drought are recorded, besides the preliminary drought years of 1557-1558. The fifth will, then, cover the equally well marked cycle of drought, which, beginning in or about the year 1860, has continued with scarcely an exception up to the present."

This was written in 1902, and it is noticeable that, as required by the cycle, the intervening years have proved of normal rainfall in northern China. Proceeding, I stated:—

"We have thus four well marked eras of 29.25 years, the beginnings of which in each case were marked by perfectly similar climatal phenomena, each being characterised as a period of drought in some special locality. It has always seemed to me that meteorologists have been in the habit of excessive generalisation, and that the true way to arrive at the secular variations of climate is to compare all observations made within a limited locality, where the conditions are more or less specialised. The mean rainfall of China, as I remarked at the beginning, would not have afforded the necessary data for such a comparison as I have attempted, the reason being that droughts in north and south China are in effect complementary, and never occur contemporaneously: and herein lies the key to the phenomena.

"According to the accepted theory of the 'monsoon,' it is produced by the excessive heating of the continent of Asia between the degrees of 35 and 45 N.L. which causes the rarefied air to flow off and leaves a partial vacuum to be filled in by moist warm air rushing across the equator. If from any cause the heat radiated from the sun be greater one year than another, the regions where the monsoons are elaborated are raised to a higher temperature, and the force of the monsoon increased, and the warm air carrying an extra supply of moisture is carried further north and spread over a wider area; hence the north of China, the usual limit of the monsoon, is superabundantly watered.

"If, however, the heating of the surface be insufficient to set up the normal circulation, the moisture from the tropics is dumped down in or about the latitude of the Yangtse basin, and mid-China receives a superabundant supply of rain, while the entire north is parched, and famine in one or more province is the result. Hence a wet summer in Shanghai is rarely or never accompanied by a sufficient rainfall in the north."

Similar conditions to a large extent prevail in India, and hence it has happened that the latter third of the last century was a period of drought and famine, which severely taxed the resources of the country. I wound up the note with the following remarks:—"It is not for me to suggest an explanation. But the 29.25 year will probably be found to depend on some hitherto unsuspected cosmical cause."

I do not pretend in this to take any credit to myself for any discovery. My part was confined to drawing up a column of centuries divided into three lines; in one was marked the year, in the second the dates when sun-spots had been observed, and in the third the years when droughts had been recorded in the northern provinces; in each of the latter a dark line was drawn across the column. The result was remarkable at the first glance, the dark lines congregating themselves thickly at the ends of the seventh, tenth, thirteenth, and sixteenth centuries, the rest being almost a blank. Personal experience showed me how the nineteenth century had followed the same rule. Mr. Clough's observations may therefore be looked upon as fully borne out by Chinese records; and it only remains to ascertain the cause of the phenomenon, which has certainly had a very considerable effect on the history of Asia.

I may point out the curious coincidence that the climatic cycle of about thirty-four years seems to agree with three sun-spot cycles, while the greater period of 29.25 would seem to correspond with twenty-seven.

Shanghai, January 8.

THOS. W. KINGSMILL.

The Origin of Bronze.

In connection with Prof. W. Gowland's remarks on the origin of bronze in his presidential address to the Anthropological Institute, abstracted in your issue of February 15 (p. 381), it may be of interest to direct attention to the fact that Plutarch, in his "De defectu oraculorum," refers to worked-out copper deposits in the island of Eubœa, from which were formerly manufactured swords

which were "cold-forged" (*ψυχρήλατος*), and in this connection he quotes Æschylus, who mentions a "self-sharpened (*αὐτόθηκτος*) Eubœan sword," self-sharpened meaning, I presume, sharpened without fire. I believe that bronze containing only a small proportion of tin is malleable in the cold, but do not know if this would be the case with that referred to by Prof. Gowland as containing antimony. It would be interesting to know if tin is associated with copper in Eubœa. Swords of pure copper would hardly be of much use.

JOHN W. EVANS.

Imperial Institute, February 23.

Result of War affected by Soldier's Stature.

MR. TWIGG at p. 340 of your issue of February 8 points out that the Japanese had an unquestionable advantage in the recent war, as being smaller than the Russians—they were smaller targets for fire-arms. This is quite correct, but the advantage is inversely as the cubes of their heights, and not as the squares only, which would only apply to plank dummies. Bullets come from all sides, and not from the front only, so that the thickness of the men's bodies must be taken into account as well as their height and breadth. The average targets offered by each to the enemy are (taking Mr. Twigg's figures) as the cubes of 1585 and 1642, or as 106 to 118, an advantage in favour of the Japanese of about 12 per cent., or nearly double that calculated by Mr. Twigg.

W. E. WARRAND.

Westhorpe Hall, Notts, February 24.

TWO BOOKS ON BIRDS.¹

TO watch the ways and habits of birds is a taste which is growing rapidly. Some watchers of birds, indeed, are not content to stop at observing their habits; they want to know how the birds acquired those habits and of what use they are to them. They speculate upon what a certain habit, if persisted in, may ultimately lead to. They wish to know, among other things, how a bird came by its colours, and what purpose in the bird's economy is served by, for instance, the red inside to its mouth, seen only when it gapes. And when careful, minute, and scrupulously accurate observers write down on the spot what they see, or think they see, natural history will always be the richer for their labours; and the theories and speculations which these inquirers weave from what they have seen and heard cannot fail to prove interesting and suggestive reading.

Mr. Selous, at once the pioneer and the great exponent of this "close observation," who in a former work on bird watching touched upon the birds of the Shetlands, returned to his loved islands two years later, and now gives us a whole volume devoted to their birds and seals. In some three dozen short chapters he discourses, with digressions, delightfully upon his experiences. With the exception of a few "peckings," and minor interpolations—mostly having to do with the working out of ideas jotted down in the rough—the chapters contain his journal, written from day to day amidst the birds with whom he lived without another companion on one or other of these remote islands, "hated by thousands" of birds, and feeling himself the most unpopular person on the island. Nothing more need be said to recommend the book to the notice of those who follow birds in the field. For his digressions, leading him sometimes wide of the subject of birds, the author does not apologise.

¹ "The Bird Watcher in the Shetlands. With some Notes on Seals—and Digressions." By Edmund Selous. Pp. xii+338; with 10 illustrations by J. Smit. (London: I. M. Dent and Co., 1905.) Price 10s. 6d. net.

"Nature-Tones and Undertones." Being Sketches of Life in the Open. Illustrated by Photographs from Nature. By J. Macclair Boraston. Pp. 223. (London and Manchester: Sherratt and Hughes, 1905.) Price 6s. net.

He rather hopes that this batch of them will make it apparent that they are a part of his method, or, rather, a part of himself; and since they occupy so much space in the book it seems only right that they should appear on his title-page. Possibly the reader is not meant to take them all too seriously, for Mr. Selous warns us that he has not suppressed his errors even when he happened to know them, because, among other reasons, "if one has got in some idea or reflection that pleases one, or a piece of descriptive writing that does not seem amiss, how tiresome to have to scratch it out, merely because it is founded on a wrong apprehension!—the spire to come tumbling just for the want of a base!"

The author rather seems to deprecate being included in the ranks of the ornithologists, his ambition being to make a naturalist who shall use neither a gun nor a cabinet. That is all very well; but to decline to avail oneself of the work done by others is sometimes to miss the clue which would explain some puzzle. If

herring-gull." The chapters on seals are very interesting, for few people have the chance of watching these animals. A good index is a great advantage to the reader, not always found in books of this kind.

A considerable part of Mr. Boraston's new work is occupied by an account of a remote and little known corner of Anglesey, and it is saying a good deal to say that this is perhaps the pleasantest and most interesting part of the book. How he journeyed there—and back—and what birds and other things he saw is told in the attractive and distinctly original style so much commended in the notices of his former work. Of more highly scientific interest, perhaps, is the series of careful notes which the author made upon a young cuckoo. These include several important observations which must not be detailed here; but we cannot refrain from quoting the author's concluding reflections on the strangely ferocious fledgling he watched so patiently. "And knowing it for a solitary and a wanderer beyond any of its kind, smuggled

FIG. 1.—Oyster-Catchers. From "Nature-Tones and Undertones."

he had handled cabinet specimens, or if he did not "hate the British bird book" so heartily, he might have known why the white lines on the diver's neck shone in such a peculiar way in the sunlight (p. 60), and perhaps would have experienced increased enjoyment in consequence. A theory anent the old puzzle of the puffin and the bunch of fish it brings home in its ornate beak, and some instructive observations on young fulmars, are only a crumb or two out of the good things which we mark in reading many charming pages. One of the illustrations shows birds following the ways of "Nature, red in tooth and claw"; and this (together with that of a herring-gull dealing with a downy puffin) we dedicate to the conversion of those who favour the protection of the larger gulls. We dare not begin to quote for fear of never ending, and must confine ourselves to this one sentence in explanation of the plate: "I saw another kittiwake being savagely murdered by another

into life in an alien nest, tended in blind devotion by creatures it requites as blindly by destroying their own offspring; fashioned like a hawk to be hunted by every chit that flies; never to mate, never to nest, never to rear or lead its young; remembering this, I could have wished that this Unnatural Selection had not been, or that this strange mockery of life might be undone." In this chapter, too, we have an interesting inquiry into the theory of the assimilation of the cuckoo's eggs to those of the foster-species, with an analysis of collections of more than seventy nests of various birds containing cuckoos' eggs and the eggs of the foster-parents. The author writes, "The variation exhibited in the collections I have seen was considerable, but I could in most cases have improved the assimilation by transferring the eggs from one nest to another. Unless more convincing evidence were brought forward than such as was furnished by the seventy-six nests mentioned above, I should con-

clude that cases of resemblance between cuckoos' eggs and those of the species in whose nests they are deposited, are due to coincidence rendered possible by a large degree of variation in the former." Although digressions are not announced on the title, the latter is wide enough to cover many things, and many odd bits of out-of-the-way knowledge are woven into this book, which is mainly concerned with birds. A rather bitter attack on game preservers and sportsmen (with a slap at the army dropped in) is sandwiched between some most charming studies of wild life and natural scenery, written in clear and powerful and often quaint and humorous style. When has the barn owl been more aptly described than in this passage? "Never a sound from wing or throat as it flaps or skims in the half-light, watching the ground with its cat's eyes as it goes, until suddenly the silence is startled by a single, rasping yell such as might make the hair stand on the back of every mouse for a

STUDIES OF CLOUDS.¹

MR. CLAYDEN'S work will be a standard one for all students of clouds. When the now international classification was first proposed by the late Ralph Abercromby and the present writer, our purpose was to devise a classification for common use at all meteorological stations and in all the navies of the world. It is evident that such a classification must be simple and practicable. A great number of forms must lead to constant errors when used by ordinary observers. Therefore we only proposed the ten types given now in the international cloud atlas.

We were well aware, however, and expressed the view in plain words, that these ten forms are not sufficient for special studies of the transformation of clouds or of the relations between cloud form and weather. For these cases each of the ten great types must be divided into several subspecies, to which proper names must be given.

FIG. 1.—Cirro-nebula changing to cirro-cumulus. From "Cloud Studies."

quarter of a mile around. The Arch-mouser is on the trail, and such a master of his craft that he appears at times to toot his horn in contempt of his quarry. Or, is this sudden shriek used to start any mouse that may be lurking below, so that when moving it may be more readily discerned?" Mr. Boraston, too, sometimes wants to know why. The eighteen photographs which illustrate this nicely got up volume are almost beyond praise. We have selected this one for reproduction, not because it is by any means the most beautiful, but because of the cleverness with which the whole of this rock, with its seaweed and its oyster-catchers, has been focused; it will appeal strongly to those who love our west coast and its birds. The whole book will be welcomed and treasured up by the great fraternity of British birdmen.

O. V. APLIN.

Various attempts have been made to extend the scheme in this way. Abbé Maze in France, Prof. Köppen in Germany, the Rev. F. L. Odenbach in America, and, above all, the Rev. Clement Ley in England, have proposed and defined more detailed classifications; and Mr. Clayden has now in his cloud studies taken a great step forward in this direction.

The descriptions and the illustrations reproduced from photographs are excellent, and everyone who is accustomed to observe the ever-changing panorama of skies will admire the large amount of exact observations given in this book. The book contains reproductions of many typical cloud-forms and certain intermediate forms showing the transformation of one cloud-form into another.

¹ "Cloud Studies." By Arthur W. Clayden, M.A. Pp. xiii+184; 61 plates. (London: John Murray, 1905.) Price 12s. net.