6. *If the discharge is irregular and the strata indistinct, an alteration of the amount of current makes the strata distinct and steady.* Most frequently a point of steadiness is produced by the careful introduction of external resistance; subsequently the introduction of more resistance produces a new phase of unsteadiness, and still more resistance another phase of steady and distinct stratification.

7. *The greatest heat is in the vicinity of the strata.* This can be best observed when the tube contains either only one stratum, or a small number separated by a broad interval. There is reason to believe that even in the dark discharge there may be strata, for we have found a development of heat in the middle of a tube in which there was no illumination except on the terminals.

8. *Even when the strata are to all appearance perfectly steady, a pulsation can be detected in the current; but it is not proved that the strata depend upon intermittence.*

9. *There is no current from a battery through a tube divided by a glass division into two chambers, and the tube can only be illuminated by alternating charges.*

10. *In the same tube and with the same gas, a very great variety of phenomena can be produced by varying the pressure and the current. The luminosities and strata, in their various forms, can be reproduced in the same tube, or in others having similar dimensions.*

11. *At the same pressure and with the same current, the diameter of the tube affects the character of the discharge and the form and closeness of the stratification.*

THE ROYAL SOCIETY OF EDINBURGH

THE goodly volume of the proceedings of this Society for the session 1877-78 witnesses to the zeal and success with which scientific problems, whether of general or of more specially local interest, are attacked by our northern *savants*.

The fascination in which the public mind has been held by those remarkable instruments, the telephone, phonograph, and microphone, here matures in fruitful study of them. Prominent among the researches referred to are those of Prof. Fleeming Jenkin and Mr. Ewing on the wave-forms of articulate sounds, as obtained from the phonograph (already described in our columns), and the thoughtful investigations of Dr. Ferguson on the indications of molecular action in the telephone, leading to the conclusion that at the sending-station the evidence of molecular action, though suggestive, is by no means conclusive, whereas at the receiving-station, the existence of molecular as well as mechanical action amounts to demonstration, and it is shown to be considerable in amount. Several striking observations in the same field are recorded by Professors McKendrick, Tait, and Forbes, Mr. Blyth, and others. In a paper on beats of imperfect harmonies, Sir William Thomson develops the theory of the phenomenon, and affirms (as a result of experiment) that in every case the ear distinguishes the two halves of the period of each beat, represented respectively by a sharp-topped and flat-hollowed curve and by a flat-topped and sharp-hollowed curve.

The Fourth Report of the Boulder Committee communicates many instructive facts, especially as regards transport of boulders. In his appended remarks Dr. Home shows reason for thinking that two notable spherical balls of marcasite found in the boulder clay at Leith, came from the westward, one from Campsie or Kilsyth (not less than thirty miles), the other from Humbie, nine or ten miles due west of Edinburgh. A geological study of the district indicates the agency of deep-sea currents loaded with ice, which flowed upon the Campsie Hills from the west-north-west, scooping out the present valley and breaking up, to a large extent, the coal strata in it. Thus some of the nodules in these strata would find their way to Leith, where they were embedded Several cases are noted in which boulders, to reach their present sites, must have crossed arms of the sea (*e.g.*, boulders in Staffa, at Appin, and in Loch Creran, from Mull, and others in Nairn, from Ross-shire). The high position of many boulders is explained by Prof. Judd's supposition, that in pliocene times there were mountains in Skye, Mull, Ardnamurchan, and even in Rum, some of which reached a height of at least 14,000 feet. In another geological paper Prof. Geikie traces out the limits of the different basins in which the old red sandstone of the British Islands was deposited, distinguishing the basins as Lakes Orcadie, Caledonia, Cheviot, Lorne, and the Welsh Lake. Dealing with the first alone, he examines the evidence for Murchison's three-fold arrangement of the old red sandstone (finding the middle division only in the north of Scotland), and describes the various districts of Lake Orcadie *seriatim*.

From experiments on suspension, solution, and chemical combination, Mr. William Durham concludes that these phenomena differ only in degree, and are manifestations of the same force. The attraction of chemical affinity is not, in all cases at least, exhausted when a definite compound is formed, but has sufficient power left to form solution or suspension compounds. The same force operating in chemical combination and solution, explains the powerful effects of solution in promoting chemical reaction and electric conductivity. Among chemical subjects treated, are the action of heat on some salts of trimethyl sulphine (Brown and Blackie), the action of chlorides of iodine on acetylene and ethylene (McGowan), and the crystallisation of isomorphous salts (Robinson).

In physiology, we note an extension of Prof. Rutherford and Messrs. Vignals' experiments on the biliary secretion, with reference to the action of cholagogues. The effects of fifty-two medicinal agents on the liver (of dogs) have been investigated, and the great majority of the conclusions are in complete harmony with the results of clinical observation, while many new facts are given to the physician.—Mr. Newman successfully imitates in a physical experiment, the function of the kidney.—Mr. Stirling furnishes some notes of the fungus disease affecting salmon.

A sketch is given by Mr. Edward Lang, of the arrangement of tables of ballistic curves in a medium resisting as the square of the velocity, and of the application of these tables to gunnery.

Without further enumeration, we may direct attention to some interesting accounts of that rare phenomenon, a white sunbow, witnessed at Edinburgh on January 10 last year.

OUR ASTRONOMICAL COLUMN

THE SATURNIAN SATELLITE HYPERION.—Prof. Asaph Hall has investigated the elements of this satellite, first from thirty of the best observations made at Washington in 1875, and again from thirty observations by Mr. Lassell at Malta, in 1852-53. In the former case the approximate elements in *Astron. Nach.* No. 2137 were used in the calculation of equations of condition, which were solved by the method of least squares. The resulting orbit is as follows :—

Passage through perisaturnium, 1875, Oct. 27·8380 Greenwich M.T.

Perisaturnium	172 59·7	For 1875,82.
Ascending Node ...	120 12·0	Referred to the plane
Inclination	6 12·1	of the earth's equator.
Excentricity	0·11885	
Semi-axis major	216″·56	

Assuming these values for the node and inclination, Mr. Lassell's observations were discussed and gave the elements :—