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SUMMARY OF THE RESEARCH PROGRESS MEETING

May 13, 1948

By R. K. Wakerling

Special Review of Declassified Reports
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Carbide & Carbon Chemicals Corp. (Y-12 Area)	25-28
Columbia University (Dunning)	29
General Electric Company	30-33
Hanford Engineer Works	34-38
Iowa State College	39
Los Alamos	40-42
Monsanto Chemical Company, Dayton	43-44
National Bureau of Standards	45-46
Naval Radiation Laboratory	47
NEPA	48
New York Directed Operations	49-50
Oak Ridge National Laboratory	51-58
Patent Advisor, Washington	59
Technical Information Division, ORDO	60-74
UCLA Medical Research Laboratory (Warren)	75
University of California, Radiation Laboratory	76-80
University of Rochester	81-82

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SUMMARY OF THE RESEARCH PROGRESS MEETING

May 13, 1948

R. K. Wakerling

Meson Mass Determination by Grain Counting. W. H. Barkas.

An independent determination of meson mass by grain counting has been made using 24 meson tracks greater than 250 microns in length. As mentioned in the Research Progress Meeting of April 22, the mass M, the number of grains N, and the residual range R, are connected by a functional relationship $N/M = f(R/M)$, where it is understood that the mass is large in comparison with the electron mass.

The plates were scanned from the edge back a distance of approximately 3 millimeters. At the same time proton tracks were also counted to give a determination of the constants involved in the above relationship. The following table of the masses discovered shows that they fall rather easily into two groups. The first of these has an average mass of 303 electron masses, while the second group exhibits an average of 197. A previous determination by grain counting done by Dr. Lattes gave the values 310 ± 10 per cent and 209 ± 10 per cent respectively.

Heavy Group		Light Group
393	302	204
359	301	204
339	299	200
331	293	200
317	283	186
313	265	186
313	264	
304	263	
	257	
Average 303		Average 197

The entire method gives a very simple and effective means of mass determination.

The Magnetic Beta Ray Lens Spectrograph. A. C. Helmholz.

A beta ray spectrograph has been built by Hayward in the Physics Department. It was designed to be an instrument of general usefulness and therefore no attempt was made to secure extremely high resolving power. The design follows that of an instrument built by Siegbahn in Sweden. A schematic of the cross section of the instrument is shown in Figure 1. A coil is wound about the brass cylinder that forms the main body of the instrument to furnish a magnetic field inside. To give the correct type of focussing field iron pole pieces were added at each end to cause a rapid rise in the magnetic field in that vicinity. The ideal field to produce zero spherical aberration is shown in the curve of Figure 2. It is this type of field that the instrument is designed to approximate. Iron bars running along the outside of the brass cylinder act as a return path in the magnetic circuit and serve to clamp the end plates on to the cylinder. The source is inserted through a small opening in one end of the chamber and the counter through a corresponding opening at the other end. Vanes are placed at the mid-point. Cooling of the coils is accomplished by forced air circulation. With the 7200 turns in the coil a current of 10 amperes is sufficient to focus electrons of 3.6 Mv energy.

The source consists of an 8 millimeter disc upon which is deposited the sample material. This disc is mounted on the end of a short thin-walled polystyrene tube which is in turn attached to a stainless steel bar. This entire assembly is such that it may be withdrawn through a vacuum seal without destroying the vacuum in the instrument as the sources are changed. For some work as many as 10 samples have been mounted on a wheel which can be rotated through the vacuum seal from outside the chamber. All save one of the samples on the wheel are shielded from the chamber by means of a heavy lead shield. In this manner it is possible to measure a number of samples in rapid succession.

For a collector a Geiger counter 1/2 inch in diameter and 1 inch long is mounted such that it can be inserted through a circular opening at the other end of the spectrograph. Investigation of various types of thin-window counters for use in this instrument is under way.

The central vane or baffle has a 2 per cent aperture; that is to say, 2 per cent of the electrons striking it will pass through to the counter. The resolving power of the spectrograph is quite satisfactory. Consideration is being given to the design of a shield which will prevent positrons from reaching the counter from the source.

Anthracene Counters. E. Martinelli.

An effort is being made to produce thin pieces of pure anthracene for meson counting. Thus far it has been possible to secure fairly clear discs of anthracene that will count alpha particles. The experimental arrangement to be used is shown schematically in Figure 3. A magnetic deflector, sometimes called the "jelly-bean," allows the mesons to pass into a re-entrant portion of the main vacuum chamber, which is at atmospheric pressure, through a thin window. Behind this window the anthracene counter is placed. In a preliminary experiment troubles were encountered with very large background pulses, the source of which is not yet understood. It is felt that the difficulty is associated with the photomultiplier tube itself, and an attempt is being made to discover and remedy the difficulty.

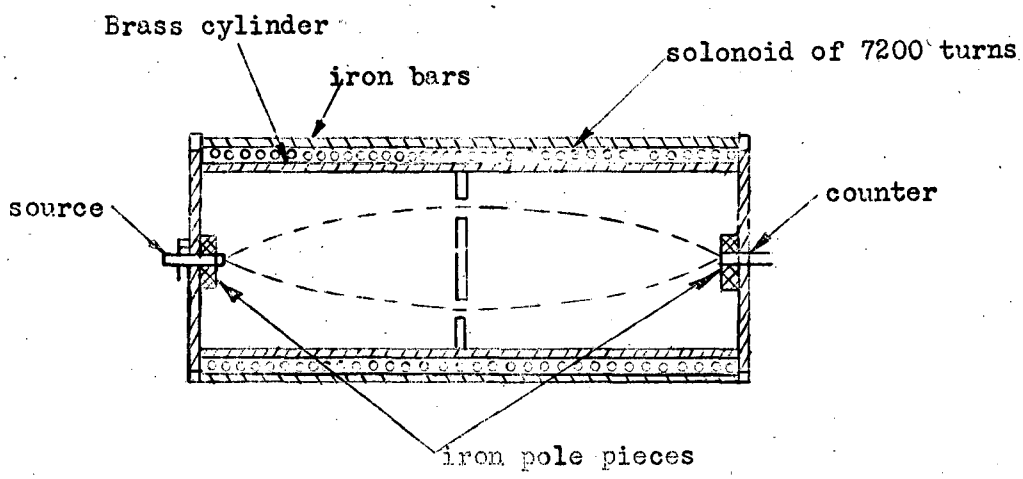

Figure 1.

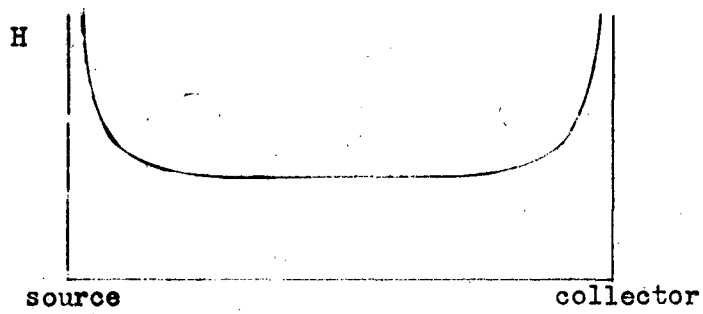

Figure 2.

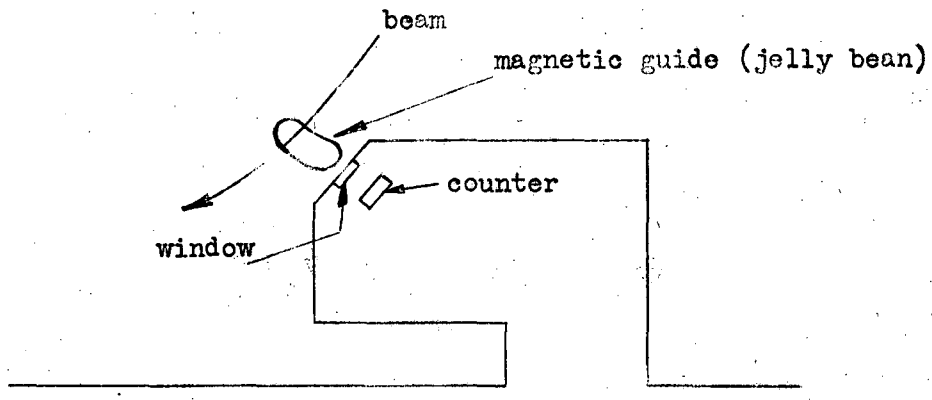

Figure 3.

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