flowers the property of becoming yellow when in contact with alkalies may be *luteoline*.

If the petals of white roses be boiled with distilled water, and a little carbonate of soda and sulphate of copper be added to the decoction, as is done with the decoction of woad, a liquid is obtained possessing a bright golden-yellow colour which may be employed in dyeing yellow. This liquid will give a fine yellow tint to linen and cotton fabrics, and nearly all white flowers will furnish similar results. I have dyed pieces of linen and cotton with decoctions of white roses, of the flowers of *Spiræa filipendula, Philadelphus coronaria* and *Galium Mollugo.*

The matter to which white flowers are indebted for this property of acquiring a yellow colour under the influence of alkalies, dissolves readily in water, still more so in alcohol, but less in æther. When the superficial layer of the petals of flowers which have been coloured yellow by ammonia is removed, all the cells are seen to be filled with a yellow fluid, in which no granules are to be perceived.

DARK RED FLOWERS.—With boiling water or alcohol, the flowers of the wild poppy furnish a violet-red solution. This acquires a fine scarlet colour by the action of acids, even when very weak. If ammonia be poured into the liquid thus acidulated, it becomes of a fine violet colour, without the least mixture of green. But if, instead of adding ammonia to the acidulated liquid, it is added directly to the infusion, this acquires a dirty greenish-red tint. When the flowers themselves are exposed to the action of ammonia, they acquire a fine violet color, like that obtained with the acidulated fluid The colouring matter of the poppy therefore differs greatly from the cyanine of M.M. Fremy and Cloez, for alkalies do not give it a green colour.

The flowers of *Pelargonium zonale* also become of a fine violet colour under the influence of ammonia: their colouring matter behaves like that of the poppy. The dark red garden verbena gives a violet-red tint to alcohol. The alcoholic solution, treated with ammonia, acquires a vinous colour with a slight greenish tint. If the alcoholic infusion of these flowers be digested with a little dry powdered hydrate of alumina, the latter acquires a light yellow colour, and the supernatant fluid becomes of a fine red colour under the influence of acids, and of a blue without the least mixture of green by the action of bases. The verbena consequently contains two distinct matters, of which one becomes blue under the influence of bases, whilst the other becomes yellow; it is to the mixture of these two matters that the green colour of the alcoholic tincture of these flowers is due.

The petals of *Anemone hortensis* act like those of the verbena. The flowers of the red pæony become of a pure blue colour under the influence of ammonia. These flowers are rapidly deprived of colour by alcohol; the tincture which they furnish is but slightly coloured, but it becomes of a deep and bright red by the addition of the smallest trace of acid. The acidulated liquid becomes blue with ammonia, whilst the non-acidulated alcoholic solution acquires a greenish tint. The petals of dark red roses become blue when exposed to ammoniacal vapours, but the colour soon passes to a greenish-blue. Alcohol readily dissolves the colouring matter of roses, but acquires very little colour. The slightest addition of acid communicates a deep red color to the alcoholic solution; ammonia poured into the acidulated liquid changes it to a greenish blue.

ROSE-COLOURED FLOWERS.—These flowers contain a mixture of two juices, of which one is colourless in acid liquids, whilst the other is red. The former becomes yellow when mixed with alkalies, the second becomes blue, and the mixture of these latter colours produces a green tint. Hence the tints which will be acquired by red or rose-coloured flowers, when exposed to the action of ammoniacal vapours, may be easily indicated beforehand. It is clear that the green colour will approach yellow more and more in proportion to the paleness of the rose, and that it will have a blue tendency in proportion as the colour becomes deeper.

BLUE FLOWERS.—The preceding statements regarding red and rose-coloured flowers applies also to blue flowers. The green colour produced in blue flowers by the action of watery ammonia tends more and more to yellow in proportion to the paleness of the flower.

EFFECTS OF THE MIXTURE OF THE WHITE AND COLORED JUICES OF FLOWERS.—When flowers of iris, of violets, pæonies, of *Cercis siliquastrum*, &c., are infused in alcohol, one is struck with the weakness of tint of the alcoholic solution, even when the petals are completely deprived of colour. It appears natural, at first sight, to attribute this decoloration to the influence of the alcohol, which may act as a reducing agent, but a close examination of the facts does not permit us to rest satisfied with this explanation; and without denying that alcohol may exercise the influence attributed to it by M M. Fremy and Cloez, I think that the following theory, either alone or combined with that just referred to, may readily account for the circumstances in question. In fact, if, instead of treating the above-mentioned flowers with alcohol, they are infused in boiling water, the watery solution is not more deeply coloured than the alcoholic tincture. It would be necessary therefore to admit that water itself is a reducing agent, which is by no means probable.

If into these solutions, whether watery or alcoholic, the smallest quantity of a soluble acid be poured, they instantly acquire a bright red colour, far deeper in tint than the original liquid. The kind of acid is quite immaterial, for even sulphurous acid immediately brightens the shade, and reproduces the colour which was only concealed. The prolonged action of this acid however soon destroys the colour. Can it be imagined that the colouring matter would reappear immediately upon the addition of *any* acid, if it had been reduced? and especially on this hypothesis, can we account for the action of sulphurous acid? I think not.

In my opinion, the decoloration is due to the mixture of the juice contained in the colourless cells with that of the coloured cells. When alcohol or boiling water acts upon a flower, its organization is destroyed, the juices contained in its cells become mixed, and the colouring matter disappears. The following experiment lends support to this explanation.

If two equal volumes of a slightly acidulated infusion, either watery or alcoholic, of pæony flowers be diluted, the one with four times its volume of water, the other with four times its volume of an infusion of white flowers, it will be seen that the latter will retain much less color than the former.

The white juices consequently destroy, or rather dissemble the colouring matter. The question now arises whether these juices act as reducing bodies, or whether they simply form colorless combinations. The experiments to which I have referred above may, I think, serve to answer this question; for if reduction takes place, sulphurous acid would not reproduce the colour. I consider therefore that the colouring matter does not experience any reduction, and that it forms with the elements of the colourless juices or a colourless combination. In infusions prepared by the action of alcohol or water upon flowers, one portion of the colouring matter remains free, whilst the other enters into the combination just mentioned. It is easy to separate the coloured portion from the colourless, by triturating the liquid with a little artificial phosphate of lime or dry hydrate of alumina; the coloured part is the first to fix upon the solid body, whilst that of which the colour is dissembled remains for the most part dissolved. If the liquid be filtered, it passes without colour. It may then be colored red by acid, and green or blue by an alkaline solution.—*Comptes Rendus*, July 24, 1854, p. 194.

On the Discovery of Microscopic Shells in the Lower Silurian Rocks.*

BY PROF. EHRENBERG.

(Communicated by Mr. Leonard Horner.)

The minute grains of greensand, which are characteristic of many rocks, have a different nature from the green earth often met with in concretionary masses. The former, from the *glauconie* of the Paris *calcaire grossier* to the azoic green sand, near Petersburgh, appears to consist of green opalescent casts of Polythalamia, composed of a hydrosilicate of iron. The cretaceous greensands of England contain unmistakeably, these stony casts In the *calcaire grossier* and nummulite limestones occur beautifully preserved and perfect examples of Quinqueloculina, Rotalia, Textularia, Grammostoma and Alveolina. In the Lower Silurian greensand casts of detached cells of Textularia and Nodosaria were found. Prof. Forbes said, that Mr. Sorby had discovered Foraminifera in the Aymestry limestone; but as some of the beds with green grains were of freshwater origin, it was almost impossible that all greensand should be derived from this source. Prof. Sedgwick pointed out instances in which the green colour was due to particles of chlorite.—Sir R. I. Murchison stated, that the whole group of Lower Silurian strata existed near Petersburgh, though only 1,000 feet thick. the upper part, representing the Bala limestone,

* British Association.