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Radiation Laboratory

Summary of the Research Progress Meeting

July 22, 1948

Margaret Foss Folden

Berkeley, California

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Cosmic Ray Experiments at the University of Minnesota. Dr. E. Lofgren.

Cloud chamber and photographic emulsion work by Drs. Oppenheimer, Lofgren, Brock and others at Minnesota was described. In the cosmic ray experiments equipment was sent up to 95,000 feet with balloons. Measurements were made by the usual observations, and the major equipment included a cloud chamber in a large aluminum shell, sealed and mounted, at atmospheric pressure. Since it must operate at constant temperature, numerous improvements have been made to accomplish this purpose, such as a black painted surface on the upper portion of the outside of the balloon. The temperature balance is measured and recorded within the balloon.

Stereo photographs are taken in magnesium cameras loaded with 7-1/2 hours of film. These are driven with a d.c. motor and powered by a 400 volt battery. The illumination system weighs about three pounds, and the cycle is determined by the same constant speed of the d.c. motor. The cloud chamber weighs twelve pounds and is about 3-1/2 inches deep. A temperature compensation system was also described.

Heavily ionizing particles which first came to attention in April were found. These are particles which may penetrate one cm. of lead, have a range comparable to the thorium alpha, an atomic number of about twelve, and an energy of fourteen billion volts. About one hundred of these tracks have been found occurring one in a thousand of charged primaries. A wide distribution is apparent, and the tracks are consistent with those of alpha particles.

Several photographs were shown which gave evidence of ionization so heavy that grain counting is impossible. It is estimated that ionization is sixteen times that of the thorium alpha, that the atomic number may be as high as seventy and that the energy may reach 160 billion volts.

Experiments at Chalk River. Dr. B. Kinsey.

A new establishment is being set up at Chalk River, 120 miles northwest of Ottawa, which will be organized along similar lines to that of Brookhaven. A concrete pile has been built there, and Dr. Kinsey diagrammed the floor plan and described the design of the pile. The flux emerging at present is of the order of 10^{+7} per sq. cm. A Van de Graaff is in construction and the building surrounding it. A chemistry department and a health service department are in construction. Photographic films are being used for health monitoring.

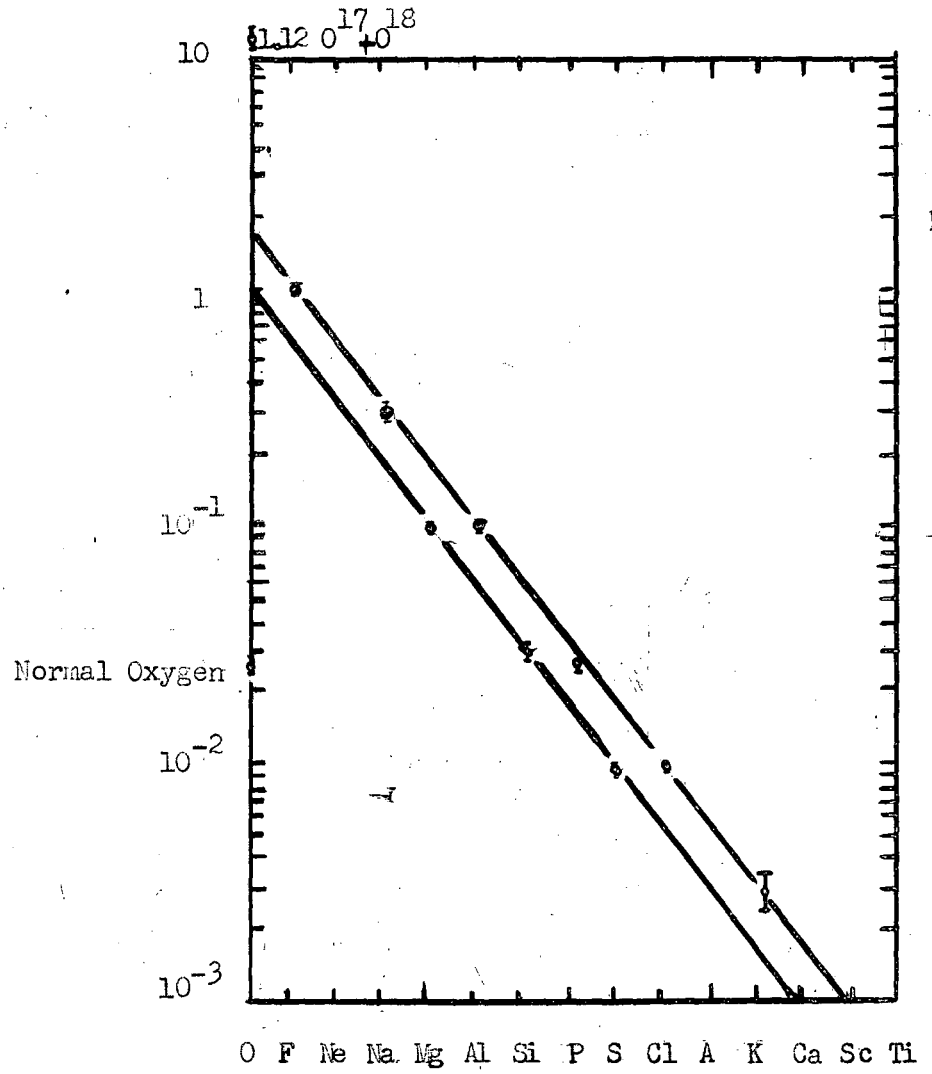
Research work has been pursued for a short time only. In the pile, work has continued now for almost a year, in other parts of the project for a shorter time. Experimentation is progressing on the examination of alpha rays produced by the capture of neutrons. A thermal neutron beam has been produced by Elliott and Bell using the magnetic lens. The results indicate an extremely large production of alpha rays. In this work cobalt and cadmium have been used. Spectrometric determinations for the examination of pairs produced by the impingement of alpha rays on the target have been made, and interest is being shown in neutron capture of the lighter elements, including determinations of energies, intensities and polarity. Hinks and his group are studying hard radiation following meson decay, as mentioned about six months ago in a letter in the Physical Review. Methods being used were described. Determinations are also being made of the lifetime of the neutron with an apparatus similar to that of Snell of Oak Ridge. The efficiencies of photo-multipliers are being investigated, and a neutron spectrometer has been set

up and is being used for classified work.

N^{17} Delayed Neutron Yields. W. Chupp.

The specific property of the nucleus N^{17} of giving 4.13 second delayed neutrons allows it to be easily distinguished in studying particle reactions among the light elements. The yield of delayed neutrons has been examined from a number of substances bombarded with 195 Mev deuterons from the 184-inch cyclotron. The beam passed through a thin LiF crystal acting as a monitor and then through a thin sample of known surface density. After 30 seconds' exposure the sample was allowed to fall into a sensitive re-entrant boron trifluoride chamber, and the monitor was pulled alongside a boron trifluoride counter. Simultaneously counts were taken for 30 seconds. The apparatus was heavily shielded by paraffin to reduce background. Measurements were taken to compare the relative yields per atom and to obtain the excitation curves as the deuterons were slowed down by copper absorbers between monitor and sample. The relative yields per atom show a roughly exponential decrease with the number of particles emitted, as indicated below and in Figure 1.

O not incl. O^{16}	F	Na	Mg	Al	Si	P	S	Cl	K
100.000	8400	2600	840	840	230	230	70	78	25



The excitation curves are monotonic with energy and show thresholds increasing with Z. The logarithms of yields are proportional to atomic number and atomic weight of the element bombarded. Following the study of the yields from separating the isotopes of magnesium it is planned to obtain data on silicon isotopes.

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