heating effect had been observed as far back as 1838. Since January last Mr. Gassiot has had several forms of apparatus constructed for the purpose of observing the phenomena of secondary discharge in relation to its heating effects:—1. If the discharge of the secondary current takes place in air the negative terminal (which in these experiments were of platina wire) became heated.—2. If the wires are sealed into small (thermometer) straight tubing neither terminal appears to be heated, but the discharge takes place, filling the entire tube with a brilliant clear white light.—3. If any part of the tube is blown into small bulbs that portion of the discharge which passes through the bulbs is spread as illuminating that portion with a brilliant blue light. —4. If the discharge takes place in a globe, or in a tube of about one inch diameter, the negative terminal is intensely heated. In the course of the experiments Mr. Gassiot noticed that the glass at the heated end became quite black; in fact, the heat of the electrode had fused the glass and reduced the lead. He, therefore, had another apparatus constructed, taking care that whenever he experimented with it the current should invariably be sent in the same direction. The result has been that the negative end has become quite black, the glass being apparently oxidized in regular layers, the most intense being nearest the wire. The positive end of the glass remains quite clean, as does the platina wire, except about 1-32 of an inch, which appears covered with a minute black deposit. At this terminal, whenever the discharge is made, a minute, but brilliant spark appears, from which the electric brush flows in great beauty and brilliancy. The negative is at first covered with the well known blue flames until it becomes red hot, or no deposit appears to remain in the negative terminal. In all the experiments made with closed glass tubes the air was exhausted by means of an air pump.

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*On the Structure of Lunar Volcanic Craters: by* Mr. James Nasmyth.

This communication was illustrated by a model of the lunar volcano Copernicus, and a diagram of Simpelius, each of which consists of a plateau, with a small central cone, surrounded by a ring shaped elevation, exhibiting concentric ridges or terraces. The circular elevations were supposed to have been formed by the accumulation of materials erupted with great energy to various distances, according to the intensity of the force; giving rise to concentric ridges, or *terraces of deposition*, which are often nearly entire circles, one within the other. Besides these there are other terraces, forming only segments of circles within the principal rings, which were attributed to the agency of landslips, these in most instances correspond to notches in the edge of the crater from which they have slipped, and their debris has rolled onward over the plateau, towards the centre. The central cone was attributed to the last expiring efforts of the eruptive action.

Prof. Phillips observed that although there might be no sign of the existence of water on the present surface of the moon, he thought there were many indications of former aqueous action. There were elevations like the *escars* of Sweden and Ireland, and small gullies converging into larger, like the channels of mountain streams. He also called attention to the narrow, dark lines, many miles in length, occasioned by shadows which change with the direction of the sunlight, showing that the level is higher on one side than the other, as in cases of *fault*. Mr. Hopkins inquired into the evidence respecting the existence of an atmosphere, or of water, on the moon. If any atmosphere existed, it must be very rare in comparison with the terrestrial atmosphere, and inappreciable to the kind of observations by which it had been tested; yet the absence of any refraction of the light of stars during occulation was a very refined test. No equal means existed of ascertaining the presence of water on the moon; and if it did not now exist, the opinion of its former existence rested on very uncertain evidence. The large size of the lunar craters compared with any on the earth was accounted for if they were produced by the expansion of a fluid mass; for there was no reason why such a force should be materially less in the moon than the earth, whilst gravitation was much less. The result would be not only a much greater elevation, but less tendency to fall. He considered the annular craters were the remains of dome-shaped elevations, of which the central part had fallen in. The lunar craters were more numerous in proportion to the terrestrial; but there might have been many more on the earth which have been washed away. Mr. James Smith remarked that the perfection of the lunar volcanoes might be due to atmospheric conditions; and referred to the great circular crater of the Sandwich Islands as being terraced like Copernicus. Mr. Nasmyth expressed his very strong conviction of the total absence of water, or of traces of watery action, on the moon; and also of the absence of any atmosphere. The sudden disappearance of stars behind the moon, without any change or diminution of their brilliancy, was one of the most beautiful phenomena that could be witnessed.

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*On the Probable Former Existence of Palæozoic Glaciers: by* Prof. Ramsay.

Admitting the probability that the earth had cooled down from a molten condition, the author contended that little trace of that refrigeration could be detected, as regards the climate of the globe, since the formation of the oldest fossiliferous strata. For a long time it had been supposed that the coal Flora indicated the influence of high internal temperature; the same inference was derived from the reptiles of the oolites and the nautili of the tertiaries. It had however lately been shown that the Silurian Fauna indicated a temperate climate in our latitude, and the other instances might be accounted for by a different geography. He then proceeded to show what he considered evidence of glacial action, during the latest Palæozoic period, in South Staffordshire and the Malvern district. This consisted in the occurrence of *trappean breccia*, sometimes more than 100 feet thick, amidst the marls and sandstones of the Permian series, or resting on the Silurian strata of Malvern and the Abberleys, where it had been described as trap by Sir R Murchison. The base of the breccia is a fine soft red marl, like tertiary boulder-clay, containing angular masses of trap, of various sizes, up to two or three feet in diameter, seldom much water-worn, but having their surfaces more or less flattened and polished and scratched like stones from the moraines of Alpine glaciers. These blocks consist of greenstone, feldspars and feldspathic porphyries, altered slate-rocks, ribboned slates, green slates and sandstones, purple slates, and quartz rock, not derived from the underlying rocks, but brought from the Longmynd and Silurian Strata north of Bishop's Castle, some of them having travelled more than forty miles. The Longmynd is now only 1,900 feet above the sea; but on its eastern side, between it and the breccias, there is the great Church Stetton fault, a downthrow to the west of 3,500 feet. And although an elevation of even 6,000 feet would not give rise to glaciers on the Longmynd, Prof. Ramsay believed that in the Permian period they formed a mountain tract from which glaciers descended to the sea, and bergs broke off and floated away, as in the latest glacial seas. There are traces of this action being renewed twice,—the last being in the new Red Sandstone. Outlying fragments of Upper Silurian rest on the Longmynd, showing that it was originally covered, whilst the breccias prove that its denudation took place before the Permian period.

Sir C. Lyell admitted the failure of the old proofs that internal heat had controlled the climate within the historico-geologic period. The idea of glaciers in the Permian age was rather startling, and out of harmony with the fact that large Monitors existed in Thuringia, and tree-ferns flourished at the same period; but it was quite possible that the Permian period included temperate and torrid climates, just as both were found indicated in the tertiary. Prof. Phillips stated, that when he first examined this trappoid breccia at Malvern, where it exists at an elevation of 1,000 feet, he had been impressed with the conviction that it was very different, as to its origin, from the ordinary conglomerates of the new Red Sandstone, and even the notion of a glacial explanation had passed though his mind. Mr. Page declared himself a believer in the operation of glacial action from a period much earlier than the Permian; some of the conglomerates of the Old Red Sandstone were so like the accumulations of angular detritus carried by bergs and piled up on the shores of Polar Seas, that an Arctic voyager might suppose them formed in the same manner. Prof. Morris referred to the existence of a series of fossils, apparently indicating a warm climate in the strata immediately beneath the supposed glacial deposit, and to the recurrence of a similar series in the beds immediately above; and also to the existence of rock-salt and gypsum, supposed indications of a warm sea, in the New Red Sandstone. Prof. Forbes observed, that if the views of Prof. Ramsay were confirmed, they would throw great light on the changes of organic life at the close of the Permian period.

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*On the Thickness of the Ice of the Ancient Glaciers of North Wales, and other Points bearing on the Glaciation of the Country: by* Prof. Ramsay.

Prof. Ramsay stated his belief that there had been two sets of glaciers in North Wales since the ground assumed its present general form The first was on a very large scale, followed by a slow subsidence of the whole country to the extent of 2,800 feet, until only the tops of