

COSMOSOLAR RAYS

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New evidence is herewith submitted on our latest findings in under water experiments and high altitude balloon tests, obtained inclusively and since the last brilliant Aurora Borealis on May 4-5, 1930.

An ionization-depth-curve showing the different readings obtained during the Aurora Borealis and in normal daily radiation has been prepared with this

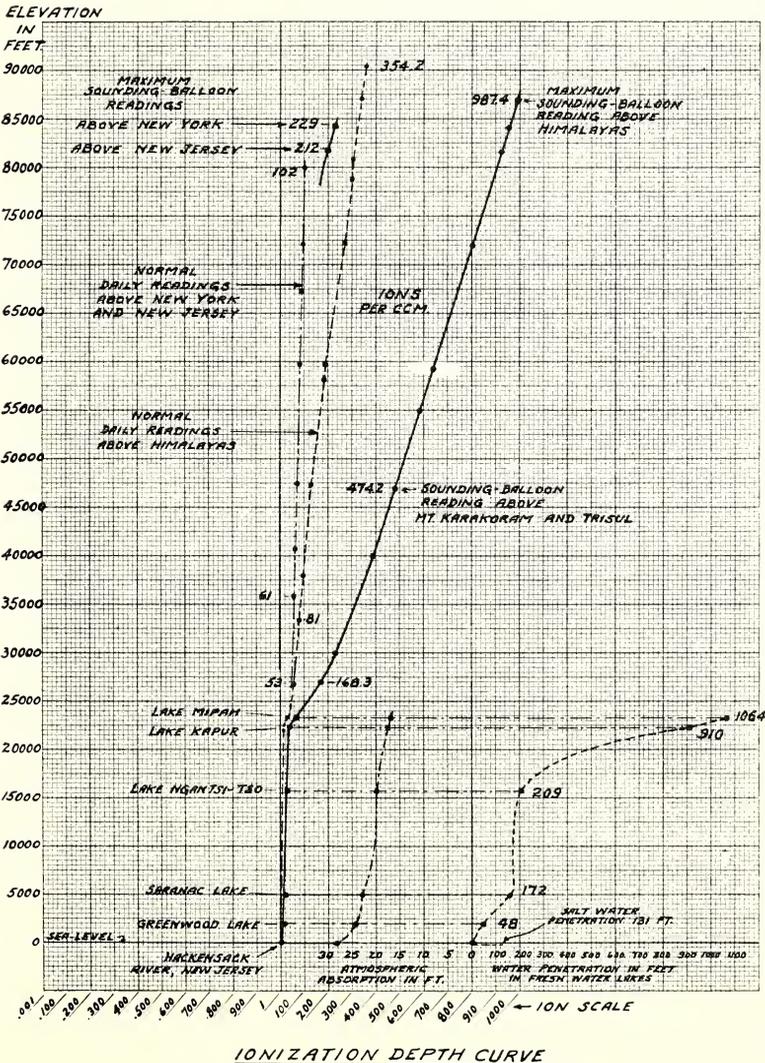


Fig. 1.

report. The values of ionization under water and in the atmosphere has been plotted to scale which agrees with our recent published reports. The absorption is also included as well as the high altitudes reached by the sounding balloons. The depths explored under water with our high precision electroscopes and other instruments, and the high altitude balloon electrometer readings is shown for both normal and maximum radiation in India and America. Another curve is being plotted for a future report, which will set forth certain data in connection with solar distribution and radioactivity.

In the present curve it will be seen by referring to the top of the sheet that the maximum ionization during visible Auroras was about 229 ions above New York, altitude 84,000 feet, while above New Jersey, altitude 82,000 feet, a value of 212 ions seemed to be the limit. During normal daily Cosmosolar radiation our highest value obtained by self recording balloon-electrometers was 102 ions for an altitude of 80,012 feet above both States. The maximum ionization curve which shows the highest readings obtained during visible Auroras, has been extended at the right of the normal ionization curve to indicate the comparison between both extremes. When Auroras make their appearances, the normal ionization gradually builds up until it swings over into the position shown by the short maximum ionization curve. In Europe however, conditions are different for the production of ions, where the values are now known to be higher, especially more so in India.

For the Himalayan mountains we have plotted a full line curve giving maximum ionization and a dotted curve for normal values. These two curves which are shown from below sea-level to the highest altitude reached by our sounding balloons, indicate the readings as observed by our under water electroscopes and high altitude balloon-electrometers. The readings are spotted for different heights in order to show what ionization is contained in the atmosphere at different points. It may be mentioned that all the ions are not capable of being measured, since some pass by the instruments owing to their extreme hardness when coming through the atmosphere. Fortunately we have sufficient evidence to know that all space is filled with them in varying quantities. However, in referring back to the maximum ionization curve for India, a reading was obtained during one of the brilliant Auroras, which was recorded at 987.4 ions for the high altitude of 87,000 feet. At the same time readings were taken with specially designed under water lead sealed electroscopes in Lake Mipah elevation 23,257 feet, on Mt. Everest, where we obtained a value of 65.5 ions per cm./sec. The readings obtained in the lower lakes have been given in previous published papers and were treated in detail. For normal daily Cosmosolar radiation a lower ionization was recorded, which showed 354.2 ions at an altitude of 90,850 feet above sea-level in India. Other recorded values are given for different altitudes on the normal daily curve. The greatest depths of water so far explored by our instruments was 131 feet of salt sea water and 1,064 feet of fresh water. These depths and the high altitude test aided us in determining the shortest wave-length in the electromagnetic spectrum. Other data that is highly valuable to science was also obtained and will be disclosed in a future paper.

Results of New Tests in Greenwood Lake, N. Y. Another body of water explored on May 2-3-4-5-6-7, 1930 was Greenwood Lake, elevation 2,100 feet on the Catskill mountains, Athens, N. Y. In this lake which is 48 feet deep, and 2,900 feet lower than Saranac Lake, we obtained instrumental values showing the difference in ionization that existed between Saranac Lake and sea-level. By a

strange coincidence, an Aurora Borealis appeared brilliantly visible at midnight on May 4, while experiments were being conducted for normal Cosmosolar radiation. Our radiometers early that day showed that some atmospheric disturbance was about to take place, although we were prepared for the occasion. The result was that our two electroscopes were constantly under water, and readings taken showed different values as the instruments descended to the bottom of the lake. The zero readings of the two electroscopes corresponded to depths of immersion of 48 feet, which were 6.9 for electroscopes No. 7 at one meter depth, and 7 ions for electroscopes No. 8. At the bottom of the lake both instruments registered exactly 1.78 ions per ccm/sec. Readings taken a few days before and after the visible Aurora showed about 3.8 ions near the surface of the lake. All under water readings are taken at one meter depth instead of at the surface, due to the presence at the surface of local radiations from the mountains. While the absorption coefficient of the hardest of the radioactive radiations is easy to compute, no such rays can affect the readings of our electroscopes at one meter depth.

General Detailed Explanations. Furthermore, we know that some other powerful radioactive elements besides uranium and radium are contained in the sun's interior, which eject these ultra-gamma rays into the earth as our past experiments reveal. But they are broken up into short wave radiation only when they fall in line with the earth's magnetic field.

Now, however, the indications are that the magnetic whirls of the sunspots act as a forcible directing field in guiding electrons from the sun. With the perceptible magnetic storms sweeping the earth upon the appearance of great sunspot activity, frequent and brilliant displays of the Aurora Borealis cause great disturbances to all radio and commercial electrical systems. During minimum sun-spot eruptions, a lesser number of displays are visible. While the fact is known, from our long series of experimental investigations and which were recently disclosed, a continual scattering of high frequency rays into the earth, guided by magnetic lines of force, has convinced us that the Aurora is also present invisibly. If such were not the case, our high precision instruments would not record the lower or normal daily values as obtained during the past 11 years. These daily Cosmosolar radiations are not as high as those measured during brilliant Auroral displays and which are indicated by the ionization curve. According to radiometric measurements, some very short waves travel at high velocity among the long waves independently of ultra-violet rays. More recent evidence shows that electrified particles shot out from the sun are influenced by an electromagnetic wave motion of an elastic nature. These particles follow the earth's magnetic field of force and distribute themselves at all hours over the earth in varying quantities. The resultant ionic concentration of these quantities have been plotted to scale as represented by the curve, which was prepared to suit the different conditions of observations. Records of high altitude balloon-electrometers and those obtained by heavy lead sealed electroscopes and other instruments under water, show a wide contrast between sea-level and altitudes reaching over 17 miles.

Observed Emanations. The insignificant quantity of radium which has been produced enabled discoveries that have changed the aspect of physical science. There are certain periods in the history of science when a group of discoveries alter the whole trend of thought.

The present change in physical science is noted where the alpha rays are slightly deflected by powerful magnetic forces and have but slight penetrative

ability. They are shot off from radium with a velocity of 20,000 miles per second. The beta rays are strongly deflected in the opposite direction to the alpha rays by much weaker magnetic forces. Their velocity has been determined to be between 185,000 and 186,000 miles per second. The gamma rays are not deflected by a magnet, and they penetrate many bodies which are opaque to ordinary light. The ultra-gamma rays travel at a velocity greater than alpha or ordinary gamma rays and are shot off from elements of higher atomic weight. When the radium breaks down into emanation, alpha particles are produced, and in the inter-atomic commotion that ensues the negative electrons are flung off and the tremor which spreads outwards through space produces the effect of the ordinary gamma rays. It is important to note that the average life of radium is 25,000 years, therefore, the average life of uranium would be 3,000,000 times as long or 7,500,000,000 years. The rate of change is so slow that, though experiments have been going on for years, the change from uranium to radium has not yet been detected in the laboratory.

Conclusions. The resultant absorption coefficient deduced from the measurable values, the wave-length of the hardest, i.e. shortest wave-length component of the Cosmosolar radiation; corresponds to something more powerful than would result from the transformation of a proton into radiation. The two most important sources of ion production are the radioactive substances and the ultra-gamma rays. The latter being a strongly penetrative radiation from the sun as lately proven. From data already available a rather remarkable agreement may be obtained between the atmospheric ion content values calculated from the known concentration of ion producing agencies and those values measured experimentally. The ionization at high altitudes is more intense than at sea-level, which has been indicated on the smooth ionization-depth curves for different locations.

BIBLIOGRAPHY

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