a process equally compatible with terrestrial or submarine eruption.

G. J. H. McCall

University of Western Australia,
Nedlands.

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PHYSICS

Radiation Enhancement following Johnston Island Thermonuclear Explosion

We wish to report the observation, made at Hobart, Tasmania, of an enhancement in the counting-rate of a balloon-borne Geiger counter at the time of the high-altitude thermonuclear explosion above Johnston Island on July 9, 1962.

The counter, designed for operation at the temperatures encountered in night flights of balloons (down to $-60°$ C), was 10 cm long and 4 cm in diameter. Thicknesses of the glass wall and internal nickel cathode were 1 mm and 0·1 mm respectively. At the time of the explosion, 0900 U.T., the balloon carrying this counter (mounted horizontally) and associated circuitry had reached an atmospheric depth of 80 g cm^{-2} and was rising in altitude at the rate of 2·5 g cm^{-2} min^{-1}. The balloon burst prematurely at 0927 U.T.

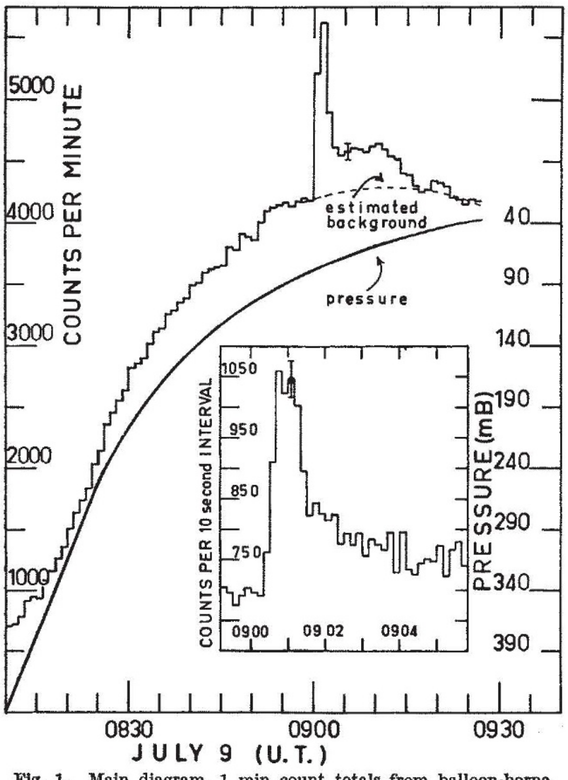

Fig. 1. Main diagram, 1 min count totals from balloon-borne Geiger counter and atmospheric pressure level versus time; inset, variation of 10-sec count totals through time of Johnston Island explosion (0900 U.T.)

Fig. 1 summarizes the observations. The maximum error in timing is estimated at ± 2 sec.

Significant features of the event are the considerable atmospheric depth at which it was observed, the delay of between 20 and 30 sec between the instant of the explosion and commencement of the enhancement, and the peak intensity (averaged over 10-sec intervals) of about 50 per cent above the normal background-level near the Pfotzer maximum of the cosmic ray transition curve. There seems little doubt that recovery to the normal background intensity was not complete until at least 0915 U.T. No effect was observed by cosmic ray neutron monitors and meson telescopes at ground-level in and near Hobart.

It is clear that if the enhancement were due to protons incident vertically at the top of the atmosphere their minimum energy was 350 MeV. However, the line of force through Hobart (geographic coordinates 43° S., 147° E., geomagnetic latitude 51° S.) crosses the equatorial plane at 2·5 Earth radii, and thus passes outside the region in which protons of energy exceeding 70 MeV were observed by *Explorer VI*[1]. The possibility that other types of radiation were responsible for the enhancement must be examined, but we consider that an attempt at this time to interpret the observations from the information available to us would be premature.

We wish to acknowledge the assistance of Mr. H. E. G. Dyer, who manned a duplicate radio telemetry station.

P. J. Edwards
A. G. Fenton
K. B. Fenton
J. G. Greenhill

Physics Department,
University of Tasmania,
Hobart, Tasmania.

N. R. Parsons

Antarctic Division,
Department of External Affairs,
Melbourne, Victoria.

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Laboratory Test of the Finlay-Freundlich Red Shift Hypothesis

A new round of discussion and experiment has been set off by a recent suggestion made by A. Ward[1]. He points out that recent developments in physics make possible a laboratory test of a proposal by E. Finlay-Freundlich[2] for an alternative interpretation of the galactic red shift. The Finlay-Freundlich hypothesis was based on anomalies in various stellar red shifts and suggested that these, as well as the Hubble–Humason red shift in galactic spectra, commonly interpreted as Doppler shifts in an expanding universe, are in fact the result of loss of energy by observed photons traversing a radiation field. No generally accepted physical mechanism has been proposed for this loss. It may be noted that an as yet unknown photon–photon interaction has been suggested in which the energy lost somehow reappears as lower frequency radiation, or alternatively, it has been proposed that the energy lost