siderable length, of the birds of Grand Menan, N.B.—Mr. F. W. Putnam has a paper on the various forms of cutting instruments made of stone.—"Notes on the bird-fauna of the Salt Lake Valley and the adjacent portions of the Wahsatch Mountains," is the title of a long paper by Mr. R. Ridgway, who also contributes a paper on the birds of Colorado, and, along with Mr. S. F. Baird, one on some new forms of American birds.—There are also interesting accounts of the numerous and profitable excursions made during the summer months by the Institute.—There is a very minute account of the celebration of the 25th anniversary of the Institute on March 5, 1873. Many well-known scientific men were present, and among others Prof. O. C. Marsh, who paid the high compliment to the Institute that through its influence the botany and zoology of Essex county were better understood than those of any other county in the United States. It was at the hands of the Essex Institute, he said, that he himself acquired his taste for scientific investigation.

Poggendorff's Annalen der Physik und Chemie, No. 3, 1874. —This number commences with a translation of Dr. Draper's recent paper on photography of the diffraction spectrum (which has already appeared in our columns).—The conductivity of flame for galvanic currents is known to be greatly exalted by presence of metallic vapours, and M. Herwig was led to inquire whether a gaseous layer, entirely formed of such vapours, would not show good conductivity even at low temperatures. He experimented with mercury, dense vapours of which can be had several hundred degrees under white heat. The vapour conductivity he finds to resemble that of the voltaic arc, rather than that of a simple metallic conductor. There is a peculiar transition-resistance, which is great in comparison with the hindrances which the current finds within the vapour-layer itself; so that the total resistance is in great measure independent of the extent of the vapour-layer. The transition-resistance is less with increased electromotive force of battery or strength of current. Further, the vaporisation in the positive mercury surface was increased by the current; another point of analogy to the voltaic arc (in which, if the electrodes be mercury and platinum, the mercury is vaporised only when it forms the positive pole); and, using a platinum point and a mercury surface, the resistance of the vapour (like that of the arc) was greater when the mercury surface was positive.—M. Friedrich Müller concludes his investigation on galvanic polarisation and the distribution of the current in electrolytes. He states that, with copper plates in dilute sulphuric acid, and also in a solution of sulphate of copper mixed with sulphuric acid, the polarisation follows a simple law: it is a linear increasing function of the density of current. Another observation of the author is that cupric oxide is reduced to copper by galvanic hydrogen (confirming previous observations that galvanic hydrogen is considerably more active than ordinary hydrogen).—The galvanic conductivity of sulphuric acid and muriatic acid, and its dependence on temperature, is the subject of a communication from M. Grotrian.—In pursuing his researches on the compressibility of elastic fluids M. Regnault did not experiment with pressures lower than one atmosphere. The difficulty of the inquiry has perhaps deterred physicists since. We here find it undertaken, however, by M. Siljeström, who contributes a paper on the subject; in the first part here given the details of apparatus are fully described, and the numerical results of some sixteen series of experiments tabulated. —M. Schneider communicates a ninth paper on new salts of sulphur, and M. Kessler describes "the simple euthyoptic spectroscope."—Among matter from other journals we note a valuable paper by M. Boltzmann, On experimental determination of the dielectricity constants of insulators.

Astronomische Nachrichten, No. 1,995.—This number contains a large number of observations of position, taken at Leipsig, of some of the minor planets—Comet II. (Tempel), Comet III. (Borelly), Comet IV. (Henry), and Comet VII. (Coggia); also the mean planes of sixty-nine variable stars for the year 1873.—Prof. d'Arrest sends his observations on the position of Coggia's comet, taken during May last.—An astronomical prize is offered by the Academy at Copenhagen for research on the data of the ancients comprised between the time of Ptolemy and the eighteenth century.—The discovery of a new planet is announced from Toulouse by Mr. Perrotin, May 19, 10 P.M. R.A. 16h. 28m. 30s., D. 22° 48'.—No. 1,996 contains a discussion of the errors of levels due to the change of direction of attraction caused by the spheroidal figure of the earth and other local causes, and Prof. Spœrer gives the results of his sun-spot and protuberance observations for April and May last.

Abhandlungen der Schlesischen Gesellschaft für Vaterländische Cultur, 1872–73.—Dr. Grätzer here furnishes a number of social statistics regarding Breslau gathered from the census made in December of that year. From a comparison with Berlin, the population of which (825,389) wasthen nearly four times that of Breslau, it appears that Breslau is less crowded; there being in it a dwelling-house to every 38·9 of the inhabitants, whereas in Berlin the proportion is 1 to every 56·9. On the whole it appears that, notwithstanding the better proportion of dwellings in Breslau, the health of the two cities is nearly alike, Breslau having counterbalancing disadvantages in bad buildings, sites, drinking and underground water, and soil.—M. Limpricht contributes a report on the watershed between Weide and Bartsche, with a list of the plants found in that region.

Verh. der k.k. zool. bot. Gesellschaft in Wien, 23ter Band, 1873. —This volume, of more than 600 closely-printed pages, is chiefly occupied by papers on entomology and botany. Among the most important are:—*Insecta.*—Contributions to the Orthoptera of the Tyrol: Krauss; Diptera collected in Galicia; Hymenoptera: Kriechbaumer; Microlepidoptera of Leghorn, by J. Mann; Contributions to the nocturnal Lepidoptera of North America, by Prof. Zeller (second part) with figures: more than a hundred new species are described; Contributions to the Phryganidæ, by Dr. Hagen of Cambridge, U.S.; Hungarian Diptera: Kowarz; Eight new German species of Diptera: Beling; New butterflies from Asia Minor; On certain species of Tipula and its allied genera: Beling.—*Crustacea.*—On *Lepidurus lubbockii* and the Phyllopoda.—*Vertebrata.*—A graphic account of the breeding and habits of the Pelican on the Danube. Beside *P. onocrotalus* and *P. crispus*, *P. minor* was also found. On *Comephorus baicalensis*, a fish allied to the genus *Cottus*, with two figures: Dybowski.—*Mollusca.*—Contributions to the genus *Aeolidia* and its allies, by Dr. Bergh of Copenhagen.—*Botany.*—Contributions to the flora of Lower Austria, by Von Reuss, jun.; Lichens of the Tyrol, by F. Arnold; Fauna of the Brdygebirg in Bohemia; Fungi of south-east Hungary, by Prof. Harslinsky; The flora of the state districts in the south-east of Lower Austria: Woloszczak; Contributions to the flora of Lower Austria, by Hackel. The volume contains a photographic portrait of the late Secretary of the Society, Ritter von Frauenfeld, with his latest contributions to Entomology and a biographical notice, by Von Wattenwyl.

Reale Istituto Lombardo. Rendiconti: t. vii., Fasc. i. e ii.—These parts contain the following papers:—Prof. Serpieri communicates his observations of the meteor shower of August 10, 1873, made at Urbino.—Observations concerning the constitutions and combinations of bodies, a paper on molecular physics, by Dr. Guido Grassi.—On a fact of importance in silkworm culture, by Prof. G. Balsamo Crivelli.—Prof. Cesare Lombroso tabulates the height and weight, cranial measurements and capacities, facial angle, &c., of 832 Italian prisoners, dividing them into homicides, thieves, highwaymen, incendiaries, tricksters, deserters, &c. These prisoners were Sicilian, Sardinian, Calabrian, Neapolitan, Piedmontese, Genoese, and Lombardian. The results are discussed in great detail.—Prof. Antonio Bucellati contributes a paper on political economy, entitled "On the theory of capital."

SOCIETIES AND ACADEMIES

LONDON

Royal Society, June 11.—Spectroscopic Notes.—On the Evidence of Variation in Molecular Structure, by J. N. Lockyer, F.R.S.

1. In an accompanying note I have shown that when different degrees of dissociating power are employed the spectral effects are different.

2. In the present note I purpose to give a preliminary account of some researches which have led me to the conclusion that, starting with a mass of elemental matter, such mass of matter is continually broken up as the temperature (including in this term the action of electricity) is raised.

3. The evidence upon which I rely is furnished by the spectroscope in the region of the visible spectrum.

4. To begin by the extreme cases, all solids give us continuous spectra; all vapours produced by high tension spark give us line spectra.

5. Now the continuous spectrum may be, and as a matter of fact is, observed in the case of chemical compounds, whereas all compounds known as such are resolved by the high tension spark into their constituent elements. We have a right, therefore, to assume that an element in the solid state is a more complex mass than the element in a state of vapour, as its spectrum is the same as that of a mass which is known to be more complex.

6. The spectroscope supplies us with intermediate stages between these extremes.

(α) The spectra vary as we pass from the induced current with jar, to the spark without the jar, to the voltaic arc, or to the highest temperature produced by combustion. The change is always in the same direction; and here again the spectrum we obtain from elements in a state of vapour, a spectrum characterised by spaces and bands, is similar to that we obtain from vapours of which the compound nature is unquestioned.

(β) At high temperatures the vapours of some elements (which give us neither line nor channelled-space spectra at those temperatures, although we undoubtedly get line spectra when electricity is employed, as stated in No. 4), give us a continuous spectrum at the more refrangible end, the less refrangible end being unaffected.

(γ) At ordinary temperatures, in some cases, as in selenium, the more refrangible end is absorbed; in others the continuous spectrum in the blue is accompanied by a continuous spectrum in the red. On the application of heat the spectrum in the red disappears, that in the blue remains; and further, as Faraday has shown in his researches on gold-leaf, the masses which absorb in the blue may be isolated from those which absorb in the red. It is well known that many substances known to be compounds in solutions, give us absorption in the blue or blue and red, and also that the addition of a substance known to be compound (such as water) to substances known to be compound which absorb the blue, superadds an absorption in the red.

7. In those cases which do not conform to what has been stated the limited range of the visible spectrum must be borne in mind. Thus I have little doubt that the simple gases at the ordinary conditions of temperature and pressure have an absorption in the ultra-violet; that highly compound vapours are often colourless because their absorption is beyond the red, with or without an absorption in the ultra-violet. Glass is a good case in point; others will certainly suggest themselves as opposed to the opacity of the metals.

8. If we assume in accordance with what has been stated that the various spectra to which I have referred are really due to different molecular aggregations, we shall have the following series, going from the more simple to the more complex.

First stage of complexity of molecule.	Line spectrum.
Second stage	Channelled-space spectrum.
Third stage	Continuous absorption at the blue end, not reaching to the less refrangible end. (This absorption may break up into channelled spaces.)
Fourth stage	Continuous absorption at the red end, not reaching to the more refrangible end. (This absorption may break up into channelled spaces.)
Fifth stage	Unique continuous absorption.

9. I shall content myself in the present note by giving one or two instances of the passage of spectra from one stage to another, beginning at the fifth stage.

From 5 to 4

1. The absorption of the vapours of K in the red-hot tube, described in another note, is at first continuous. As the action of the heat is continued, this continuous spectrum breaks in the middle, one part of it retreats to the blue, the other to the red.

From 4 to 3

1. Faraday's researches on gold leaf best illustrate this, but I hold that my explanation of them by masses of two degrees of complexity only, is sufficient without his conclusion ("Researches in Chemistry," p. 417), that they exist "of intermediate sizes or proportions."

From 3 to 2

1. Sulphur vapour first gives a continuous spectrum, at the blue end, on heating this breaks up into a channelled-space spectrum.

2. The new spectra of K and Na (more particularly referred to in the following note) make their appearance after the continuous absorption in the blue, and red vanishes.

From 2 to 1

1. In many metalloids the spectra without the jar are channelled; on throwing the jar into the circuit the line spectrum is produced, while the cooler exterior vapour gives a channelled absorption-spectrum.

2. The new spectra of K and Na change into the line-spectrum (with thick lines which thin subsequently) as the heat is continued.

Spectroscopic Notes.—On the Molecular Structure of Vapours in connection with their Densities, by J. N. Lockyer, F.R.S.

1. I have recently attempted to bring the spectroscope to bear upon the question whether vapours of elements below the highest temperatures are truly homogeneous, and whether the vapours of different chemical elements at any one temperature are all in the same molecular condition. In the present note I beg to lay before the Royal Society the preliminary results of my researches.

2. We start with the following facts:—

I. All elements driven into vapour by the induced current give line-spectra.

II. Most elements driven into vapour by the voltaic arc give us the same.

III. Many metalloids when greatly heated, some at ordinary temperatures, give us channelled-space spectra.

IV. Elements in the solid state give us continuous spectra.

3. If we grant that these spectra represent to us the vibrations of different molecular aggregations, and this question is discussed in another the previous (note) spectroscopic observations should give us facts of some importance to the inquiry.

4. To take the lowest ground. If, in the absence of all knowledge on the subject, it could be shown that all vapours at all stages of temperature had spectra absolutely similar in character, then it would be more likely that all vapours were truly homogeneous and similar among themselves as regards molecular condition than if the spectra varied in character, not only from element to element, but from one temperature to another in the vapour of the same element.

5. At the temperature of the sun's reversing layer the spectra of all the elements known to exist in that layer are apparently similar in character, that is they are all line spectra; hence it is most probable that the vapours there are truly homogeneous and that they all exist in the same molecular condition, than if the spectrum were a mixed one.

6. The fact that the order of vapour densities in the sun's atmosphere which we can in a measure determine by spectroscopic observations does not agree with the order of the modern atomic weights of the elements, but more closely agrees with the older atomic weights, led me to take up the present research. Thus I may mention that my early observations of the welling up of Mg vapour all round the sun *above the Na vapour*, have lately been frequently substantiated by the Italian observers. So that it is beyond all question, I think, that *at the sun* the vapour density of Mg is less than that of Na.

7. The vapour densities of the following elements have been experimentally determined:—

H	1	S	32 (at 1,000°)
K	39	I	127
As	150	Hg	100
Br	80	N	14
Cd	56	O	16
Cl	35·5	P	62

8. To pursue this inquiry the following arrangements have been adopted:—

The first experiments were made last December upon Zn in a glass tube closed at each end with glass plates; and I have to express my obligations to Dr. Russell for allowing them to be conducted in his laboratory, and for much assistance and counsel concerning them.

A stream of dry H was allowed to pass. The tube was heated in a Hofmann's gas furnace, pieces of the metal to be studied having previously been introduced. It was found that the glass tube melted; it was therefore replaced by an iron one. The inconvenience of this plan, however, owing to the necessity for introducing the metal into the end of the hot tube when the first charge had volatilised, and moreover the insufficiency of the heat obtainable from the gas furnace, soon obliged me to replace both tube and furnace by others, which have now been in use for many weeks, and which still continue to work most satisfactorily

The iron tube is 4 ft. in length, and is provided with a central enlargement, suggested to me by Mr. Dewar, forming a T-piece by the screwing in of a side tube, the end of which is left projecting from the door in the roof of the furnace. Caps are screwed on at each end of the main tube; these caps are closed by a glass plate at one end, and have each a small side tube for the purpose of passing hydrogen or other gases through the hot tube. The furnace is supplied with coke or charcoal, an electric lamp connected with thirty Grove's cells is placed at one end of the tube and a one-prism spectroscope at the other. The temperatures reached by this furnace may be conveniently divided into four stages:–

I. When the continuous spectrum of the tube extends to the sodium line D, this line not being visible.

II. When the continuous spectrum extends a little beyond D, this line being visible as a bright line.

III. When the spectrum extends into the green, D being very bright.

IV. When the spectrum extends beyond the green and D becomes invisible as a line, and the sides of the furnace are at a red heat.

I may add (1) that I have only within the last few days been able to employ the third and fourth stages of heat, as the furnace was previously without a chimney, and the necessary draught could not be obtained; and (2) that I was informed a little time ago by Prof. Roscoe that with a white-hot tube he had observed new spectra in the case of Na and K. These spectra which I now constantly see, when these temperatures are reached, I shall call the "new spectra."

9. The results of the experiments, so far as the visible spectrum is concerned, between the stages indicated, may be stated as follows:—

H No absorption.
N ,, ,,
K I have observed either separately or together.
  (α) The line absorption line near D.
  (β) Continuous absorption throughout the whole spectrum.
  (γ) Continuous absorption in red and blue at the same time, the light being transmitted in the centre of the spectrum (as by gold-leaf).
  (δ) Continuous absorption clinging on one side or other of the line. (This phenomenon which, so far as I know, is quite new, will be described in another note.)
  (ε) The new spectrum.
Na I have observed either separately or together.
  (α) D absorbed.
  (β) Continuous absorption throughout the whole spectrum.
  (γ) Continuous absorption clinging on one side or the other of D.
  (δ) The new spectrum.
Zn Continuous absorption in the blue. (An unknown line sometimes appears in the green, but certainly no line of Zn.)
Cd Continuous absorption in the blue.
Sb New spectrum with channelled spaces and absorption in the blue.
P The same. (This, however, in consequence of the extreme delicacy of the spectrum requires confirmation.)
S Channelled-space spectrum (previously observed by Salet).
As Probable channelled-space spectrum. (Observations to be repeated.)
Bi No absorption.
I Channelled spectrum in the green and intense bank of general absorption in the violet, where at the ordinary temperature the vapour transmits light.
Hg No absorption.

10. These results may be tabulated as follows:—

	V.d.	Modern atomic weight.	
H	1	1	No visible absorption.
K	39	39	Line absorption.
As	150	75	Probable channelled-space absorption.
Cd	56	112	Continuous absorption in the blue.
I	127	127	Channelled-space absorption + band of absorption in violet.
Hg	100	200	No absorption.
N	14	14	,, ,,
O	16	16	Not observed.
P	62	31	Channelled-space spectrum probable.
Na	(?)	23	Line absorption.
Zn	(?)	65	Continuous absorption in the violet.
Sb	(?)	122	Channelled-space spectrum and absorption in the blue.
S	32	32	Channelled-space spectrum.
Bi	(?)	208	No absorption.

11. It will be seen from the foregoing statement that if similar spectra be taken as indicating similar molecular conditions, then the vapours, the densities of which have been determined, have not been in the same molecular condition among themselves. Thus the vapours of K, S, and Cd at the fourth stage of heat gave us line, channelled space, and continuous absorption in the blue, respectively. This is also evidence that each vapour is non-homogeneous for a considerable interval of time, the interval being increased as the temperature is reduced.

On the alleged Expansion in Volume of various substances in passing by Refrigeration from the state of Liquid Fusion to that of Solidification, by Robert Mallet, F.R.S.

Since the time of Reaumur it has been stated with very various degrees of evidence, that certain metals expand in volume at or near their points of consolidation from fusion. Bismuth, cast-iron, antimony, silver, copper, and gold are amongst the number, and to these have recently been added certain iron-furnace slags. Considerable physical interest attaches to this subject from the analogy of the alleged facts to the well-known one that water expands between 30° F. and 32°, at which it becomes ice; and a more extended interest has been given to it quite recently by Messrs. Nasmyth and Carpenter having made the supposed facts, more especially those relative to cast-iron and to slags, the foundation of their peculiar theory of lunar volcanic action as developed in their work "The Moon as a Planet, as a World, and a Satellite" (4to, London, 1874). There is considerable ground for believing that bismuth does expand in volume at or near consolidation; but with respect to all the other substances supposed to do likewise, it is the object of this paper to show that the evidence is insufficient, and that with respect to cast-iron and to the bassic silicates constituting iron slags, the allegation of their expansion in volume, and therefore their greater density when molten than when solid, is wholly erroneous. The determination of the specific gravity in the liquid state of a body having so high a fusing temperature as cast-iron is attended with many difficulties. By an indirect method, however, and operating upon a sufficiently large scale, the author has been enabled to make the determination with considerable accuracy. A conical vessel of wrought iron of about 2 ft. in depth and 1·5 ft. diameter of base, and with an open neck of 6 in. in diameter, being formed, was weighed accurately empty, and also when filled with water level to the brim; the weight of its contents in water, reduced to the specific gravity of distilled water at 60° F. was thus obtained. The vessel, being dried, was now filled to the brim with molten grey cast-iron, additions of molten metal being made to maintain the vessel full until it had attained its maximum temperature (yellow heat in daylight) and maximum capacity. The vessel and its contents of cast-iron when cold were weighed again, and thus the weight of the cast-iron obtained. The capacity of the vessel when at a maximum was calculated by applying to its dimensions at 60° the coefficient of linear dilatation, as given by Laplace and others, to its range of increased temperature; and the weight of distilled water held by the vessel thus expanded was calculated from the weight of its contents when the vessel and water were at 60° F. after applying some small corrections.

We have now the elements necessary for determining the specific gravity of the cast-iron which filled the vessel when in the molten state, having the absolute weights of equal volumes of distilled water at 60° and of molten iron. The mean specific gravity of the cast-iron which filled the vessel was then determined by the usual methods. The final result is that, whereas the specific gravity of the cast-iron when cold was 7·170 it was only 6·650 when in the molten condition; cast-iron, therefore, is less dense in the molten than in the solid state. Nor does it expand in volume at the instant of consolidation, as was conclusively proved by another experiment. Two similar 10-inch spherical shells 1·5 in. in thickness, were heated to nearly the same high temperature in an oven, one being permitted to cool

empty as a measure of any permanent dilatation which both might sustain by mere heating and cooling again, a fact well known to occur. The other shell, when at a bright red heat, was filled with molten cast-iron and permitted to cool, its dimensions being taken by accurate instruments at intervals of thirty minutes, until it had returned to the temperature of the atmosphere (53° F.), when, after applying various corrections, rendered necessary by the somewhat complicated conditions of a spherical mass of cast-iron losing heat from its exterior, it was found that the dimensions of the shell whose interior surface was in perfect contact with that of the solid ball which filled it were, within the limit of experimental error, those of the empty shell when that also was cold (53° F.), the proof being conclusive that no expansion in volume of the contents of the shell had taken place, which was further corroborated by the fact that the central portion was found much less dense than the exterior, whereas if the cast-iron expanded in consolidating the central portions must be more dense than the exterior.

It is a fact, notwithstanding what precedes and well known to iron-founders, that certain pieces of cold cast-iron do float on molten cast-iron of the same quality, though they cannot do so through their buoyancy, as various sorts of cast-iron vary in specific gravity at 60° F., from nearly 7·700 down to 6·300, and vary also in dilatability; that thus some cast-irons may float or sink in molten cast-iron of different qualities from themselves through buoyancy or negative buoyancy alone; but where the cold cast-iron floats upon molten cast-iron of less specific gravity than itself, the author shows that some other force, the nature of which yet remains to be investigated, keeps it floating; this the author has provisionally called the repellent force, and has shown that its amount is, *cæteris paribus*, dependent upon the relation that subsists between the volume and "effective" surface of the floating piece. By "effective" surface is meant all such part of the immersed solid as is in a horizontal plane, or can be reduced to one. The repellent force has also relations to the difference in temperature between the solid and the molten metal on which it floats.

The author then extends his experiments to lead, a metal known to contract greatly in solidifying, and with respect to which there is no suggestion that it expands at the moment of consolidation. He finds that pieces of lead having a specific gravity of 11·361 and being at 70° F. float or sink upon molten lead of the same quality, whose calculated specific gravity was 11·07, according to the relation that subsisted between the volume and the "effective" surface of the solid piece, thin pieces with large surface always floating, and *vice versa*. An explanation is offered of the true cause of the ascending and descending currents observed in very large "ladles" of liquid cast-iron, as stated by Messrs. Nasmyth and Carpenter. The facts are shown to be in accordance with those above mentioned, and when rightly interpreted to be at variance with the views of these authors.

Lastly, the author proceeds to examine the statements made by these authors, as to the floating of lumps of solidified iron-furnace slag upon the same when in a molten state; he examines the conditions of the alleged facts, and refers to his own experiments upon the total contraction of such slags, made at Barrow Ironworks, and a full account of which he has given in his paper On the true nature and origin of volcanic heat and energy, printed in Phil. Trans. 1873, as conclusively proving that such slags are not denser in the molten than in the solid state, and that the floating referred to is due to other causes. The author returns thanks to several persons for facilities liberally afforded him in making these experiments.

Chemical Society, June 18.—Prof. Frankland, F.R.S., vice-president, in the chair.—The following papers were read:—On the action of chlorine, bromine, &c., on isodinapthyl, by W. Smith.—Dr. Armstrong then read four communications from the laboratory of the London Institution, No. XIII. On coal-tar cresol and some derivatives of paracresol, by H. E. Armstrong, and C. L. Field; No. XIV. On the action of the chlorides of the acids of the sulphur series on organic compounds, by H. E. Armstrong and W. H. Pike; No. XV. On chloro, bromo, and iodo-nitrophenolparasulphonic acids, by H. E. Armstrong and F. D. Brown; and No. XVI. Note on the decomposition of dichloronitrophenol by heat, by H. E. Armstrong and F. D. Brown.—The sixth paper was by Mr. F. Neison, On the products of the decomposition of castor oil, No. III. On decomposition by excess of alkaline hydrate, in which he has succeeded in elucidating the conflicting statements of different chemists on this subject.—On hydrogen persulphide, by Dr. W. Ramsay.—Suberone, by Dr. C. Schorlemmer and Mr. R. S. Dale.—On the action of nitrosyl chloride on organic bodies. Part I.—On phenol, by Dr. W. A. Tilden, —An apparatus for determining the moisture and carbonic anhydride in the atmosphere; A method for determining ozone in the presence of chlorine and nitric oxide; and On the constitution of urea, by Dr. D. Tommasi.—On the restitution of burnt steel, by Mr. S. L. Davies.—On the action of earth on organic nitrogen, by Mr. E. C. Stanford.—Aniline and its homologues in coal-tar oils, by Mr. W. Smith.

Zoological Society, June 16.—Dr. A. Günther, vice-president, in the chair.—An extract was read from a letter received from Dr. A. B. Meyer, concerning two birds (*Rectes bennetti* and *Campephaga aurulenta*) lately described in the Society's Proceedings by Mr. Sclater.—A letter was read from Mr. William Summerhayes, relating to certain species of Curassows found in Venezuela.—Dr. J. Murie read a paper on the nature of the sacs vomited by the Hornbills, which he stated, in confirmation of Prof. Flower's account of these objects, to consist of the epithelial lining of the stomach.—Mr. W. Saville Kent, F.L.S., communicated a second paper upon the gigantic cephalopods recently encountered off Newfoundland. From further information received, Mr. Saville Kent apprehended that it would be necessary to refer the two individuals preserved in St. John's Museum to the genus *Ommatostrephes*, thus avoiding the institution of a new genus for their reception, as proposed in his former paper.—Mr. A. H. Garrod read a paper on the "showing off" of the Australian Bustard (*Eupodotis australis*) and pointed out the peculiar structures by which this "showing off" was accomplished.—A communication was read from Dr. F. Stolicza, containing a description of the *Ovis polii* of Blyth, of which he had lately obtained specimens in Yarkand.—Mr. R. B. Sharpe read a paper on a new genus and species of Passerine birds from the West Indies, which he proposed to name *Phœnicomanes iora*.—A communication was read from the Rev. O. P. Cambridge, containing descriptions of some new species of Spiders of the genus *Erigone* from North America.—Dr. Günther read a paper describing some new species of reptiles from the Camaroon Mountains, West Africa. Amongst these were two new species of Chameleon, and a new snake of the family of Lycodontidæ, proposed to be called *Bothrolycus ater*. One of these Chameleons was referred to a new subgenus (*Rhampholeon*), being remarkable for its abbreviated tail and the development of a denticle at the inner base of each claw.—Mr. Sclater read a paper containing a description of three new species of the genus *Synallaxis* from M. Jelski's collections in Central Peru, which he proposed to call *S. Pudibunda*, *S. graminicola*, and *S. virgata*.—Messrs. H. P. Blackmore and E. R. Alston communicated a joint paper on the Arvicolidæ which have hitherto been found in a fossil state.—Prof. Newton read an account of a living Dodo shipped for England in the year 1628, extracted from letters in the possession of Dr. J. B. Wilmot, of Tunbridge Wells.—Mr. J. E. Harting read a paper on the common Lapwing of Chili, which he proposed to separate from *Vanellus cayanensis*, under the name *V. occidentalis*.—A second paper read by Mr. Harting contained an account of the eggs of some new or little-known Limicolæ.—A communication was read from Mr. R. Swinhoe containing an account of a new Cervine form discovered in the mountains near Ningpo, China, by Mr. A. Michie, and proposed to be called *Lophotragus michianus*.—Dr. J. Murie read a paper on the structure of the skeleton of *Fregilupus varius*, based on a specimen in the Museum of Cambridge.

Meteorological Society, June 17.—Dr. R. J. Mann, president, in the chair.—On the connection between colliery explosions and weather in the year 1872, by Robert H. Scott, F.R.S., and W. Galloway, Inspector of Mines. The paper is in continuation of those by the same authors read before the Royal Society in 1872, and before the Meteorological Society in 1873, which contained the results for the four preceding years. The number of fatal explosions which occurred during the year was 70, causing the loss of 163 lives. Three of these killed each of them more than ten men, being the same as the average number of serious explosions for the last twenty years. The number of non-fatal explosions was 224. A comparison of the dates of all recorded explosions with the curves of the barometer and thermometer kept at Stonyhurst for the Meteorological Office, as shown on a diagram, lead to the following results:—58 per cent. of the explosions are due to changes of pressure, 17 per cent. to great heat of the weather, while 25 per cent. are not attributed

by the authors to meteorological agencies. These proportions are nearly the same as those which have come out from the discussions of similar facts for previous years. The paper next deals with an objection which has been raised to the reasoning in its predecessors, viz. that it is not fair to take the meteorological records for Stonyhurst as a test of the atmospherical phenomena in a coalfield situated at some distance from the observatory. The authors show, by taking an instance of a barometrical depression, whose centre passed over Stonyhurst, and which was accompanied by an explosion in South Wales, that such an objection as that cited could never have originated with anyone accustomed to deal with daily weather charts. The next question discussed was the alleged greater prevalence of explosions with certain winds; and it was shown by the most reliable data for our climate that the ordinary changes of pressure and temperature in the windrose were hardly sufficient to account for the explosions which are found to accompany the *sudden* changes of weather. The paper proceeds with a discussion of a diagram exhibiting the continuous curve of barometrical pressure from Glasgow Observatory for the last nine months of 1873, and a curve showing the prevalence of fire-damp in the mines of the West of Scotland district for the period. These latter returns have been furnished by Mr. Galloway from the entries in the books ordered to be kept at each mine by the Coal Mine Regulation Act, 1872. The books of thirty-five mines about Glasgow have been used for the comparison. The two curves show a very remarkable accordance in their course, though that of fire-damp exhibits some striking irregularities, owing probably to the fact of the men having been slow to learn the new duties required of them by the Act. It may be expected that these irregularities will disappear in future years. The result places it beyond the possibility of a doubt that the escape of fire-damp is related mainly to the conditions of atmospherical pressure, and that a careful watch over the barometer is, above all, necessary in each colliery, though one such record would suffice for several adjacent mines. The paper gives some instances of explosions which might all have been prevented by proper ventilation and by the use of safety-lamps, and states how pressing the need is that safety-lamps only should be used in all places where fire-damp may accumulate, whenever the atmosphere is in a disturbed condition, as shown by the record of the barometer and thermometer. The authors conclude by stating their conviction that it is not too much to ask those charged with the responsibility of the safety of miners' lives to learn the first principles of the laws of diffusion and intermixture of gases, and to familiarise themselves with the use of the barometer and thermometer, so as to know when it behoves them to take extra precautions in the management of their mines.—Solar radiation, 1869-74, by Rev. F. W. Stow.—The diurnal inequalities of the barometer and thermometer, as illustrated by the synchronous observations made during May 1872 at the summit and base of Mount Washington, New Hampshire, at the respective heights of 2,615 ft. and 6,283 ft. above the sea-level, by W. W. Rundell. The hourly mean differences of pressure and temperature at these stations and at Portland, Maine, the nearest U.S. station to Mount Washington, are discussed and their most probable coefficients are determined, also the times at which their maxima and minima occur.—On the diurnal variation of the barometer at Zi-Ka-Wei, and mean atmospheric pressure and temperature at Shanghai, by Rev. A. M. Colombel.—Weather report for 1873 at Woosung, China, by C. D. Braysher.—Notes regarding a remarkable hailstorm at Pietermaritzburg, Natal, on April 17, 1874, by Rev. J. D. La Touche.

Royal Astronomical Society, June 12.—Prof. Adams, president, in the chair.—A paper by Mr. Stone, the Government astronomer at the Cape of Good Hope, was read, describing his observations of the eclipse of April 16 made near Klipfontein, in South Africa, of which an account has been given in NATURE (vol. x. p. 59).—Mr. Bidder described a micrometer which he had contrived for measuring the position of very faint stars. Ghosts of the wires, which can be rendered dimmer or brighter at the discretion of the observer, are projected into the field of view by means of reflecting prisms; and diaphragms can be used, cutting out the light of the wires from any portion of the field.—M. d'Abbadie was called upon to give some account of the French preparations for the transit of Venus. The French Government will occupy five stations, and will make use of the Daguerreotype in preference to the collodion process. Their photographs will be taken in the principal focus of their instruments, and the image of the sun will thus be only about 36 millimetres in diameter. The trial photographs are so sharp that they hope to be able to make use of a magnifying power of 250 in measuring the photographs for the purposes of reduction.—The President announced to the Society that a petition was about to be presented to the Dean of Westminster, praying him to admit of the erection of some memorial to Jeremiah Horrox in Westminster Abbey.—It was announced that the next meeting of the Society would be held in their new room in Burlington House.

PARIS

Academy of Sciences, June 15.—M. Bertrand in the chair.—The following papers were read:—Solar theories; reply to some recent criticisms, by M. Faye. The author meets objections raised by MM. Ledieu, Duponchel, and P. Secchi, in former numbers of the *Comptes Rendus*.—On the heat evolved by chemical reactions in the different states of bodies, by M. Berthelot. The author considered the heat developed in the gaseous, liquid, and solid states.—Observations on the communication relating to Phylloxera made by M. Lichtenstein during the *séance* of June 8.—A note by M. Blanchard, in which the author highly eulogises the experiments of Lichtenstein.—Researches on the electrolysis of the alkaline carbonates and bicarbonates, by MM. P. A. Favre and F. Roche. This is a thermo-chemical research undertaken with a view of throwing light on the constitution of these bodies.—On the phenomena of static induction produced by means of Rhumkorff's coil; a note by M. E. Bichat. The author finds that static electricity, as from the Holtz machine, when passed through the secondary wire gives rise in the primary wire to the development of a current possessing all the properties of the voltaic current, and like this current appearing to have only one direction.—M. J. M. Gaugain presented a note on magnetism.—On some properties of the systems of curves ($\mu = 1, \nu = 1$), by M. Fouret.—Generalisation of a theorem communicated at the *séance* of June 1, by M. H. Durrande.—On oxyfluoboric acid, by M. A. Basarow. This acid is stated to be produced when boric fluoride is passed into water, and the assigned formula is $BO_2H, 3HF$. The present research tends to prove that no such body exists, the composition formerly determined by analysis being a result of chance.—On the absorption of ammonia from the air by vegetables, by M. T. Schlœsing. The author has been growing two tobacco plants under precisely the same conditions, except that one plant was freely supplied with ammonia, while the other was excluded from this gas. Analyses prove that the plant supplied with ammonia is much richer in nitrogeneous compounds than the other.—Research on the oxygen dissolved in the water of artesian wells, by M. A. Gérardin. The author concludes that oxygen is never found in subterranean waters if these are kept out of contact with the air.—On a case of lead-poisoning, by MM. G. Bergeron, and L. l'Hote.—On creatine, by M. R. Engel. The author has studied the reactions of this substance.—Anæsthesia by intravenous injection of chloral after the method of Prof. Oré; removal of a cancer from the rectum, by MM. Deneffe and Van Wetter.—On the geology of the regions comprised between Tangiers, El-Araich et Meknès (Morocco), by M. Bleicher. The author has recognised the following formations—recent, tertiary, cretaceous, and jurassic.—On the character of the littoral zone in the English Channel, the ocean, and the Mediterranean, by M. P. Fischer.

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