

in  $n_\mu$ ). Thus the spectrum might be steeper than presented here.

**Shapiro, M.M.:** Regarding the steepening of the spectrum at energy  $>10^{15}$  ev, is there any strong argument against the following interpretation: at progressively higher energies, it becomes progressively easier for particles generated inside the Galaxy to escape, and thus produce a relative deficiency of primary particles at the highest energies?

**Oda, M.:** That is exactly what we are inclined to think.

**Greisen:** This is not so much a question as a challenge. It seems to me that cosmic ray physicists have too much predilection for showing data on *log-log* graph paper and then drawing straight lines. With crude data one line is enough, and a power law is deduced. If the data are a little better one always needs two lines and then one deduces a "break" in the spectrum. At lower cosmic ray energies, the same procedure is usually followed and the slope of the line is about 1.0. When the study concerns air showers, the small showers demand a slope of 1.5-1.9 while the largest showers suggest a slope of 2.0-2.5 (in the integral energy spectrum). I claim that the "sudden breaks" which have been discussed so much may be imposed on the data by resolving power of the apparatus and the method of analysis. Would it not be more realistic, and a better fit, to represent the whole energy spectrum not by straight-line segments, but by a smooth curve of slowly increasing slope? No abrupt changes in primary spectrum, nature of interaction, or composition of the primaries would then have to be assumed.

**Oda:** We do not necessarily say "the sudden break". But I still think that this is not a continuous change of the exponent but that, above  $10^6$  of the size, the spectrum is well expressed by a single power law and below  $10^5$  the exponent is quite different. There is a change, probably not a sudden, within not too wide range of the size.

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### III-2-23. Bolivian Air Shower Joint Experiment

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The contents of this article are similar to III-2-15 and the separate manuscript was not presented.

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