12. A plate of copper with an edging of wax was placed on the electro-magnet in the same manner as the glass plate; over it a very weak solution of nitrate of silver was quickly poured; the plate immediately blackened from the decomposition of the silver salt by the copper. In about a minute the finely divided silver arranged itself into curves, as represented in fig. 8, which were after a few minutes again destroyed. By using a sheet of chemically-pure copper, obtained by electrotype deposit, I found a permanent impression of these curves could be obtained, owing to the oxidation of the copper along the spaces, which the finely divided silver, when distributed in curve-lines, did not cover.

13. A plate of hard copper, such as is used by engravers, was placed in precisely the same circumstances, and covered with a tolerably strong solution of nitrate of silver. It was left in contact with the electro-magnet for a night. On washing off the deposit of silver which covered it, it was found that the acid of the silver salt had bitten deeply into the plate over an oval space around the poles, leaving a small space between them quite bright. The copper over this etched space was covered with an immense number of minute holes; and beyond this the oxidation of the surface had proceeded in curved lines, as represented in fig. 9. We thus have permanent evidence of the influence of magnetic force in determining chemical action.

14. Into one of the glass troughs before named, placed on the electro-magnet, a weak solution of nitrate of silver was poured, and into this an equally weak solution of sulphate of iron. In about five minutes precipitation of silver commenced; this precipitate arranged itself over the glass in curves proceeding from and around the poles in the same manner as it distributed itself over the copper plate. In a short time, precipitation increasing, two curious curved spaces were formed by the fine deposit, proceeding from one pole towards the other in opposite directions, increasing in width as they proceeded, until they were abruptly checked at a little distance from the poles towards which they were directed; these spaces being very distinct from the first formed curved lines. Fig. 10 represents this very interesting arrangement.

These experiments are sufficient to show that magnetism exerts a powerful influence on molecular arrangements, and that it regulates the direction of crystaline formations. I hope to be enabled to pursue this interesting inquiry still further; it has most important bearings on many of the great phænomena of nature, and I am therefore anxious thus early in my inquiry to call attention to the singular and conclusive results which I have obtained.

6 Craig's Court, Dec. 10, 1845.

On the Solubility of Oxide of Lead in Pure Water. By Lieut. Col. Philip Yorke.

In the Philosophical Magazine for August, 1834, I published a paper on the action of water and air on lead. Some of the principal results contained in it were confirmed by Bonsdorff in two papers; he found that 7000 parts of pure water free from access of carbonic acid dissolved one of oxide of lead; my experiments gave $\frac{1}{12,000}$th to $\frac{1}{10,000}$th. Since that time, two papers have appeared on the same subject, one by Dr. Christison,* and one by Mr. R. Phillips, Jr.† The last-named chemist considers that the oxide of lead is not dissolved, but merely mechanically suspended in the water, because the liquid is deprived of the lead by passing it through a paper filter. It is to this opinion that I propose to direct attention in the present notice.

The fact that the aqueous solution of oxide of lead would not pass through a filter was noticed by me in the paper already referred to; but as the action of tests on the liquid was just what one observes with solutions; as no time allowed for subsidence made any difference in these appearances; as the liquid deposited crystals of oxide of lead not only on the lead but on other bodies; as when decomposed by the voltaic battery it gave metallic lead at the negative pole, and peroxide at the positive; I did not consider that the stoppage of the oxide of lead by the filter was any proof of its not being dissolved. There still, however, remains this question to be answered,—In what way does the paper act in retaining the oxide? and I think that the following experiments afford an answer to the question.

I placed some clean rods of lead in bottles of distilled water loosely stopped; in this way, after removing the rods of lead, I obtained a clear liquid, which, when tested by sulphuretted hydrogen, gave a deep brown color. On passing this liquid through a double filter, which had been previously washed with hot distilled water, it appeared to be very nearly deprived of lead: when two or three fluid ounces had passed through, the filters were removed, washed, then immersed in a solution of sulphuretted hydrogen, again washed and dried. Some torn fragments of the filters were then mounted in Canada balsam for examination by the microscope. On examination with powers of from 150 to 400, the fibres of the flax composing the paper were seen to be browned, and in many instances it could be distinctly observed that the coloring substance occupied the interior of the tubular fibre. Now, it is stated by Mr. Crum, in the Philosophical Magazine for April 1844, that cotton wool possesses the power of abstracting the oxide of lead from its solution in lime-water, and that this property is made available in the processes for dying cotton with the chromates. I found that on filtering a solution of oxide of lead in lime water through a triple filter, that whereas the original solution gave a deep black when tested by sulphuretted hydrogen, the filtered liquid gave but a pale brown; and it required that the unfiltered liquid should be diluted with thirty times its volume of water to produce the same tint as the filtered.

I then tried the effect of mere immersion of the paper in the aqueous solutions before used. A bit of filtering-paper ten inches by two inches was boiled in distilled water and then put into an ounce phial filled with the aqueous solution; after remaining six hours the liquid

*Transactions of the Royal Society of Edinburgh.
†Pharmaceutical Journal for December, 1844.

was poured off and tested: it gave a pale brown, and it required that the liquid which had not been in contact with the paper should be diluted with ten times its volume of water to produce the same tint. This experiment was repeated with a stronger solution of oxide of lead in water, the water was poured off at the end of four hours, it then gave a pale brown, and it required that the original liquid should be diluted with four times its bulk of water to produce the same tint. A fresh portion of the same solution was then poured on the same paper and left for a night; then, on testing, the liquid gave a brown tint, barely perceptible, and it required that the original liquid should be diluted with from fifteen to twenty times its volume of water to produce the same.

From these experiments it is clear that the effect in question is dependent on a power possessed by the paper in common with several other porous bodies and organized fibres, of separating certain substances from their solutions, a power sufficiently well known, though little understood.* In considering this view of the subject in the present instance, there is a circumstance of some practical importance which it would appear ought to follow, viz. that after the fibres of the paper had been saturated with the oxide of lead, then this substance should pass through in solution. To ascertain whether this was the case I made the following experiments.

I obtained a strong aqueous solution of oxide of lead by immersing slips of clean lead in about three quarts of distilled water, contained in a two-necked bottle, through which oxygen gas was passed and maintained in contact with it, under a slight pressure. In this manner I procured a solution which when quite clear yielded $\frac{1}{7500}$th of ignited oxide of lead. A filter of paper rather less than $\frac{1}{200}$th of an inch thick and four inches in diameter was prepared and washed; then, by fitting into one of the two necks of the bottle a siphon with equal legs, so as to resemble Gay-Lussac's apparatus for washing filters (except that I used a contrivance to prevent the necessity of the air supplied to the bottle from bubbling through the solution), I was enabled to allow the filtration to go on with considerable regularity for many hours. The first portion of liquid which passed through gave a pale brown when tested; when nine fluid ounces had passed through the effect was the same as at first, and a portion (*a*) was reserved for future comparison. When forty fluid ounces had passed through, the liquid, which was quite clean, gave a much darker tint with the test than any which had previously been obtained in the experiment. It gave a tint about equal to that given with the unfiltered liquid when diluted with its own volume of water; while it (*i. e.* the last filtered portion) required to be diluted with twice its volume of water to produce the same tint as that given by the reserved filtered portion (*a*). The liquid now passed through the filter very slowly; it was tested

* The effective filter mentioned in Dr. Clark's Notice, page 384, is formed of well-washed sand, and has been in use during twelve months without any apparent diminution of power.

again, when eight more fluid ounces had passed through, with the same result as before, except that the tint was a trifle darker.

This experiment sufficiently shows that the effect contemplated does occur, and that it would be unsafe to trust to the action of a filter to separate oxide of lead from water for an unlimited time.

Proc. Chem. Soc.

New Process for Silvering Glass.

Sir,—Having made several attempts to silver glass by the process described in your Magazine, vol. xlii. p. 408, being the process described by Professor Faraday; and as many persons might be desirous of performing these experiments, which are exceedingly interesting and beautiful, and require very nice manipulation, I will describe a model which I adopted with complete success, and seldom failed in the attempt. Add to wood naptha an equal quantity of distilled water, until the naptha becomes cloudy; into this mixture put a few drops of the silver solution mentioned below, (I am supposing the vessel to be an ounce phial,) and heat the mixture in a hot-water bath. In a few days the solution will become brown; filter, and then put in a few more drops of the silver solution. Finally, put in a few drops of oil of cassia and oil of cloves; a very small quantity only is required.

In a short time the bottle containing the mixture will become of a beautiful dark purple color, and ultimately become perfectly white. A few drops more of the two oils will make more silver precipitate. The silver solution is prepared as follows:—Dissolve nitrate of silver in distilled water; pour in a small quantity of spirits of hartshorn (not the strong caustic ammonia) until a small precipitate takes place; immerse the bottle containing the mixture in warm water, and the precipitate will redissolve, and become clear. Lond. Mec. Mag.

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

On the Manufacture of Artificial Ultramarine in Germany. By M. C. P. Prückner, Manufacturing Chemist, at Hoff, Bavaria.

(Extract from Erdman's Journal de Chinie Pratique.)

MM. Guimet and Robiquet were the first who manufactured artificial ultramarine on a large scale for the wants of commerce; in 1830, Levercus established a manufactory in the envirous of Cologne, and in 1841, MM. Leykauf, Heine & Co., also established one at Nuremberg; this is now the property of MM. Zeltner and Heine, who produce ultramarine of every different quality and price.

The process of MM. Leykauf and Heine has never been published, but the information afforded me by these gentlemen as well as the researches to which it has given rise, has induced me to give an idea of the process in the hope of throwing some light upon this branch of science.