As soon as a quantity of the latter can be prepared, I hope to isolate the acid.

Salts of the oxides of barium, magnesium, strontium, silver, zinc, manganese, and chromium have been prepared by the direct action of bisulphide of carbon. Some of these differ considerably from the salts prepared by Berzelius by the action of the bisulphide of carbon upon the sulphides of the metals. The process which furnishes the lime-salt well crystallized will be tried with other compounds, and the results submitted to the Society.

A very offensive suffocating gas is evolved during the decomposition of bisulphide of carbon by lime, which is injurious, if not poisonous; and having suffered severely from breathing this and other noxious compounds derived from the same source, I think it right to call attention to it. I have formed a gas of similar properties by passing bisulphide of carbon and hydrogen together through heated lime, and should not be surprised if it prove to be the long-sought simple sulphide of carbon.

Slightly ammoniacal alcohol breathed from a cloth appears to be the best restorative for the severe depression caused by respiring the offensive gases and vapours above named.

XX. "On the Geometrical Isomorphism of Crystals." By the Rev. W. Mitchell. Communicated by Dr. Frankland. Received June 12, 1862.

In a paper "On the Geometrical Isomorphism of Crystals," published in the Philosophical Transactions for 1857, by H. J. Brooke, F.R.S., it was shown that all the substances crystallizing in the various forms of the pyramidal and rhombohedral systems might be regarded to be as isomorphous as those belonging to the cubical system.

This isomorphism was shown by so taking the arbitrary primitive pyramid of the one system, or the rhomboid of the other, as to bring these forms nearly isomorphous for every substance in the one system or the other. In this way tables were formed showing that the same notation for any form would be not strictly isomorphous, but plesiomorphous for any other form of another substance bearing the same notation.

It is the object of the present paper to show that not only the forms of the pyramidal and rhombohedral systems, but also those of the prismatic, are as strictly isomorphous as those of the cubical system. This is effected by demonstrating all the forms of these three systems to be but partial developments of the cubical system. Consequently every form can be indicated by the symbols of the cubical system. In other words, instead of having distinct axes and parameters for each system, and for every substance in that system, all are referred to the rectangular axes and equal parameters of the cubical system.

The pyramidal system is regarded as a tritohedral development of the cubical system, the faces so developed being all symmetrically taken with respect to one of the cubical axes. Thus, adopting the notation for the cubical system in the last edition of Phillips's 'Mineralogy,' the two faces of the cube $0\,0\,1$ and $0\,0\,\bar{1}$ will form the basal pinacoids, while the remaining faces $1\,0\,0$, $0\,1\,0$, $\bar{1}\,0\,0$, and $0\,\bar{1}\,0$ will give the direct square prism.

The faces of the rhombic dodecahedron $1\,1\,0$, $\bar{1}\,1\,0$, $\bar{1}\,\bar{1}\,0$, and $1\,\bar{1}\,0$ will give those of the inverse square prism.

There will be two groups of square pyramids derived from the four-faced cubes, the first in the development of the faces indicated by the symbols

$$\begin{array}{llll} k\,0\,h, & 0\,k\,h, & \bar{k}\,0\,h, & 0\,\bar{k}\,h \\ k\,0\,\bar{h}, & 0\,k\,\bar{h}, & \bar{k}\,0\,\bar{h}, & 0\,\bar{k}\,\bar{h}; \end{array}$$

the second by

$$\begin{array}{llll} h\,0\,k, & 0\,h\,k, & \bar{h}\,0\,k, & 0\,\bar{h}\,k \\ h\,0\,\bar{k}, & 0\,h\,\bar{k}, & \bar{h}\,0\,\bar{k}, & 0\,\bar{h}\,\bar{k}; \end{array}$$

the poles of both of these forms always lying in the zone $0\,0\,1$, $1\,0\,0$.

The remaining eight faces of the four-faced cube, when developed symmetrically with respect to the cubic axes, viz.

$$h\,k\,0,\quad k\,h\,0,\quad \bar{k}\,h\,0,\quad \bar{h}\,k\,0,\quad \bar{h}\,\bar{k}\,0,\quad \bar{k}\,\bar{h}\,0,\quad k\,\bar{h}\,0, \text{ and } h\,k\,0,$$

give the octagonal prism.

The inverse square pyramids are derived from the tritohedral development of the faces of the twenty-four-faced trapezohedron and

three-faced octahedron,—the one group being derived from the faces

$$k\,k\,h,\quad \bar{k}\,k\,h,\quad \bar{k}\,\bar{k}\,h,\quad k\,\bar{k}\,h$$
$$k\,k\,\bar{h},\quad \bar{k}\,k\,\bar{h},\quad \bar{k}\,\bar{k}\,\bar{h},\quad k\,\bar{k}\,\bar{h},$$

the other from

$$h\,h\,k,\quad \bar{h}\,h\,k,\quad \bar{h}\,\bar{h}\,k,\quad h\,\bar{h}\,k$$
$$h\,h\,\bar{k},\quad \bar{h}\,h\,\bar{k},\quad \bar{h}\,\bar{h}\,\bar{k},\quad h\,\bar{h}\,\bar{k}.$$

The tritohedral development of the form $h\,k\,l$ gives the ditetragonal pyramid; of these there are three groups.

1st. $k\,l\,h,\quad l\,k\,h,\quad \bar{l}\,k\,h,\quad \bar{k}\,l\,h,\quad \bar{k}\,\bar{l}\,h,\quad \bar{l}\,\bar{k}\,h,\quad l\,\bar{k}\,h,\quad k\,\bar{l}\,h$
$k\,l\,\bar{h},\quad l\,k\,\bar{h},\quad \bar{l}\,k\,\bar{h},\quad \bar{k}\,l\,\bar{h},\quad \bar{k}\,\bar{l}\,\bar{h},\quad \bar{l}\,\bar{k}\,\bar{h},\quad l\,\bar{k}\,\bar{h},\quad k\,\bar{l}\,\bar{h}.$

2nd. $h\,l\,k,\quad l\,h\,k,\quad \bar{l}\,h\,k,\quad \bar{h}\,l\,k,\quad \bar{h}\,\bar{l}\,k,\quad \bar{l}\,\bar{h}\,k,\quad l\,\bar{h}\,k,\quad h\,l\,k$
$h\,l\,\bar{k},\quad l\,h\,\bar{k},\quad \bar{l}\,h\,\bar{k},\quad \bar{h}\,l\,\bar{k},\quad \bar{h}\,\bar{l}\,\bar{k},\quad \bar{l}\,\bar{h}\,\bar{k},\quad l\,\bar{h}\,\bar{k},\quad h\,\bar{l}\,\bar{k}.$

3rd. $h\,k\,l,\quad k\,h\,l,\quad \bar{k}\,h\,l,\quad \bar{h}\,k\,l,\quad \bar{h}\,\bar{k}\,l,\quad \bar{k}\,\bar{h}\,l,\quad k\,\bar{h}\,l,\quad h\,\bar{k}\,l$
$h\,k\,\bar{l},\quad k\,h\,\bar{l},\quad \bar{k}\,h\,\bar{l},\quad \bar{h}\,k\,\bar{l},\quad \bar{h}\,\bar{k}\,\bar{l},\quad \bar{k}\,\bar{h}\,\bar{l},\quad k\,\bar{h}\,\bar{l},\quad h\,\bar{k}\,\bar{l}.$

Ditetragonal pyramids may also be developed from the faces of the forms $h\,h\,k$ and $k\,k\,h$, whose poles lie in the zones $0\,1\,1$, $1\,0\,0$, and $1\,0\,1$, $0\,1\,0$.

The forms of the hexagonal system are regarded as tetartohedral developments of the cubical system, the groups of faces being always taken symmetrically with respect to the diagonal of the cube or one of the octahedral axes.

The two faces of the octahedron $1\,1\,1$ and $\bar{1}\,\bar{1}\,\bar{1}$ thus form the basal pinacoids.

The six faces of the rhombic dodecahedron

$$1\,0\,\bar{1},\quad 0\,1\,\bar{1},\quad \bar{1}\,1\,0,\quad \bar{1}\,0\,1,\quad 0\,\bar{1}\,1,\quad \text{and}\quad 1\,\bar{1}\,0$$

give one hexagonal prism, while the other is derived from six faces of the twenty-four-faced trapezohedron, whose symbols are

$$2\,\bar{1}\,\bar{1},\quad 1\,1\,\bar{2},\quad \bar{1}\,2\,\bar{1},\quad \bar{2}\,1\,1,\quad \bar{1}\,\bar{1}\,2,\quad 1\,\bar{2}\,1.$$

The dihexagonal prisms are derived from those faces of the form $h\,k\,l$ which lie in the zone $1\,0\,\bar{1}$, $2\,\bar{1}\,\bar{1}$.

There are three groups of positive rhomboids, two derived from the three-faced octahedron, and one from the twenty-four-faced trapezohedron.

The following are the symbols of these groups :—

$$\begin{array}{lll}
h\,h\,k, & k\,h\,h, & h\,k\,h \\
\bar{h}\,\bar{h}\,k, & \bar{k}\,\bar{h}\,\bar{h}, & \bar{h}\,\bar{k}\,\bar{h} \\
 & & \\
h\,h\,\bar{k}, & \bar{k}\,h\,h, & h\,\bar{k}\,h \\
\bar{h}\,\bar{h}\,k, & k\,\bar{h}\,\bar{h}, & \bar{h}\,k\,\bar{h} \\
 & & \\
k\,k\,\bar{h}, & \bar{h}\,k\,k, & k\,\bar{h}\,k \\
\bar{k}\,\bar{k}\,h, & h\,\bar{k}\,\bar{k}, & \bar{k}\,h\,\bar{k}.
\end{array}$$

The last group is restricted to those forms of $k\,k\,h$ whose poles lie between those of $1\,1\,\bar{1}$ and $1\,1\,\bar{2}$, &c.

The direct rhomboids are all derived from the form $h\,k\,k$, and consist of two groups,

$$\begin{array}{lll}
h\,k\,k, & k\,h\,k, & k\,k\,h \\
\bar{h}\,\bar{k}\,\bar{k}, & \bar{k}\,\bar{h}\,\bar{k}, & \bar{k}\,\bar{k}\,\bar{h},
\end{array}$$

and

$$\begin{array}{lll}
h\,\bar{k}\,\bar{k}, & \bar{k}\,h\,\bar{k}, & \bar{k}\,\bar{k}\,h \\
\bar{h}\,k\,k, & k\,\bar{h}\,k, & k\,k\,\bar{h}.
\end{array}$$

The form $h\,k\,l$ furnishes four groups of hexagonal scalenohedrons.

$$\begin{array}{rllllll}
\text{1st.} & h\,k\,l, & h\,l\,k, & k\,l\,h, & l\,k\,h, & l\,h\,k, & k\,h\,l \\
 & \bar{h}\,\bar{k}\,\bar{l}, & \bar{h}\,\bar{l}\,\bar{k}, & \bar{k}\,\bar{l}\,\bar{h}, & \bar{l}\,\bar{k}\,\bar{h}, & \bar{l}\,\bar{h}\,\bar{k}, & \bar{k}\,\bar{h}\,\bar{l}. \\
 & & & & & & \\
\text{2nd.} & h\,k\,\bar{l}, & h\,\bar{l}\,k, & k\,\bar{l}\,h, & \bar{l}\,k\,h, & \bar{l}\,h\,k, & k\,h\,\bar{l} \\
 & \bar{h}\,\bar{k}\,l, & \bar{h}\,l\,\bar{k}, & \bar{k}\,l\,\bar{h}, & l\,\bar{k}\,\bar{h}, & l\,\bar{h}\,\bar{k}, & \bar{k}\,\bar{h}\,l. \\
 & & & & & & \\
\text{3rd.} & h\,l\,\bar{k}, & h\,\bar{k}\,l, & l\,\bar{k}\,h, & \bar{k}\,l\,h, & \bar{k}\,h\,l, & l\,h\,\bar{k} \\
 & \bar{h}\,\bar{l}\,k, & \bar{h}\,k\,\bar{l}, & \bar{l}\,k\,\bar{h}, & k\,\bar{l}\,\bar{h}, & k\,\bar{h}\,\bar{l}, & \bar{l}\,\bar{h}\,k. \\
 & & & & & & \\
\text{4th.} & h\,\bar{l}\,\bar{k}, & h\,\bar{k}\,\bar{l}, & \bar{l}\,\bar{k}\,h, & \bar{k}\,\bar{l}\,h, & \bar{k}\,h\,\bar{l}, & \bar{l}\,h\,\bar{k} \\
 & \bar{h}\,l\,k, & \bar{h}\,k\,l, & l\,k\,\bar{h}, & k\,l\,\bar{h}, & k\,\bar{h}\,l, & l\,\bar{h}\,k.
\end{array}$$

The forms of the prismatic system are then shown to be formed by an analogous development of faces about the rhombic axes; making two of the faces of the rhombic dodecahedron the basal pinacoids.

In examining the Tables accompanying the paper, in which all the known faces of crystals are expressed in the notation of the cubical system, it will be seen that the indices are necessarily somewhat large.

This inconvenience is more than compensated for by the fact that the angular elements of every face, and its relation to another face, can at once be calculated from the symbols of the faces by very easy formulæ. The magnitude of the indices are also shown to be much diminished by using approximations bringing every pole to its place on the sphere of projection within 5 or 6 minutes—an approximation not greater than that constantly used to make observations tally with the calculated symbols.

XXI. "On the Forces concerned in producing the larger Magnetic Disturbances." By Balfour Stewart, Esq., M.A., F.R.S. Received June 14, 1862.

(Abstract).

The author begins by alluding to a previous communication made to the Royal Society, containing an account of the great magnetic storm of August 28–September 7, 1859, in which he had shown that the first effect of this great disturbance was to diminish in intensity both components of the earth's magnetic force at Kew, during a period of about six hours. Such an effect, he argues, can scarcely be supposed due to any combination of earth-currents, of which the period is only a few minutes.

But another appearance is noticeable on the photographic curves which regard the progress of this great disturbance.

While the great wave of force had a period of about six hours, there were superimposed upon it smaller disturbances having a period of a few minutes, and therefore comparable in this respect with earth-currents.

These smaller disturbances are of very frequent occurrence, and show themselves in the Kew magnetograph curves as serrated appearances, occasionally magnified into peaks and hollows.

Two hypotheses may be entertained regarding them.

1st. They may be conceived to represent small and rapid changes in the intensity of the whole disturbing force which acts upon the magnet; and since (as stated above) this force cannot be supposed due to earth-currents, so neither can its variations be caused by these.

2nd. The peaks and hollows may be supposed due to the direct action of earth-currents upon the magnets.