order \((n-2)\), and which the author considers to be also important in reference to the general theory of binary quantities: viz. if 
\[
YU = \Pi(x, y, z)^n, \quad DU = (Xd_x + Yd_y + Zd_z)U, \quad \text{and} \quad Y, DY \text{ are what}
\]
\(U, DU\) become when \((x, y, z)\) and \((X, Y, Z)\) are interchanged; then the equation is of the form 
\[
I \cdot Y + II \cdot DY + III \cdot DU + IV \cdot U = 0.
\]
Taking \((x, y, z)\) as current coordinates and \(U = 0\) as the equation of the curve, then if \((X, Y, Z)\) are the coordinates of a point on the curve, \(Y = 0\), and we have for the equation of the tangent at the point in question 
\[
DY = 0.
\]
The equation shows that the intersections of the curve \(U = 0\) and the tangent \(DY = 0\), lie on one or other of the curves \(III = 0, DU = 0\), and that they do not lie on the curve \(DU = 0\); consequently they lie on the curve \(III = 0\), which is in fact the before-mentioned curve of the order \((n-2)\).

III. "On the Action of Acids on Glycol." By Dr. Maxwell Simpson. Communicated by Dr. Frankland. Received March 24, 1859.

The glycol employed in the following research was prepared according to Dr. Atkinson's excellent method *, to whom is due the credit of having first substituted acetate of potash for acetate of silver in its preparation. He was not the first, however, to prepare it from bromide of ethylene, as M. Wurtz has been in the habit of preparing it from that body for the last two years.

The following slight modification of Dr. Atkinson's method will be found very convenient, particularly when large quantities of glycol are to be prepared. Instead of heating the materials for forming the monoacetate of glycol in a close vessel, they are heated in a large balloon, connected with a Liebig's condenser in such a manner as to cause the condensed vapours to flow back into the balloon.

* Philosophical Magazine, Dec. 1858.
filtered, and evaporated on a water-bath to the consistence of a syrup, gives on cooling a white solid mass, which is the body in question. This was pressed between folds of blotting-paper, dried in vacuum over sulphuric acid, and analysed. The numbers obtained on analysis lead to the formula

\[
\begin{align*}
C_4H_5O_2 & \quad S_2O_4 \quad O\_g \\
Ba & 
\end{align*}
\]

as will be seen from the following percentage Table:

<table>
<thead>
<tr>
<th></th>
<th>Theory.</th>
<th>Experiment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>C_4</td>
<td>24·00</td>
<td>11·45</td>
</tr>
<tr>
<td>H_5</td>
<td>5·00</td>
<td>2·40</td>
</tr>
<tr>
<td>S_2O_6</td>
<td>80·00</td>
<td>38·15</td>
</tr>
<tr>
<td>BaO</td>
<td>76·50</td>
<td>36·51</td>
</tr>
<tr>
<td>O_3</td>
<td>24·00</td>
<td>11·49</td>
</tr>
<tr>
<td></td>
<td>209·5</td>
<td>109·00</td>
</tr>
</tbody>
</table>

The formation of this compound may be thus explained:

\[
\begin{align*}
C_4H_5O_2 & \quad S_2O_4 \quad O\_g \\
Ba & 
\end{align*}
\]

On neutralizing this compound with carbonate of baryta, the basic hydrogen is replaced by one atom of barium. I propose to call this salt sulphoglycolate of baryta. It is analogous in composition to the sulphoglycerate of baryta obtained by M. Pelouze. This salt does not readily crystallize. It is almost insoluble in ether and in absolute alcohol, but freely soluble in water. It is somewhat deliquescent. Exposure to the temperature of 100° Cent. causes slight decomposition. From its solution in water, sulphuric acid precipitates sulphate of barytes. Baryta-water occasions no precipitate, at least in the cold; on heating, however, for some time, it becomes turbid, from the separation of the same salt.

Action of Hydrochloric and Acetic Acids on Glycol—Chloracetine of Glycol.—A mixture of equivalent quantities of glycol and glacial acetic acid was introduced into a long tube and saturated with dry hydrochloric acid. The tube was then hermetically sealed, and exposed to the temperature of a water-bath for about four hours. On

* Chromate of lead was employed in this analysis.
opening the tube and adding water to its contents, a heavy oil separated, which was well washed with the water, in order to remove any acetic acid or undecomposed glycol it might contain, dried over chloride of calcium, and distilled. Almost the entire quantity passed over between 144° and 146°. Specimens obtained at different times gave the following numbers on analysis, which lead to the formula

\[
\begin{align*}
\text{Cl} & \quad \text{C}_4\text{H}_4\text{O}_2 \quad \text{O}_2, \\
\text{C}_8 & \quad 48.00 \quad 39.18 \quad 38.96 \quad 38.98 \\
\text{H}_7 & \quad 7.00 \quad 5.71 \quad 6.05 \quad 5.99 \\
\text{O}_4 & \quad 32.00 \quad 26.14 \\
\text{Cl} & \quad 35.50 \quad 28.97 \quad 27.48^* \\
122.50 & \quad 100.00
\end{align*}
\]

I propose to call this body chloracetine of glycol. It is the intermediate compound between Dutch liquid and diacetate of glycol. Its formation may be thus explained:

\[
\text{Cl}_2\text{H}_4\text{O}_2 + \text{O}_2 + \text{C}_4\text{H}_4\text{O}_2 \quad \text{O}_2 + 4\text{H}_2\text{O} = \text{C}_4\text{H}_4\text{O}_2 \text{Cl}_2 \quad \text{O}_2 + 4\text{H}_2\text{O}.
\]

Chloracetine of glycol is a colourless liquid, heavier than water, its specific gravity being 1.1783 at 0° Cent. It boils at 145°, distilling without decomposition. It is not decomposed by cold water, at least not to any great extent; even boiling water effects its decomposition with difficulty. Heated with potash, it gives chloride of potassium and acetate of potash. It is probable that the ether of glycol is also formed in this reaction, or perhaps glycol itself. This point I have not yet been able to determine. Chloracetine is isomeric with a compound I obtained a short time ago, by exposing ordinary aldehyde to the action of chloride of acetylene (C_4H_4O_2Cl). This body differs from the chloracetine in its boiling-point, which is about 23 degrees lower, and in being more readily decomposed both by water and potash. The products formed by the action of potash also establish a difference between these bodies. Both give chloride of potassium and acetate of potash, but the body from aldehyde gives, in addition, resin of aldehyde; whereas from chloracetine no resin

* A slight loss occurred in this analysis.
† Comptes Rendus, 29 Nov. 1858.
could be obtained. Chloracetine has since been prepared by M. Lorenzo in a manner analogous to that by which I prepared its isomer, namely, by treating glycol with chloride of acetyle. These compounds find their places in two very remarkable series of isomeric bodies, proceeding from ethylene (olefiant gas) and ethylidine (C₄H₄?), supposed to be contained in the chloride of ethylidine derived from aldehyde. The following is a list of these compounds:

<table>
<thead>
<tr>
<th>Ethylidine.</th>
<th>Ethylene (olefiant gas).</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₄H₄ (?)</td>
<td>C₄H₄</td>
</tr>
</tbody>
</table>

Aldehyde . . C₄H₄O₂ C₄H₄O₂ Oxide of ethylene. Ether of glycol (Wurtz).

Chloride of ethylidine . . C₄H₄Cl₂ C₄H₄Cl₂ Dutch liquid.

Geuther . . C₄H₃O₂Cl C₄H₃O₂Cl Diacetate of glycol (Wurtz).

Chloracetine of ethylidine (Simpson) . . C₄H₄C₅Cl₂ C₄H₄C₅Cl₂ Chlor-acetine of glycol (Simpson).

(Wurtz and Frapolli) . . C₄H₄Cl C₄H₄Cl Not yet discovered.

Acetal (Döbereiner) (C₄H₅)₂O₄ (C₄H₅)₂O₄ Diethyl-glycol (Wurtz).

I am still studying the action of acids on glycol, and hope soon to be able to communicate further results. The foregoing experiments were performed in M. Wurtz's laboratory.

The Society then adjourned over the Easter recess to Thursday, May 5.