

towards the end of the eighteenth century. The historical portion of the work shows the evolution of mechanical coal cutting in Great Britain since that date. Descriptions are given of every machine that has been put to practical use, as well as detailed particulars of those that are now in successful operation. The conclusions drawn by the author from his elaborate investigations are that the whole of the coal of Great Britain must be cut by machines, or the industry will find itself in much the same condition as the corn-growing industry, swamped by American production. The pillar and stall method of mining should be replaced by the long wall method, and coal-cutting machines would render blasting unnecessary. The most serious problem to be dealt with is that of cutting coal under a weak roof. The difficulties are perhaps hardly sufficiently emphasised by the author. In a tender coal the roof is crushed down on the machines, or supports have to be set near the faces. These get in the way of a machine. Moreover, machines are so noisy when at work that it is impossible to hear the preliminary warning sounds that the roof generally gives before it breaks down. Eventually, no doubt, it will be ascertained which machine can best be adapted to these conditions, or how the conditions can be modified to suit the machine that promises best.

The author's lucidly written and well illustrated volume cannot fail to prove of great value in directing the attention of mine owners to problems that, at the present time, are of the utmost importance.

Metallography: an Introduction to the Study of the Structure of Metals, chiefly by the Aid of the Microscope. By Arthur H. Hiorns. Pp. xiv + 158; with ninety-six illustrations. (London: Macmillan and Co., Ltd.; New York: The Macmillan Company, 1902.) Price 6s.

THE study of the properties and constitution of metals and alloys has made great progress during the last few years, and has reached a point when it can no longer be neglected by engineers. Steel workers have already received some guidance from the labours of metallographists, chiefly, perhaps, from investigations on what Osmond called the "pathology of metals," and the time may not be far distant when the microscope and the pyrometer will form part of the outfit required in the ordinary testing of materials. Metallography has been regularly taught for some time at many of the technical schools both in this country and in America, and it is remarkable that no text-book on the subject existed in the English language before the publication of the work under review. The researches on which Mr. Hiorns has based his book are scattered and highly specialised, and the acquirement of a general elementary knowledge of the subject has been a difficult matter for the student. The appearance of this book is, therefore, particularly well timed, and it will be eagerly read by many, who will not be disappointed by what they find.

The author has carefully collected most of the important results which have recently been obtained, and has given a terse and lucid summary of them which is surprisingly complete, considering the modest dimensions of the book. He has not devoted much effort to the philosophic aspect of the subject, but that is, perhaps, just as well, inasmuch as the science is in its infancy. With regard to the illustrations, exception may be taken to many of the photomicrographs, which appear to have been taken from a set of poor negatives. On the other hand, they have been beautifully reproduced on special paper. In the study of steel, the author has handicapped himself unnecessarily by using such low powers of magnification that some of the structures of which he speaks cannot be seen at all. Nevertheless, taking the book as a whole, Mr. Hiorns deserves the thanks of his fellow workers and teachers for the useful aid he has given them.

NO. 1713, VOL. 66]

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Notes on Young Gulls.

IN northern Bohemia there is a large pond or artificial lake—the Hirschberger Grossteich—with a small, rocky island. This is a favourite breeding-place of gulls. Most of these are *Larus ridibundus*, but some *Sterna hirundo* also breed on the rock. For the purpose of studying its plankton I have repeatedly visited this pond, and have thus had occasion also to make some observations on the gulls which may perhaps be of interest to readers of NATURE.

The rock island which forms the breeding-place is some 400 square metres in extent, and rises in ledges to a height of 15 metres. It is composed of the Cretaceous "Quadersandstein" of those parts, partly bare and partly covered with patches of tough, greenish-brown grass and brighter green thistles. The *Larus ridibundus* nests on this rock are pretty carefully built and entirely composed of dry leaves of bulrushes. There are generally three eggs in each nest. At the height of the breeding season there are about 200 such nests on the rock, besides the much less numerous *Sterna* nests. The nests usually lie on the bare rock close to the margin of a patch of vegetation. The dirty brownish-yellow and black-spotted, mimetic colouring of the down-covering of the young is very effective. When from two to ten days old these young crouch, on being disturbed, against the half-dry grass-tufts and thistles close to their nest, and are then by no means easy to detect. It seems to me that the colouring of these young gulls is not quite the same as that in young of the same species breeding in different environments. It is quite likely that we have here a case of adaptation of the colour of the young to different surroundings, unaccompanied by any difference in the colouring of the adult into which they develop. Older ones, which are already beginning to replace the down with feathers, but in which the head is still entirely covered by the primitive yellowish-brown and black down, do not, as a rule, try to hide themselves in this way, but hurl themselves into the water and swim away rapidly when the boat approaches the rock. The old birds scream loudly and try, first, to entice the intruder away in the usual manner by slowly swimming and flying about near the boat and pretending to be wounded and lame. Besides this, however, they also swoop down on the swimming young, sometimes pushing them right under the water. The first of these actions clearly tends to draw the attention of the intruder away from the young; the second has the very opposite effect. Perhaps it may be accounted for in this way. The young have—this can be observed clearly enough—no idea of the nature of the movements of a boat, and often try to escape it by swimming straight ahead in front of the bow. It gives the impression that the old birds try by their screams to convey instructions to the young about the direction in which they should swim so as better to escape the boat. The young, however, often appear not to understand or to heed these "words of advice," whereupon the old birds pounce down on them and give them one or two good slaps with their wings so as to make them understand and obey. These sharp lessons do not seem to be of much good, however. After being thus slapped, the young continue to swim straight ahead of the boat as stupidly as before.

One of the eggs I brought home and hatched artificially. The bird began to chirp in the egg a few days after I had placed it in the oven, upon which I cut away the blunt end of the eggshell and found, as was natural after hearing the bird give voice, the beak protruding into the air-chamber. On the fourth day after this the young gull left the egg-shell. It then weighed 22.7 gr. We weighed it daily for a fortnight. The average daily gain of weight during this time was 8.5 gr.

The daily increments were quite irregular, varying between 1.6 and 3.2 gr. the first four days, and between 5 and 27.5 gr. the latter ten days. These irregularities were, of course, due to differences in the quantity of the contents of the intestine. One day—not three, as has been stated by Prof. Thomson (NATURE, vol. lxiv. p. 588)—after birth the young bird swam about when placed in water just as well as a young duck. For

the first six or seven days it preferred to stand on its *heels*, and usually rose to its toes, that is, the normal position of the adult, only when walking.

The bird often ate indigestible things, little stones, &c., not, as it appeared to me, altogether accidentally, but chiefly and purposely, after it had made a good meal off some living food—*Tenebrio* larvæ, *Limnæus*, or the like. Smaller edible things like ants' chrysalids it picked off the ground itself very early, but larger morsels, bits of fish, mice, &c., it only takes when held in the hand and presented to it even now, when it is eight weeks old. The stones, &c., it occasionally eats, and the hair and larger bones it has swallowed it brings up and vomits in a mass. It lost the thorn of the beak on the fourth day and began to fly a little after four weeks; when seven weeks old it began to make longer excursions, and flew—without precept or example—very well. It has, however, not yet attained to anything like the elegant flight of full-grown gulls, and occasionally makes an involuntary somersault in the air when trying to soar or rest on the wind without flapping its wings.

R. V. LENDENFELD.

Prague.

The Effect of Light on Cyanin.

WHILE working on the reflective power of cyanin mirrors I have noticed some very interesting effects of light on that substance. Freshly fused cyanin is of a deep metallic bronze colour, but exposure to light turns it plum colour and finally a steely blue-black. In the moderate light of a cloudy day the change is perceptible in half an hour, in direct sunlight in less than a minute. The complete change to blue-black requires an exposure of about twenty hours to diffuse daylight or half an hour to direct sunlight. It has long been known that cyanin is unsuitable for use as a cloth dye on account of its rapid fading in sunlight, but recent investigators of the optical properties of this substance appear to have overlooked this light effect. That the effect is purely photographic and not due to any rise in temperature is shown by the fact that long-continued heating in the dark produces no trace of discoloration. On the contrary, the effect of heating is to reverse the effect produced by the light, for a thin coating of cyanin, exposed until blue-black throughout, returns nearly to its original bronze colour on fusion or long-continued heating in the dark. By an exposure of thirty hours I have obtained on cyanin easily recognisable photographs of small, well-illuminated objects. A cyanin mirror, or better yet a piece of ground glass washed over with fused cyanin, exposed for ten hours to the spectrum of a Nernst lamp shows the effect to be very strong in the yellow, just perceptible in the adjacent red and green, and imperceptible in the blue and ultra-violet. It appears to correspond with the absorptive index as determined by Pfleger in various parts of the spectrum. At the same time, the exposure to light greatly decreases the absorbing power where it was originally large, as may be easily seen on looking at a sodium flame or a spectrum through an exposed coating of cyanin. It is as though the absorption were due to molecular resonance and the light produced a fatigue or destruction of this resonating power.

A most noteworthy change in the refractive index accompanies this change in the absorptive index, and is shown by the alteration in the reflecting power. The reflecting power of fresh cyanin is roughly 20 per cent. in the yellow, 2 per cent. in the blue-green and 6.5 per cent. in the ultra-violet. After exposure to light the reflecting power is nearly constant, 6.5 per cent., from the red out to 250μ in the ultra-violet. Now in the blue-green the absorptive index is so small as not to affect the reflecting power sensibly, so that the refractive index varies from about 1.1 to 1.6. Evidently work on the optical constants of cyanin is of little value unless carried on without exposure of the cyanin to daylight. A decrease in the absorptive index from 0.75 to nearly zero is indicated by the decrease in the reflecting power in the middle of the yellow, where exposure to light does not greatly affect the refractive index. The general effect of exposure to light is, then, to remove the absorption band and to destroy the characteristic anomalous dispersion.

The cyanin used was furnished by Kahlbaum, in Berlin, and is the ordinary diamyl iodide, $C_{29}H_{53}N_2I$, easily soluble in alcohol and ether, but only very slightly soluble in water.

Göttingen, August.

P. G. NUTTING.

NO. 1713, VOL. 66]

Fog Bow at Oxford.

A SOMEWHAT curious phenomenon, presumably an effect caused by the searchlights at Spithead, was visible here in Oxford on the night of Saturday last.

About 11.15 p.m., the night being fine and warm and the sky somewhat overcast, my attention was arrested by the appearance of an arc of whitish light, about 15° above the south horizon, within which the sky appeared of an intense black. The arc rapidly increased in elevation until, in six or seven minutes' time, it had reached the zenith, forming an arch extending, apparently, to the horizon on the east and west; it then declined northwards, and in another four or five minutes had vanished.

In appearance it suggested a brilliant lunar fog bow, but the light was of a more bluish tint, the interior circumference being far brighter than the outer; the brilliancy did not diminish to any great extent until the bow attained its highest altitude, after which it rapidly became fainter. The distance from Spithead is rather more than seventy miles.

J. ROSE.

Rawlinson Road, Oxford, August 20.

Simple Means of Producing Diffraction Effects.

IN the interesting article on "Photography of Diffraction and Polarisation" published in the issue of *NATURE* for August 7, the writer describes various means of producing diffraction effects. It may possibly interest some readers of *NATURE* to know that beautiful fringes may be seen with even simpler apparatus than that described in the article referred to. All that is required is an ordinary folding foot-rule, preferably of ivory. To see diffraction bands by its means, it is only necessary to close the two halves of the rule until they are almost in contact and then to fold them over. On looking at the sun or other bright source of light through both slits, a series of brilliant diffraction bands will be seen.

WILFRED HALL.

Tynemouth, August 20.

Time-Signals by Wireless Telegraphy.

MAY I suggest that the wireless telegraph offers a means of enabling Greenwich or other astronomical time being sent to ships at sea for the correction of their chronometers and the finding of their longitude? Distinct signals have already been transmitted from England to America, and these are all that is necessary for communicating time. At certain hours of the day or night, for example 1 p.m., a series of wireless signals, perhaps ten or twenty, at intervals of one second, might be sent from Greenwich far and wide as an extension of the time-ball signal which now serves for ships in the Thames and the Downs. By international regulation these time-signals could be protected from other wireless signals. I need scarcely add that such time-signals would also be useful inland.

JOHN MUNRO.

Croydon, August 25.

THE BELFAST MEETING OF THE BRITISH ASSOCIATION.

SINCE the publication of our last article on the approaching meeting, the following additional arrangements have been made:—

The local executive committee (chairman, Sir Otto Jaffe) invites members, associates and holders of ladies' tickets to a garden party in Botanic Gardens Park, near Queen's College, on September 15, at 3 to 5.30 p.m.

In connection with this reception, the new fernery recently arranged by Mr. Charles McKim, curator of the Botanic Gardens, will be opened for the first time, and will be found well worth seeing by those interested in ferns and tropical plants.

On September 16, Lord O'Neill gives a garden party at Shane's Castle, picturesquely situated on the shore of Lough Neagh.

The Belfast Harbour Commissioners invite members, associates and holders of ladies' tickets to a reception in the Harbour Office on September 16, at 8 p.m.