vals, became affected several times with dermatitis to such an extent that he could not remain at home. Some near-by plant was suspected as causing the trouble, and several of the most common ones of the native vegetation on the dry hills surrounding the residence were tested. The method used was the crude but effective one of placing leaves against the forearm, held lightly in contact for a few minutes by a cloth band.

In this way it was found that when Encelia leaves were used the skin, which had been in contact with the unbroken leaf, soon turned red, in a few hours began swelling and finally broke out in blisters similar to those produced by poison ivy.

The other members of my family were apparently entirely immune to its influence, but I am thoroughly familiar with two other cases of individuals who are similarly affected by the same Encelia, one of them as severely as my son. Evidently the degree of susceptibility varies with the individual much as does that of ivy poisoning.

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QUOTATIONS

PROFESSOR ARTHUR H. COMPTON'S STUDIES OF COSMIC RAYS

THE Department of Public Relations of the University of Chicago has sent SCIENCE the following press release:

Professor Arthur H. Compton, University of Chicago physicist, has returned to his laboratory on the Midway with a trunkful of new data on the cosmic rays. Since March Dr. Compton has been roving the western hemisphere measuring the intensity of these remarkable emanations as they struck the earth at widely scattered sites.

Two results of his survey, neither of which fits the hypotheses which had been current as to the nature of the rays, were emphasized by Dr. Compton. The first of these is that the intensity of the rays is less near the magnetic equator than near the magnetic poles, which indicates that they are electrical in nature, rather than pure wave-forms.

The second is that the intensity of the rays apparently increases continuously at the higher altitudes, probably reaching a maximum at the top of the atmosphere. This is also held to be an argument against the pure-wave theory.

During the past twelve months Dr. Compton has taken measurements at sixteen major sites, while six further expeditions, under his direction, three of which have now completed their work, have made tests at sites throughout the remainder of the globe.

Dr. Compton's branch of the world-survey included measurements last autumn at Denver and other points in the Rockies; on the Jungfrau in the Swiss Alps, and in Chicago. This spring and summer he and his party have carried their instruments to the Hawaiian Islands, where Mount Haleakala was the major objective; the equatorial Pacific, where tests were made aboard ship; Auckland, New Zealand; Mount Cook, New Zealand, 1,000 miles from Auckland; Mount Kosciuski, Australia; Brisbane, Australia; Panama; Lima, Peru; Arequipa, Peru; Mexico City and neighboring peaks; Churchill, Manitoba, and the Fox Basin, Canada, where the measurements were made at the edge of the ice-pack, 100 miles north of the Arctic Circle.

The three cooperating parties which have completed their work are those of Professor R. D. Bennett, of the Massachusetts Institute of Technology, to Alaska, California and Denver; Professor J. M. Benade, of Punjab University, Lahore, to Ceylon, Sumatra, Java, Singapore, Tibet and India, and Allen Carpe, who was killed climbing Mount McKinley in Alaska. The three which have not yet reported are those of Dr. E. O. Wollan, of the University of Chicago, to Spitzbergen and Switzerland; Dr. A. LaCour, of Copenhagen, at Copenhagen and Greenland, and Professor S. M. Naude, of the University of Cape Town, to Mount Winterhoek in South Africa.

Two further parties will start in the near future, Dr. Compton has announced. Dr. E. P. Ledig, of the Carnegie Station, at Mount Huancayo, Peru, will go to the mountains of south Chile and the Argentine, and Dr. Thomas C. Poulter, of Iowa Wesleyan University, will go with Admiral Byrd's expedition to Antarctica.

During the past 12 months Professor Compton has traveled 50,000 miles, from latitude 46 degrees south to latitude 68 degrees north. He has crossed the equator four times and seen five continents.

Most important of the findings thus far assembled, according to Dr. Compton, is that the intensity of the rays is less near the magnetic equator than near the magnetic poles. This he had not anticipated. In the regions where Professor Robert A. Millikan, of the California Institute of Technology, had also made tests the Compton and Millikan measurements agree substantially. "In certain other areas, however," Dr. Compton said, "particularly in the tropics, our data give a new type of information."

The new data do not substantiate the tentative wave-form theory suggested previously by Millikan and Professor Jeans, of England.

In accounting for the difference between the intensity of the rays at the magnetic equator and the magnetic poles, Professor Compton pointed out that the earth is apparently acting as a huge magnet in relation to the rays.

"If the cosmic rays are electrified particles shot toward the earth from remote distances, as they seem to be," he said, "the effect of the earth's magnetic field will be to bend the rays away from the equator and concentrate them at the poles. This, for example, is what happens in the aurora borealis, which is due to electrons shot toward the earth from the sun. The electrons are concentrated near the earth's magnetic poles, and produce the 'northern lights' as they strike the upper atmosphere.

"If the cosmic rays are uncharged, like light rays or neutrons, they should not be affected by the earth's magnetic field."

The cosmic rays is a kind of radiation similar in effect to x-rays or rays from radium, Dr. Compton said. They come into the atmosphere from high altitudes, moving at a speed nearly equal to the velocity of light, which is 186,284 miles a second. They are observed by the fact that they make air and other gases electrically conducting.

"The rays do come from high altitudes, probably from outside the earth and possibly from interstellar space," Dr. Compton said, "though it is still as good a guess as any that they may emanate from the earth's upper atmosphere." Professor Compton found that the rays are slightly more intense in the day time than they are at night, which may lend some support to the theory that they are associated in some way with the sun, though other expeditions failed to find such an effect.

The minimum intensity of rays, according to latitude, was found at Lima, Peru, which is on the magnetic equator, 12 degrees, or about 800 miles, south of the geographical equator.

The second important result of the expedition was the observation that the rays increase in intensity continuously with altitude. "This would be expected if the rays were coming into the earth's atmosphere from outside and being absorbed by the atmosphere," Dr. Compton said. "If the rays had tended to diminish in intensity as the top of the atmosphere was approached, this would have been taken to support the wave theory."

The highest altitude where tests were made by Dr. Compton was at 19,000 feet on the volcano Mount El Misti, near Arequipa, Peru, though Professor Benade has since made tests 100 feet higher in the Himalayas. This is three miles higher than any cosmic ray mountain expedition has gone with equipment for precision work. The finding agrees with that made by Professor Piccard in his stratosphere ascension and also with the finding of Professor E. Regener, of Germany, who sent up a sounding balloon to 25 miles this spring.

One of the most significant new observations made during the summer was discovery of the sudden burst of ionization by individual cosmic rays in the apparatus. Using the burning of a single hydrogen atom in oxygen as a unit of energy, Dr. Compton said that the ionization of a radium atom would involve a million such units and the ionization of a cosmic ray several hundred millions of such units. Several hundred million volts potential would be required to produce such a ray artificially, he said.

During the tests on Mount El Misti, Dr. Compton and his wife and 15-year-old son, Arthur Alan, who served as his assistant, camped for a week at a temperature of zero and made tests 24 hours a day. On Mount Cook, in New Zealand, the heavy equipment had to be packed by the party over a mile of snow. In the Fox Basin, off Hudson Bay, probably the largest unexplored region on the continent, a new island 30 miles long was discovered by the Compton party, and named "Poole Island" for the captain of the tug *Ocean Eagle,* which carried the group.

The Carnegie Foundation shared the expenses of the expedition with the University of Chicago. The measuring device used was a steel chamber heavily sheathed with lead and copper, containing argon at 30 atmospheres pressure. An electrometer measured the varying conductivity of the argon. Dr. Compton was awarded the Nobel Prize for physics in 1927.

SCIENTIFIC BOOKS

The Theory of Electric and Magnetic Susceptibilities. By J. H. VAN VLECK. Oxford University Press, 384 pages, 1932.

THIS volume impressed the reviewer as being one of the most convincing gospels for the new quantum mechanics that he has read.

This does not imply that more apologia for quantum mechanics are needed at present, or that the works of Weyl and Dirac are not convincing in their way. But every so often, for the good of one's soul, one should go back to the experimental data which could not be made to fit the older theories and reconvince oneself that the newer theories are needed. When one is struggling with electron exchange in collisions and with spinor analysis, it is perhaps heartening to know that the beautifully straightforward methods of classical physics can not be used here, and to be certain that one has not somehow overlooked a much easier way of handling the difficulties.

Usually, one looks back to the history of the theory of radiation, to Planck's work, to the photoelectric effect and to the development of spectroscopy, to be reconvinced. This book shows that the development of the theory of the reaction of matter to static electric and magnetic fields forms just as convincing, and perhaps more understandable, a set of reasons for the necessity of revising the older theories.

This side of the argument for quantum mechanics is very little known, to some extent due to the fact that much of the original work was in the nearly