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A COSMIC RAY JET IN THE 10^{15} ELECTRON VOLT ENERGY RANGE

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A COSMIC RAY JET IN THE 10^{15} ELECTRON VOLT ENERGY RANGE **+

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A 22.4 litre stack of emulsions was exposed in Minnesota during September 1956 in a balloon flight at 116,000 feet. The emulsion stack, which was flown in a cooperative experiment with the University of Bristol, weighed 200 lbs and had dimensions of 16" x 12" x 7". The largest jet so far found by naked-eye scanning traversed the en-

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entire Minnesota half of the stack with a total length of 26 cm. The primary interaction is a $6 + 1$ star. In the nine radiation lengths of the Minnesota portion of the stack, the jet multiplied from nine particles, mainly in two cores, to 8000 particles. The electromagnetic cascade appeared to be initiated by several gamma rays probably from the decay of two neutral mesons. The electromagnetic cascade was still increasing in numbers after nine radiation lengths. At approximately 23 cm from the primary interaction, the primary particle produced a meson jet in the core of the electromagnetic cascade. The meson star was classified as $4 + 80$ p. The angle containing half of the 80 minimum ionization particles was 3×10^{-4} radians. The energy of the primary alpha particle is estimated to be $\gg 10^{15}$ electron volts. The energy in this event which appeared in electronic component is approximately 10^{14} electron volts.

FIGURE CAPTIONS

Figure 1. Initial stages of the cascade as observed in the Minnesota half of the stack. Two radiative cores are evident with a minimum ionization particle between them. This particle is presumably a remnant of the primary alpha particle. The distances marked are measured from the primary interaction.

Figure 2. Further development of the electronic cascade.

Figure 3. The secondary interaction of energy greater than or equal to 10^{15} electron volts. The star is $4 + 80$ p. There are 3 tertiary interactions produced by the mesons from this star. In this figure distances are shown both from the primary interaction and from the meson jet. As the cascade leaves the stack in Plate 1 it contains 8000 minimum particles.

PLATE 148
3.3 CM

PLATE 144
3.9 CM

PLATE 139
4.6 CM

PLATE 134
5.4 CM

SCALE

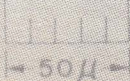


FIG. 1

PLATE 124
6.9 CM.

PLATE 117
8.0 CM

PLATE 98
10.8 CM

PLATE 71
14.9 CM

PLATE 45
18.8 CM

SCALE

50μ

FIG. 2

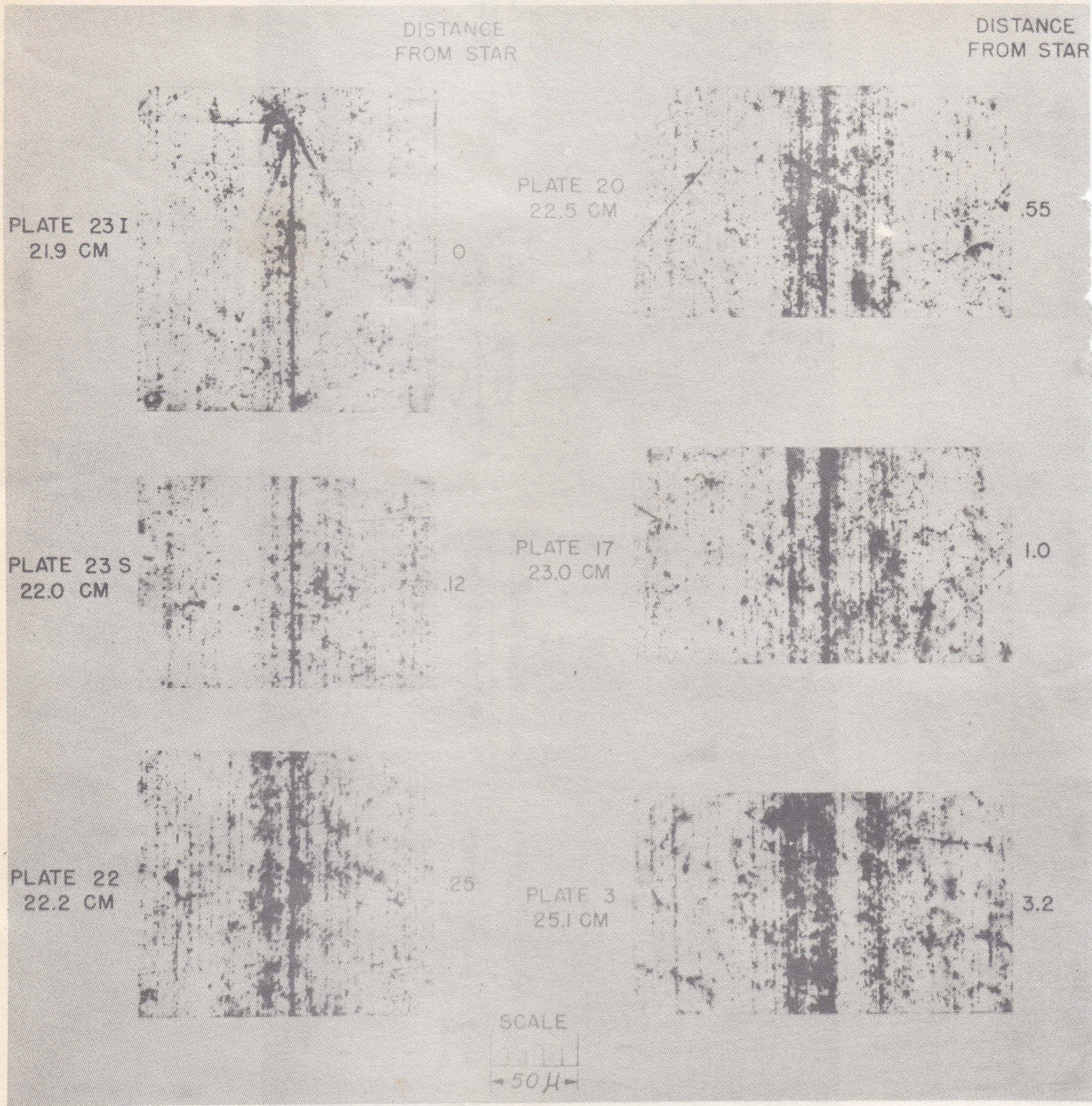


FIG. 3