In the display of August 28, they were of various colors; in that of September 1 they were of a uniform red. The brightness seemed to be about the same in both cases, and sufficient for one to read a printed page with ease. There was no moon. The southern streamers, especially, were very changeable; having continually many of what were then called "merry dancers," or rapidly changing clouds of light, among them. These displays, as it was noticed in the papers at the time, were visible as far south as Cuba; though of course they were not there so brilliant. They were accompanied by magnetic storms, and interference with telegraphic work.

The present writer was then engaged in astronomical observations, which had to be suspended during these illuminations.

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INFERENCES CONCERNING AURORAS

To the Editor of Science: I was much interested in the vivid description of the aurora of August 26 given by Dr. C. C. Nutting, followed as it was in the next issue of Science by a number of letters from different localities concerning the same, and I find in the last issue of Science, that of November 17, a most interesting account of this aurora, with general considerations respecting this phenomenon, given by Professor C. C. Trowbridge, of Columbia University.

Inasmuch as I had some time ago prepared a paper entitled "Inferences Concerning Auroras" for presentation at the meeting of the National Academy of Sciences in Boston, where the paper was read on November 14, it may be of interest to make a few brief statements concerning the inferences presented. In an address at the opening of the Palmer Laboratory of Physics at Princeton, entitled "Atmospheric Electricity" which appears in Science, N. S., Vol. 30, No. 781, pp. 857–869, December 17, 1909, I took occasion to state some opinions based upon the observation of auroras for many years, particularly as to the general relation of the auroral streamers to the earth. I quote the following statement:

> I have come to the opinion that the auroral streamers often extend in a general direction outwardly from the earth, sometimes for very great distances relatively to the known extent of our atmosphere. The effects observed appear unaccountable on any other supposition, while they are consistent with the idea of outwardly directed streams of great extent.

The evidence furnished by the recent aurora of August 26 confirmed the inferences which I had made many years ago, and added considerably to the possibility of applying certain ideas in explanation of auroral phenomena generally. In the paper before the National Academy I have, I think, established with a fair degree of certainty that the auroral streamers are in reality vertical or approximately vertical to the earth's surface. These vertical streamers appear in bands, more or less wide, in the general direction of parallels of latitude forming belts or zones in which the streamers extend upward, somewhat like trees in a forest. I find an explanation, also, of those auroras which appear to be limited to a narrow belt, and appear as a single narrow streak of light across the sky from east to west. There may be, of course, in any aurora, a number of such belts occupying different latitudes. I have endeavored to show, and I think successfully, that the curvature of the so-called auroral arch is a purely optical effect of perspective, increased somewhat by the curvature of the earth, and that the appearance of folded curtains of streamers merely means that the lower ends or feet of the streamers which are, with relation to the observer, of varying altitude, or are of varying latitude as in a belt which is of a winding nature.

It is pointed out, also, that the convergence of long streamers towards the zenith seen in the great auroras is purely an optical effect of perspective, and that the so-called zenith crown is, in reality, due to bundles of streamers nearly vertical like the others, but seen on end overhead.

There are a number of other inferences which are supported by the observations of Carl Störmer and others, among which is the probable existence of a conducting layer at a

height approximately fifty miles above the earth's surface.

It is expected that my paper will soon be published in the *Proceedings* of the National Academy of Sciences. In it the arguments are presented in full. ELIHU THOMSON

A BUSINESS MAN'S APPRAISEMENT OF BIOLOGY

THE erection and dedication during recent months of important additions to the physical being of the Scripps Institution for Biological Research of the University of California has brought the name of the chief donor of money, Miss E. B. Scripps, quite conspicuously to public notice. Indeed so exclusively has the growth of the institution seemed in the eyes of the community to be the work of Miss Scripps that a brief statement of what has actually been and is going on here appears almost imperative not only to her but to all who have the welfare of the enterprise at heart.

In what follows I speak primarily in the interest of a department of the University of the State of California, the purpose of which is to investigate nature for the general good, and only secondarily in the interest of the particular persons who will figure in my remarks.

One of the most important secondary services a scientific research institution can render the public is in demonstrating that specialized and disciplined talent for studying nature, business experience and skill, and material wealth must be and can be brought together for the great task of making nature yield its best to the development of man's latent physical and spiritual capacities. A point needing emphasis just now is that no one who has grasped the full meaning of the task, and has had actual experience in it, can possibly raise the question as to which of these three factors is all-important—which is the "real thing" in the undertaking. All are absolutely indispensable, and debate on which is most important is scholastic folly. The reason for these remarks is the circumstance that the temper of the day makes the wealth factor appear to most eyes as the main one, the determining one, the one to which all the others are secondary. The prevalent theory that, after all, he who "holds the purse strings" is the real "power behind the throne" even in educational and scientific institutions, and so is the one to whom homage is chiefly due, is an embryonic trait, as biologists say, in the development of civilization —a trait to be left behind with advance toward adulthood. No one understands this better than do some of those who give large sums of money to public institutions. It does not disparage by one whit the importance of having large wealth and being willing to devote portions of it to the general good to point out that, as everybody knows who is acquainted with Miss Scripps, nothing could be more alien to her nature than to glory in the mere giving of a large sum of money toward the creation of an impressive physical structure dedicated to public use. Evidence that an "investment," be it large or small, contributes substantially to the general welfare, would give her supreme satisfaction, as this would be evidence not of mere ability to give, but to give *wisely*. In how far satisfaction of this sort is coming to Miss Scripps for what she has invested in this enterprise I do not know. I suspect there is still uncertainty in her mind; for the institution is too young to enable her to judge what service it may render.

But the personage primarily in view in this communication is not Miss E. B. Scripps, but Mr. E. W. Scripps. The truth is I am taking it for granted that Miss Scripps recognizes now the desirability of a kind of publicity concerning the origin and aims of the Scripps Institution not hitherto furnished, and that she would be willing to have me use her conception of an "investor" in behalf of the public as a starting point for what I am going to say about her brother. My words are addressed first and foremost to men of science, especially those who reflect on the larger human significance of material knowledge and the discovery of it.

The narration of a bit of personal-professional experience will be permissible, since it