SCIENCE

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BRILLIANT AURORÆ OF 1892.

BY LEWIS SWIFT, ROCHESTER, N. Y.

THE months of June and July of the current year will long be remembered as having afforded three interesting auroral displays, one of them being of unrivalled splendor and intensity. Of all the newspaper descriptions of them which I have read, not one

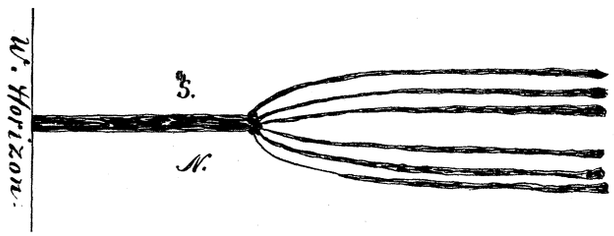

FIG. 1.

portrays them as seen from the flat roof of the Warner Observatory with an unobstructed horizon. Two of these exhibitions I consider unique if not unexampled.

On the evening of June 16, just before midnight, turning my eye from the telescope, a bright narrow beam of light was seen extending from the western horizon to an elevation of some 50°, at right angles to the magnetic meridian, and, of course, parallel with its equator. Here it divided into six parallel bands or branches, like six gigantic fingers of an outstretched hand, which continued to 5° beyond Alpha Cygni, or to a length of more than 60°, when they all sharply ended (Fig. 1). After a visibility of about twenty minutes it slowly disappeared, and was the only sign of aurora observed during that entire night.

Again, at early twilight on the evening of July 16, a portion of a faint auroral band some 15° in length was observed just south of Alpha Aquilla, having on the south side two, and on the north,

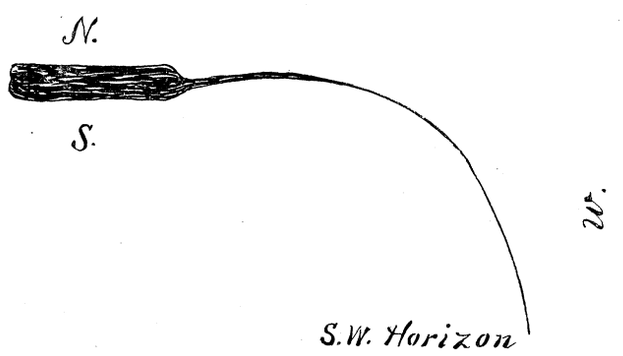

FIG. 2.

one short, narrow band close to, though not touching, the principal one. This, being so far south, was of itself an uncommon occurrence, and, as twilight deepened into night, a slender stem not exceeding 15° in width issued from the western end and gradually lengthened, curving to the south-west and south until, like a mighty sickle, the band serving for a handle and the curved ray for its cutting blade, it reached nearly to the south-western horizon (Fig. 2). It lasted about a half-hour, growing brighter and longer as twilight increased, when it quite suddenly disappeared. Immediately after, a rosy cloud and tinted streamers appeared in the north west, and the grandest auroral display of the century commenced.

During thirty five years of out-door night work I have never seen any auroral phenomena at all resembling these two instances, and would much like to know if these appearances were witnessed by other observers elsewhere

A perfect auroral exhibition consists of at least ten distinct phenomena. It is very seldom, however, that all or even a majority of the requisites are present at any one display. They are here named in the order of their most usual appearance: 1, evenly diffused light in the north; 2, a dark arch whose apex is in the magnetic meridian; 3, streamers; 4, luminous patches, especially in the north-west, sometimes of a red color, often for a long time stationary; 5, colored patches and streamers; 6, merry dancers; 7, corona in the magnetic meridian and equator, the point where the streamers seem by perspective to converge; 8, streamers issuing south from the corona, occasionally extending to near the southern horizon; 9, curtains, with frilled, wavy edges, apparently suspended from the sky; 10, narrow luminous bands, often reaching from the eastern to the western horizon, always at a right angle to the magnetic meridian, but seldom, if ever, coincident with its equator.

As seen from this station by myself, my assistant, and a friend, all of the above features, save the hanging curtains, were simultaneously visible.

That there is a connection between the aurora and sun-spots is quite generally conceded, though denied by some eminent authorities. We know that auroræ frequently occur when no spots are visible on the sun, and that sun-spots are often seen when auroral exhibitions, either boreal or austral, are entirely absent, but to this the advocates of the theory make answer to the former that sun-spots may have been on the other side of the sun, and, to the latter objection, that there may have been auroræ visible only in the Arctic or the Antarctic regions, or in both. But there is need of further confirmatory evidence by the general co-operation of astronomers in the collection of enlarged data for the establishment, modification, or complete rejection of the prevailing theory that sun-spots, auroræ, and terrestrial magnetism are intimately connected.

Intelligence has just reached me that the famous display of July 16 was also witnessed from the southern hemisphere on a scale of grandeur comparable to our own. This simultaneity of the phenomena at both terrestrial poles suggests the question whether this is always the case.

When the writer was a lad, in perhaps the year 1834 or 5, the sky being densely cloudy and the ground covered with snow, he saw at eight o'clock one evening every visible object, especially the snow and sky, suddenly assume a bright crimson red. He wonders if any reader of *Science* recalls that memorable spectacle which appalled so many people. He does not remember to have ever seen an explanation of the ghastly phenomenon from any country where the sky was cloudless, but it was, doubtless, caused by an extraordinarily tinted aurora.

BIOLOGICAL NOTES FROM NEW ZEALAND.

BY GEO. M. THOMSON, DUNEDIN, N.Z.

A VERY interesting feature in connection with the flora of New Zealand is the rarity of those plant structures which are correlated with the presence of mammalia. If we except the spiny *Aciphyllas*, there is not a single species of plant peculiar to these islands which shows any contrivance either for distribution by, or protection against, mammals, even where other species of the same genus are so modified in other parts of the world. *Aciphylla* is a

genus of tall, rigid, umbelliferous plants, peculiar to the islands, with the exception of a rare and feeble species which occurs on the mountains of eastern Australia. The leaves and bracts of two of the species, in all their subdivisions, end in long, rigid spines, rendering them most formidable plants. The only suggested explanation for the occurrence of such strongly-armed species is that they were thus protected against the moas. This may or may not be true. It may be said in favor of the hypothesis that the moas were extraordinarily abundant in former times and they were vegetable feeders, the contents of their crops, consisting of rounded pebbles and comminuted vegetable fibres, being commonly found. It is also the case that since the introduction of pigs into the colony, these plants have been immensely reduced in numbers. The pigs root up the ground at some little distance from the plant, and so get at it from below.

But, leaving this exceptional case, we find the general statement true with which this note is prefaced. A few examples may be given. The genus *Acœna* consists of small rosaceous herbs which have undergone considerable retrogressive development. The name refers to the spines, formed of the four produced and hardened persistent calyx-lobes which project above the fruit. Of the five species found in New Zealand, two have a wide distribution outside the islands; *A. sanguisorbæ* ranging westwards across Tasmania and Australia, and reappearing in Tristan d'Acunha; while *A. adscendens* is a more Antarctic type, occurring in the Macquarrie Islands, Tierra del Fuego, and the Falkland Islands. In both these species the calyx spines are tipped with small barbed hairs, by means of which the fruit adheres to any passing animal with great persistence. In the other species of the genus which are peculiar to New Zealand, the spines have almost or altogether lost the barbs and the fruit is not distributed widely. The change is not, however, complete in all; thus in *A. microphylla* the spines are strongly developed and occasionally have reversed hairs on their summit. In *A. Buchanani* the spines are feeble and rarely have a few apical hairs, but sometimes they are not developed. Lastly, in *A. inermis* the calyx merely has its angles thickened in fruit, and there are no spines.

The only other New Zealand plants in which the fruit is carried by means of barbs which could catch on to passing animals belong to the genus *Uncinia*, a group of sedges which have the utricle furnished with a long barbed bristle or seta. This forms a most efficient organ for hooking hairs, etc., and it renders the fruit a great pest to dogs. The New Zealand species are, as Hooker says, "difficult of discrimination," and some are so closely allied to Tasmanian or to South American forms as to be almost indistinguishable. The genus is widely spread in the Southern Hemisphere, and also occurs as far north as the mountains of Abyssinia. It is clear that the barbed bristle is a character developed outside of these islands and is evidently of great antiquity. In some of the more slender endemic forms it is not very strongly developed, but I know of no species which has lost it.

Spiny and prickly plants are very rare, and, with the exception of the *Aciphyllas* already mentioned, are all Australian. *Discaria toumatou* is probably the same as the Australian *D. australis;* in this plant the leaves are small, and the branches are developed into strong spines which protect it against grazing animals. *Eryngium vesiculosum* is a low-growing umbelliferous plant with very prickly leaves and bracts, but it is a common Australian and Tasmanian species. The same remark applies to *Rubus australis*, but in this case the formidable, recurved prickles, which have earned the plant the name of "bush lawyer," are chiefly of service as climbing organs. There is, indeed, no endemic spiny plant in New Zealand (except *Aciphylla*).

The tendency to lose the protective character is shown in a most instructive manner in a few instances. Thus there are in these islands two species of the myrtaceous genus *Leptospermum*. *L. scoparium*, which is also common in Tasmania, has rigid, pungent leaves, which only an animal with a hard palate could attack with impunity. On the other hand, *L. ericoides*, which is confined to the islands, has quite lost the pungent tip to its leaves, and the foliage and branches are much softer and less rigid.

An exception to the rule here exemplified is afforded by the nettles, of which one endemic species, *Urtica ferox*, is about as diabolical a species as can be met with. Its long, stinging hairs inflict a painful wound. It is difficult to say what they serve to protect the plant from. As if to show that perfection of protective development in one direction does not always serve in another, it is a fact worth noting that this species is so very much attacked by leaf-eating insects that it is often a matter of difficulty to get herbarium specimens quite perfect.

THE PSYCHOLOGICAL LABORATORY AT YALE.

FOR several years Professor Ladd has been lecturing on physiological psychology, using charts, models, microscope slides, etc., for illustration. His earnest desire to have a laboratory for this science finally met its fulfilment last spring. The second, third, and attic floors of a building were given for that purpose, and $1,500 were appropriated for equipping the apartments and for apparatus. Dr. E. W. Scripture, a pupil of Wundt in Leipzig, was called from Clark University to take charge. Orders for apparatus were sent off at once, and the preparation of the rooms went on all summer, so that the work of instruction and research began without a hitch on the first day of the term.

The laboratory consists of fifteen rooms, among which are the lecture room, seminary room, library, chemical, and battery rooms, apparatus room, isolated room, time room, general-research room, and workshop. The workshop contains a screw-cutting lathe and all tools that can be desired for the repair and manufacture of apparatus. A regular mechanic is at work here part of the time. This workshop, which is the most complete one ever put into a psychological laboratory, is regarded as the foundation of research and demonstration work. The plan followed in investing the funds has been to spend as little as possible for mere demonstration apparatus and to reserve nearly all for research work; nevertheless it is of supreme importance to have the lectures on psychology consist almost entirely of demonstrations. This difficulty has been completely solved by the workshop where the apparatus for demonstration is put together or manufactured with sufficient care for the purpose.

Three rooms, including the isolated room, are given over entirely to research. This isolated room is a small room built inside of another room; four springs of rubber and felt are the only points in which it comes in contact with the outer walls. The space between the walls is filled with sawdust as in an ice-box. The room is thus proof against sound and light, and affords an opportunity of making more accurate experiments on the mental condition than yet attempted.

A particularly new feature is the electrical communication between the rooms. It is nearly always necessary to separate the experimenter from the one experimented on; in order to avoid the large number of electrical wires necessary to connect the rooms separately a switchboard has been arranged similar to a telephone switchboard, to which sets of wires run from each room. But this one with fifty-six wires has been put in with the aid of a carpenter at about one-tenth the cost of a telephone-board.

The following courses are given in the laboratory by Dr. Scripture: 1. A regular lecture course in experimental and physiological psychology of one hour per week, for seniors and graduates; the seniors alone recite on another day. 2. A laboratory course in experimental psychology for graduates, conducted on the seminary method by the men themselves. The object is not only to give a thorough knowledge of the psychological work in the laboratory, but to train the men in handling apparatus and in conducting lectures, thus providing a supply of instructors ready to take positions. This course has seventeen members, being exceeded in the graduate department only by Professor Ladd's philosophical courses. 3. Research work. It is the constant endeavor to awaken in the students the spirit of original investigation, this being what America most lacks in its educational life. Men are also encouraged on the principle that one learns most by doing. Last, not least, the fact is recognized that the amount of research done determines the standing of the laboratory in the scientific world. Already six original investigations of the highest class are under way; they include one on attention, in which