

It therefore became necessary for me to patent this device independently of commercial considerations, and the Motomusic Company soon realised its advantages. But until the attitude of commercial firms towards scientific inventors has considerably changed I shall continue to avoid undertaking any investigation the results of which may be directly capable of commercial application. If this be impossible, I shall continue to follow my previous practice of rendering such inventions unpatentable by the method of publication; and I advise others to do the same. Of course, there is nothing to prevent Germans from exploiting inventions that have been published without previous protection (e.g. the "Thermos" flask). G. H. BRYAN.

The Aurora Borealis of November 5.

WITH reference to the description in NATURE of November 18 (p. 314) of the appearance of the aurora borealis in Yorkshire about 7 p.m. on the evening of November 5, I may mention that I saw it at the same time from the neighbourhood of Broadley Common, in the west of Essex, latitude $51^{\circ} 45' N$.

It formed a low, colourless luminous arch on the northern horizon, probably about 6° high and 30° in length. There were no streamers, and no movement was visible. J.

November 19.

As a supplement to the observations of Mr. Scriven Bolton on the aurora borealis of November 5, and his beautiful illustrative drawing (NATURE, November 18), may I be allowed to record the following observations. Mr. Scriven Bolton ceased observing at 7.40 p.m.; I began at 8 p.m., although the aurora had been noticed about 7 p.m. The aurora appeared in the form of a bright whitish-green glow, of the form depicted by Mr. Scriven Bolton, extending on the horizon from N. by E., to W. by N., with streamers occasionally rising from it. At 8.25 p.m. the general glow was affected with pulsations, and at 8.40 p.m. five comet-like streamers appeared in the N.W., and a brighter patch of luminosity N. by W. A single streamer appeared in the N. at 8.45 p.m., and at 8.50 p.m. a dark arch formed, separating an upper bright arch from the brightly glowing region beneath. This must not be confounded with the dark segment, so often seen in auroræ surmounted by a bright arch. This particular phenomenon I do not remember to have observed before in auroral displays.

At 8.55 p.m. the luminous arch rose rapidly, reaching to the Pointers of the Great Bear, and became very bright. It then, 8.58 to 9.0 p.m., divided in the middle, and broke up into luminous clouds, which appeared to drift, until a very bright patch was formed due W. The bright clouds had disappeared by 9.2 p.m., but five minutes later the summit of the arch formed again, though it was much fainter than before. It then increased in brilliancy, and disappeared at 9.9 p.m. At 9.12 p.m. a very bright streamer arose in the N.W. At 9.15 p.m. the sky became overcast with dark, filmy stratus clouds. The luminous patch in the W. was also observed earlier in the evening, at about 7.0 p.m. The stars seen through these bright clouds were certainly dimmed in lustre. Looking at the bright glow with a direct-vision prism, I could only see a mere ghost of light in the green.

The aurora was observed during a disturbance of greater intensity on the magnetic needles. A marked easterly movement in declination was synchronous with the formation of the dark arch, and with the rising and marked increase of luminosity of the bright arch. A. L. CORTIE.

Stonyhurst College Observatory, November 20.

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A Remarkable Solar Halo.

A SOMEWHAT remarkable halo was visible at Bristol for more than an hour during the morning of Thursday, November 11, between nine and half-past ten. At nine the sky was bright and almost cloudless; a couple of hours or so later it was completely overcast and much rain fell. The halo was white with a slight red coloration on the inside edge, and the whole circle was visible. The most striking feature at 9.30 was the clearness of the sky outside the ring, and its darkness inside. It looked just like a circular cloud of smoke bounded by a bright ring. When measured by my colleague, Mr. Broadbent, the diameter of the halo was found to be $44^{\circ} 10'$.

DAVID ROBERTSON.

Merchant Venturers' Technical College, Bristol,
November 17.

Rule for Determining Direction of Precessional Movement.

PROF. A. M. WORTHINGTON has kindly pointed out to me that my interpretation of Prof. Watanabe's rule (NATURE, October 21, 1915) gives the wrong direction of azimuthal turning for the gyroscope. In my statement, for upper part of the wheel read lower part of the wheel. A. GRAY.

The University, Glasgow.

SCIENTIFIC EXPOSITION AT ITS BEST.¹

(1) ALL who have enjoyed Sir Ray Lankester's popular essays published in the *Daily Telegraph* under the title "Science from an Easy Chair," will be glad to have a third instalment of them in permanent form; those to whom they are new are to be envied. The mood of the essays expresses the conviction that while science is for foresight and the practical mastery of things, it is also for our delight, "in this world of unending marvels and beauty." Far from echoing the old moan that increase of knowledge is increase of sorrow, the author declares that science "satisfies man's soul." To accept this generous appreciation it may be necessary, however, to include with "science" the attendant feelings and imaginings which are usually kept at a stern arm's length off.

What are the characteristics of these masterly essays, when we get beyond their obvious qualities of learning and lucidity, experience and insight? The first is that Sir Ray Lankester, like Huxley before him, is able to show us the interest and significance of common things. Thus there are illuminating chapters on the sand and pebbles and shells of the sea-shore, on a piece of amber, on sea-anemones and jelly-fish, shrimps and barnacles, on daddy-long-legs, on Christmas trees, and more besides. It is the function of art and poetry to idealise what we see and do every day; but science also has its share (for there are really no hard and fast compartmental rôles in life) in showing us the significance of the commonplace, and fine examples of lucid exposition of difficult,

¹ (1) "Diversions of a Naturalist." By Sir Ray Lankester. Pp. xv.+424 (London: Methuen and Co., Ltd.) Price 6s.

(2) "The Birth-Time of the World and Other Scientific Essays." By Prof. J. Joly. Pp. xv.+307. (London: T. Fisher Unwin, 1915.) Price 10s.6d. net.

(3) "Birds and Man." By W. H. Hudson. Pp. 306. (London: Duckworth and Co., 1915.) Price 6s. net.

though near-at-hand, subjects will be found in the essays on the blood and the lymph.

Another feature is the author's felicitous suggestion of movement. Nothing, not even a fossil, is finished and done with; there is question on the back of question; science is a developing system. So the essays give us problems to stretch our brains over, such as the production of orange-coloured flames under water by rubbing quartz-pebbles together; the moth's flight into the candle; the puzzles of animal courtship; the science of dancing; the missing link, *Eoanthropus dawsoni*, better known as the Piltdown skull; the difference between instinctive behaviour (regarded as due to automatically-working, inherited, "mechanisms of the mind"), intelligent behaviour (regarded as based on learning by individual experience), and the conscious behaviour of man and some higher animals where educability is illumined by self-recognition.

In the essays on palmistry, toads in stones, "dousing," maternal impressions, telegony, and the like, the reader will have the pleasure (or otherwise) of seeing how a "tough-minded" inquirer exposes the weak points of faked evidence. "The whole spirit of science, as contrasted with that of superstition and ignorance, is summed up in the Royal Society's motto, "Nullius in verba" (on no man's assertion!), and King Charles's command, "Don't chatter; make trial!"

Another of the characteristics of Sir Ray Lankester's popular essays is the emphasis laid on making the most of things. Science is for life, not life for science. The question is never far off: Cannot man make more of his kingdom? Thus we find essays on the importance of Nature-reserves, both at home and abroad, where wildness is allowed to flourish and shy creatures feel at home; on the promotion of scientific discovery by money—the plan being to watch for the quite unmistakable discoverer and commandeer him in the service of the State at a generous salary; on the supply of pure milk, and the most effective kind of diet—"not much, but many."

A few more personal chapters complete the charm of the volume, as when the author tells of dredging in Norwegian fjords, of finding a newly-born grey seal on the shore of Pentargon Cove in Cornwall, and of the flowers in the meadowland above Argentière. In regard to the bright colour of Alpine samples of flowers which are paler elsewhere, the author holds that there are genuine high-coloured races (rendered possible by the nutritive vigour of much-sunned plants) which have survived in the short summer of the high Alps since they attract the visits of the pollinating insects more surely than do the paler individuals. It is fitting indeed that our notice of this delightful book should happen to end at a high level!

(2) Prof. Joly's book consists of twelve essays, old and new, all of fascinating interest. They are full of original ideas, they show great expository skill, and they make considerable demands on the reader's intelligence, encouraging him, however, with a fine suggestion of the bracing air of Alpine

heights. (The book is illustrated with beautiful photographs of the Alps, to which the author owes some of his inspiration.) The first essay, on "The Birth-time of the World," infers from denudative effects and radioactive products the time that has elapsed (perhaps a hundred million years) since the ocean condensed upon the earth's surface. The second essay argues from the quantity of sodium in the sea to the activity of denudation throughout geological time, and it seems that rather more than a depth of two kilometres of parent rock must have been removed from off the entire land surface of the globe. The essay on "Mountain Genesis" seeks to show that the heat of radioactivity has been a factor in determining the surface features of the earth; and this is followed up by a discussion of Alpine structure. A very ingenious attempt is made to interpret the much-discussed details on the surface of Mars as physical surface features. "Mars presents his



FIG. 1.—The Great Aletsch Glacier. From "The Birth-Time of World."

history written upon his face in the scars of former encounters—like the shield of Sir Launcelot," and as to the theory of organismal intervention, the author very wisely remarks: "In seeking other minds than ours we seek for what is almost infinitely complex and co-ordinated in a material universe relatively simple and heterogeneous."

Another essay deals with "pleochroic haloes," microscopic darkened spheres in certain of the rock minerals, which turn out to be "a quite extraordinary record of radioactive energy," and afford very striking evidence of the unchanged stability of the common elements since the beginning of geological time. In another discourse the author takes a very hopeful view of the application of radioactivity in medicine, and has some important suggestions to make. A somewhat

technical essay deals with the latent image in photography, while skating is the subject of a very successful popular lecture at a high level. A selectionist interpretation is given of the brightly-coloured Alpine varieties of certain flowers, for pollinating insects are scarce and readily benumbed, and survival rewards variants in the direction of brighter blossoms. To this is appended a theory of the way in which "a unified course of economical expenditure" is impressed upon the organism, and gives to "the developmental progress of the individual its prophetic character." But the theory is stated very elliptically, and does not seem to us to be very clear.

In his concluding essay, which rather takes our breath away, Prof. Joly argues that the present gravitational properties of matter cannot be supposed to have acted for all past duration, and proceeds to speculate concerning the pre-material



FIG. 2.—The Ampezzo Thal. Dolomite Alps. From "The Birth-Time of the World."

state of the universe, when kinetic entities, not yet materialised, exhibited a dreary succession of unprogressive, fruitless motions.

It gave us a pleasant thrill to renew acquaintance after a quarter of a century with a remarkable essay entitled, "The Abundance of Life"—certainly one of the most instructive contributions that have been made to the contrast between animate and inanimate material systems. The contrast is stated in physical terms: "The transfer of energy into any inanimate material system is attended by effects retardative to the transfer and conducive to dissipation. The transfer of energy into any animate material system is attended by effects conducive to the transfer, and retardative of dissipation. The organism is a configuration of matter which absorbs energy acceleratively, without limit, when unconstrained." The attitude of the organism towards energy external to it

"results in its evasion of the retardative and dissipatory effects which prevail in lifeless dynamic systems of all kinds." But what is it in the organism that enables it to take the attitude thus so admirably defined?

(3) A re-publication of Mr. Hudson's "Birds and Man" is very welcome, for no such wise and beautiful book should be allowed to get out of print. He tells us of "birds at their best," that is, in their native haunts all-unsuspecting, and of the enrichment which their beauty brings to the open mind; of the reality of sympathy between living creatures, for instance, between wagtail and cow, robin and man; of the pleasingness of all natural sounds heard in their proper surroundings; of the secondary æsthetic element which the voices of some birds have, inasmuch as they approach the expressive tones of the human voice; and of the secret of the charm of flowers, which seems to us to exaggerate, almost *ad absurdum*, the associative factor in æsthetic emotion. His chapters on ravens, owls, and geese are charming and illuminating appreciations; his protests against the "cursed collector" and his patrons, and against stuffed birds as household decorations are still too dismally relevant—though we think that there has been a wholesome change in public opinion to which Mr. Hudson's insight and infectious enthusiasm have effectively contributed. We confess, too, that we have more hope for the conservation of the beautiful along this line than by the severe legislation which the author suggests. At the end the book brings us very picturesquely to Selborne and to an imaginary conversation with Gilbert White, which is high art and sound sense too. The frontispiece of this delightful book is a very fine coloured picture of the furze wren or Dartford warbler.

JOHN DALTON AS A SCIENCE LECTURER.¹

AS is well known, John Dalton began his academic career at the age of twelve, by a public announcement, affixed to the door of his father's cottage, that he was prepared to impart the elements of a liberal education to the youth of Eaglesfield, of both sexes, on reasonable terms. In actual attainment he was probably not greatly in advance of his scholars—some of whom were lads of sixteen or seventeen, who offered to fight their mentor when disciplinary duty was to be done. In moral power and mental vigour he was more than a match, we may be sure, for even the most pugnacious of his pupils. These qualities doubtless secured for him the ascendancy proper to his position as the principal.

During this short apprenticeship to the profession of a pedagogue, Dalton sowed the seeds of his future greatness. A couple of years' experience of self-taught teaching, when wholly dependent upon his own powers of self-reliance, acquisitiveness, and industry, must, at such a period

¹ "John Dalton's Lectures and Lecture Illustrations." Parts i. and ii. by Prof. W. W. Haldane Gee. Part iii., by Dr. Hubert F. Coward and Dr. Arthur Harden. (Manchester: Literary and Philosophical Society, 1915.) Price 1s. 6d.