Velocities of Emission of α-Particles

THE relative velocities of the α-particles from thorium X, thoron, thorium A, thorium C, thorium C′ and radium C′ have been measured by the direct magnetic deflection method using a permanent magnet[1] giving a field of about 5,000 gauss. The deflections were measured with a microphotometer, and by carefully investigating possible sources of error such as loss of velocity by absorption at the source, non-uniformity of the magnetic field, and the effect of any movements of the photographic emulsion during development, it has been possible to obtain a considerable improvement in the accuracy of measurement of α-ray relative velocities.

The results for the relative velocities are shown below; the probable error is 1 in 20,000. The absolute velocities are deduced from the value $1\cdot922 \times 10^9$ cm. sec.$^{-1}$ for radium C′ [2].

	Relative Velocity	Absolute Velocity
Radium C′ ..	1·00000	$1\cdot922 \times 10^9$ cm. sec.$^{-1}$
Thorium X ..	0·86042	$1\cdot653_7$
Thoron ..	0·90464	$1\cdot738_7$
Thorium A ..	0·93935	$1\cdot805_4$
Thorium C ..	0·88811	$1\cdot707_0$
Thorium C′ ..	1·06872	$2\cdot054_1$

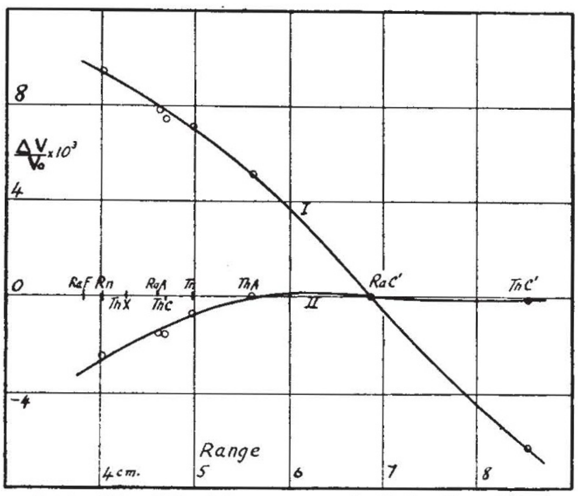

FIG. 1.—The relation between range and velocity of α-particles. Curve 1, deviations from the Geiger relation $V^3 = kR$; Curve II, deviations from $V^{3\cdot26} = kR$.

The complexity of thorium C discovered by Rosenblum produced a slight broadening of the line but no evidence of complexity was found in the other groups. The velocity for thorium C corresponds to the weighted mean of the two main components.

The relative velocities of the α-particles from radium A, radon, and radium C′ are also being measured and the following preliminary results have been obtained:

	Velocity relative to Radium C′	Absolute Velocity
Radon	$0\cdot8455 \pm 0\cdot0003$	$1\cdot625 \times 10^9$ cm. sec.$^{-1}$
Radium A	$0\cdot8839 \pm 0\cdot0002$	1·699

From the velocity ratios obtained in this work and the range measurements of Lewis and Wynn-Williams[3] a new correction curve (Fig. 1, curve 1) to the Geiger relation, $V^3 = k\,R$, has been calculated from the equation

$$\Delta V/V_0 = V/V_0 - (R/R_0)^{\frac{1}{3}}$$

used by Rutherford, Ward and Lewis[4]. V_0 and R_0 are the velocity and range of radium C′.

It is found that the equation $V^{3\cdot26} = k\,R$ accurately expresses the relation between velocity and range above a range of 5 cm. The deviations from this relation calculated similarly are shown by curve II.

From these curves the velocities relative to radium C′ may be calculated with a maximum error of 0·0004, for other groups of α-particles the ranges of which have been measured by Lewis and Wynn-Williams.

	Velocity relative to Radium C′	Absolute Velocity
Actinon (short)	0·9179	$1\cdot764 \times 10^9$ cm. sec.$^{-1}$
Actinon (long)	0·9420	1·811
Actinium A	0·9795	1·883
Actinium C (short)	0·9034	1·736
Actinium C (long)	0·9282	1·784
Actinium C′	0·9841	1·891
Polonium	0·8310	1·597

There are systematic differences between the results given above for thorium C (mean), thorium C′ and radium A, and those obtained earlier by Rosenblum[5] in the course of his experiments on the fine structure of α-ray spectra using the large electromagnet of the Paris Academy of Sciences. Recently, however, Rosenblum and Dupouy[2] have measured the velocities of seven groups after having made a fresh exploration of the field of the magnet. The results agree to well within the limit of error, 0·5 to 1 in 1,000, with those reported here.

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[3] Lewis and Wynn-Williams, *Proc. Roy. Soc.*, A **136**, 349; 1932.
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Productivity of the Fisheries North and South of the Suez Canal

THE work of the great oceanographical expeditions, and the experience of the fisheries administrations in the different countries, have alike gone to show that living things are more abundant in temperate and polar seas, than in those of the tropics and subtropics.

It is a little surprising, therefore, that the fisheries of the Gulf of Suez should have the reputation of being more productive than those of the Mediterranean coast of Egypt; for, though I have shown elsewhere[1] that the Port Said end of the Suez Canal may be the hotter, this is only so for six months of the year, and even then must be regarded as a local effect, the main water masses of the northern Red Sea being always hotter and salter than the eastern Mediterranean.

That the Gulf of Suez fishery is indeed more productive, is well shown by the evidence of the Egyptian fishery statistics concerning the trawl fishery, where the mean catch in kilograms per net per day's fishing at Alexandria and Suez for the last ten years, and at Port Said for the last nine are: Alexandria, 115; Port Said, 131; Suez, 232.

In the long line fishery, a motor ketch, working in the summer of 1930 from Alexandria, and in the summer of 1931 from Suez, gave a greater yield per basket of lines at Suez, compared with Alexandria. Nevertheless, as much of the Suez catch was made up of dogfish, sharks and rays, the catch at Alexandria was sixteen times as valuable. Similarly in the trawl fishery, though elasmobranchs form only a small