

prospectus of a biography of this illustrious man of science, which he intends to publish. Forty new members were admitted. Prof. Zöllner continued his lecture on his observations of the solar protuberances, and on a method of ascertaining the movements of celestial bodies by means of spectral analysis. His views were discussed by MM. Oppolzer, Scheibner, and Struve. A number of proof-prints of Prof. Heis' (Münster) stellar maps were committed to MM. Julius Schmidt and Prof. Galle, to report upon. M. de Littrow, superintendent of the Vienna University Observatory, communicated and explained the plan of the new Observatory to be built there, and commented upon the recent endeavours of some calculators of the solar parallax to derive useful results from Father Hell's observations, dating from 1769, proving these attempts to be altogether useless, by exhibiting the original diaries of this observer, and distributing fac-similes of the most important passages of them. A communication, concerning the establishment of a Humboldt Foundation at Vienna, was read.

September 16.—The president and council were elected; M. Struve, President; Prof. Bruhns, Vice-President; MM. Auwers and Winnecke, secretaries; Prof. Zöllner, Librarian; M. Auerbach, Treasurer; MM. Argelander and de Littrow, members of the Council. A new member was admitted. Mr. Julius Schmidt read his report on Prof. Heis's stellar maps. Prof. Forster read a paper concerning the solar eclipse of August 18, 1868, with Dr. Tieb's remarks on the photograms of it, taken at Aden, and proposed that the President and Council should ensure their assistance on the occasion of the next transit of Venus to any astronomers who should apply for it. The motion has been adopted. Dr. Kaiser gave an account of his observations concerning the ellipsoidal form of the Moon, and the solar protuberances, which elicited a reply from Prof. Zöllner, M. de Littrow communicated the first report of the permanent Adriatic Commission, and the programme of the prizes for the discovery of comets, lately proposed by the Imperial Academy of Vienna. Prof. Schönfeld exhibited a letter from Fabricius to Tycho Brahe (1596), in which the first notice of Mira Ceti is given, and entered into historical details concerning this variable star. The session of 1869 was closed by thanks voted to the Imperial Academy for having placed suitable localities at the disposal of the Society.

CHEMISTRY

Preparation of Uranium

M. FÉLIGOT has communicated to the *Annales de Chimie et de Physique* [xvii. 368] a short note on the preparation of uranium. A mixture of 75 grammes of uranic chloride, 150 grammes of dry potassium chloride, and 50 grammes of sodium in fragments, is introduced into a porcelain crucible, itself surrounded by a plumbago crucible. The reaction is effected in a wind furnace, at the temperature of redness; but the heat must be increased for a short time at the close of the operation. In the black slag may be found, after cooling, globules of fused uranium. Throughout the operation, it is necessary to avoid the presence both of moisture and atmospheric air.

A specimen of the metal prepared in this way by M. Valenciennes had the specific gravity, 18.33. Uranium, is, therefore, one of the densest of metals.

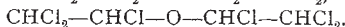
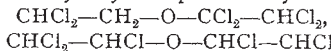
Stannous Chloride and Acids of Arsenic

A. BETTENDORFF has examined the action of stannous chloride on the oxygen acids of arsenic. When a solution of stannous chloride in fuming hydrochloric acid is added to a solution of arsenious or arsenic oxide in the same acid, a brown precipitate is formed, which, after proper washing and drying, consists of metallic arsenic mixed with a small quantity of stannic oxide. In an aqueous solution of arsenious or arsenic acid, stannous chloride produces no precipitate; but on adding strong hydrochloric acid till the liquid fumes slightly, precipitation takes place. Arseniferous hydrochloric acid of sp. gr. 1.182 to 1.135 gives an immediate precipitate; the same diluted to sp. gr. 1.115 gives imperfect precipitation after some time; and in a similar solution of sp. gr. 1.100, no precipitation takes place. From this it may be inferred that the reaction occurs only between stannous chloride and arsenious chloride; further, that in a solution of arsenious acid in hydrochloric acid of sp. gr. 1.115 part of the arsenic is present as chloride, but that hydrochloric acid of sp. gr. 1.100 dissolves arsenious acid as such, without converting it into chloride. The reaction above described is extremely

delicate, and capable of detecting 1 pt. of arsenic in a million parts of solution. On antimony compounds stannous chloride exerts no reducing action, even after prolonged heating; hence the above-described reaction may be used to detect the presence of arsenic in antimony compounds, the solution being previously saturated with hydrochloric acid gas. Another useful application of the same reaction is to the preparation of hydrochloric acid free from arsenic: 421 grms. of crude hydrochloric acid of sp. gr. 1.164 were mixed with a fuming solution of stannous chloride, the precipitate separated by filtration after twenty-four hours, and the hydrochloric acid distilled, the receiver being changed after the first tenth had passed over, and the remaining liquid distilled nearly to dryness. The acid thus obtained gave not the slightest indications of arsenic, either by Marsh's test or by precipitation with hydrogen sulphide.—[Zeitschr. f. Chem. (2), v. 492.]

Dichlorinated Aldehyde

PATERNO has obtained dichlorinated aldehyde $C_2H_2Cl_2O$ by the action of sulphuric acid on dichloroacetal. It is a liquid boiling at $89^\circ-90^\circ$, attracts moisture from the air, and is thereby converted into a hydrate, which crystallises in beautiful laminae, left to itself, even in sealed tubes, it becomes dense, and changes into a white amorphous mass, which has the aspect of porcelain; but, when heated to 120° , is reconverted into the original product. Dichlorinated aldehyde dissolves without decomposition in alcohol and ether; when poured into water, it first sinks to the bottom and then dissolves, especially on application of heat; in short, it exhibits the most complete analogy with chloral. It is difficult to oxidise, its vapour not undergoing any sensible alteration when mixed with air or oxygen and passed over red-hot spongy platinum; but when gently heated with several times its own volume of fuming nitric acid, it is energetically attacked and converted into dichloroacetic acid $C_2H_2Cl_2O_2$. Phosphoric pentachloride attacks it strongly, producing the compound $C_4H_4Cl_6O$ or $C_2H_2Cl_2O$. $C_2H_2Cl_2O$, the action doubtless consisting in the replacement of O by Cl_2 (as in the action of PCl_5 on aldehydes in general), whereby $C_2H_2Cl_4$ is produced, which, as soon as it is formed, unites with a portion of the undecomposed dichlorinated aldehyde, producing the compound $C_4H_4Cl_6O$. The constitution of this body may be represented by the following formulæ:—



The compound $C_4H_4Cl_6O$ is a colourless oil, having an irritating odour, heavier than water, soluble in alcohol and ether; it distils at 250° emitting acid vapours. Alcoholic potash attacks it strongly, with evolution of heat, and formation of potassium chloride; and, on adding water to the resulting liquid, a heavy aromatic oil separates, boiling at 196° , and having the composition $C_4H_2Cl_4O$ —that is to say, containing 2HCl less than the preceding. This last compound unites directly with four atoms of bromine, forming the crystalline compound $C_4H_2Cl_4Br_4O$. In this respect, the compound $C_4H_2Cl_4O$ is analogous to Malaguti's chloroxetose C_4H_6O , which he obtained by abstracting four atoms of chlorine from perchlorinated ethylic oxide $C_4H_6Cl_4O$. According to this analogy, the compound $C_4H_4Cl_6O$ may be designated as hexchlorinated ethylic oxide, and $C_4H_2Cl_4Br_4O$ as tetrachloro-tetrabrominated ethylic oxide. The two compounds C_4Cl_6O and $C_4H_2Cl_4O$ may also be regarded, respectively, as perchlorinated vinyl oxide and tetrachlorinated vinyl oxide.—[Giornale di Scienze di Palermo, v. 123, 127.]

Colouring Matter of Wine

FR. PONCHIN proposes the use of a solution of potassium permanganate acidulated with sulphuric acid to distinguish between the natural colouring matter of wine and the various substances added to imitate that colour. For this purpose a normal solution of 2 grammes of the permanganate in 100 grammes of distilled water is prepared when wanted for use; 15 grammes of this solution acidulated, and 3 drops of pure sulphuric acid, are added to 15 grammes of normal red wine contained in a test-tube, and the liquid after being shaken is left at rest. The greater part of the colouring matter is then slowly precipitated in red flocks, while the supernatant liquid retains the same colour, without weakening, for 24 hours afterwards. After a few days, however, the precipitate acquires a deeper red colour and the liquid becomes nearly colourless. For very deeply coloured wines a larger proportion of the normal solution must be used, care being, however, taken not to add it in excess, as that

would produce complete decolorisation. If, on the other hand, the same solution be added in the same quantities to wine which has been artificially coloured red, the deception will soon become apparent by the speedy decolorisation of the liquid, or by the communication of some different colour to the liquid and to the precipitate. The following table exhibits the various colours assumed by the liquid and precipitate produced under these circumstances in wine coloured by different substances—

Substances added.	Colour of Liquid.	Colour of Precipitate.
Pernambuco wood . . .	Light orange red . . .	Reddish yellow
Campeachy wood . . .	Golden yellow . . .	Orange yellow
Archil	Very light red . . .	Reddish yellow
Laccamuffa	Very light green . . .	Greenish-grey
Prepared Cochineal . . .	Nearly colourless . . .	Grey
Fitolacca	Nearly colourless . . .	Yellowish
Myrtle	Nearly colourless . . .	Dingy-greenish
Violets	Very light rose . . .	Yellowish
Colouring matter of normal wine	Persistent wine-red . . .	Blood-red

Dye-woods resist decolorisation more strongly than vegetable juices; and Brazil wood, when treated with the above-mentioned reagent, aided by heat, acquires a crimson-red colour, due to the formation of brazilin.—[Ann. di Chim. app. alla Med., September, 1869, p. 142.]

PHYSICS

Professor Magnus on Heat Spectra.

PROFESSOR MAGNUS has recently contributed to the Berlin Academy a memoir on the radiation and absorption of heat at low temperatures. The results, which are of the highest importance, are essentially as follows:—

1. Different bodies, heated to 150° C., radiate different kinds of heat.

2. Some substances emit only one kind, some many kinds, of heat.

3. Of the first class, perfectly pure rock-salt is an instance. Just as its incandescent vapour, or that of one of its constituents (sodium), is solitary in tint, so the substance itself, even at 150°, emits heat of but a single ray. It is monothermic, just as its vapour is monochromatic.

4. Rock-salt absorbs heat radiated from rock-salt in larger quantity, and more powerfully, than that derived from sylvine and other kinds. It does not, therefore, as maintained by Melloni and Knoblauch, transmit heat from all sources with uniform facility.

5. The amount of absorption effected by rock-salt increases with the thickness of the absorbing plate.

6. The high diathermancy of rock-salt, does not depend on its small absorptive power for the different kinds of heat, but on the fact that it only radiates (and, consequently, only absorbs) heat of one kind; while almost all other bodies at the temperature of 150° emit heat which contains only a small fraction or none of those rays which are given out by rock-salt.

7. Sylvine (potassium chloride) behaves like rock-salt, but is not monothermic to an equal extent. This circumstance is also obviously in analogy with the incandescent vapour of the salt, or of potassium, which is known to furnish an almost continuous spectrum.

8. Heat purely derived from rock-salt is almost completely absorbed by fluor-spar. It might thence have been expected that heat radiated from fluor-spar would also be energetically absorbed by rock-salt; yet 70 per cent. of it traverse a plate of rock-salt 20 mm. in thickness. If we remember that the total heat emitted by fluor-spar is more than thrice as large as that of rock-salt, this phenomenon is readily explicable; nevertheless, it is probably dependent upon some other property of fluor-spar.

9. If a spectrum could be projected of the heat radiated at 150°, and rock-salt were the radiating substance, such a spectrum would contain only *one* band. If sylvine were employed, the spectrum would be more expanded, but still would only include a small portion of the spectrum which would be given by the heat radiated from lamp-black.

In a subsequent communication, Herr Magnus treats of the reflection of heat radiated at the surfaces of fluor-spar and other bodies.

Having succeeded in obtaining the heat from different substances at 150° free from the rays of flames and other thermogenic bodies, and afforded proof that there are some substances which emit waves of one or but few lengths, while others present them in more frequent variety, it next appeared interesting to solve

the problem how bodies behave with reference to reflective power; whether, in bodies which act similarly upon light, differences parallel to those which are observed in respect of the absorption and transmission of heat do not also occur in its reflection.

Differences in reflective power are unmistakably apparent only when rays are reflected which have a uniform, or but slightly varying, length. Such rays have already been derived either from a section of the spectrum furnished by a rock-salt prism, or by transmitting the rays from a source of heat of many wave-lengths through substances which absorb a number of them. There are, however, but very few bodies that transmit rays of only one or a few wave-lengths; moreover, such rays, obtained by either method, have a very low intensity.

In spite of this difficulty, MM. de la Provostaye and Desains showed, as early as 1849, that different quantities of the heat from a Locatelli's lamp were reflected from speculum metal, silver and platinum, according as it had been conducted through glass or rock-salt; and, for reflecting surfaces of all kinds, less in the case of glass than in that of rock-salt.

Soon afterwards, by an extended series of experiments, and employing the prismatically dispersed heat of a lamp, it was proved by the same physicists that heat, from the different portions of the spectrum is differently reflected. But, doubtless in consequence of the low intensity of the incident heat, their researches had reference solely to reflection by means of metallic surfaces. Now, if in rock-salt we possess a substance that emits waves of only one or but few lengths, and are acquainted with other bodies which, at 150°, also radiate but a few kinds, researches can be instituted on reflection at non-metallic surfaces. It has thus appeared that the different kinds of heat or wave-lengths are reflected from such surfaces in very different proportions. One of the most striking examples may here be adduced: it refers to the reflective power of fluor-spar.

Of the heat radiated by a great variety of substances, unequal (though but slightly differing) amounts were reflected at an angle of 45°; being in the case of—

Silver	between 83 and 90 per cent.
Glass	6 " 14 "
Rock-salt	5 " 12 "
Fluor-spar	6 " 10 "

But of the heat from rock-salt, fluor-spar reflected 28 to 30 per cent., whereas silver, glass, and rock-salt returned no more of this heat than in the preceding cases.

Here, too, it was evident, as in the experiments on thermic transmission, that sylvine emits, besides a large quantity of the rock-salt kind, species of heat of another nature. Fluor-spar reflects 15 to 17 per cent. of the heat from sylvine; less, consequently, than that from rock-salt, and more than that from the other radiating bodies.

Granted an eye that could distinguish different wave-lengths of heat in the same manner as wave-lengths of light, and when the waves from rock-salt are incident upon different bodies, fluor-spar will appear to it brighter than any. If the rays are derived from sylvine, fluor-spar would seem still brighter than all the above bodies, but not so bright as when submitted to the rock-salt rays.

Melloni has shown that different substances transmit heat in very unequal proportions, and that the source of heat has a marked influence on the facility of transmission. Still, the sources of heat were only distinguished by degree; it was merely recognised that an increased temperature corresponds to increased variability of wave length. It now appears that at one and the same temperature, and *ihat*—viz., 150°—far below incandescence, different substances emit very different kinds of heat, and that, within such a range, an extraordinarily large number of different heat-rays or wave-lengths continually intermingle. This manifold intermixture is particularly furthered by the selective reflection taking place at the different surfaces.

It follows from what has been said that an eye capable of discerning the different wave-lengths of heat, as it can now discriminate the colours of light, would perceive, with very little warmth to itself, every possible variety of tint in surrounding objects.

PHYSIOLOGY

Pettenkofer on Cholera

NEARLY the whole of the second part of the Zeitschrift für Biologie, bd. v. (300 pages), is taken up by a long memoir by Prof. Von Pettenkofer on "Soil and Sock-water in their