ther evidence, the opinion he formerly advanced; that as bisulphate of potash is a double sulphate of water and potash, and therefore neutral in its composition, so, with the sole exception of the anormal class already noticed, all salts, usually considered as bisalts are, in like manner, really neutral in composition. He shows that this theory is strictly applicable to the red chromate of potash, which appeared to present a difficulty.

The chlorides are next considered. The law followed by the chlorides of the magnesian class of metals appears to be that they have two atoms of water strongly attached to them, and which may, therefore, be regarded as constitutional. Thus, chloride of copper crystallizes with two atoms of water, and with no lower proportion; but several chlorides of this class have two or four atoms more; the proportion of water advancing by multiples of two atoms. The chlorides have probably their analogues in the cyanides, although we are less acquainted with the single cyanides of iron, copper, &c.: but the disposition of the protocyanide of iron, and of the cyanide of copper to combine with two atoms of cyanide of potassium, may depend on the cyanides of iron and of copper possessing, like the corresponding chlorides, two atoms of constitutional water, which are displaced by two atoms of the alkaline cyanide in the formation of the double cyanides.

December 15, 1836.

WILLIAM LAWRENCE, Esq., V.P., in the Chair.

Thomas Graham, Esq., M.A., was elected a Fellow of the Society.

A paper was read, entitled, "Further Observations on the Optical Phenomena of Crystals." By Henry Fox Talbot, Esq., F.R.S.

The author had described, in a former paper, the remarkable circular mode of crystallization frequently occurring from a solution of borax in phosphoric acid, and producing, when examined by the polarising microscope, the appearance of a black cross, with four sectors of light, and occasionally coloured rings, upon each crystal. In the present memoir, he describes some deviations from the usual forms of crystalline circles; the most striking varieties consisting in the cross being itself highly coloured, instead of black, upon a white ground. The author shows that these crystals consist of boracic acid alone, resulting from the decomposition of the borax by the phosphoric acid. He gives an explanation of the optical appearances they present on the hypothesis of their being constituted by an aggregate of acicular crystals, radiating from a central point; and the whole circle being of variable thickness at different distances from its centre, and acting with great energy on polarised light. Other modes of crystalline formation, dependent chiefly on the pre-

sence or absence of combined water, are next described. These sometimes produce crystals composed of two opposite sectors of a circle, united at the centre; at other times, they exhibit irregular elongated shapes, having a stem, either subdivided at both extremities into minute diverging fibres, or abruptly truncated; and occasionally they present regular geometric forms: but, whatever be their shape, they undergo, in general, spontaneous changes in the course of one or two days after they have been formed.

The author then notices a property belonging to some crystals, similar to that possessed by the tourmaline, of analysing polarized light; for which reason he denominates them *analytic crystals*. As an example, he mentions those obtained by dissolving sulphate of chromium and potash in tartaric acid by the aid of heat. A drop of this solution, placed on a plate of glass, soon yields, by evaporation, filmy crystals, which frequently have this property. The plumose crystals of boracic acid, when crystallized from a solution of borax in phosphoric acid, also possess this analytic power, and present very beautiful appearances when viewed with the polarizing microscope. Another instance occurs in the oxalate of potash and chromium, a salt whose optical properties have been investigated by Sir David Brewster. If gum arabic be added to a solution of this salt, and a drop of it be put between two plates of glass, a very beautiful arborescent, but microscopic crystallization takes place, composing a multitude of minute prisms, growing, as if by a species of vegetation, and variously arranged in sprigs and branchlets, often resembling in miniature, the tufts of marine confervæ. A similar plumose appearance, accompanied with the same analytic properties, is obtained from the evaporation of a drop of a mixed solution of nitre and gum arabic. This analytic effect is shown to be the consequence of the high degree of doubly refractive power possessed by these crystalline filaments, and which exists even in those whose diameter is evanescent on microscopic examination. The author entertains hopes that it will be possible to obtain large and permanent artificial crystals, which may possess the advantages of the tourmaline, without the inconvenience resulting from its dark colour.

December 22, 1836.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair.

William Page Wood, Esq., was elected a Fellow of the Society.

"First Memoir on the Theory of Analytical Operations." By the Rev. Robert Murphy, M.A., F.R.S., Fellow of Caius College, Cambridge.

The author considers the elements of which every distinct analytical process is composed, as of three kinds; the first, being the *sub-*