ionizing particles present in the extensive showers, at 3260 m elevation;

(2) the value of the ratio R does not vary strongly with the distance from the core of the showers. Hence the lateral distribution of the N-component does not differ strongly from that of the electrons.

These results rule out the possibility that most of the N-component observed near the core of a shower is produced far above the apparatus. The peaked lateral distribution observed, and the fact that the particles of the N-component in a single shower can be as many as 10^6, suggest that the mechanism of production of the N-component inside an extensive shower is similar to that of the electrons. The N-component must be the result of a nuclear cascade process which develops throughout the atmosphere. The core of the shower contains the most energetic particles of the N-component and keeps on supplying less energetic particles to the outer regions of the shower.

[1] The term N-component is used here in the sense defined by B. Rossi [Rev. Mod. Phys. 20, 537 (1948)]; namely, the N-component consists of all of the particles capable of producing nuclear disintegrations (high energy neutrons and protons, π-mesons, etc.).
[2] Cocconi, Tongiorgi and Greisen, Phys. Rev. 76, 1020 (1949).
[3] V. Cocconi Tongiorgi, Phys. Rev. 75, 1532 (1949).
[4] We want to point out that the geometrical distances, d, between the core selectors and the N-component detector are to be taken only as an indication of the order of magnitude of the average distances of the particle of the N-component from the core of the showers. As a matter of fact, the true average distances are somewhat smaller than d, since the requirement of the N-component hitting the detector favors the showers whose core lies in between the core selectors and the N-detector.

Spectral Emission from Scintillation Solutions and Crystals*

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WE have investigated the spectral emission of several solutions that have been used as scintillation counters.[1] Some of the results are presented in the figures. The following emission spectra are shown, with a mercury spectrum superimposed on each one for calibration.

Figures (1A) and (1B): Crystalline terphenyl excited by 50 kv x-rays and the mercury line 2537A, respectively. (1C): A solution of terphenyl in benzene irradiated with 50 kv x-rays. (1D), (1E) and (1F): Solutions of terphenyl in benzene, xylene, and toluene excited by the 2537A line, the light falling on the side of the cell opposite to the slit. (1G): A solution of terphenyl in benzene excited by the 2537A line, the light falling on the side of the cell nearest the slit.

Figure (2A): An anthracene crystal excited by 50 kv x-rays. (2B) and (2C): Anthracene crystals excited by 2537A light shining on the side farthest from and nearest to the slit respectively. (2D): A solution of anthracene in xylene irradiated with 50 kv x-rays. This was taken with the spectroscope slit wide open, so that the spectrum is displaced about 100A toward shorter wavelengths. (2E): The same solution excited by 2537A light.

The spectra obtained with particle bombardment (Compton electrons from the x-rays) appear to be the same as the fluorescent spectra caused by ultraviolet light. From Figs. (1D), (1E) and (1F) we see that the light emitted is characteristic of the terphenyl molecule and is the same with different solvents.

There is evidence that some of the light emitted is reabsorbed, both in the solutions and in the crystals. Since the ultraviolet light used to excite the fluorescence is very strongly absorbed by the solutions, the emitted light must travel about 5 mm through the solution if we irradiate the side away from the slit, and only a very short distance if we irradiate the part nearest the slit. In
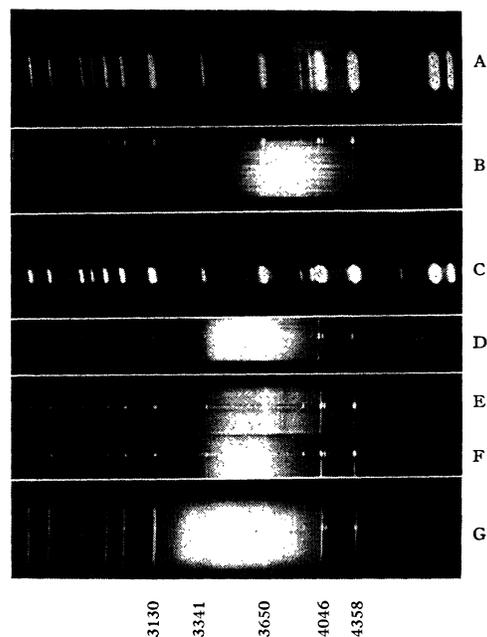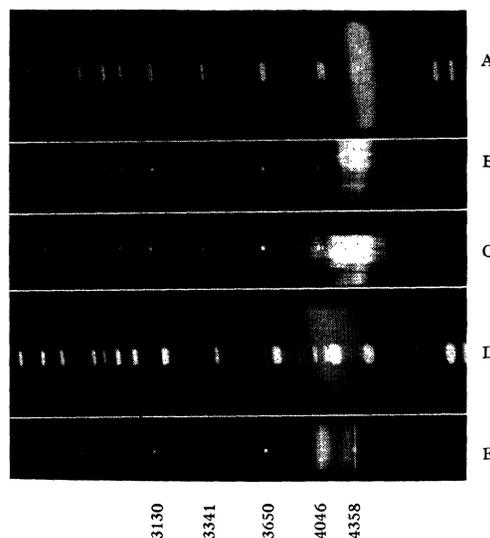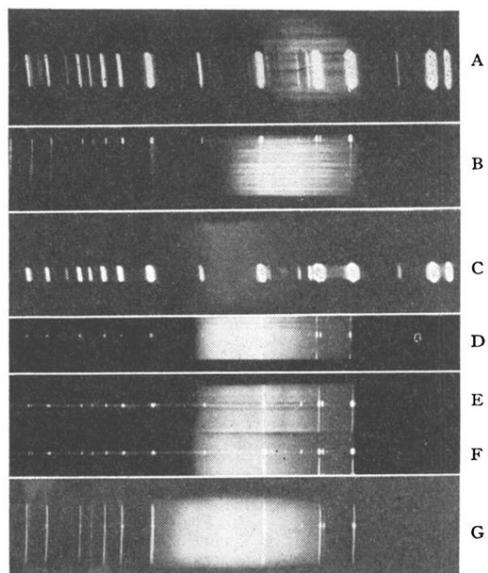

FIG. 1. Emission spectra of terphenyl.

FIG. 2. Emission spectra of anthracene.

Fig. 1 the solution reabsorbs the band at 3280A, and the crystal, which has a much higher density of terphenyl molecules, reabsorbs the 3450A band. The 3720A band is weaker in (1A) than in (1B) because the crystal was thicker. In the same way, as we go from (2A) to (2E) the bands at about 4740A and 4460A disappear and one appears at 4050A.

The 5819 end-window photo-multiplier tube will favor anthracene crystals over terphenyl solutions because of its spectral sensitivity. Observations with this tube show that the pulse height from the terphenyl solutions due to the Cs^{137} 630-kev electron is about 35 percent of the pulse height from an anthracene crystal. When a 1P21 photo-multiplier is used this ratio is about 50 percent; and with a 1P28, which favors the solutions, the ratio of pulse heights is approximately 65 percent.
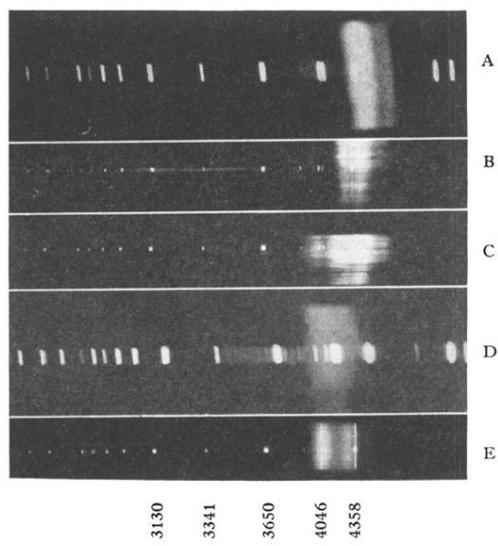
3130 3341 3650 4046 4358

FIG. 1. Emission spectra of terphenyl.

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