

ance of blue lights," says Professor Larkin, "was over a wider area than at first thought. At Petaluma * * * blue flames eighteen inches in height played over a wide expanse of marsh land." Before the earthquake only "a flickering ominous haze was seen playing above the ground." "A dark funnel-shaped mass was seen in Fourth Street, San Francisco, suspended in the air, and it was illuminated by scintillating lights, like fire-flies." "Blue flames were seen hovering over the bases of foothills in western San Francisco." In San José, on the street called the Alameda, looking eastward, at the time of the shock the whole street was seen "ablaze with fire, it being of a beautiful rainbow color but faint. This, no doubt," observes Professor Larkin, "was an electrical display, for had gas been on fire all along the street the houses would have been ignited. And letters from a point north of San Francisco describe blue lights as flickering like an aurora over a wide area of marsh land with a troubled surface of adjoining water. And can it be that the giant Electricity took part in the vast seismic turbulence? * * * The writer scarcely knows which one of the multitude of theories regarding the cause of earthquakes to adopt."

Later Professor Larkin grows more confident and asserts that "the San Francisco earthquake was due to a readjustment of the edge of the layers once torn apart when the earth was young. * * * It appears that two faults were involved. * * * I do not wish to assert that the earth's charge of electricity helped in the havoc, but believe that it did. That giant is able to do any vast work."

No wonder that in Professor Larkin's mind 'great questions arise.' "Did man appear on earth before his dwelling was ready? Does nature care whether man exists? It is asserted that she has slain thirteen million human beings by convulsive force alone within the historic period."

'Swing low, Sweet Chariot,' sings Professor Larkin, with cheerful relevance. And, indeed, when we stop to think of it, why not?

D. S. J.

SPECIAL ARTICLES.

TIME VARIATION OF THE INITIAL NUCLEATION OF WET DUST-FREE AIR.

IN the further development of the investigation¹ on the time variations of the efficient colloidal nucleation in filtered air, I find results of the same character as those already discussed; but the dependence of the nucleation on the fluctuations of the barometer shows itself even more obtrusively than before. The minima of atmospheric pressure coincide with maxima of the larger colloidal nucleation and therefore (by inference but not necessarily) with minima of ionization of the dust-free air, both in the daily and in the weekly periods of observations. Maximum pressure would correspond to maximum ionization as if the radiant energy originated in the compression of the atmosphere, or were dependent on the mass of the atmosphere bearing on a given place. This would, if finally substantiated, be an important result, but no more so than the correlative result that minimum pressure and maximum of the initial colloidal nucleation of dust-free air go together. The bearing of this on 'adsorption' of atmospheric ionization will be stated presently.

At the same time since the change of absolute temperature, t , due to sudden expansion equivalent to a drop δp at a barometric pressure p and vapor pressure π may be written

$$t_2/t_1 = (1 - \delta p/(p - \pi))^{(k - c)/c}$$

the correction for the changes of the barometer are in the same sense as the observed changes in nucleation. These corrections are found by varying the numerator of $\delta p/(p - \pi)$ and observing the effect on the angular diameter of the corona. While I see no room for error, it must nevertheless be acknowledged that the present method of small exhaustion (though possibly more sensitive) is not as straightforward as the method mentioned in my address where no variation could be detected, the terminal corona remaining unchanged.

At the present stage of investigation, therefore, the need of any cosmical radiation has ceased to be obvious and should be abandoned,

¹ SCIENCE, XXIII., p. 952, 1906.

and the results, if they are not due to some obscure barometric effect which has escaped me, are most directly referable to changes of pressure within the atmosphere, the number of the colloidal nuclei specified being greatest when the pressure is least. This view, moreover, would not be incompatible with the persistence of terminal coronas referred to above. It is also compatible with the following. If among the initial nuclei entrapped (which lie very near the region of ions) the ions actually preponderate, the observations would then mean that increased ionization accompanies the falling barometer. Under these conditions, however, radioactive emanation is known to be withdrawn from the stagnant air within the porous ground and the earth generally. Hence the data could now be interpreted as evidence of the necessary fluctuation of such emanation with the barometer.

I may add that I have since installed a second apparatus side by side with the first and that the data, though differing in their details, show the same dependence on the barometer in their broader time variations.

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USE OF THE TERM PERMIAN IN AMERICAN GEOLOGY.

FOR over fifty years the Permian question has been one of the moot problems of American geology. Of late it has been quite generally agreed that the title should not, at least, be applied to any American formation having the taxonomic rank of period or system, coordinate with such terms as Carboniferous or Cretaceous.

Division is now upon the point whether the so-called Permian section as represented in Kansas should be called by Murchison's title and given the rank of series, or whether the name should not be abandoned altogether as a designation for any American formation.

Upon this point Professor Prosser has recently made a summary of opinion. Among the statements is this: "There is still a difference of opinion among American geologists in regard to the correlation of the Upper Paleozoic formations of Kansas with the Russian Permian. The *Journal of Geology*, pub-

lished in 1898 'A Symposium on the Classification and Nomenclature of Geologic Time-divisions,' in which Dr. Williston, Professor Calvin and Dr. Keyes reported adversely both as to the identification of the Permian in Kansas and as to its recognition as a period coordinate with the Carboniferous or Devonian; while Dr. William B. Clark stated that for the later divisions of the Paleozoic he should employ the chronologic terms Carboniferous and Permian."

Professor Prosser further observes: "No one has, perhaps, insisted as strenuously as Dr. Keyes that the name Permian should be dropped from American geology. In 1897 he attended the sessions of the International Congress of Geologists at St. Petersburg and participated in the excursions to the Carboniferous and typical Permian of Russia. Later he prepared a paper on the 'American Homotaxial Equivalents of the Original Permian,' and quotations from this can not be regarded as from one favoring the retention of the name 'Permian.'"

It is quite manifest that Professor Prosser has objected to my usage of the title of 'Oklahoman series' for the so-called Lower Permian of Kansas. My repeated use of the term Oklahoman has been made advisedly. It had been thought quite desirable to have the title of this section distinctive, irrespective of what age might be eventually assigned to it.

The recent discovery in New Mexico and Texas of a great formation (Guadalupe series) having a thickness of more than 2,500 feet, that appears to be intercalated between the Carboniferous Red Beds (Cimarronian series) and the equivalent of the Oklahoman series, indicates that the Kansas section of the latest part of the Paleozoic is not nearly so complete as it was thought to be. It also suggests that in Kansas there are no formations below the Red Beds that can be considered of late Carboniferous age, or that might be paralleled with the Permian at all. This, it would seem, would almost put an end to the contention for a Permian age of such Kansas beds as the Neosho, Chase and Marion formations.

Tschernychew, who is one of the best au-