Agenia, Aporus, Miscophus, Ammophila, Crabro, Cerceris, Philanthus, and some others, all of which stupefy the caterpillars, spiders, or bees, which they store up for the nourishment of their brood, and it would be desirable to have it pointed out to what genera the insects really belong. The species seen by Mr. Cecil, in a collection at Athens, which is described as "a thin-bodied variety," is, I think, a species of the genus Ammophila, or of Pompilus; that observed by Mr. Armit, of Queensland, is probably a species of Pelopæus. Some further definition of the insects I consider highly desirable, as the general term wasp must, I believe, lead to a very false conclusion.

British Museum, November 2 FREDK. SMITH

### The Expected Meteor Shower

THE meteor shower of Biela's comet, referred to in your "Astronomical Notes" as likely to occur on the 27th inst., should also be looked for on several evenings preceding that date. Last year there were more of these slow-moving *Andromedes* on the 25th than on the 27th of November. On the former night, from 5h. 30m. to 7h., I saw sixteen shooting stars, seven of which belonged to this stream, for they showed a good radiant at R.A. 24° Dec. 45° N. Yet on the 27th only two others were noted out of a total of 10 recorded during a watch from 9h. to 10h. 30m. An occasional look out is therefore advisable on several nights about the 27th, when, if meteors are seen in more than ordinary profusion, it will be important to record their numbers and paths. W. F. DENNING

Ashleydown, Bristol, November 7

### Geological Climate and Geological Time

IN considering the climatic changes which have evidently taken place on various parts of the earth's surface, it seems to me that what may have been a very important factor has been rather strangely left out of calculation by physicists, never having been noticed hitherto, as far as I am aware. It is that of the heat which must at one period or other have been transmitted from the moon. There can be scarcely a doubt that this must at one time have influenced the earth's climate to a very powerful degree, producing the effects of a second or additional sun. In the absence of any perceptible marks of atmospheric or aqueous erosive action on the moon it is at present impossible to arrive at any idea of its relative age or at what period its heat may have been most abundantly radiated; but if the much hotter climate which once prevailed in northern latitudes could be referred to this cause it might give us some clue to the difficulty. Something also might be done in comparing the various changes of climate which have taken place in certain parts of the earth's surface, as indicated by geological evidence, with the actual course of the moon. The subject is at least worth entertaining, and may be recommended to the consideration of physicists. WILLIAM DAVIES

10, Guildford Street, Russell Square, November 4

### A "New Galvanometer"

THE galvanometer (with its coil moving about a horizontal axis) described by Dr. Obach in NATURE, vol. xviii. p. 707, is not new. Prof. Pickering has fully described it, under the name of *Cosine* galvanometer, in his "Elements of Physical Manipulation," Part 2 (1876), p. 260. When this instrument was first used I do not know. R. E. BAYNES

Christchurch, Oxford, November 9

## *COMMERCIAL CRISES AND SUN-SPOTS*[1]

"Thou Sun, of this great world both eye and soul."

IT is curious to notice the variety of the explanations offered by commercial writers concerning the cause of the present state of trade. Foreign competition, beer-drinking, over-production, trades-unionism, war, peace, want of gold, superabundance of silver, Lord Beaconsfield, Sir Stafford Northcote, their extravagant expenditure, the Government policy, the wretched Glasgow Bank directors, Mr. Edison and the electric light, are a few of the happy and consistent suggestions continually made to explain the present disastrous collapse of industry and credit.

It occurs to but few people to remember that what is happening now is but a mild repetition of what has previously happened time after time. October, 1878, is comparable with May, 1866, with November, 1857, with October, 1847, and, going yet further back, with a somewhat similar condition of things, in 1837, in 1825-26, and even in 1815-16. The incidental circumstances of these commercial collapses have indeed been infinitely diversified. At one time the cause seemed to be the misconduct of the great firm of Overends; in 1857 there was the mutiny in India, the peace with Russia, and a commercial collapse in the United States; in 1847 occurred the Irish famine and a failure of European harvests generally, following upon the great railway mania; the crisis of 1837 succeeded an immense expansion of home trade, the establishment of joint stock banks, and the building of multitudes of factories and other permanent works; 1825 was preceded by extravagant foreign speculations and foreign loans; 1815 was the year of the general peace. All kinds of distinct reasons can thus be given why trade should be now inflated and again depressed and collapsed. But, so long as these causes are various and disconnected, nothing emerges to explain the remarkable appearance of regularity and periodicity which characterises these events.

The periodicity of the earlier portion of the series is so remarkable that, even without the corroboration since received, it convinced scientific inquirers that there was some deep cause in action. Dr. Hyde Clarke, for instance, wrote, more than thirty years ago, a paper entitled "Physical Economy—a preliminary inquiry into the physical laws governing the periods of famines and panics." This paper was published in the *Railway Register* for 1847, and is well worth reading. In the commencement he remarks: "We have just gone through a time of busy industry, and are come upon sorrow and ill-fortune; but the same things have befallen us often within the knowledge of those now living. Of 1837, of 1827, of 1817, of 1806, of 1796, there are men among us who can remember the same things as we now see in 1847. A period of bustle, or of gambling, cut short in a trice and turned into a period of suffering and loss, is a phenomenon so often recorded, that what is most to be noticed is that it should excite any wonder." Dr. Hyde Clarke then proceeds to argue in a highly scientific spirit that events so regularly recurring cannot be attributed to accidental causes; there must, he thinks, be some physical groundwork, and he proposed to search this out by means of a science to be called Physical Economy. In the third page of his paper he tells us that he had previously written a paper on the laws of periodical or cyclical action, printed in Herapath's *Railway Magazine* for 1838. "At this time," he says, "it was my impression that the period of speculation was a period of ten years, but I was led also to look for a period of thirteen or fourteen years. . . . In the course of these inquiries I looked at the astronomical periods and the meteorological theories without finding anything at all available for my purposes." A little below Dr. Hyde Clarke continues:—"Still thinking that the interval was an interval of about ten years, I was, during the present famine, led to look for a larger period, which would contain the smaller periods, and as the present famine and distress seemed particularly severe, my attention was directed to the famine so strongly felt during the French Revolution. This gave a period of about fifty-four years, with five intervals of about ten or eleven years each, which I took thus:—

"1793 1804 1815 1826 1837 1847."

Dr. Hyde Clarke was by no means the only statist who

[1] This article, although treating the same subject, and partially containing the same facts as a paper by the same writer, read at the recent meeting of the British Association, is a distinct composition. The paper in question will probably be published elsewhere.