The Twinkling of the Stars

EVERY one who observes the stars at all must have noticed that they twinkle much more on some nights than on others, and this irrespective of any sensible difference in the clearness of sky or air. On rare occasions the twinkling becomes a really striking phenomenon, and at such times it is interesting to note the series of changes which together make up a "twinkle." For this purpose it is convenient to select two stars of suitable size and distance apart, and to look steadfastly at one, while the attention is directed to the other. The star which is not looked at will become alternately visible and invisible, and the manner in which these changes succeed each other will be found rather remarkable.

On the evening of the 1st of the present month, observing an unusual degree of twinkling, I made the above experiment on the stars ε (Epsilon) and ζ (Zeta) of Ursa Major. Looking steadily at either one of these, I noticed that the other, which was normally quite apparent, became every now and then totally invisible, and that not for an instant, but for a period of some duration. On one occasion I actually counted 30 in the interval of disappearance, and this I found afterwards to correspond to five seconds. More frequently, the star would be invisible for one or two seconds, then suddenly flash into full brilliancy, and after a variable interval vanish as suddenly again.

From this it would appear that a "twinkle," at least when strongly marked, may be resolved into a sudden accession of brightness following a more or less prolonged period of comparative obscuration.

Stars may easily be found which will show the phenomenon I have described, even more strikingly than the two above named. I once tried two of the bright stars in Orion, and in this case the apparent sudden and absolute extinction, from time to time, of a conspicuous object, produced an effect almost startling.

Clifton, Dec. 12 GEORGE F. BURDER

Logarithmic Tables

THE general procedure in determining numerical values in a scientific investigation is as follows. From a few observations we first compute the approximate values of certain constants, using for this purpose a theory which is purely a mathematical fiction; and then, secondly, by comparison with extended series of observations we form equations of conditions, and determine the small corrections required by the approximate values of the constants. In the first part of this work logarithms of seven or more decimal places are necessary, but in the second part, which is generally by far the most laborious, logarithms of four and five decimals can be extensively used. Hence it is important that we should have well-arranged and convenient tables of such logarithms. An objection to nearly all the small tables that I have seen is that they are encumbered with tables that are not necessary to, or which do not properly accompany a table of logarithms, such as anti-logarithms, tables of meridinal parts, &c., and the result is that the logarithmic tables are made inconvenient for use.

In the logarithmic tables recently edited by Prof. J. M. Peirce, (Ginn Brothers, Boston, 1871), the arrangement of the logarithms of numbers and of the Gaussian logarithms leaves nothing to be desired, and the method of printing the agreement in larger type is a good one. In his table of the trigonometric functions Prof. Peirce has also introduced a good idea in giving the double argument, *arc* and *time*. This arrangement of the trigonometric function is however different from the one generally given, and hence for a computer accustomed to the common table is not convenient. I think that a table of four figure logarithms, in which the logarithms of numbers and the Gaussian logarithms should be printed after the arrangement and with the excellent type and paper adopted by Prof. Peirce, and with the trigonometric functions arranged in the common order with the double argument *arc* and *time*, and which should contain *nothing else*, is a desideratum.

For tables of five decimal places I would follow the same order of arrangement, but would print the argument to the trigonometric function in arc only, and would add a small table of squares for use in least square work. ASAPH HALL

Washington, Nov. 9

"Will-o'-the-Wisps"

PROF. GEIKIE, in his introductory lecture of the Murchison Chair of Geology at Edinburgh, which appeared in NATURE, vol. vii. p. 184, mentions that he never had the good fortune to encounter one of these legendary sprites. It may not be uninteresting to some of your readers to know that they are still extant. On October 5 last I was walking to the "Lizard" with a friend, and near Ruan Major we saw a light travelling fast over the country, which my friend took to be the light of a dog-cart. As there was no road in the neighbourhood we watched, and soon saw two others rising from the same place and bounding over the country till they seemed to be about thirty feet from the ground in a swampy field opposite us, when they disappeared. Another rose from the other side of the field, and after reaching the middle of the field, it also disappeared. In about ten minutes we saw five or six, but none afterwards.

I have asked several farmers of the district and many of my friends if they had ever seen any, but have only met with one farmer who said that when a boy he used to see them on Goonhilly Downs adjoining. The geological formation of this district is serpentine. HOWARD FOX

Falmouth, Jan 15

Spectroscopic Observations

IN corroboration of Capt. Herschel's statements regarding the mistaken idea of high dispersive power being essential to success in observations of solar prominences, I beg to give a few results obtained by a direct-vision spectroscope of dispersive power insufficient to separate D.

An object glass of 2″ diameter and 2′ 5½″ focal length (solar) was attached to this spectroscope in January last; and on the first observation—using coloured glass that absorbed rays from B to a point rather less refrangible than F—the latter line was found bright at four points on the sun's periphery, the slit being placed radial as well as tangential to the limb.

Since then I have frequently observed prominences with and without the coloured glass, and on one occasion obtained G bright. In this case the prominence, which occurred on the day preceding the binocular eclipse of June last, was a small one, but C, the line near D, and F, were all intensely vivid.

By the same spectroscope can be observed the brilliant lines of γ Argus, as also the principal lines of a large number of stars, without using a cylindrical lens.

At the red end of the spectrum I have obtained a broad belt of atmospheric absorption lines still less refrangible than the solar line that lies beyond the double atmospheric band on the red side of A.

I do not quite agree with Captain Herschel in attributing nothing to an Indian atmosphere, for the air here is doubtless more homogeneous than in the variable climes of Europe, but his protest against the prevalent notion of instruments of small dispersion being worthless for solar observations cannot be too widely circulated.

Many valuable data have probably been lost to science by observers being unaware of the power of the instruments at their disposal to work out the problems of nature.

Mangalore, Nov. 26 E. W. PRINGLE

GEORGE CATLIN

MR. GEORGE CATLIN, whose death we referred to last week, died in Jersey City on the 23rd of December last, after a lingering and painful illness. Mr. Catlin was born at Wilksbarre, Pennsylvania, on the 26th of July, 1796.

Mr. Catlin began the series of Indian paintings which has made his name so well known everywhere, when accompanying Governor Clark, of St. Louis, in the years 1830 and 1831, while he was engaged in making treaties with several Indian tribes. In 1832 he ascended the Missouri to Fort Union, and afterward returned in a canoe with two companions, a distance of 2,000 miles, visiting and painting all the tribes, so numerous at that time on the whole length of the river. Between this and 1847 he made several extended journeys among various North American tribes, often sailing hundreds of miles in a bark canoe.

By this means he accumulated a large number of paintings representing the portraits of the principal men of the tribes, and pictures of savage life, which were exhibited by him in various parts of the United

States. He then opened his collections in London and Paris. He was occupied in their display until 1852, when he went to Venezuela, and visited the Oronoco, Amazon, and Essequibo, taking a great number of pictures on his route. He afterwards crossed the continent to Lima, and going northward visited the mouth of the Columbia River, Nootka Sound, Alaska, and Kamtschatka. From Vancouver Island he went to the Dalles, and up the Columbia River to Walla Walla, thence to the Salmon River Valley, and across the mountains into Snake River Valley at Fort Hall, thence to the Great Falls of the Snake River, and returning to Portland, proceeded to San Francisco and San Diego. From San Diego he crossed the Colorado of the West and the Rocky mountains, and descended the Rio Grande del Norte in a canoe to Matamoras.

From Matamoras he set out for Sisal, in Yucatan, and thence proceeded to Havre. Returning from that place in the fall of the same year (1855), he went to Rio Janeiro and Buenos Ayres. Ascending the Paraguay and the Parana, he crossed the "Entre Rios" mountains to the head waters of the Uruguay, which he descended to the mouth of the Rio Negro, and returned again to Buenos Ayres. From this place in 1856 he coasted the whole length of Patagonia, and then north to Panama; thence to Chagres, to Caraccas in Venezuela, to Santa Martha, and Maracaibo. It is probable that this closed his active explorations, as he soon went back to Europe, where he stayed until a year or two ago, when he returned to this country. Continually accumulating paintings in all his expeditions, their aggregate was very great, and on opening an exhibition of the greater part of them in the museum of the Smithsonian Institution in the winter of 1871 and 1872, they attracted great attention from visitors. They are now boxed up in that institution, awaiting disposal. Mr. Catlin's object in bringing them to Washington was to secure an appropriation from Congress for their purchase, this to include the remainder of his collection, which is now in Philadelphia.

The paintings of Mr. Catlin, although far from being unexceptionable as works of art, are of very great value as ethnological representations; and it is very much to be hoped that some measures may be taken to get the entire collection permanently preserved and studied. Especially in view of the fact that by far the greater number of the North American tribes included in his representations have either become exterminated or have changed their habits of life, the interest and value of Mr. Catlin's faithful portraitures may well be realised.

The first work published by Mr. Catlin was entitled, "Illustrations of the Manners, Customs, and Condition of the North American Indians, written during Eight Years of Travel and Adventure among the wildest and most remarkable Tribes now existing." This was illustrated with over three hundred steel-plate engravings from his gallery, and has long been a work of reference on subjects connected with the American aborigines, having passed through a number of editions. Some of his other works were, "North American Portfolio of Hunting Scenes," "Notes of Eight Years' Travel and Residence in Europe," "Life among the Indians," "Okeepah," "The Subsided and Uplifted Rocks of North America," &c.

*ON THE OLD AND NEW LABORATORIES AT THE ROYAL INSTITUTION**

A TIME when, through temporary absence from one chair, and through a change of occupancy of the other, we are deprived of the presence of our two Professors, seems to offer an opportunity for reviewing the past history, the scientific results, and the future prospects of our laboratories. A time when, through circumstances which cause us much regret, we are deprived, at our evening meetings at least, of the presence of our Secretary, offers perhaps the only occasion when the task of such a review could fall to other hands than his. The fact that it has fallen to mine is attributable to the office in which your votes have placed me, rather than to any individual qualifications of my own. And it would have been impossible for me to undertake the task, had he not placed at my disposal his wide-spread information upon many branches of science, as well as his intimate knowledge of the history of the Institution, to the well-being of which his care and devotion have so largely contributed.

The first dawn of our history is to be sought among those stormy years with which the last century drew towards its close, and out of which many new thoughts and aspirations of men took their birth.

Its character, in accordance with the views of its early promoter, Count Rumford, was at first far more industrial than it eventually became. Its two great objects were "the general diffusion of the knowledge of all new and useful improvements, and teaching the application of scientific discoveries to the improvement of arts and manufactures, and to the increase of domestic comfort and convenience." The Institution was to contain models, or actual specimens of fire-places and kitchen utensils for cottages, farm-houses, and large dwellings; a complete laundry for a gentleman's family; grates and chimney pieces; brewers' boilers; distillers' coppers; ventilators; limekilns; steam-boilers; spinning wheels; agricultural implements; bridges, &c.; and at one time some eighteen or twenty young mechanics were actually boarded and lodged in the house. The records of our early proceedings give an instance, illustrating the views of the founders. In January, 1800, when the designs for the theatre, model-room, and workshops were formed, the architect proposed that the laboratory should occupy the position which it ultimately held. But, with a view to giving more room to the workshops, the proposal was set aside in the very next month, and the space in the basement under the theatre assigned to the purpose. Happily, however, before the building had reached the first floor, this position was found unsuitable; and further consideration devised the laboratory, which we have all known so well as that of Davy, of Faraday, and of Tyndall. A staircase leading to it from the front hall, although long since closed, was removed only in 1866, to make room for Prof. Tyndall's smoke chamber.

From Count Romford's final departure from England in 1802 we may date the decline of the industrial element, some echo of which still rings in our motto, "Illustrans commoda vitæ;" and early in the following year a definite proposal to give up that part of the original plan was made.

From a report to the managers in 1803, it appears that, although chemistry had always been a primary object of the Institution, yet from motives of economy nothing more had been done in the way of either laboratory or apparatus than was necessary for the immediate purpose of the lectures. It was consequently proposed that the workshop should be added to the laboratory and fitted with seats for 120 persons, and the forge adapted to chemical purposes. The report ends as follows:—"This laboratory will be equal, or indeed superior, to any in this country, and probably to any on the Continent."

The chemical laboratory was altered in accordance with that report, and remained unchanged until 1863, when, on the appointment of Dr. Frankland to the Professorship of Chemistry, the lecture seats were removed so as to adapt the room more properly to purposes of scientific research.

It is interesting to contrast the verdict of 1873 with that of 1803. "Originally built," to quote Dr. Bence Jones's own words, "as a workshop for blacksmiths, fitted with a forge, and furnished with bellows which only last

* A lecture delivered on Friday evening last by William Spottiswoode, LL.D. Treasurer R.S. and R.I.