

1. The pressure in the vacuous space is sensibly the same in all parts.

2. It is a matter of indifference in which direction the refrigerating water flows in reference to the direction of the steam and condensed water.

3. The temperature of the vacuous space is sensibly equal in all its parts.

4. The resistance to conductivity must be attributed almost entirely to the film of water in immediate contact with the inside and outside surfaces of the tube, and is little influenced by the kind of metal of which the tube is composed, or by its thickness up to the limits of that of ordinary tubes.

5. The conductivity increases up to a limit as the rapidity of the stream of water is augmented.

6. By the use of a spiral of wire to give a rotary motion of the water in the concentric space, the conductivity is increased for the same head of water.

The author, in conclusion, gives an account of experiments with atmospheric air as the refrigerating agent; the conductivity is very small in this case, and will probably prevent air being employed for the condensation of steam except in very peculiar circumstances.

IV. "Notice of Recent Scientific Researches carried on abroad." By the FOREIGN SECRETARY.

During the last Session of the Royal Society the Council passed a Resolution,—That it should be one of the duties of the Foreign Secretary to furnish the Society, from time to time, with early notice of researches of special importance carried on abroad; such notice to be drawn up in the form of a short communication to the Society, to be read as early as practicable at an Evening Meeting of the Society, and published in the 'Proceedings.' In the time which has since elapsed I have been only partially successful in obtaining that cooperation without which it is scarcely possible to comply with the instructions of the Council.

The regular and frequent appearance of the 'Comptes Rendus,' and of the Abbé Moigno's 'Cosmos,' containing, as they do, the earliest notices of important memoirs, and the publication in full of many memoirs in the 'Annales de Chimie,' render superfluous any mention of the labours of men of science in France. So also, very striking discoveries, such for instance as the qualitative analysis by the lines of the spectrum, and the consequent discovery of a new element, due to Professors Bunsen and Kirchhoff, published in the English Journals almost as soon as they are made, may be passed over in silence.

For most of the following notices I am indebted to the kindness of our Foreign Member, M. Haidinger, of Vienna. On receiving a letter containing the substance of the Resolution of the Council, he sent a printed circular, dated Sept. 1, 1860, to various active labourers in the field of science, inviting them to send a short account of the researches in which they themselves or others had been engaged, to the Foreign Secretary of the Royal Society. This appeal was responded to by the arrival of a number of letters containing a large amount of information which would otherwise have been most difficult to obtain.

The 'Denkschriften' and 'Sitzungsberichte' of the Academy of Sciences of Vienna are peculiarly rich in memoirs on Mineralogy, Crystallography, and on the optical and physical properties of Crystals, by MM. Haidinger, Zippe, Schabus, v. Zepharovich, Kengott, Hochstetter, Carl v. Hauer, v. Lang, Murmann, Rotter, Weiss, Handl, Dauber, Schrauf, Leydolt, Grailich, of whom the last two have been lately cut off by an early death. Many of these papers date back too far to be included in the present notice. Some of the most important of the recent communications on these subjects are by M. Haidinger, on Meteorites, on the form and optical characters of Hörnesite, a new mineral species belonging to the isomorphous group containing Vivianite, and several other hydrous arseniates and phosphates: by M. v. Zepharovich, who has also contributed many papers on Mineralogy, Geology, and Physical Geography, to the 'Jahrbücher der k. k. geologischen Reichsanstalt' of Vienna, on a new determination of the forms and angles of epidote, and some laboratory crystals not previously measured: by M. Carl v. Hauer, on Crystallogenesis, and on

compounds of selenium and vanadium : by M. Dauber, on the determination of crystallographic constants, and the limits of their errors : by M. Schrauf, on the form of Smithsonite ; and by M. Tschermak, on the secondary formation of minerals in the Greenstone of Neutitschein.

Major v. Sonklar is the author of a paper on the diminution of temperature at different heights, in different seasons of the year, in the Eastern Alps.

M. Kreil has determined the magnetic constants and geographical position of numerous points in the South-east of Europe, and some places on the coast of Asia.

M. Karl Friesach has continued the publication of his *Magnetic and Astronomical Observations* in North and South America.

M. Simon Spitzer has written a series of papers on the integration of linear differential equations.

MM. Helmholtz and v. Piotrowski are the authors of a memoir on the friction of incompressible fluids.

M. Karl Fritsch has written several memoirs on Meteorology. One of these is on the disturbances of the daily range of the most important meteorological elements on days in which thunder-storms occur. The daily range of atmospheric pressure, temperature, pressure of vapour contained in the atmosphere, from hour to hour, in different months, are known already for various stations. These, however, hold only for a mean condition of the atmosphere. In days on which thunder-storms occur, the range of each of the meteorological elements exhibits a peculiar character impressed upon it in the course of the preceding night and morning ; and, as thunder-storms usually occur in the afternoon and evening, the approach of a thunder-storm, or of the gale of wind by which it is not unfrequently accompanied, may in most cases be predicted. Another gives an account of the phænological observations made in the Austrian Empire in the course of the year 1858. This contains a comparison of the times of blossoming of seventy-three species of plants, at fifty-nine different stations, with the times of blossoming of the same plants at Vienna. On an average of the whole year, vegetation is earliest at Villa Carlotta on the lake of Como, 120 toises above the level of the sea, being fourteen days in advance of Vienna ; and latest at Gurgl in the Oetzthal, 966 toises above the

sea-level, being thirty-one days behind Vienna. This difference exhibits a regular diminution in each month from the spring to the summer.

The supplement to the eleventh volume of the 'Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus,' contains a comparison by M. Fritsch of those epochs in the life of plants and animals in different localities in the Austrian empire, which admit of being accurately determined for the year 1857. These observations include a record of definite phases of vegetable and animal life under the most various local circumstances, and extend as far as possible over the whole flora and fauna. They have been now continued for eight years. It is proposed to continue them till they embrace a period of ten years, when M. Fritsch hopes to deduce from them many important results, a task which will probably occupy him for several years. A memoir on the law of the influence of temperature on the epochs of definite phases of the development of plants, taking into account the effects of insolation and moisture, in the 'Denkschriften' of the Vienna Academy of Sciences, vol. xv., is intended as a precursor to this undertaking.

Professor Zantedeschi is the author of nine papers on Acoustics, published in the 'Sitzungsberichte' of the Academy of Vienna.

1. On the doctrine of the third sound, or on the coincidence of sonorous vibrations, with a remark on the analogy presented by the vibrations which constitute the light of the solar spectrum. The experiments of the author show that the number of vibrations in a given time, of the third sound, is always the difference of the numbers of vibrations of the two given sounds, and is not always the greatest common measure of the two given sounds, as has been asserted by some writers.
2. On the correspondence which sonorous bodies manifest in the resonance of many sounds in one.
3. On the unit of measure of musical sounds, on their limits, on the duration of the impression of the vibrations on the acoustic nerve of man, and on the increase of pitch of the fundamental note in tuning-forks of steel due to a spontaneous molecular change. The principal object of the author is the determination of a fixed note, to which, as to an invariable unit of measure, the notes of different instruments may be referred. The number of vibrations per second which produces the note C is from 272 to 276 at St. Petersburg; 271 in Naples; 268

in Milan, 266 in Venice, 268 in Vienna. According to M. Lissajous, in Paris, in 1856, the number of vibrations of the note A was 898 ; while according to Sauveur in 1715 it was 810. This elevation is by some supposed to be due to improvements made in the construction of musical instruments. Professor Zantedeschi attributes it to a molecular change which is gradually developed in the steel of which tuning-forks are made. In order to eliminate this source of error, he proposes to substitute for the tuning-fork a pipe such as is used at the present time by tuners of instruments in the South of Italy. He compared a number of tuning-forks and pitch-pipes known to be more than fifty years old, and found that the former had become higher, though unequally, when compared with the latter. In order to secure the fixity of a note, he considers that it ought to be compared with the syren of Cagnard de la Tour, or with the toothed wheel of Savart. By these means, especially when combined with improvements suggested by M. Zantedeschi, the stability of the note, or the amount of its error, may at any time be ascertained. In France the A has been lowered from 898 to 870 vibrations. 4. On the limits of the sounds produced by free reeds, and on their harmonics, considered in relation to the law of Bernoulli. 5. On the fundamental law of the harmonics of a musical string, on the vibratory motion from which they are derived, and on the interpolation of harmonics between the notes of instruments sounded by means of a bow and those of the human voice. 6. On the separation of waves corresponding to harmonics, and on the coexistence of several vibratory waves in the same aërial column. 7. On the lengths of the aërial waves, and on their velocity in pipes, and on the influence which various circumstances exert on the sound produced. 8. An experimental examination of the method commonly followed in the determination of the nodes and ventral segments of columns of air vibrating in tubes. 9. On the fundamental laws of vibrating rods, and of the oscillation of air in tubes.

Professor Zantedeschi is in possession of a series of meteorological observations embracing a very long period, by means of which he hopes to be able to establish the constants of the climate of Italy.

M. Schaub, Director of the Observatory, and Superintendent of the Hydrographical Institution at Trieste, is occupied with the discussion of tide observations made during one whole year, beginning

October 16, 1859, with a self-registering gauge, in the harbour of Trieste. The results of the observations for more than two months have appeared in the 'Mittheilungen' of the Geographical Society of Vienna. The height of high water above low water was found to be 87 centimetres at spring tides, and 24 centimetres at neap tides.

Professor Lorenz, of Fiume, the author of various Essays on Geology, Physical Geography, and Natural History of various districts in the Salzkammer Gut and on the Croatian coast of the Adriatic, which date back too far to fall within the scope of the present notice, has recently published the following memoirs:—Geological Survey of the Liburnian Karst and the adjacent Quarnero islands, giving a sketch of these Adriatic coast declivities and islands, the geological constitution of which had never before been examined with accuracy (*Jahrbuch der k. k. geologischen Reichs-Anstalt*, Band X.). An inquiry into the sources of the springs of the Liburnian Karst and adjacent Quarnero islands, some of which are remarkable for their excessively low and constant temperature (*Mittheilungen der k. k. geographischen Gesellschaft in Wien*, B. III.). On the forest-trees of the Liburnian Karst range. A Report on the question whether trees and other growths could be produced on the declivities of the Croatian Adriatic coast, being the result of physical and botanical researches continued for two years, accompanied by a vegeto-geographical map of that country. This Report is now going through the press, and will appear in the 'Mittheilungen' of the Geographical Society of Vienna. A Report on the flora of the same country is also in progress.

During the last five years Professor Lorenz has been engaged in researches on the Liburnian (Croato-Adriatic) coasts, and also in the hitherto unexplored waters of the Quarnero (or Gulf of Fiume), his object being to inquire into the distribution of submarine algæ and animals, on the same principles that had guided the founders of this still youthful department of science, such as Ersted in the Baltic, Forbes in the Ægean and British seas, Sars, Arbjørnsen, Löven in the Scandinavian sea. Professor Lorenz considers that he has made improvements in the method of carrying on researches of this kind. The physical hydrography of the submarine stations in the Quarnero, the geology and quality of the sea-bottom, temperature of the air, density and chemical composition of the sea-water, the currents,

tides, transparence, colour, luminosity, mean temperature at different depths, &c., were methodically observed during four years. Algæ and animals of every kind were arranged according to their vertical and horizontal distribution, and their natural groups and paragenesis were deduced from the above-mentioned physico-marine observations. A bathygraphical map, and numerous tables and figures, accompany the work, which in a few weeks will be ready for the press. A memoir on new starfishes and polyps collected and described by the author, intended as a precursor to the larger work, appeared in the 39th volume of the 'Sitzungsberichte' of the Vienna Academy.

I may add, that Professor Lorenz expresses his readiness to procure for the Royal Society any information that may be desired respecting the natural history of the Adriatic coast, adjacent to Fiume, a service which he appears peculiarly well qualified to render by the nature of his previous researches, as well as by his position as Professor of Natural History at Trieste.

I am indebted to Dr. Namias, the Secretary of the I. R. Istituto Veneto, for the titles of memoirs that will appear in the 5th volume of the 'Atti' of that Society. Among these are a memoir on the purple of the Ancients, and the means used in extracting it from the *Murex*, by Professor Bizio. On some methods of applying electricity in the cure of disease, by Dr. Namias, who is also author of a memoir on electricity, in which he has established some new principles, and for which a prize was awarded by the Istituto Milano. A memoir on the hypothesis of the metamorphosis of power, and on the conservation of force, by Professor Turazza, is to appear in vol. ix. of the 'Raccolta,' in 4to. A general theorem on the teeth of bevel-wheels, by Professor Minich. On instantaneous movement about a point, by Professor Bellavitis. Comparative examination of some new species of Lichens, and on *Chrysothrix noli tangere*, by Professor Massalongo.

M. Senoner has supplied information respecting works on the Natural Sciences, published by various Societies and individuals. In Vienna, the 'k. k. Zoologische-botanische Gesellschaft' publishes valuable Transactions. The 'Wiener entomologische Zeitschrift,' conducted by Lederer and Miller, is a periodical of great merit. The 'Oesterr. botanische Zeitschrift,' edited by Dr. Skofitz, contains many excellent papers on the Flora of the Austrian Empire.

The Geological Surveys by the 'Geogn. montanistischer Verein' of

Gratz, are carried on diligently under the direction of M. v. Zollikofer. Yearly volumes are published by the Museum in Linz, and by the Natural History Museum of Klagenfurt. In Trieste, Professor Stoffich is a most assiduous collector of all the productions of the Adriatic. Professor Danilo of Zara, and Professor Lanza of Spalatro, are at work upon a Fauna of the Adriatic. The 'Werner Verein' of Brünn has completed its Geological Surveys, and is proceeding to publish a geological map of Moravia and Silesia. Natural History Museums, for the purpose of making Collections only, have been established in Bregenz, Trent, and Roveredo.

In Milan, the 'Società Italiana di Scienze Naturali' (formerly the Geological Society) publishes Transactions containing excellent papers in every department of the Natural Sciences. The 'Atti' of the Ateneo Italiano (formerly the Accademia Medico-fisico-statistica) contain also many articles on Natural History. Stoppani's Paleontology of Lombardy has reached its 14th number. In Brescia, a beautiful work on fungi (*Miceti dell' agro Bresciana*), in which some new species have been established, has been very lately published by Antonio Venturi.

Professor Zeithammer of Pesth, author of papers in Petermann's 'Mittheilungen' on barometric measurements of heights, and the temperature of springs in the mountainous districts of Agram and Sambor, and on the mode of writing Slavonian names of places in other languages, is about to publish in the same journal an essay on the natural grouping of the mountain ranges of Croatia, giving the elevations of the principal stations above the sea-level, to be followed by a separate work on the hypsometry of Slavonia, and the military frontier.

With the view of exhibiting to the eye the ethnographic relations of separate tribes, he has just published in the 'Mittheilungen der k. k. geographischen Gesellschaft,' ideas on the establishment of an Austrian Ethnographic Museum, which, in its principal features, would be equally applicable to any other country.

M. Steinheil has communicated to the Munich Academy of Sciences a simple method of adjusting an equatorial, by levelling the declination axis and the finder, and observing transits of stars with the declination axis horizontal. He also exhibited an 'aplanatic' object-glass, constructed on the principle indicated by Gauss in the first volume of

Bohnenberger's 'Zeitschrift für Astronomie,' having an aperture of 3 inches, and a focal length of 46 inches, French measure, which bears a power of from 300 to 360 extremely well. The success of this object-glass has induced him to attempt the construction of a similar refractor with an aperture of 54 lines, and a focal length of only 48 inches.

Professor v. Kobell has announced to the same Academy the discovery of a new acid, dianic acid, in the mineral called tantalite, from Tammela, euxenite, æschynite, and samarskite.

December 20, 1860.

General SABINE, Treasurer and Vice-President, in the Chair.

The following communications were read :—

I. "Notice of recent Scientific Researches carried on abroad."

By the FOREIGN SECRETARY.

On the 29th of last November, an extract was read before the Berlin Academy from a memoir on the magnetization of iron and steel, by Professor Wiedemann. In following up his investigations on the relation between the magnetic and mechanical properties of iron and steel, published in the 'Verhandlungen der Baseler Naturforschenden Gesellschaft,' Band II., Professor Wiedemann has obtained the following results :—

1. If an iron wire be twisted during or even after the passage of a voltaic current through it, the wire becomes magnetic.

When the wire is twisted in the manner of a right-handed screw, the point at which the current enters becomes a south pole, in the opposite case it becomes a north pole. If, during the passage of the current, the wire be twisted in different directions, the polarity changes with the direction of the twist. If it be twisted in different directions after the interruption of the current, the magnetism produced by the first twisting diminishes rapidly.

2. If a voltaic current be transmitted through a magnet in the direction of its axis, the magnet will twist.

The experiments were made with wires of iron and steel, of from 1 to 2 millimetres in diameter, surrounded by a voltaic helix, and stretched