

the one which had appeared well defined on the ground glass was confused on the Daguerreotype plate, and *vice versa*. This was sufficient to prove to me the cause of the difficulty I had been laboring under, viz. that the visual focus was not coinciding with the photogenic focus. But the most surprising feature of that discovery was that the photogenic focus was larger than the visual focus; at first consideration it should have been shorter, as the rays operating in photography are the most refrangible, although I could not at first understand the cause of that anomaly; it was sufficient to me to know that in order to have a well defined Daguerreotype picture, I had only to set the focus on the ground glass for an object nearer the camera, at the distance indicated by the various screens. In continuing my experiment, I found some lenses in which the photogenic focus was shorter, and some others in which the two foci were coinciding.\*

I communicated a paper on this subject to the Royal Society, and to the Academie des Sciences, in May, 1844; and from that time photographers have been able to find the true photogenic focus of their camera, and opticians, who at first denied the fact, at last have studied and considered the question, trying to construct lenses in which the two foci could agree.

M. Lerebour, of Paris, was the first who, on my suggestion, examined the subject, and he soon published a paper to the Academie des Sciences, in which he explained the cause of the difference. He stated that by altering the proportions between the angles inscribed in the curves either of the crown or flint glass, he could render at will the photogenic focus longer or shorter than the visual focus, and by the same means

could bring them to the same point. There is no question that M. Lerebour was right, as far as the result, referred to the chromatic correction, but if, according to the density of the two glasses, certain curvatures are required to correct the spherical aberration, these curvatures cannot be altered with impunity, only for the purpose of changing the direction of the most refrangible rays. For this reason I have always preferred lenses in which the spherical aberration is the most perfectly corrected, without caring if the photogenic rays are, or not, coinciding with the visual rays, having the means of ascertaining how I could obtain on my Daguerreotype plate the best defined image. In fact, from my own observations that the red, orange and yellow rays are antagonistic to the photogenic rays, that the last rays have a greater power when the former are proportionately less abundant; I am of opinion that when the photogenic rays are only condensed on the plate, and that the others are disposed on the spaces more or less distant from the photogenic points, the action is more rapid; rapidity being the principal object in photography, I prefer lenses in which the two foci are separated, although the operation is a little more difficult, and requires considerable care.

The question of the photogenic focus is involved in another kind of mystery, which requires some attention. I have found that with the same lenses there exists a constant variation in the distance between the two foci; they are sometimes more or less separated: in some lights they are very distant, and in some others they are very near and even coincide. For this reason I constantly try their position before I operate. I have not yet been able to discover the cause of that singular phenomenon, but I can state positively that it exists. At first I thought that variations in the density of the atmosphere might produce the alteration in the distance between the two foci, or that, when the yellow rays were more or less abundant, the usual rays were refracted on different

\* Mr. Tonson, of Davenport, was the first to call attention to the fact, that the luminous and chemical focus of ordinary lenses did not correspond. Phil. Mag., vol. 15, page 381. Mr. Claudet was certainly the first to observe the fact with achromatic lenses.—R. H.