And so generally

$$K \begin{pmatrix} b_1 & b_2 & b_{n-1} \\ a_1 & a_2 & a_3 \dots a_n \end{pmatrix} \\ = K \left(a_1, a_2 \frac{1}{b_1}, a_3 \frac{b_1}{b_2}, a_4 \frac{b_2}{b_1 b_3}, a_5 \frac{b_1 b_3}{b_2 b_4} \dots, a_n \frac{\dots b_{n-4} b_{n-2}}{\dots b_{n-3} b_{n-1}} \right) \times \dots b_{n-3} b_{n-1}.$$

To this may be added the following as being derived in similar fashion :—

$$K \left(a_1 x^{-1}, a_2 x, a_3 x^{-1}, a_4 x \dots a_n x^{(-1)^n} \right) = K (a_1, a_2, a_3 \dots a_n)$$

if n be even, and

$$= K (a_1, a_2, a_3 \dots a_n) x^{-1}$$

if n be odd.

The simple continuant I have found to be identical with Euler's "*Novus Algorithmus*." An examination of his paper with this title will at once make evident the advantages of the new mode of considering the function.

Monday, 4th May 1874.

SIR WILLIAM THOMSON, President, in the Chair.

The following Communications were read :—

1. On the Formation of Allotropic Sulphur.

By James Dewar, Esq.

2. On Some Compounds of Dimethyl-Thetine. By Professor Crum Brown and Dr E. A. Letts.

(*Abstract.*)

In this paper the authors describe in detail compounds of dimethyl-thetine, some of which were enumerated in an earlier communication. Hydrobromate of dimethyl-thetine is readily obtained as a colourless crystalline body by the action of sulphide of methyl on bromacetic acid at ordinary temperatures. Its analysis shows that it contains quantities of the different elements agree-

ing with the formula $C_4H_9BrSO_2$, and its mode of formation and reaction lead to the constitutional formula —

The result of its analysis are as follows:—

Calculated.		Obtained.	
C_4	= 48 23·9	23·7	 23·1
H_9	= 9 4·5	4·5	 4·8
O_2	= 32 15·9	—	 —
S	32 15·9	—	 16·1
B_1	80 39·8	40·0	 39·7
	<hr/> 201		<hr/> 100·0

It is a very deliquescent body, and has a powerful acid reaction.

Dimethyl-thetine.—The base, of which the body just described is the hydrobromate, is obtained from the latter by the action of oxide of silver. It may also be prepared from the sulphate of dimethyl-thetine by treatment with carbonate of baryta. It is a very deliquescent crystalline body, containing one molecule of water of crystallisation, which it loses if exposed for several days over sulphuric acid *in vacuo*.

The numbers calculated for the formula

agree with those obtained by experiment, thus—

Calculated in 100.		Obtained.	
C	 34·7	34·0	 33·9
H	 7·2	7·3	 7·3
H_2O	 13·0	18·0	 —

Hydrochlorate of dimethyl-thetine.—This body may be obtained either by saturating a solution of the base with hydrochloric acid, or by means of double decomposition between the sulphate of

dimethyl-thetine and chloride of barium. It is a crystalline substance of strong acid reaction.

The formula

was verified by a chlorine determination.

Calculated in 100.	Obtained.
$\text{Cl} \dots\dots 22\cdot7$	23·4

Chloroplatinate of dimethyl-thetine is obtained in beautiful light orange-coloured crystals when solutions of the hydrochlorate and chloride of platinum are mixed. This salt contains two molecules of water of crystallisation, and has the formula

The salt was analysed by determination of water and platinum—

Calculated in 100.	Obtained in 100.
$\text{Pt} = 28\cdot6$	28·5 28·4
$\text{H}_2\text{O} = 5\cdot2$	5·4 —

Bromaurate of dimethyl-thetine was obtained by mixing alcoholic solutions of hydrobromate of methyl-thetine and bromide of gold. The analysis shows too small a quantity of gold for the normal bromaurate, but agrees with the amount required for a salt crystallising with three molecules of alcohol. This compound has not been more particularly examined.

Sulphate of dimethyl-thetine was prepared by the action of sulphate of silver on hydrobromate of dimethyl-thetine. It can be obtained in large crystals, which are not deliquescent. It was analysed by a sulphuric acid determination.

whereas 28·2 per cent. and 28·0 per cent. were obtained by experiment.

Nitrate of dimethyl-thetine, prepared by treating the hydrobromate with nitrate of silver, is a transparent crystalline substance.

The formula

was verified by an organic analysis—

Calculated.		Obtained.
C	 26·2	26·4
H	 4·9	4·9

Double Salt of dimethyl-thetine and bromide of lead.—A boiling solution of hydrobromate of dimethyl-thetine dissolves carbonate of lead with evolution of carbonic acid, and on cooling deposits beautiful silvery scales.

The formula of this body is

Calculated.		Obtained.	
C	 5·6	5·7	 5·7
H	 ·9	·9	 ·9
Br	 37·0	37·0	 37·5
Pb	 48·4	48·4	 48·5

In addition to these compounds, a very beautiful salt was obtained by the action of hydriodic acid on the base, or by double decomposition between iodide of barium and sulphate of dimethyl-thetine. In appearance it resembles permanganate of potash, and is a poly-iodide; but its examination is not as yet completed.

Hydrobromate of diethyl-thetine was prepared in a similar manner to the corresponding dimethyl compound, which it resembles; it is so deliquescent, however, as to render its analysis almost impossible. It gives beautiful orange-coloured salts with bichloride of platinum.

In the course of these experiments the action of iodacetic ether upon sulphide of methyl was studied. The reaction here takes a different course, iodide of trimethyl-sulphine being produced in large quantity.

3. On a New Example of the Opheliidæ (*Linotrypane apogon*)* from Shetland. By W. C. M'Intosh.

This peculiar iridescent pinkish Annelid was dredged in 1871 in Bressay Sound, in four or five fathoms, on a bottom of coarse sand and gravel, which abounded with finely-branched *Melobesia calcarea*, Ell. and Soland.

The form resembled an active nematoid worm, being elongated, nearly cylindrical throughout the greater part of its length, and devoid of bristles or lateral projections. It progressed in the most vigorous and spasmodic manner, by twisting or thrusting itself through the sand, after the mode of *Ammotrypane*, or a most rapid eel-like fish. Moreover, the slightest interference caused it to break in pieces, so that not a single specimen out of the whole series remains entire, though every precaution was taken to immerse the animals in spirit on removal from the dredge. The activity and purpose displayed by the species are diagnostic when compared even with the most nimble of the nematoid group, so that no difficulty is experienced in distinguishing it.

The Annelid reaches the length of three or four inches, and is only about a millimetre ($\frac{1}{25}$ th inch) in diameter. The body is rounded, slightly tapered in front, where the pinkish colour is best marked, and richly iridescent, even to a greater degree than either *Ammotrypane* or *Ophelia*. The head terminates in a rounded anterior border, from which two short clavate processes project. The latter have a very thin investment of the hyaline cuticle, with a thick layer of granular cells (hypoderm) beneath. Some longitudinal fibres occur at the base, but the contractility of the organs is limited. Two eyes, consisting of encapsulated masses of black pigment, are situated near the dorsal surface of the tissues of the snout.

* *λινον*, a thread, and *τρυπάνη*; the specific name from *ἄπωγων*, beardless