In addition, the diagram shows the inversion in intensities of the spark and arc lines in the spectrum of a relatively cool star, such as α Orionis. The line positions indicated by the diagram indicate that the enclosed lines may be present from the spectrum of a star, either on account of too low or too high a temperature. In the case of low temperature, however, iron is represented among the lines in the spectrum, but at the highest temperature all visible indications of its presence seem to have vanished.

This result affords a valuable confirmation of my view, that the arc spectrum of the metallic elements is produced by molecules of different complexities, and it also indicates that the temperature of the hottest stars is sufficient to produce simplifications beyond those which have so far been produced in our laboratories.

Philosophical Society, February 8.—Mr. F. Darwin, in the chair.—On the cathode rays, by Prof. J. J. Thomson. The experiments described in this paper were of two kinds: the first set were on the electric charges carried along the rays, the second on the deflection produced in these rays when they traversed a uniform magnetic field. In the experiments on the electrical effects produced by the rays, the cathode, a plane disc, was placed in a small side tube fused to a large bulb; between this tube and the bulb there was a thick earth-connected metal disc with a slit in it: a pencil of cathode rays shot through this slit into the bulb. In the bulb the side opposite to the slit there was an arrangement similar to that used by Perrin in his experiments on the charges carried by the kathode rays; it consisted of two cylinders, one inside the other; the outer cylinder was connected with the earth, and the inner cylinder (which was insulated from the outer) was connected with one pair of quadrants of an electrometer. Slits were cut in the cylinder so that the kathode rays could pass through the slits into the inside of the inner cylinder. The cylinders were placed at a considerable distance from the direct line of the rays, so that unless the rays were deflected by a magnet they did not enter the cylinder. The charge in the cylinder produced by each make and break of the coil was investigated. A slight charge was found to pass into the cylinder even when it was not in the direct line of the rays, due probably to a diffused charge sent out from the tube through the slit into the bulb at each discharge of the coil; this charge was small; it was generally negative, but at high excavations it was frequently positive. When the rays were deflected by a magnet so as to pass inside the cylinder, the cylinder received a strong negative charge, and a fluorescent patch was stopped by the cylinder, small when the motion of the magnet the patch was removed to one side or another of the cylinder. This experiment seems conclusively to show that there is a flow of negative electricity along the cathode rays. The following experiments show, however, that there must be something besides a stream of negatively electrified particles along the cathode rays. If the negative charges in the cylinder do not increase indefinitely, it reaches a certain limit and then remains constant, though the cathode rays keep pouring into the cylinder; and further, if the inner cylinder be charged negatively to begin with, then if this charge exceeds a certain amount, though the insulation is perfect when the rays are not playing upon the cylinder, yet as soon as the rays fall upon it some of the negative charge escapes. In the experiments on the magnetic deflection of the rays, the rays were produced in a side tube and sent into a large bell jar through a slit in a metallic plate. The bell jar was placed between two coils arranged as in a Helmholz galvanometer so as to produce a uniform magnetic field. The rays in their course through the bell passed in front of a glass plate ruled into squares. A large number of photographs of the rays were taken in different gases and at various temperatures and excitations. The following were some of the results obtained. The magnetic deflection of the cathode rays in air, hydrogen, carbonic gas, and methyl iodide is the same, provided the maximal potential difference between the cathode and the anode is the same. Coming through the slit there are certain "rays" which are not deflected by a magnet: these have little if any power of producing phosphorescence. The path of the rays for the first part of their course was very approximately circular. On electricity in gases and the formation of clouds in charged gases, by J. S. Townsend. In the paper on this subject it is shown that the gases, given off when certain chemical actions are going on, have sometimes a very large electrostatic charge. The oxygen and hydrogen given off when a current is sent through a sulphuric acid solution carries with them a positive charge, and when these gases are prepared in a similar manner from a caustic potash cell they carry with them negative electricity. The gases have the property of retaining their electricity in a very striking manner, the fraction of the charge lost when the gas is bubbled through a liquid being very small. When put into vessels and shaken up with sulphuric acid, a large proportion of the electricity still remains in the gas. If a charged gas be left in a flask it loses its charge slowly, for after the space of two hours it is found that 93 per cent. of the original charge remains. These gases have the property of condensing a cloud when they get into a moist atmosphere, which can be completely removed by sulphuric acid. The whole process of bubbling through water and forming a cloud and again bubbling through sulphuric acid and removing it can be gone through without losing more than 23 per cent. of the original charge on the gas. The dry gas, when it gets into the air of the room will form a perfectly stable cloud in the unsaturated atmosphere. These clouds are very heavy and are easily weighed, and it was found that the weight of the cloud is proportional to the charge; but the proportionality to the charges with the sign of the charge, the cloud being much heavier in negative oxygen than in positive oxygen, the quantity of electricity being the same in each case.

Royal Dublin Society, January 20.—Dr. J. Joly, F.R.S., in the chair.—The Committee, consisting of Prof. W. J. Sulzberger, F.R.S., Mr. R. Lloyd Prager, Dr. J. E. C. Stimpson, and Mr. Alfred Delap, appointed by the Royal Dublin Society to investigate the recent bog-flow in Kerry, presented their report, which was communicated by Prof. W. J. Sulzberger. The report was illustrated by photographs taken on the spot by Dr. A. F. Dixon.—Mr. T. Preston made two communications: (a) The parallelogram of forces and the law of motion; (b) Applications of a fundamental method in Kinematics and dynamics. Prof. Hartley, F.R.S., and Mr. Hugh Ramage exhibited specimens of photographs of spectra which illustrate the use of the spectrograph in the accurate measurement of minerals and metallurgical products.

February 17.—Prof. G. F. Fitzgerald, F.R.S., in the chair.—The following paper was read:—On the geology of Slieve No. 1428, Vol. 55]