Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 148.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Thermo-electric Effect and the Supra-conducting State

USING the supra-conducting galvanometer described in a previous issue of NATURE¹, we have tried to measure the thermo-electric effect of lead and tin when they were both supra-conducting. The method used to obtain a temperature difference between the junctions was similar to that described by Borelius, Keesom, Johansson and Linde².

One junction, *A*, was immersed in liquid helium, and its temperature was regulated by controlling the pressure over the liquid. The second junction, *B*, was enclosed in a metal container which was also immersed in the liquid helium; this container could be evacuated independently of the outer chamber containing liquid helium and so isolated thermally except for the metal connexions from *B* to the outside. The temperature of the junction *B* was first brought to the same value as *A* by the thermal conduction of the low-pressure helium gas in the *B* container; the temperature of *B*, which was measured by a helium gas thermometer, could be raised by means of a constantan heating coil.

With the temperature of *A* at 3.8° K. and *B* at a somewhat higher temperature, a current was registered by the galvanometer. With *A* at 2.0° and *B* anywhere between 2.0° and 3.7°, no current was indicated. When *B* was raised above 3.7°, while *A* remained at 2.0°, a current flowed in the galvanometer.

Since the supra-conducting point of lead is 7.2° K. and that of tin 3.7° K., we can conclude from this experiment that no thermo-electric effect exists when both junctions are in the supra-conducting state, but the effect comes in when either one of the junctions is raised above the supra-conducting point of one of the metals.

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July 2.

¹ NATURE, 135, 906; 1935.

² G. Borelius, W. H. Keesom, C. H. Johansson and J. O. Linde, *Leiden Comm.*, No. 217 c. *Or Proc. Kon. Akad. Amsterdam*, 34, 1365; 1931.

The Masses of Be⁸ and C¹²

THE recent set of nuclear masses proposed on the basis of disintegration experiments¹ includes the values 4.0034 for He⁴, 8.0071 for Be⁸ and 12.0027 for C¹². From these values it follows that the binding energy of two α -particles is either slightly negative or else very small (less than 200,000 volts) whereas that for three α -particles is quite large (7×10^6 volts).

This seems surprising, but may be obtained simply without assuming anything more than a Gamow type of interaction between two α -particles. Thus, taking this interaction potential in the form

$$V = 4e^2/r, r > r_0; \\ = -c, r < r_0;$$

with c and r_0 related in such a way as to give a certain small value for the binding energy of Be⁸, one finds that the observed mass of C¹² may be obtained by suitable adjustment of the single parameter r_0 . For example, taking 200,000 volts for the binding energy of Be⁸, a value of r_0 slightly greater than 2×10^{-13} cm. will give the observed mass of C¹². Smaller values of r_0 than this give rise to increasingly larger binding energies than the observed, and these results are not critically dependent on the value assumed for the binding energy of Be⁸. More precise limits for r_0 will be fixed by consideration of heavier nuclei.

We have here a further example of the sensitivity of binding energies for short range fields to changes in the field parameters.

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¹ Oliphant, Kempton and Rutherford, *Proc. Roy. Soc. A*, 150, 241; 1935. Bethe, *Phys. Rev.*, 47, 633; 1935.

Deposition of Artificial Radio-Elements by Electrochemical Exchange

THE method of preparation of sources of some natural radio-elements (polonium, radium *C*, etc.) on metallic plates by electrochemical exchange and the advantages that it presents are well known. I have tried to apply the method to the separation of radio-copper (period 10 hr.) from zinc. Preliminary experiments have shown that, of the metals nickel, tin, lead and iron which are in the series of tension between copper and zinc, lead gives the best results. The following method has been adopted:

8-12 gm. of zinc powder is attacked by concentrated hydrochloric acid, after irradiation by neutrons, until a residue of 200-300 mgm. remains. This is separated by filtration from the solution. Measurements made with the aid of a Geiger-Müller counter show that *practically all the activity is concentrated on the non-dissolved zinc*. The latter is now dissolved separately in concentrated hydrochloric acid and diluted with about two volumes of distilled water. A plate of lead of suitable dimensions and with one side covered by an insulating material is then rotated in this solution. After 30 minutes, more than half the radio-copper is deposited on the plate.