

31st January 1966

Dear Hap:

The contents of my JFI article can be viewed best in the light of history. A century ago electrical measurement became good enough to demonstrate that an electroscope discharged at a rate faster than could be accounted for by current thru the insulation. This excess discharge rate became known as "the natural leakage of an electroscope". It was one of the unexplained phenomena of nature. Seventy years ago X-rays were discovered. A few years later natural radio activity from rocks was found in form of alpha, beta and gamma rays. All these rays would increase the discharge rate of an electroscope. This brought on the idea that "the natural leakage of an electroscope" was caused by some kind of radiation emanating from the earth. When an electroscope was placed deep in a mine the discharge rate was expected to greatly increase. Actually the discharge rate decreased to a value similar to the current thru the insulation. When the electroscope was placed on a high mountain the natural leakage greatly increased. These mine and mountain experiments suggested that "the natural leakage of an electroscope" was caused by some unknown radiation which came from outside the earth. The name Cosmic Rays was attached to this unknown radiation by Millikan in 1925.

During the past half century cosmic rays have been the subject of much investigation. Repeated experiments have been made to locate the celestial source of these rays, now known to be particles. The lack of success has been frustrating. Cosmic ray particles come from all directions with a peculiarly high degree of uniformity. Theoreticians have attempted to account for the isotropy of particles by elaborate computations involving hypothetical magnetic fields in space, the distribution of energy of particle spectra, interaction of particles, etc., all very unsatisfying.

Eight years ago the university here built some instruments called cosmic ray telescopes, a rather gratuitous term for the elementary devices. These have been operated in an abandoned railway tunnel. The data comes out in form of tables of hourly counts. It has been worked on by the local people in a prosaic manner using harmonic analysis. This method of approach has been quite unrewarding. Only a crude fit to theory of observations is possible. A slightly improved fit is secured by recourse to fictitious functions, namely second harmonic of sidereal time, and antisidereal time. All this is reminiscent of epicycle which were popular toward the close of the middle ages. Obviously a

new and different approach was needed.

My JFI article explains how I have handled the data and describes the surprising results. Some discussion is given about future apparatus which should be disregarded. Much more sophisticated and useful equipment is now being designed. All this is more enticing than poles and wires. At low latitude the earths magnetic field removes many of the random low energy particles. I plan to try Cosmic Ray Astronomy observations somewhere in the southern states, preferably where no cosmic ray studies are in progress. This keeps me from being in competition with existing programs and helps spread science around. The desired environment must have the appurtenances of civilization and industry. Science will not prosper in places like Green Bank where I have had some experience. I am presently thinking of Gainesville with the associated industry at Jacksonville.

I have had a couple of exchanges of correspondence with NSF; also with Tom Carr at Gainesville. My present thinking is to do a few years of Cosmic Ray Astronomy at what probably is an auspicious place. About 1970 some idea should be possible about future solar activity, or rather the lack thereof. If circumstances seem to be favorable, I'll start looking for a suitable place in the Great Lakes region to put up more poles and wires.

I may have more to discuss on this subject when I see Bill Hinkley.

Best regards,


Grote Reber