Radium Effects Not Due to Cosmic Rays

Physics

Whatever it is that makes radium, and related elements, disintegrate and give off the rays that are so helpful both to the physicist and the physician, the cosmic rays are not responsible. This has been found by Dr. Louis B. Maxwell, National Research fellow working at the Bartol Research Laboratory of the Franklin Institute. He will report his latest researches in the forthcoming issue of the institute's journal.

Shortly after the discovery of radium and its effects, over thirty years ago, the suggestion was made that some highly penetrating rays bombarded the earth from space, and were absorbed by certain elements. This energy, it was thought, might break up the radium atoms, and be given off again as rays of longer wave length.

The eventual discovery of such highly penetrating rays, which have been particularly studied by Dr. R. A. Millikan, of the California Institute of Technology, brought a renewal of interest in this theory. Though these rays from space are highly penetrating, they are completely stopped by a thickness of 225 feet of water, or equivalent amounts of other materials.

Dr. Maxwell took some polonium, another element in the radium series, and measured the rate at which it disintegrated on the surface of the ground, and in a mine 1150 feet below the surface. The mine contained a large quantity of a zinc ore, willemite, which is more absorbent of the rays than water. At the depth at which the experiment was performed, the material above absorbed as much as 400 feet of lead, or more than half a mile of water, so that it was certain that no cosmic rays could reach the instruments.

Despite this, the rate of decay of the polonium was almost exactly the same whether the experiment was done on the ground or in the mine, and thus Dr. Maxwell concludes that there is no appreciable effect of cosmic rays on radioactivity.

As a matter of fact, his calculations show that it is unreasonable to expect any such effect. Only once in some 20,000,000 years would a cosmic ray be absorbed by a polonium atom, in the apparatus, so feeble are the rays. This would make it entirely impossible to measure the effect of the absorption of a ray by an atom, and also shows that the vastly more frequent breakup of the polonium atoms cannot be due to such an absorption.

Even if the cosmic ray is something like a bullet, and merely has to pass near a polonium atom to break it, they cannot be held responsible, Dr. Maxwell points out. With the size of the polonium plate used, only two cosmic rays would reach it every second, while 3,000 atoms of polonium in it disintegrate every second. Thus less than a tenth of one per cent. of the disintegration could be blamed on the cosmic rays.

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Radio Stations Must Keep Frequency

Radio

Closer adherence to their assigned frequencies by radio stations is one way of preventing a large amount of the heterodyne whistles which so often annoy broadcast listeners, John V. L. Hogan, New York consulting engineer, told members of the Institute of Radio Engineers.

One form of such interference comes from stations on adjoining channels. That is, if one station is assigned to the 570 kilocycle band and another to 580 kilocycles, the two waves will combine with each other to produce a heterodyne note of very high pitch—too high to be picked up by the ordinary receiver, or to be heard if it was. As the stations wander from their assigned frequencies, and approach more closely, so that they are separated by 9 instead of 10 kilocycles, the pitch of the heterodyne note becomes lower, but is still too high to be troublesome. However, when the two stations approach within 8, 7 or 6 kilocycles, the result is the "peanut whistle" accompaniment to received music or speech. The obvious remedy is to insist that each station stays within half a kilocycle of its assigned frequency.

However, as there are not enough radio channels to have a clear one for every station, two or more must be put on one in many cases, and this causes another sort of heterodyne interference, Mr. Hogan pointed out. As the carrier wave of the station goes far beyond the area where the program of the station can be heard well, two stations on the same frequency may interfere at surprisingly great distances. If the two stations are both exactly on the same frequency, there will be no such interference, though a listener inside the range of each would hear both programs simultaneously.

If each station deviates half a kilocycle from its proper frequency, but in opposite directions, so that one kilocycle separates them, the heterodyne note will come just at the pitch that most receivers are sensitive, and so produce the maximum interference. The remedy for this is to keep the stations within a fortieth of a kilocycle, or 25 cycles, of their assigned frequency, instead of allowing them to wander one whole kilocycle, as at present. With modern equipment, it is easily possible to maintain such precision, said Mr. Hogan, and with such a deviation the interference produced would be too low in pitch to be detected.

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New Visual Phenomenon

Physiology

A new and most important phenomenon in the field of visual acuity or keenness was observed in the course of investigations of eye strain and eye fatigue among postal authorities made by the U. S. Public Health Service.

In order to find the effect of the degree of illumination on eye fatigue a special test of visual keenness was devised. This test measured what may be called snap acuity, because the time of exposure is so short.

The subject looks for one hundredth of a second at a broken circle in a special piece of apparatus, and must then tell the direction of the break in the circle. The subject was tested in the morning shortly after beginning work and again in the evening shortly after stopping work. Snap acuity was found to be slightly lower at the close of the day's work than at the beginning. No relation was observed between snap acuity and the degree of illumination under which the subject had been working. Snap acuity improved after the subject had been working under high illumination for a sufficient length of time and correspondingly decreased after working under low illumination. This phenomenon had never been observed before.

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