or near the centre of each group, crystallization was set up, giving rise to a radiating fibrous structure, which gradually developed zone after zone of divergent fibres until the entire mass of primitive spherulites was permeated by this secondary structure—a structure engendering a molecular rearrangement of the mass, such as would obliterate any trace of structure which the primitive spherulites might have originally possessed.

In a supplementary note the views of Mr. J. P. Iddings with reference to the spherulites in question were given. Mr. Iddings considers that the structures here described as primary are of secondary origin. The author stated in detail his reasons for adhering to the conclusions given in this paper.

3. "A Monograph of the Bryozoa (Polyzoa) of the Hunstanton Red Chalk." By George Robert Vine, Esq.

4. "Evidence furnished by the Quaternary Glacial-Epoch Morainic Deposits of Pennsylvania, U.S.A., for a similar mode of formation of the Permian Breccias of Leicestershire and South Derbyshire." By William S. Gresley, Esq., F.G.S.

The author noted that nodules of ironstone occurring in the Pennsylvanian glacial deposits of Quaternary age are scratched in precisely the same manner as those which he has described from the Permian deposits of Leicestershire and Derbyshire, and concluded that one and the same agency, viz. ice, has been instrumental in producing the observed results in both cases.

XI. *Intelligence and Miscellaneous Articles.*

DIAMAGNETISM TESTED BY CARNOT'S PRINCIPLE. THEORETICAL PREDICTION. BY J. PARKER, M.A., FELLOW OF ST. JOHN'S COLLEGE, CAMBRIDGE.

IN May 1889 I published a short paper in the Philosophical Magazine in which Carnot's principle was applied to diamagnetism. An oversight occurs in the paper which has since been corrected by M. Duhem, who has adopted and extended the substance of the paper.

The present state of experiment and theory on diamagnetism may be briefly stated thus:—

(1) If a piece of bismuth be placed near a strong iron magnet in the open air, the bismuth behaves as if repelled by the iron.

(2) If the same experiment were performed in a vacuum, it is shown by Carnot's principle that the bismuth would not be repelled and might be attracted.

We therefore conclude that if the experiment were performed in a place from which the air could be pumped away at will, the repulsive force on the bismuth would become zero when the pressure of the air was sufficiently reduced, and by continuing the exhaustion still further it would probably become attractive.

The action of the bismuth in the open air will be explained if we remember that both the iron and the bismuth are surrounded by a mass of magnetized air, so that the behaviour of the bismuth is due to three causes:—

(1) The attraction of the iron magnet.

(2) The attractions of the magnetized atoms of air.

(3) The resultant of the unequal pressures of the air over the surface of the bismuth.

The conclusions of this paper naturally lead us to question the propriety of making our "absolute" units of electricity and magnetism depend on the actions between bodies surrounded by electrified or magnetized air about which all that is known is that, at some distance away, the air with which it is in equilibrium has a measurable pressure.

AN EASY MODE OF PRODUCING THE ACTIVE SPARK IN HERTZ'S EXPERIMENTS. BY H. CLASSEN.

In repeating Hertz's experiments in the State Physical Laboratory at Hamburg, an observation was made which shows how in a simple manner we can overcome the difficulty experienced by many observers of keeping the primary spark effective for a long time together. In the same manner in which Rijke* used the action of a current of air on the make-and-break spark of an induction-coil in order to produce a stronger action in the secondary coil, so may the spark of the coil itself, and therefore also its inductive action on any other conductor, be similarly influenced.

In the experiments a large Ruhmkorff's coil was used which had a very rapid contact-maker, and which gave sparks up to 14 centim. If the ends of the secondary coil are loaded with conductors, and the discharging-knobs are brought within a distance of a few centimetres, the discharge takes place mostly in the form of a continuous rose-coloured strip of light, and is useless for Hertz's experiments. But when this band is blown away so that flames a centimetre in length project on the side, sharp brightly luminous sparks occur between the knobs. The current of air produced by a Münke's water-pump was now blown continuously between the knobs, and thus a series of sharp cracking sparks passed quite continuously, and could without difficulty be continuously maintained for hours. A series of Hertz's experiments could now be repeated, and even when the current of air was replaced by one of steam the action was the same. The whole process suggests the idea that, in the ordinary discharge with a luminous band of light, detached metallic particles effect a permanent conduction, and that the essential discharge-spark is only produced as these particles are blown away. The influence of the ultra-violet illumination, too, which has been designated by various observers as highly disturbing, would, after the researches of Lenard and Wolf on the pulverization of bodies

* Pogg. *Ann.* cxvii. p. 276 (1862).