fringe of much more thinly spaced particles able to produce bursts of small size.

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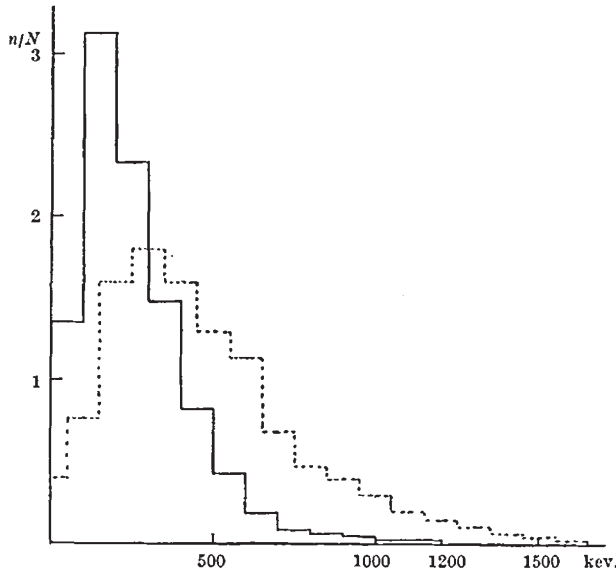
β Spectrum of Actinium K

THE radio-element actinium K recently discovered[1] derives from actinium ($Z = 89$) by emission of an α-particle and is placed in the position 87



β-Continuous spectrum of actinium K (full line) and of actinium C″ (dotted line).

of the Mendeléeff table. This element behaves chemically like an alkaline metal, and its period is 21 minutes.

Actinium K has been prepared from an aqueous suspension of lanthanum fluoride containing actinium. The different radio-elements normally deriving from actinium were eliminated by eight successive precipitations of carbonates (lead, barium, lanthanum) with ammonium carbonate. The residual solution was evaporated and calcined. The decay curve of the product obtained by this way shows that the actinium K is radioactively pure.

A fraction of the product was placed on a sheet of mica 20 μ thick or on a sheet of aluminium 5 μ thick and introduced into a Wilson cloud chamber. The method of introduction of the sources and the method of measurement of the β-ray tracks have already been described[2]. 1,600 β-rays have been measured in this way, and the continuous spectrum obtained is represented in the accompanying graph. For comparison the continuous spectrum of actinium C″ has been indicated in the same figure.

The principal characteristics of the spectrum are brought together in the following table, in which are also shown the characteristics of the continuous spectra of actinium B and actinium C″.

	E_P (kev.)	E_m (kev.)	E_M (kev.)
Actinium K	150	265	1·200
Actinium C″	300	470	1·600
Actinium B	400	360	1·000

E_P = energy corresponding to the maximum probability of emission.
E_m = average energy.
E_M = maxima energy.

There have been observed on the photographic plates tracks of a certain number of positons the energies of which vary from 400 to 2,000 kev. The frequency of these positons is ten times higher when the mica sheets are used instead of the aluminium. It is thus possible that the actinium K emits an intense γ-radiation of more than 3,000 kev.; the positons observed would result from the materialization of these γ-rays in the support.

If we admit that the upper limit of energy of actinium K spectrum is 1,200 kev. this point is found on the upper branch of the Sargent curve, corresponding to permitted transitions.

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Phase Transitions of Nuclear Matter

THE distribution of capture cross-sections of slow neutrons reveals a surprising concentration of strongly absorbing elements in the region of the rare earths[1]. As has been pointed out[2], this fact may be explained in the simplest way by the supposition that the mean spacings between the resonance capture levels of slow neutrons have a minimum in this region of the periodic system. A more detailed study of the connexion between the distribution of the capture cross-sections and the variation of resonance level density carried out by me seems to prove definitely the non-monotonic shift of the resonance level spacings with a minimum in the region of the rare earths (mean atomic weight 160).

This fundamental fact permits us to draw some conclusions on the properties of excited nuclear matter. The general conception of nuclear excitation due to Bohr[3] enables us to treat excited nuclei as thermodynamical systems. Between the mean level spacing D and the thermodynamical quantities of the nucleus, we have the relation[4]

$$D \sim e^{-S(E,A)}, \qquad (1)$$

where S is the entropy of the nucleus as a function of the excitation energy E and the atomic weight A. From (1) it follows that a minimum of D implies a maximum of S if all thermodynamical quantities are assumed to be continuous. Consequently the nuclear entropy at excitations equal to the dissociation energy of a neutron Q varies non-monotonicly with A. As is well known, Q is fairly constant for light elements but decreases slowly towards the end of the periodic system because of the coulomb repulsion. If all the nuclei at excitations equal to Q were in the same thermodynamical state, then the excitation