this time!), an irresistible group of nestlings of the Canada jay, and a trio of manatees depicting three leading attitudes, make up a selection which is altogether admirable, and if for only these the book deserves support. On the contrary, however, illustrations such as those which do duty for a transverse section of a Hydra, for a tactile papilla and that of the calf's tongue, are beneath criticism; and doubtful to a degree are the incorporation in such a book as this, as all-typical, of such forms as Gonium, Calcolynthus, and Prophysema, about the latter two of which the less that is put before the elementary student the better. Old friends are with us, as, for example, the puss moth larva, with its "intensely exaggerated caricature of a vertebrate face." Anthropomorphic truly; but is this science?

We assume the authors would have the beginner read this book while prosecuting a more detailed study of individual forms, as with the now universal type-system. Its appearance within a year of Davenport's "Introduction to Zoology," a book of somewhat kindred aims, betokens a desire on the part of those responsible for the elementary scientific education of young America for a liberalising and humanising influence. The experiment is an interesting one, and it in some respects meets the ever-recurring question of the teacher, "What best can I give the student to read?" The lines on which the book is written appear to us risky in their great breadth and cursoriness; but while we await the result of experience before pronouncing further upon the book we admit that salient truths are expressed in a refreshingly familiar way, and that it is pleasant reading. The authors have fallen into the common error of according uneven recognition to authority, as, for example, in attributing the well-known series of drawings of Amœba to Schulze on p. 8, but not on p. 53, where at least a cross reference should have been inserted.

OUR BOOK SHELF.

Gustav Theodor Fechner. By W. Wundt. Pp. 92 (Leipzig: Engelmann, 1901.) Price 2*s.* net.

G. T. FECHNER, at once a distinguished and industrious devotee of exact research, and a poetic and religious enthusiast, is a most attractive figure in the history of German thought in the nineteenth century; and in the lecture delivered by Prof. Wundt before the Royal Society of Saxony in commemoration of the hundredth anniversary of his birth (April 19), the general reader will find a readable account of him which is composed with the double authority of a personal friend and colleague and of a successor.

The chief interest of the lecture itself lies in the proof that Fechner was first led to the psychophysical work by which he will be best remembered from a desire to find experimental confirmation for his poetico-philosophical theory of the universal animation and intelligence of physical nature.

Many readers will perhaps turn with most interest to the section of the appendix which contains the author's personal reminiscences of his famous predecessor. It is curious to learn from Prof. Wundt that Fechner's interest in the experimental psychology of which he was the originator was entirely confined to the problem of the so-called "logarithmic law" of psychophysical action, and that he could not be brought to read exact researches into other psychological questions. A. E. T.

LETTERS TO THE EDITOR.

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Two Problems of Geometry.

IN your issue of August 22, Mr. A. B. Basset asks for solutions of the two problems, the trisection of an angle by means of the cissoid, and the duplication of the cube by the conchoid. I happened to come across a solution of the latter in an old book, Leslie's "Geometrical Analysis" (1821), where the problem is solved also in several other ways—by means of the cissoid, two parabolas, a rectangular hyperbola and circle, and the logarithmic curve. The problem of the trisection of an angle is also solved in several ways—by means of the conchoid (two ways), an hyperbola ($e = 2$) and intersecting circle, a rectangular hyperbola and circle, the quadratrix, the companion to the cycloid, and the Archimedean spiral, but *not* by the cissoid.

The problem of the duplication of the cube is solved in the following way by the conchoid.

Let AB, AC be the two given lines placed at right angles. Complete the rectangle AD and circumscribe a circle about it. Then if through C a line ECG be drawn cutting BD, BA produced in E and G and the circle again in H, and making EC = HG, it is known that AG and DE are the two mean proportionals between AC and AB. (Philo's construction.) Bisect BD at F, and on AB describe an isosceles triangle having BK = AK = BF. Join KG.

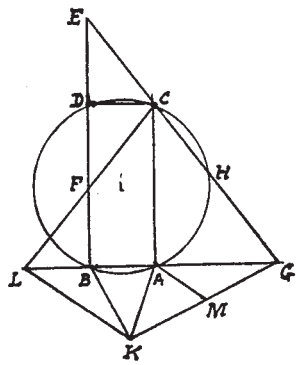

FIG. 1.

Then $ED \cdot EB = EC \cdot EH = GH \cdot GC = GA \cdot GB$,
$\therefore GA \cdot GB + BF^2 = ED \cdot EB + BF^2 = EF^2$;
and $GK^2 = AK^2 + GA \cdot GB = EF^2$, $\therefore GK = EF$.

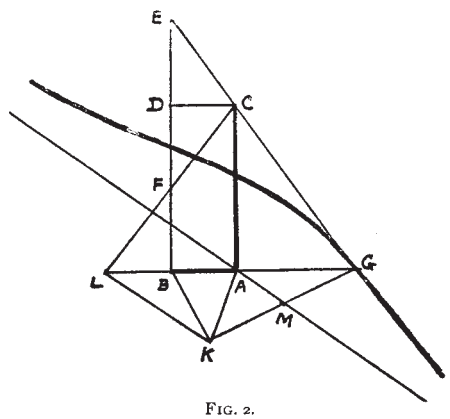

FIG. 2.

Join CF meeting AB produced in L, join LK and draw AM ∥ LK.

Then $LA = 2AB$, and $ED : BA = CA : AG$
$\therefore 2DE : AC = 2AB : AG = AL : AG$
$\dots AL : AG = DE : DF$, $\therefore EF : DF = LG : AG$
$= GK : GM$; but $EF = GK$, $\therefore GM = DF = \frac{1}{2}AC$.

We have then the following construction.

With K as pole, AM as asymptote, and ½AC as the constant distance, describe a branch of a conchoid on the farther side of AM. Let BA cut the curve in G, then AG is the first, and KM the second mean proportional between AC and AB.

I have not been able to find any more recent accounts, but perhaps some others of your readers can tell whether the cissoid has been employed to trisect an angle, or whether it is possible to solve the problem by means of this curve. An easy solution, which is not given in Leslie's book, would be by means of the Limaçon, $r=a(1+2\cos\theta)$. D. M. Y. SOMMERVILLE.

24 Balhousie Street, Perth, August 24.

Auroræ and Meteors.

ON Tuesday, September 10, a beautiful display of the curtain Aurora Borealis was observed here at 9.30 p.m. It extended from the northern horizon to about 12°, and from north-by-east to north-north-west. The most brilliant part of the display lasted for about ten minutes after we first observed it, and then dissolved into a diffused, though vivid, glow. At 10.20 p.m. the Aurora was evidently much more distant, exhibiting itself as a brilliant glow above the north-western horizon.

At 9.52 p.m., the same evening, a brilliant meteor was observed darting towards the south-west, the line of motion passing between Corona Borealis and Hercules. The maximum brilliancy of the meteor was superior to that of Jupiter. At 10.45 p.m. a meteor was observed darting past Arcturus, which was then about 3° above the north-by-west point of the horizon. At 10.50 p.m. (Greenwich time) a brilliant meteor darted from a point within 1° of α Persei in a westerly direction, leaving a broad streak.

ALEX. C. HENDERSON.

The Manse, Rusness, Sanday, September 11.

THE INVERNESS EARTHQUAKE OF SEPTEMBER 18.

THE earthquakes of the Inverness district rank among the strongest ever felt in this country, but we must go back nearly a century to find one that surpassed the recent shock in intensity and extent of disturbed area. That of August 13, 1816, of which Sir T. Dick Lauder's brief but graphic account is the chief memorial left to us,[1] damaged several buildings in Inverness, and was felt over the whole of Scotland. After this, no shock of much consequence occurred until that of February 2, 1888, which was felt so far as Edinburgh and Glasgow and was perceptible over a district the area of which is estimated at about 15,000 square miles.[2] The earthquake of November 15, 1890, was slighter still; buildings were practically uninjured by it, and its disturbed area did not exceed 7500 square miles.[3] In all three cases the epicentre lay close to Inverness and not far from the northern boundary fault of the Highland district, and it is, therefore, natural that movements along this fault or system of faults should be held responsible for the origin of the earthquakes.

The shock of last week occurred shortly before 1.30 a.m., and thus it is possible that we may never know the full extent of its disturbed area. It does not seem to have been noticed in either Edinburgh or Glasgow, but the southern limit of the area cannot have lain many miles north of the line joining these cities, for the shock was certainly felt along the south coast of Fifeshire. Most of the rest of Scotland must have been sensibly shaken, for we have records from places as far north as Wick, in the west of Mull, and all along the east coast of Aberdeenshire.

In Inverness the damage, though never serious, is considerable in amount. There is scarcely a street in the town which has entirely escaped. In a few houses, chimney-stacks or parts of them fell down, and many chimney-cans were overthrown or displaced. For some miles round the town similar slight damage occurred. At Dochgarroch, about four miles south-west of Inverness, a long crack was formed in the north bank of the Caledonian canal. It is in the middle of the towing-path, in the hard-packed surface, and is nearly half an inch wide and about 600 yards long.

From the accounts which have appeared in the newspapers and from a few which I have already received, it is possible to draw roughly an isoseismal line corresponding to the degree 7 of the Rossi-Forel scale. This is in the form of an ellipse, with its longer axis parallel to the great fault and with the larger part of the curve lying on the south-east side of the fault. As the fault hades in this direction, it is exceedingly probable that a slip along it at no great depth gave rise to the recent earthquake.

The stronger Inverness earthquakes generally occur without the warning of preliminary shocks, but are followed for some time by weaker movements. Three at least occurred on the morning of the 18th, and it is not unlikely that for another month or so slight shocks may be felt in and around Inverness before the earth's crust there is once more brought to rest.

CHARLES DAVISON.

[1] Quoted by D. Milne, *Edin. New Phil. Journ.*, vol. xxxi. 1841, pp. 116-117.

[2] C. A. Stevenson, *Edin. Roy. Soc. Proc.*, 1888, pp. 260-266.

[3] *Quart. Journ. Geol. Soc.*, vol. xlvii. 1891, pp. 618-632.

DR. J. L. W. THUDICUM.

THE death of Dr. Thudicum removes from our midst the living equivalent of a very familiar name. As a worker, to the younger generation of men of science he was not known, but some of his numerous communications upon topics extraordinarily varied can scarcely have escaped the observation, and have most probably received the serious attention, of almost every one interested in the medical sciences. More than half a century ago he graduated in medicine at Giessen. Almost immediately afterwards, stimulated by the work and magic influence of the great Liebig, who had attracted to the quiet and secluded university a bevy of young men eager to become adept in methods which, in the hands of their great master, had forced Nature to yield up truths of such momentous importance to physiology, Thudicum began to work at physiological chemistry.

Shortly afterwards he settled in this country, took a medical qualification and began to practise. It must be admitted that he established himself in London at an opportune moment. The application of exact chemical method to physiological, and certainly to pathological, phenomena was then in its infancy. The pupil of Liebig, trained in the methods of the Giessen laboratory and possessed of a practical knowledge of disease, had acres of virgin soil to cultivate. His power was soon appreciated; in 1856 he became physician to the St. Pancras Dispensary, and in 1858 lecturer to the Grosvenor Place School of Medicine. In 1865 he was appointed lecturer on pathological chemistry at St. Thomas' Hospital and director of a newly founded chemical and pathological laboratory there, obviously a position with immense opportunities.

His studies soon received official recognition, in that Sir John Simon, the principal medical officer to the Privy Council, engaged him in 1864 to undertake a series of researches upon pathological chemistry. Thudicum's results were embodied in reports which were published as appendices to the reports of the medical officers of the Privy Council and Local Government Board, and continued to appear at various dates down to 1882. Although no doubt a mass of constant work was embodied in these reports, they were not so fruitful in practical results as was anticipated, or perhaps it would be fairer to say, the tremendous achievements shortly afterwards of bacteriology in this department o