



## On the employment of a silvered glass as a camera lucida

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*Middle Carboniferous Group.*

Stage E.	Lower Coal-measures or Gannister Beds	} Essentially marine.
„ D.	Millstone-Grit series	
„ C.	Yoredale series	

*Lower Carboniferous Group.*

Stage B.	Carboniferous Limestone series	} Essentially ma- rine (except in Scotland).
„ A.	Lower shales, slates, Carboniferous and Calciferosus Sandstone series	

The author then proceeded to show, by reference to the writings of Dr. F. Römer of Breslau, of M. De Koninck, M. Charles Barrois, &c., that stage E with its marine fauna, is represented both in Germany, Belgium, and France, as well as in the British islands, so that the classification would hold good over Western Europe, which was a sufficiently extensive area to justify the establishment of a distinct group of strata.

2. "On Coal-pebbles and their Derivation." By H. K. Jordan, Esq., F.G.S.

In this paper the author endeavoured to explain the mode of production of pebbles of coal in the clays and sandstones of the South-Wales Coal-field and elsewhere, the occurrence of which had been long since noticed by Sir William Logan and Sir Henry De la Beche. His opinion is that the pebbles in question are derived either from the seam of coal above which they are found, or from a seam of coal which formerly existed in the same, or approximately in the same position, and which has been destroyed by erosion, the effect of strong currents of water, which distributed the grains of sand and other materials upon the coal-seam.

LXXIII. *Intelligence and Miscellaneous Articles.*

ON THE EMPLOYMENT OF A SILVERED GLASS AS A CAMERA  
LUCIDA. BY A. TERQUEM.

EVERY one knows how fatiguing is the prolonged use of the camera lucidæ usually employed for drawing objects in relief or microscopic objects. Nevertheless this apparatus is very convenient when we wish to reproduce the outline of objects of which the perspective is difficult to obtain directly, such as certain physical apparatus: photography cannot always be employed, when the sketch is not to reproduce integrally the object itself with all its details.

I have found that, for the usual camera lucida with either one or two reflections, a glass semi-silvered by Foucault and Martin's process can be substituted with great advantage. For this purpose it is sufficient to leave the glass in the silver bath from one to two minutes at the most, according to the strength of the reducing agent and, especially, according to the external temperature, the influence of which on the reduction of silver is considerable.

I have made use of a simple plate of glass having a breadth of 1 decimetre and a length of 1·5. Semi-silvered glass has great reflecting-power, and yet remains very transparent; it presents merely a slight brown shade.

It is known that M. Foucault advised the investing with this semi-silvering the objectives of telescopes for viewing the sun, in order to arrest nearly the whole of the rays of obscure heat\*.

When the glass is silvered, washed, and dried, the silver (which might be removed by the slightest friction) is fixed by coating the glass with a transparent varnish. For this purpose it is heated to about 40°, and the following varnish is poured upon the silvered face:—alcohol, 100 cubic centims.; mastic tears, 10 grams. The thin film of resin which adheres is very transparent and has a very even surface. The reflecting-power of the glass is slightly diminished, but is still sufficient. The silvered surface could be covered with another glass plate; but this would give rise to multiple reflection, which is avoided by using the varnish.

The glass is then fixed, when the varnish is dry, by one of its edges, in a nipper fitted to a foot, permitting various inclinations to the horizontal to be given to the glass; if the object to be drawn is vertical, the angle of 45° should evidently be preferred. The paper on which the drawing is to be made is fixed beneath. It is indispensable that above the glass a sight-piece be placed, to give the eye a perfectly fixed position. If the object has a strong relief, the images of the various parts are formed at different distances behind the glass, and the perspective changes with the position of the eye; it is the same with the coincidence of the points on the paper and the different parts of the image to be drawn. The sight-piece consists simply of a small slip of blackened cardboard pierced with a small aperture; this can be supported by the apparatus which sustains the glass.

If the illumination of the object, placed at a suitable height and distance before the inclined glass, be in a certain correspondence with that of the drawing-paper, the image of the object, the pencil, and even the line of the drawing as it is being executed can all be seen at the same time without any fatigue. The conditions of the illumination can be easily realized by the aid of screens or shutters.

The advantage of this camera lucida over that generally used arises from the reflection taking place over a large surface, which gives more intensity, and especially from the circumstance that the simultaneous visibility of the pencil and the image is independent of the position of the eye of the observer, depending only on certain conditions of illumination which can be easily regulated before commencing the execution of the drawing. It would be easy, by taking two parallel glass plates, one semi-silvered and the other having received a thick coat of silver, to make a camera lucida that

\* The same arrangement would be very advantageously employed in photographic enlarging-apparatus, where the solar heat sometimes cracks the plates.

could be fitted to microscopes, and more convenient than those at present employed.

NOTE ON THE SENSATION OF COLOUR. BY C. S. PEIRCE.

It may, perhaps, be worth while to notice a few consequences of three theories concerning colour which are usually regarded with some favour.

*First Hypothesis.*—The appearance of every mixture of lights depends solely on the appearances of the constituents, without distinction of their physical constitution. This I believe is established.

*Second Hypothesis.*—Every sensation of light is compounded of not more than three independent sensations, which do not influence one another. This is Young's theory. It follows that, if we denote the units of the three elementary sensations by  $i$ ,  $j$ , and  $k$ , every sensation of light may be represented by an expression of the form

$$Xi + Yj + Zk.$$

*Third hypothesis.*—The intensity of a sensation is proportional to the logarithm of the strength of the excitation, the barely perceptible excitation being taken as of unit strength. Negative logarithms are to be taken as *zero*. This is Fechner's law. It is known to be approximately (and only approximately) true for the sensation of light. From this it follows that, if  $x$ ,  $y$ ,  $z$  be the relative proportions of a mixture of three lights giving the elementary sensations  $i$ ,  $j$ ,  $k$ , the sensation produced by the mixture is

$$I \log x . i + J \log y . j + K \log z . k,$$

where  $I$ ,  $J$ ,  $K$ , are three constants.

From these principles it follows that, if a light giving any sensation such as that just written have its intensity increased in any ratio  $r$ , the resulting sensation will be

$$\begin{aligned} & I \log rx . i + J \log ry . j + K \log rz . k \\ &= I \log x . i + J \log y . j + K \log z . k + \log r (I i + J j + K k). \end{aligned}$$

Thus the result of increasing the brilliancy of any light must be to add to the sensation a variable amount of a constant sensation,  $I i + J j + K k$ ; and all very bright light will tend toward the same colour, which may therefore be called the *colour of brightness*. Moreover, if the three primary colours be mixed in the proportions in which each by itself is just perceptible, the sensation produced will be

$$\log r (I i + J j + K k),$$

and can only differ by more or less.

Now I find in fact that all colours are yellower when brighter. If two continuous rectangular spaces be illuminated with the same homogeneous light, uniformly over each, but unequally in the two, they will appear of different colours.