantly in parts of the Clyde Sea Area. For example, in "The Mollusca of the Firth of Clyde," 1878, p. 33, A. Brown writes: "Exceedingly abundant a little above low water in Ettrick and St. Ninian's Bays, Bute; and in Fintry Bay, Cumbrae. It is common also all along the Ayrshire coast, and in most sandy bays throughout the district. In Cumbrae they are known as 'Aikens,' and are used both for food and bait." Further confirmation is found in the *Medusa* records and in the fauna and flora published for the British Association in 1901—records of almost thirty years age and older.

By contrast with these records of abundance one of us (R. E.) cannot recall ever having seen a living *S. subtruncata* in the course of twenty years. In recent years we have made a very careful search for this species in Cumbrae, Bute, and the Ayrshire coast, etc., without finding a single living specimen, although the shells occur in millions in Kames Bay, St. Ninian's Bay, and Hunterston sands.

Further, inquiries amongst fishermen reveal the facts that old men (70-80 years) immediately recognise *S. subtruncata* as 'Aikens,' and assert that they knew them and used them in youth and middle life, but "have not seen a single full one for thirty years or more." Similar evidence is got from younger men, until we reach men of 45 or so, who say they have never seen or used them although their fathers did.

In short, there is good evidence that *S. subtruncata* died out in this district about thirty-five to forty years ago. Type samples of the dead shells have been sent to the Royal Scottish and British Museums and the Fisheries Laboratory at Lowestoft.

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Successive α-Transformations.

IT is well known that, in such parts of the radioactive transformation series as are not disturbed by β-emissions, the successive α-particles are shot out with ever-increasing energy. The paradox that, although the probability of emission increases so enormously with the energy, it is the slowest particles that first come out, has once again come to the fore now that wave mechanics has led to a theoretical connexion between energy and decay-period. It seems worth while to point out that this difficulty can be very simply explained if we assume that all the α-particles in question are originally in the same quantum state. For if N interacting particles have the total energy NE they will not each fly away with the energy E; it will depend on the nature of the forces acting between them whether the first ones take more than their share or less.

A simple example is provided by the helium atom; the removal of one electron involves binding the other closer, and the remaining electron has less energy than it had before the removal. If a helium atom is placed in an electrical field it has, according to wave mechanics, an intrinsic probability that it will become ionised (Oppenheimer, *Phys. Rev.*, **31**, p. 66; 1928), and owing to the above energy relation the second ionisation will take place more slowly than the first. In the helium atom we have the case that the particles in question, at the distances in question, repel each other; in a radioactive nucleus we have the opposite case. For by hypothesis the particles here are so close to one another that their attractions outweigh their repulsions; it follows at once that the first particle is the most difficult to remove.

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Astrophysical Estimate of Ionisation Potential of Vanadium.

IN a previous letter (NATURE, June 9, 1928) I outlined the method by which estimates of ionisation potentials might be derived from the spectra of Cepheid variables. Many of the lines emitted by ionised atoms are intensified at or near maximum luminosity phase and diminish in intensity as the star passes through the phase of minimum light. Many arc lines, on the other hand, show the reverse tendency. By comparing the behaviour of certain ionised lines with spark lines due to titanium, scandium, strontium, and barium, the ionisation potentials of which are known, it has been possible to estimate this constant for iron, yttrium, and lanthanum (loc. cit.), and quite recently for vanadium. From the periodic changes in intensity of the ionised line λ4205·07 I have obtained for the *ionisation potential of vanadium* 6·74 *volts*, the final figure being extremely uncertain.

In a recent letter from Dr. W. F. Meggers, Bureau of