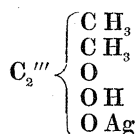


Dimethoxalic acid is a white solid, readily crystallizing in beautiful prisms resembling oxalic acid. It fuses at $75^{\circ}7$ C., volatilizes slowly even at common temperatures, and readily sublimates at 50° C., being deposited upon a cool surface in magnificent prisms. It boils at about 212° C., and distills unchanged. Dimethoxalic acid reacts strongly acid, and unites with bases, forming a numerous class of salts, several of which are crystalline. In addition to the baryta-salt above mentioned, we have examined the silver-salt, which is best formed by adding oxide of silver to the free acid, heating to boiling, and filtering, when the salt is deposited in star-like masses of nacreous scales as the solution cools. On analysis, this salt gave numbers closely corresponding with those calculated from the formula



Attempts to produce an ether by digesting the free acid with absolute alcohol at a temperature gradually raised to 160° C. proved abortive, traces only of the ether being apparently formed.

Thus the final result of the action of zinc upon a mixture of iodide and oxalate of methyl is perfectly homologous with that obtained by the action of zincethyl upon oxalic ether. In the methylic reaction, however, no compound corresponding to leucic ether was obtained. This cannot create surprise when it is remembered that dimethoxalic ether approaches closely in composition to lactic ether, which is well known to be instantly decomposed by water. We have sought in vain to obviate this decomposition of dimethoxalic ether by adding absolute alcohol in place of water to the product of the reaction.

February 25, 1864.

Major-General SABINE, President, in the Chair.

- I. "On the Joint Systems of Ireland and Cornwall, and their Mechanical Origin." By the Rev. SAMUEL HAUGHTON, M.D., F.R.S., Fellow of Trinity College, Dublin. Received February 8, 1864.

(Abstract.)

This paper is a continuation of a former paper "On the Joints of the Old Red Sandstone of the Co. Waterford," published in the 'Philosophical Transactions' for 1858, and contains the results of the author's observations for some years, in Donegal, the Mourne and Newry Mountains, Cornwall, and Fermanagh, with deductions from theory.

The author establishes the existence in Waterford of a Primary Conjugate System of Joints, and of two Secondary Conjugate Systems, lying at each side of the Primary at angles of $27^{\circ}5'$ and $37^{\circ}11'$.

In Donegal there exists a Primary Conjugate System, and a Secondary System, making with the Primary an angle of $32^{\circ} 24'$. In the Mourne and Newry Mountains there is a Primary Conjugate System, and two Secondary Systems at each side of the Primary, making angles of $31^{\circ} 46'$ and $30^{\circ} 56'$. In Cornwall there is a Primary and also a Secondary Conjugate System, making an angle of $27^{\circ} 28'$. And in Fermanagh there are Primary and Secondary Systems, forming an angle of $31^{\circ} 1'$.

Having given, in detail, the observations on which the preceding results are founded, the author says:—"Collecting together into one Table the results of the preceding observations, we find the following Table of Primary and Secondary Joints (True Bearings):—

Name.	Waterford.	Donegal.	Mourne.	Cornwall.	Fermanagh.
Primary System (A)	N. of E. $32^{\circ} 26'$	N. of E. $26^{\circ} 16'$	N. of E. $39^{\circ} 40'$	N. of E. $32^{\circ} 34'$	N. of E. $21^{\circ} 30'$
Primary Conjugate (C)	W. of N. $31^{\circ} 37'$	W. of N. $29^{\circ} 35'$	W. of N. $38^{\circ} 31'$	W. of N. $32^{\circ} 55'$	W. of N. $25^{\circ} 48'$
First Secondary (A')	N. of E. $58^{\circ} 11'$	N. of E. $58^{\circ} 40'$	N. of E. $70^{\circ} 40'$	—	N. of E. $54^{\circ} 0'$
Conjugate to First Secondary (C')	W. of N. $60^{\circ} 3'$	—	W. of N. $70^{\circ} 40'$	—	W. of N. $55^{\circ} 20'$
Second Secondary (A'')	S. of E. $5^{\circ} 50'$	—	—	N. of E. $4^{\circ} 0'$	—
Conjugate to Second Secondary (C'')	E. of N. $4^{\circ} 30'$	—	W. of N. $7^{\circ} 35'$	W. of N. $6^{\circ} 30'$	—

The only remarkable agreement as to direction of joints disclosed by the preceding Table is that between Waterford and Cornwall. If we compare together the Primary and Secondary Joints in each locality, we find the following Table of Angles between Primary and Secondary Joints:—

	Waterford.	Donegal.	Mourne.	Cornwall.	Fermanagh.
Between Primary (A, C) and First Secondary (A', C')	$+27^{\circ} 5'$	$+32^{\circ} 24'$	$+31^{\circ} 46'$	—	$+31^{\circ} 1'$
Between Primary (A, C) and Second Secondary (A'', C'')	$-37^{\circ} 11'$	—	$-30^{\circ} 56'$	$-27^{\circ} 28'$	—

This Table discloses a very interesting and unexpected result; viz. that in Waterford, Donegal, Mourne, and Fermanagh, the angle between the Primary and first Secondary Joint-Systems ranges between the narrow limits of $27^{\circ} 5'$ and $32^{\circ} 24'$, and that in Waterford, Mourne, and Cornwall, the angle between the Primary and second Secondary Joint-Systems ranges from $27^{\circ} 28'$ to $37^{\circ} 11'$.

The paper concludes with a brief deduction of the observed laws of Conjugate and Secondary Joints from known mechanical principles.

II. "On the supposed Identity of Biliverdin with Chlorophyll, with remarks on the Constitution of Chlorophyll." By G. G. STOKES, M.A., Sec.R.S. Received February 25, 1864.

I have lately been enabled to examine a specimen, prepared by Professor Harley, of the green substance obtained from the bile, which has been named biliverdin, and which was supposed by Berzelius to be identical with chlorophyll. The latter substance yields with alcohol, ether, chloroform, &c., solutions which are characterized by a peculiar and highly distinctive system of bands of absorption, and by a strong fluorescence of a blood-red colour. In solutions of biliverdin these characters are *wholly wanting*. There is, indeed, a vague minimum of transparency in the red; but it is totally unlike the intensely sharp absorption-band of chlorophyll, nor are the other bands of chlorophyll seen in biliverdin. In fact, no one who is in the habit of using a prism could suppose for a moment that the two were identical; for an observation which can be made in a few seconds, which requires no apparatus beyond a small prism, to be used with the naked eye, and which as a matter of course *would* be made by any chemist working at the subject, had the use of the prism made its way into the chemical world, is sufficient to show that chlorophyll and biliverdin are quite distinct.

I may take this opportunity of mentioning that I have been for a good while engaged at intervals with an optico-chemical examination of chlorophyll. I find the chlorophyll of land-plants to be a mixture of four substances, two green and two yellow, all possessing highly distinctive optical properties. The green substances yield solutions exhibiting a strong red fluorescence; the yellow substances do not. The four substances are soluble in the same solvents, and three of them are extremely easily decomposed by acids or even acid salts, such as binoxalate of potash; but by proper treatment each may be obtained in a state of very approximate isolation, so far at least as coloured substances are concerned. The *phyllocyanine* of Fremy* is mainly the product of decomposition by acids of one of the green bodies, and is naturally a substance of a nearly neutral tint, showing however extremely sharp bands of absorption in its neutral solutions, but dissolves in certain acids and acid solutions with a green or blue colour. Fremy's *phylloxanthine* differs according to the mode of preparation. When prepared by removing the green bodies by hydrate of alumina and a little water, it is mainly one of the yellow bodies; but when prepared by hydrochloric acid and ether, it is mainly a mixture of the same yellow body (partly, it may be, decomposed) with the product of decomposition by acids of the second green body. As the mode of preparation of *phylloxanthine*

* Comptes Rendus, tom. l. p. 405.