that the hardness conferred upon tool steel when plunged at a good red heat into cold water was due, not to carbon, but to the presence of β iron, rendered stable at low temperatures on being suddenly chilled in the presence of carbon, the last-named element, as such, possessing a comparatively insignificant hardening influence. M. Osmond also said that an investigation made on a series of alloys had verified Prof. Roberts-Austen's law that the influence of elements on iron is in accordance with the periodic law. These, briefly, are the points on which Prof. Arnold joined issue; and in order to support his contention, he has made a vast number of experiments which he claims, if we understood him correctly, entirely upset the theories of M. Osmond and Prof. Roberts-Austen.

The paper by Mr. Hadfield, to which we have referred, is entitled "The Results of Heat Treatment on Manganese Steel and their Bearing upon Carbon Steel." Mr. Hadfield's connection with that remarkable alloy of iron known as manganese steel is well known, and the great difficulty with which it is magnetised renders it especially interesting in connection with this subject. During the discussion Mr. Hadfield showed that manganese steel may be made magnetic; in fact he produced a bar which was distinctly affected by the magnet at one end, whilst at the other end there were no magnetic properties. We must, however, refer our readers to the *Transactions* for the many interesting details contained in this paper. The meeting terminated with the usual votes of thanks.

The summer meeting this year will be held in Belgium, commencing on Monday, the 20th August, when members will assemble in Brussels. The meeting will extend until the following Friday, so as to give members an opportunity to travel home on the Saturday.

THE ROYAL SOCIETY'S CONVERSAZIONE.

THE first (or gentlemen's) soirée of the Royal Society took place on the evening of May 2, in the Society's rooms at Burlington House. There were numerous exhibits, and it will be seen from the following summary that most branches of science contributed evidences of progress.

Prof. Hunter Stewart and Mr. Henry Cunynghame exhibited apparatus for micro-photography.

Experiments in persistence of vision were shown by Mr. Eric S. Bruce.

Mr. J. Theodore Bent exhibited antiquities and anthropological objects from the Hadramoot, Southern Arabia.

Two models of the South Lodge Camp, Rushmore Park, Wiltshire, an entrenchment of the Bronze age, before and after excavation, with the relics therefrom, were shown by General Pitt-Rivers; and also two models of the Handley Hill entrenchment before and after excavation, on the same scale as the South Lodge Camp, with the relics therefrom.

New Dicynodont reptiles from South Africa were exhibited by Prof. H. G. Seeley; and a skull of Deuterosaurus.

Mr. Richard Kerr showed an ovate palæolithic implement and two molar teeth of *Rhinoceros tichorhinus*, found by him in brick-earth at St. John's-road, Radnor Park, Folkestone, in August 1893.

Chemistry was represented by Dr. J. H. Gladstone's exhibit of early specimens of partly soluble cotton xyloidin, and of Austrian gun-cotton for military purposes. In 1847 the exhibitor prepared xyloidin from starch and from cotton. His specimens have all spontaneously decomposed, except those shown, which are mixtures of the soluble cotton xyloidin and ordinary gun-cotton.

Some maps and plans which accompany the Report on Nile Reservoirs, recently published by the Egyptian Government, were exhibited by Prof. J. Norman Lockyer.

Mr. J. Wimshurst exhibited models showing an improved method of communication between shore stations and light-ships, or other like purposes.

Mr. R. E. Crompton showed an electrically heated altar and electrically heated soldering bits for soldering and brazing; and a potentiometer, to measure electromotive forces, from ·0001 to 1500 volts, correctly to 1-2000; and Sir David Salomons showed some new phenomena in "vacuum tubes."

Mr. Owen Glynne Jones exhibited his absolute and relative viscosimeters.

Prof. Roberts-Austen's exhibit comprised an ink-recording pyrometer, consisting of a thermo-junction of platinum and platinum iridium attached to a dead-beat galvanometer, and a series of pyrometric curves obtained by photographic recorders in different iron works, and showing the temperature of the hot blast used in smelting iron.

Mr. A. E. Tutton exhibited an instrument of precision for producing monochromatic light of any desired wave-length, and an instrument for grinding section-plates and prisms of crystals of artificial preparations accurately in the desired directions. (Both these instruments are described in NATURE, vol. xlix. p. 377.)

Dr. Karl Grossmann and Mr. J. Lomas exhibited crystals of ice (hexagonal hopper) and photographs.

Dr. Karl Grossmann showed some specimens of Obsidian from Iceland. The specimens were brought by the exhibitor from the Hrafntinnuhryggur in Iceland (N.E.) The large specimen showed *conchoidal fracture*, evidently produced on falling from a cliff. The smaller specimen shows *flow structure*.

A twin-elliptic pendulum and pendulum figures were exhibited by Mr. Joseph Goold; and a glass model, showing a method of transmitting force by spheres or discs, by Mr. Killingworth Hedges.

An exhibit which attracted much attention was M. Moissan's electric furnace, and specimens of chemical elements obtained by means of it: vanadium, chromium, molybdenum, tungsten, uranium. The furnace consists of a parallelopiped of limestone, having a cavity of similar shape cut in it. This cavity holds a small crucible, composed of a mixture of carbon and magnesia. The electrodes are made of hard carbon, and pass through holes cut on either side of the furnace, meeting within the cavity. For the purpose of certain experiments a carbon tube was fixed in the furnace at right angles to the electrodes, and so arranged as to be 10 mm. below the arc, and about the same distance from the bottom of the cavity. This tube contains the material to be heated, and by inclining it at an angle of about 30° the furnace may be made to work continuously, the material being introduced at one end of the tube and drawn off at the other. A temperature of about 3500° C. is produced. The metals are reduced by heating a mixture of their oxides with finely divided carbon, and for this purpose a current of about 600 ampères and 60 volts is employed. M. Moissan has not only succeeded in reducing the most refractory metals, but has fused and volatilised both lime and magnesia. Nearly all the metals, including iron, manganese, and copper, have also been vapourised, whilst by fusing iron with an excess of carbon, and then quickly cooling the vessel containing the solution of carbon in molten iron by suddenly plunging it into cold water, or better into a bath of molten lead, he has been successful in producing small colourless crystals of carbon, identical in their properties with natural diamonds.

A new harmonic analyser was exhibited by Prof. Henrici. This analyser differs from that shown last year by an improved integrating apparatus. The maker, Herr G. Coradi, of Zürich, has introduced a glass-sphere, whereby all *slipping* has been avoided, and greater compactness has been obtained. The instrument exhibited gives only one term (two coefficients) in Fourier's expansion at a time, but on going six times over the curve to be analysed as many terms can be obtained. There is no difficulty in introducing more integrators in the same instrument, and one has been made which gives five terms on going once over the curve, and ten in going twice over it.

Callendar and Griffiths' long distance direct-reading electrical thermometers and pyrometers were shown by Mr. E. H. Griffiths; and a torsional ergometer or work-measuring machine, used in connection with a mechanical integrator and as an electrical governor, by the Rev. F. J. Smith.

Mr. Henry Wilde showed his magnetarium for reproducing the phenomena of terrestrial magnetism and the secular changes in its horizontal and vertical components, and a magnetometer for showing the influence of temperature on the magnetisation of iron and other magnetic substances.

Polyphase electric currents were illustrated by Prof. Silvanus P. Thompson, with models and experiments.

The Marine Biological Association contributed living pelagic larvæ, &c., from Plymouth, examples of the echinoderm fauna of Plymouth, and a hybrid between brill and turbot.

Mr. Henry A. Fleuss showed a mechanical pump for the rapid production of very high vacua, and vacuum tubes ex-

hausted by it; and Mr. H. N. Dickson his charts and sections showing the temperature of the water in the northern and western parts of the North Sea and the Faroe-Shetland Channel at all depths, August 1893.

Dr. H. R. Mill and Mr. Edward Heawood exhibited bathymetrical maps of Windermere, Ullswater, Coniston Water, Derwentwater and Bassenthwaite, Buttermere and Crummock, Ennerdale Water, Wastwater and Haweswater. Contour lines at each 25 feet of depth beneath the surface were shown, and the configuration of the basins was thus for the first time accurately delineated.

Prof. J. Norman Lockyer exhibited photographs of stellar spectra taken with a 6-inch objective prism of 45°, and photographs of the great sun-spot of February 1894, taken at Dehra Dun.

Living larvæ influenced by the colours of their surroundings were exhibited by Prof. E. B. Poulton; and microscopic slides illustrating the behaviour of the nucleus during spore formation in the hepaticæ, by Prof. J. B. Farmer.

Photographs of diffraction and allied phenomena were exhibited by Mr. W. B. Croft. The photographs showed Newton's rings, reflected and transmitted; Grimaldi's fringes; Fresnel's interference from a bi-prism; Arago's shifting of bands towards the denser medium; Talbot's bands. The shadows of needles, wire gauze, perforated zinc, a screen with circular holes, opaque circular screens with Arago's bright centre. A comparison of the diffraction of Fresnel with that of Fraunhofer and Schwerd; the diffracting object consists of groups of small circles of light. Uniaxal and biaxal crystals; conical refraction.

Specimens demonstrating some phenomena of chemiotaxis in inflammation were exhibited by Mr. W. B. Hardy and Dr. A. A. Kanthack.

Prof. Marshall Ward showed apparatus employed for observing and measuring the growth of bacteria, fungi, and other micro-organisms under different conditions under the microscope. The essential feature is the culture-cell. It has a quartz floor, and is capable of holding large quantities of water, and thus while letting the light-rays pass does not rapidly vary in temperature. By the side of the culture-cell containing the hanging-drop in which is the organism under observation, is an exactly similar cell, but with a small thermometer in it, the blackened bulb of which is in the cell, and gives the temperature *inside* the latter. The rest of the apparatus consists in the measuring eye-piece; the screens of coloured glass, various liquids, &c., for growth in different kinds of light; and a warm chamber in which the whole microscope can be enclosed and kept at known temperature.

A demonstration of the trails of Oscillatoriæ formed the exhibit of Mr. J. G. Grenfell.

Prof. E. Waymouth Reid exhibited microscopic specimens illustrative of the process of secretion in the skin of the eel. The chief point of general interest in the process is the peculiar manner in which the surface of the skin is cast off when the animal is stimulated.

Prof. G. B. Howes exhibited eggs and young of *Ceratodus Forsteri*, and a male of *Lepidosiren paradoxa*.

Mr. E. J. Allen showed nerve elements from the ganglia of lobster embryos; and Dr. D. Sharp a collection of white ants *Termitidæ*).

A specimen and drawing of the South American mud-fish, *Lepidosiren paradoxa*, was exhibited by Prof. E. Ray Lankester. (See NATURE, vol. xlix. p. 555.)

Dr. Alexander Muirhead exhibited a new form of Lord Kelvin's siphon recorder, Muirhead's artificial cable, and Muirhead's automatic curb transmitter. Lord Kelvin's siphon recorder and Muirhead's automatic curb transmitter were shown in operation in connection with an artificial cable of the same capacity and conductor resistance as the Atlantic cable, which is to be laid next July by the Anglo-American Telegraph Company. Capacity of artificial cable 800 microfarads; resistance of conductor 3350 B.A. units.

Demonstrations by means of the electric lantern took place during the evening, Dr. D. H. Scott showing photographs from sections in Dr. W. C. Williamson's collection, illustrating the microscopic structure of fossil plants from the coal-measures. The lantern was also used by Prof. E. B. Poulton, who exhibited illustrations of recent work upon the influence of environment upon the colours of certain Lepidopterous larvæ. Variously coloured twigs and shoots, such as occur in nature, have been shown to influence the appearance of many twig-like larvæ in such a manner as to conceal them. During the summer of 1893 certain larvæ of two species (*Gastropacha quercifolia* and *Otontoptera bidentata*) were surrounded, during their growth, with lichen-covered twigs. Larvæ thus treated developed lichen-like marks upon the body.

THE RELATIVE SENSITIVITY OF MEN AND WOMEN AT THE NAPE OF THE NECK (BY WEBER'S TEST).

THE difference in the sensitivity of the two sexes has been discussed often and from various points of view, but still, as it would seem, upon insufficient data. More observations being wanted, I submit the following, partly for such value as they have in themselves, partly to show an easy method of observation which others may pursue with advantage, and partly as a good illustration of the method of percentiles, or centiles.

The test employed is one of a familiar kind, made with the points of a pair of compasses, and usually associated with the name of Weber. If one person becomes just conscious of the doubleness of the pricks when the distance between the points is a, and another person does so when the interval is b, then the ratio of a to b may fairly be taken to express the relative obtuseness of the two persons, so far as concerns the form of sensitivity tested, and the inverse ratio of b to a to represent its relative delicacy. The particular test used was one that has three especial merits: it requires no minuteness of measurement, no uncovering, and the person tested is unable to see the operation. It consists in pressing the points of the compasses against the nape of the neck and across the line of the spine, while the experimentee sits with his or her head bowed forward. The just-perceptible interval at the nape of the neck averages as much as half an inch or thereabouts, while its variation in different persons is large. Consequently there is no need for extreme delicacy of measurement, neither does the varying thickness of cuticle caused by various degrees of usage, interfere materially with the results, as it does when like experiments are made, as is usual, on the finger-tips. The varying delicacy of perception due to differing amounts of practice is here entirely eliminated, because all persons are equally unpractised, no one occupying himself or herself in attempts to discriminate between two simultaneous pressures on the nape of his or her neck, while everybody has life-long practice in discriminating roughnesses, though in various and unascertainable degrees, with his or her finger-tips. There are parts of the body, such as the back, which are still less discriminative than the nape of the neck, but there is no other equally suitable part that is so get-at-able, in respect to the the ordinary dress of man or woman. Lastly, the attitude of the person who is being tested, entirely precludes him from watching the operator, and guessing from the hands or movements of the latter, whether he is applying two points, or only one, at the moment when he asks what is felt. The observations were all made by Sergeant Randall, who superintends my laboratory; he employed the two points of a Flower's craniometer, which was handy for use, as it was wanted to make other measurements of the same persons. The observations were carried on for some months, until a sufficient number had accumulated to justify discussion. Stature was included among them, but, failing on examination to trace any notable relation between stature and the just-perceptible interval on the nape of the neck, I have disregarded stature altogether in the following summary, and age too, so far that the person tested was often not fully grown.

The observations made on males and females, respectively, are summarised in the first and third lines of Table I. Their sums, reckoned in each case from the beginning of the series, are entered in lines 2 and 4, while the percentages of those sums are given in lines 3 and 6, but solely for the purpose of graphic projection in the form of dots, in Fig. 1. Those dots are joined by straight lines, forming traces for the males and females respectively. The lengths of the ordinates to the traces, which are drawn at the 10th, 20th, &c. divisions of the base, are the 10th, 20th, &c. percentiles, or centiles; or, in still briefer language, the 1st, 2nd, &c. "deciles." Their values, obtained by simple interpolation from the entries in lines