

17th March 1967  
Saint Patricks Day

Dear Hap:

Thanks for your letter of the 10th which arrived on the 14th. The enclosures seem to be primarily efforts to maintain salaries far into the indefinite future. The R.C. Quarterly Bulletin, Fall 1966 arrived on the 10th.

Since my letter of the 13th February, I've further investigated the theory and performed more particle counting experiments in a coal mine. The random magnetic field in region of space surrounding the sun is on order of  $10^{-5}$  gauss. In order that a particle may traverse this field in a reasonably straight line for a few astronomical units; the particle energy must be  $3 \times 10^{11}$  ev or greater. Lower energy particles may be removed by placing observer under 150 feet of rock. This will maximize the particle number at above energy.

Unfortunately, it is now clear that all rock, coal, etc. has a high level of natural radioactivity. However this natural radioactivity is of low energy and may be removed by local shielding. It seems that a foot of lead or ten feet of fresh water are adequate and equally effective. Apparently lead picks up radioactive contaminants from the granite with which it is found. However after a century or so, the radioactive contaminants die away. Thus any lead used should be from roofs of old churches, etc. Zinc seems to contain traces of natural radioactive cadmium. Thus brass fittings and galvanized tanks should be avoided. The detector itself must be made of low radioactivity material. Fortunately electrolytic copper seems to be very good. Old steel is satisfactory. However, modern steel is contaminated by radioactive tracers put in to follow production process during manufacture.

Spark plates have a much smaller solid angle capable of receiving particles than geiger tubes. Consequently, they are only 40% as susceptible to local particles originating in

random directions. This gives a 2.5 to 1 improvement in signal to noise ratio for particles arriving from a chosen direction merely by change in physical geometry of detector.

My present thinking is as follows. The cosmic ray telescope should be installed at a low latitude to view as much of the celestial sphere as possible. It should be located under a hemispherical mound or semicylindrical ridge in east-west direction. The radius of curvature should be 150 to 200 feet. The observers cavity should be lined with tanks containing fresh water ten feet thick. The detector is to be made of electrolytic copper and covered with quarter inch of old lead. One module of telescope is to consist of two spark plates spaced axially seven diameters. This will produce a circular beam eight degrees in diameter. Several modules may be placed in close proximity on a common frame to increase the effective pickup area. Direction of pointing may be chosen by adjusting position of movable frame. The coincidences from all modules will be recorded on a magnetic tape. The first thing is to build a suitable spark plate according to my sketch of last month and test it.

Today I have sent off two aluminum cases 45" long, 8" wide and 10" high via Hammonds who are representatives of the American Express Company. These cases are addressed to you at 405 Lexington Ave. Enclosed with this letter is a list of contents and package containing two keys and key ring. Also enclosed are two invoice sheets listing material sent here in 1961. The range finders are itemized as such. The hand tools and drawing instruments are given under Personal Effects. These sheets should assist in getting the cases past U.S. customs. The geiger tubes are used. They may go thru customs O.K. If not, I'll declare them as personal property I'm bringing with me. The cases should arrive before I do.

The ticket will be a welcome means of getting back to the Land of the Stars and Stripes.

Best regards,

*Grote*  
Grote Reber

14/3/67

Contents of aluminum cases 45" long, 8" wide, 10" high.

Case with key 49Y6

- 1 large range finder
- 1 tripod stand for above
- 2 extra plates for top of stand
- 2 extra handles for cases
- 1 midget range finder
- 1 stamp pad
- 1 drawing set
- 3 bundles of pencils
- 1 package of scales
- 1 package of spacers
- 1 T square
- 1 package of hand tools
- 1 geiger tube no 3882
- 1 envelope data on range finders
- 1 100 feet steel tape

Case with key 49Y5

- 1 small range finder
- 4 geiger tubes nos 3835, 3841, 3875, 3836
- 1 bundle envelopes on cosmic ray data
- 1 envelope of aerial fotos of Michigan
- 1 reading glass
- 1 envelope of drawing triangles and protractors
- 1 package of crayons, erasers, etc.
- 1 package of letter openers
- 1 6 feet steel tape.

*Grote Reber*  
Grote Reber