of Mount Cassius, and separates it from the first of the valleys of that chain, the Wadi Kondîl; and from the Mediterranean on the west to the Nusairy Mountains on the east. A little to the north of Lattakia the plain juts out into the sea, in the Ras Ibn Hani. The portion of the plain north of Lattakia is low, flat, and separated from that lying east and south-east of the town by a low ridge which divides it from the valley of the Nahr-el-Kebîr. The eastern and south-eastern portion of the plain is traversed by three streams, flowing south-south-west from the Nusairy Mountains, and emptying into the Mediterranean east of the meridian of Lattakia. The first of these is the Nahr-el-Kebîr, the second the Nahr-el-Snowbar, and the third the Nahr-el-Beidha. The surface line of the plain rises gradually from the western limiting ridge of the Nahr-el-Kebîr to the base of the mountains, about five hours (by camel) east of Lattakia. The plain, however, in this portion is so channelled by the deep valleys of the above-mentioned streams and their affluents that it can only be called a plain with reference to an ideal surface tangent to the tops of its hills, or rather ridges, which occupy but a small portion of the total area. The height of the ridges near the centre of the table-land is about 350 feet, and increases gradually, with each successive ridge, until the foot of the mountain is reached. The flanks of these ridges are steep, often at an angle of 45°, and the bottoms of the main streams on the parallel of Lattakia are about 100 feet above the sea.

The soil of this table-land is a tenacious clayey loam, the product of alluvial deposit from the streams which now flow through its valleys. The deposits of marine shells are found at various points in the valleys of all three of the streams flowing through this plain. In my recent visit to some of these localities with Dr. Dodds of Lattakia, my aim was rather to survey the general character of the sites and the nature of the deposits than to make an exhaustive collection of the species, which would require much time and labour.

The nearest locality is in the basin of the Nahr-el-Kebîr, about an hour and a half north-east of Lattakia. Dr. Dodds has visited it, and found it less productive than that which we chose for our search. Our route lay nearly due east from Lattakia to a village called el-Qutrûjeh, three hours away from the town. At a distance of about an hour and a half from Lattakia we came upon a detached mass of conglomerate, the clay of which was barely solidified, containing many of the species of shells and corals which we afterwards found loose in the soil. The mass was about two feet long by a foot broad and six inches thick. It was the only one we found, and the only one found by Dr. Dodds in all his journeys through this plain. Near it were many detached shells, but of two or three species only. The most productive locality is the sides of the ridges east of el-Qutrûjeh. What seems most curious is that the shells are almost all found between the levels of 150 and 250 feet (measured by the aneroid). We found few above 250 feet, and those below that level were manifestly carried down by water.

The shells are found loose on the surface of the soil, or projecting from the steep slope of the hillside, associated with recent snail-shells. In a subsequent article I hope to give the names of the species found.

So far as I know, no similar deposit has been found in the alluvium of Syria. In a recent journey through Northern Syria we searched in vain for any traces of marine shells in the western portion of the Lattakia Plain and the valley of the Orontes. I have never seen them in the plains of Akkar, or Esdraelon, or Sharon. GEORGE E. POST

Syrian Protestant College, Beirût, Syria

A Carnivorous Wasp

A FEW days ago a wasp, which had created some mild excitement by sailing over our luncheon-table, was observed to seize a fly which was on the back of an arm-chair. It settled on the fly, and when I came to look at the butchery—for I cannot call it a fight—the poor fly was minus its head, and I was in time to see one of its wings fluttering down to the ground. The wasp was stretching over its victim and holding him as a spider might do, and on my approach he spread his wings and carried off the body to the other end of the room, presumably to eat it. Both the wasp and the hou·efly seemed to be of the common sort which have given so much trouble to the Queen's lieges in this hot weather. I never heard before of a wasp that imitated the habits of a spider. Could you tell me if this is an ordinary thing, or whether it was merely an individual eccentricity of this wasp? F. N.

August 16

Intelligence of a Frog

LAST night I rescued a frog from the claws of a cat, and, to my great surprise, it turned, and, after gazing at me for a few seconds, jumped slightly towards me, halting after each leap and looking up into my face. It thus gradually approached, and in about two or three minutes had actually climbed upon one of my feet. Its mute appeal for protection was most remarkable, and could not possibly be misunderstood. R. R.

Lawton, August 15

Meteor

LAST night, about 10.20 p.m., I happened to see a meteor worth recording. It moved horizontally, from south to north, across the middle of the western sky) about half way down from the zenith. The sky was cloudless: had that sky not been flooded by the light of a moon that was scarce on the wane, and that extinguished all but very few stars, the meteor would, no doubt, have been a brilliant phenomenon; under the circumstances its splendour was much dimmed. Its course was indicated by a series of small sparkling spangles, which flashed forth beautifully amid the gold-gray glow; the intermission of its lustre is a noteworthy fact. J. HOSKYNS-ABRAHALL

Combe Vicarage, near Woodstock, August 8

Podalirius minutus

IN Prof. Mayer's recent work on the Caprellidæ ("Fauna u. Flora des Golfes Neapal") there is a species figured and described as *Podalirius minutus*, in which the anterior of the three posterior pairs of thoracic appendages are very minute, contain only two joints, and are attached about midway between the two ends of the segment which bears them. With this marked exception this species agrees very closely on all points with *Caprella lobata* and *C. linearis*. My object in drawing attention to it is to ascertain if it has been recorded as a member of the British fauna. H. C. CHADWICK

SCALES

SCALES, as used by the architect and surveyor, may be roughly divided into two classes. In the first we have scales of equal parts, in the second scales of unequal parts, by means of which results may be obtained which otherwise would require more or less calculation. The fundamental idea of a scale of equal parts is that any assigned magnitude may be represented by a line of determinate length, and that thus any relation between magnitudes of the same kind may be indicated by a relation between lines in the same ratio. The simplest form in which they can be used is to represent in an enlarged or diminished size the magnitude of a length, as when, for instance, a mile is represented by an inch. By altering in two rectangular directions the magnitude of an area, we obtain a plan of it in which the scales used may be different for the two directions, as when the cross-section of a stretch of country has one scale for horizontal distances, and a different scale for vertical heights.

By introducing the system of coordinates, and representing, according to selected scales, the magnitudes of two or three related and dependent quantities, by lengths measured in two or three perpendicular directions, we are able to represent by geometry the connection between those quantities. This is done in innumerable cases in which the *plotting* of a quantity is effected and is the basis of the methods employed for obtaining continuous records of charging magnitudes. The important subject of graphical arithmetic and statics, curves of velocity, indicator diagrams, curves of bending moment, &c., as

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well as working drawings for machinery and plans for building, all depend for their usefulness on the representation of magnitudes by lines of proportional length. In the widest application of plain scales we may say that the relations between material things are represented by relations between magnitudes in space, and they have in this way been of the utmost service in scientific discovery, presenting to the eye the general nature of the relation between two associated quantities, and suggesting to the mind the probable law of their connection in cases when the law is unknown.

A convenient form in which to use ordinary scales is to have a foot-rule divided into inches, and into the half, quarter, and eighth of an inch, like plotting scales, and then subdivided on the one side decimally and on the other side duodecimally, the edges of the rule being bevelled off so as to enable distances to be immediately pricked off from the scale on to the drawing. Frequently scales are required different from those which are usually made, and it is then necessary to make a scale of the required size on the drawing. This is also required when measurement has to be made on the drawing itself. The scale must then be put on the paper at the same time that the drawing is made, so that if the paper should alter its dimensions, the scale will alter in the same proportion. A valuable adjunct to a scale of this kind is a vernier scale, which enables us to take off small distances with far more accuracy than the ordinary diagonal scales.

Of the scales in the construction of which numbers found by calculation are used, the commonest are those found on the ordinary sector, which contains a scale of chords by means of which an angle may be more accurately set out than by the ordinary plain scale protractor. By it we are enabled also to set off lines proportional to the trigonometrical functions, to solve all questions in proportion, to reduce or enlarge drawings in a required ratio, to describe a polygon of a given number of sides, and to perform calculations by means of the logarithmic line. This last is a line numbered from 1 to 100, the distance from 1 to any number being made proportional to the logarithm of that number. Thus, since the logarithm of 10 is 1 and of 100 is 2, the scale consists of two parts, the part from 10 to 100 being a repetition of that from 1 to 10, since the logarithm of a number between 10 and 100, say 40, is equal to the logarithm of 10 added to the logarithm of the same number divided by 10, such as 4. Thus by the compasses alone we are able to perform, with a certain degree of accuracy, the operations of multiplication, division, finding a third or fourth proportional, and evolution and involution. For instance, to multiply 35 by 27 we should first multiply 3·5 by 27, or of 35 by 2·7, in order that the product might be less than 100, and afterwards multiply the result by 10. Taking in the compasses the distance on the scale from 1 to 3·5 we should set that interval beyond the 27 on the scale. We should then find the leg of the compass furthest from the beginning of the scale pointing to 94·5, so that the product required would be 945. A similar process obviously enables us to perform division. There is, however, some inconvenience in using the compasses, and this may be avoided by the use of the slide-rule. This rule consists of two parts, one fixed, which we shall call A, the other sliding, which we shall call B; on each of these parts a logarithmic line of numbers is placed. Hence by the sliding of the rule we can perform the same operations which would otherwise require the use of compasses. For instance, to divide x by y, place the number on B denoting y against the number on A denoting x, then the number on A which is opposite to the beginning of B will give the quotient required. Similarly the square root of a number may be extracted by so sliding B that the number on A opposite to 1 on B may be the same as the number on B which is opposite the number on A, the square root of which is required. The rule may be arranged in other ways so as to give at once the squares of numbers, the lengths of the spaces being made proportional to the logarithms of the squares of the numbers indicated. This is used, for instance, in finding the content of timber.

A slide-rule which has lately been devised by Major General Hannyngton, whilst remaining very compact in size, is capable of much greater accuracy. Here instead of one very long rule, the rule is divided into a number of parts which are placed under each other, each part being a continuation of the part above it; the slide also consists of a number of parts arranged under each other, consisting of a set of bars with spaces between, which are united at the extremities by cross pieces. The bars on the slide fit into grooves in the fixed part or stock, and are so arranged that the numbers on the stock and on the slide both begin together, although the former is longer than the latter, in order that in every position the slide may have a part of the stock opposite to it. The use of this "extended slide-rule" is the same as that of the ordinary rule, but in the case of the largest which is made, it is as exact as a rule ten feet long, whilst it is compactly arranged, so as to be only one foot long. By this rule all the operations performed by the ordinary slide-rule may be effected, but with much greater accuracy. On account of this it would seem as if this rule ought to become very popular when its merits become known.

The graduating of a scale so that the distances from the end of it may be proportional to the logarithms of the numbers which are marked on it, which is the principle of the slide-rule, is evidently capable of a greatly extended application, and different scales may be devised intended for different purposes. Thus a set of three scales has been devised by Mr. Lala Ganga Ram, intended for the use of engineers, architects, and builders. The first of these is intended to show at a glance the scantlings of timber in beams and joists, and to obtain the stresses in trusses. The principle employed is correct, and the results obtained are very approximate. The depth and breadth of a beam sufficient either for strength or stiffness, can be found by the same rule. It has on the reverse side a scale, by means of which the stresses in the principal rafter and the beam of a king post truss may be found, and then the same quantities may be determined for trusses of different form by multiplying by a certain coefficient marked on the edge of the scale. This gives without any difficulty the maximum stresses coming on the principal rafter and tie-beam, and is all that is usually required, since the scantlings or minor components of a truss are generally determined from practical rather than from theoretical considerations. The second scale is designed to give the thickness of retaining walls. By means of information contained on the back of it the thickness may be found for various forms of wall and kinds of loading. Here again the method of using the scales could not be simpler, and the results are such as agree with calculation. The third of the set enables us to find the stresses (or, as they are called by the inventor, in accordance with ancient custom, strains) on girders. When we state that this scale enables us to ascertain the stress on the flanges at any point of a beam up to 200 feet span, and also the shearing stress at any point of beams with different systems of bracing under both uniform and travelling loads, and that this is effected by merely sliding the scale, it is evident that we have here a means of obtaining at sight results which would otherwise require a considerable amount of calculation. The results are such as, for all practical purposes, seem to be abundantly accurate.

The principle of the slide-rule is thus one which is susceptible of almost indefinite application. It may be used in all cases when the results we wish to attain depend on calculations for which logarithms are ordinarily used

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—in just those cases, in fact, in which calculation is laborious. It has the defect of logarithmic calculation in a very exaggerated degree, inasmuch as it is not accurate, but in very many cases this is of no great importance, since the degree of accuracy attainable is abundantly sufficient for all practical requirements. Scales possess one great advantage over methods of calculation, in that it is not possible to make the mistakes which so easily enter into arithmetical calculations. If they be accurately constructed, the modes of using them are so simple that there is scarcely a possibility of making a mistake, and we can predict beforehand the degree of accuracy which may be relied on. For engineering and other simple calculations we believe that these scales, and others like them, will be more and more used as they become more widely known.

THE FISHERY BOARD FOR SCOTLAND

THE second Annual Report of the Fishery Board for Scotland has just been issued, and contains much of scientific as well as economic interest.

The first Royal Commission on British Fisheries was founded in 1630. Immediately after the Union the fishing industry almost ceased to exist, owing apparently to the enactment of salt duties. In 1727 an Act was passed, by which the Board of Trustees for Manufactures and Fisheries was created, which, besides encouraging and superintending the fisheries, was empowered to pay certain "bounties" to the herring "busses," and offer premiums to the fishermen who first discovered herrings during each season at the different parts of the coast. In 1808 "An Act for the further encouragement and better regulation of the British White Herring Fishery" was passed. The Commission appointed to carry it into effect had charge of the whole fisheries of the British coasts, and later of the Isle of Man, and, in addition to granting bounties, had 3000*l.* placed at their disposal for encouraging the fishermen to use larger boats, so that they might go further out to sea. The Commissioners stationed officers at the chief coast fishing centres both in England and Scotland, and later two officers to the port of London, from whence large consignments of herring were sent abroad. The Admiralty provided a ship of war to assist in the work of superintending, and in 1815 a cutter was obtained for use in the Firth of Forth, and afterwards at other parts of the coast. Whatever influence the Commissioners had in improving the supply of fish and in developing the fisheries cannot now be estimated, but there can be no doubt that they rendered immense service in collecting statistics, which were till recently the only reliable fishery statistics extant, and of sufficient value to have justified the existence of the Board of Fisheries, even though all other work done were left out of consideration. From the statistics so collected, a valuable chart (Appendix A, Table VIII.) has been prepared by Mr. Robertson, one of the clerks of the Board, which shows at once the take of herring from 1809 to 1882; while Appendix C gives fresh statistics of the quantities and values of white fish and shell-fish. In 1820 the officers were instructed to take the cod and ling fishery under their charge; in 1821 the bounty for encouraging deep-sea fishing was withdrawn; in 1830 all bounties were repealed, and part of the money set aside for the erection of piers and harbours. In 1839 the Secretary of the Board of Manufactures was appointed Secretary of the Fishery Commissioners, and soon after this the Commissioners began to direct their attention to some of the hitherto neglected problems connected with the fisheries. In 1836 the question arose whether or not sprats were young herring, which Dr. Knox, who was appealed to, decided in the negative. This question having led the Commissioners to take an interest in the young herring, and to see the necessity of gaining some definite information as to the growth, food, and habits of the fish, Mr. Henry Goodsir carried on investigations in the Firth of Forth during 1843-44, from which it was ascertained that the food of the herring consists chiefly of young Crustacea. From the Report of 1846 it is evident that the Commissioners were acquainted with the fact that the herring ova sink and adhere to whatever they come in contact with. In 1850 the English stations were discontinued, and in 1856 another step in the right direction was taken, at the request of Dr. Buys Ballot, who invited those engaged in the great herring fishery to make observations in order to ascertain the circumstances likely to lead to the most profitable fishing and to enable them to make a herring chart. According to instructions issued by the Board of Trade, samples of herring collected on various parts of the coast of Scotland were forwarded to it, but no record is made of their examination. In 1860 complaints of the effects of trawling for white fish in the spawning grounds having led to another inquiry, Prof. Allmann decided that there was no evidence to show that trawling was likely to do injury to the spawning ground. No continuous investigations were, however, carried on by the Board, a new complaint being merely followed by a new inquiry or new Commission. Had the Board been provided with funds necessary to carry on continuous investigations as to growth, food, and habits of the herring and other useful fishes, much valuable information might have been obtained and great expense of Commissions of Inquiry avoided. It is therefore a matter of surprise and regret that, notwithstanding the example of other States, the influence of the Fisheries Exhibitions, and the demand for more information, the Treasury has not yet provided the new Board with sufficient funds. Another agitation arose in 1860, which led to the appointment of Prof. Allmann and Dr. Lyon Playfair, C.B., to inquire into the effects of trawling at the Fluke Hole, Pittenweem, and about the same time Dr. Playfair and Vice-Admiral Henry Dundas were requested to inquire into the claims of the sprat fishermen of the Firth of Forth. The agitation continuing, a Royal Commission, consisting of Dr. Lyon Playfair, C.B., Prof. Huxley, F.R.S., and Lieut.-Col. Francis Maxwell, was appointed in 1862 to inquire as to "the operation of the Acts relating to trawling for Herring on the Coasts of Scotland." The Report of this Commission is especially interesting, because it contains the results of the inquiries made by Prof. Allmann during the winter and spring of 1862 as to the nature of herring ova. The investigations made by him proved that the spawn of the herring "was deposited on the surface of stones, shingle, and gravel, on old shells and coarse sea-sand, and even on the shells of small living crabs and other Crustacea," and that it "adhered tenaciously to whatever matter it happened to be deposited on." The Report also contained a valuable chapter on the natural history of the herring, in which it is pointed out for the first time that there are two principal spawning periods, an autumn period with August and September as the two principal months, and a spring period with February and March as the principal months.

In 1873 the Scottish Meteorological Society began a series of inquiries with a view of determining how far the temperature of the sea and other meteorological conditions affect the migration of the herrings. From information obtained it was concluded (1) that the catch of herrings is less during any season with a high temperature than during a corresponding season with a low temperature; (2) that if the catch of herrings is higher in one district than in the other, the catch is greatest in the district with the lowest temperature; (3) that when the surface temperature is higher than the temperature lower down, the herrings seek the deeper water. It will be seen from the foregoing statement that the officers of the old Board were not utilised for making investigations. Important facts were however established as to (1) the

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