

## **The correlation of cranial and oculobulbar conformations / C. M. Culver.**

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THE CORRELATION  
BULBAR

C. M. CULVER

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## THE CORRELATION OF CRANIAL AND OCULO- BULBAR CONFORMATIONS.

C. M. CULVER, M.A., M.D., ALBANY, N. Y.

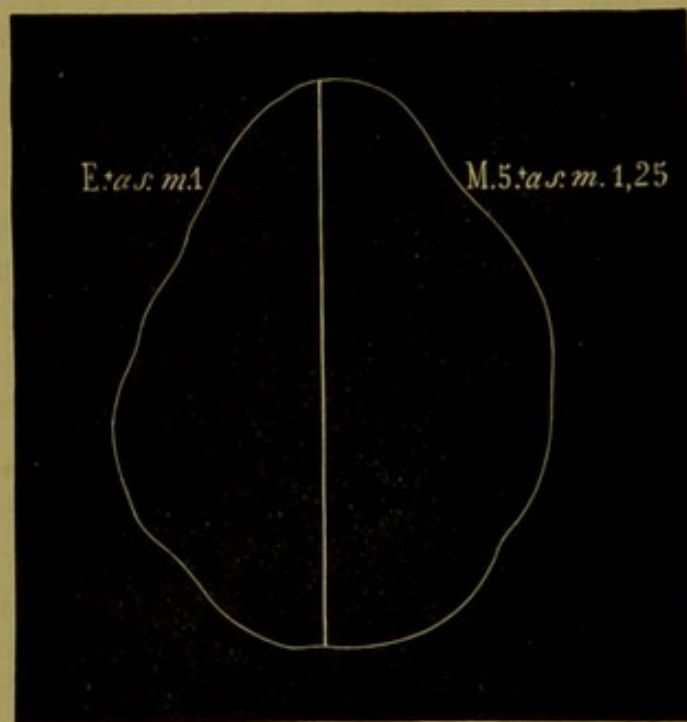
*(With two wood-cuts.)*

THIS correlation has been somewhat discussed. No definite law concerning it has, to my knowledge, been formulated. If there were a uniform similarity between the shape of a cranium and of the eyeballs it contains, it seems as if the most natural one would be between the ratios of the transverse and longitudinal (or antero-posterior) diameters of the spheroids in question. If such a correlation existed it might be practically utilized. The static, refractive power of an eyeball is conditioned by the ratio of its transverse and longitudinal diameters. If the long eye were usually in a long skull, the oculist might find it of aid to him to use a pair of outside calipers, primarily, with them making measurements of the patient's head; and then, applying the law, know something about the kind and degree of ametropia to be found in that case. On page 299, of Landolt's work on "Refraction and Accommodation," the author gives a figure, which is here reproduced, representing the cranial conformation of O—S—, the left side of whose skull was undeveloped, while the other half was like that of the average adult. As affecting the making of a rule, of the kind above suggested, this figure seems to me to have a double significance, its parts being somewhat contradictory. O—S— had the face and cranium of an infant, on one side, while face and cranium were developed so as to be in correspondence with his adult

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age, on the other side. A myopic eye is longer, antero-posteriorly, relatively to its transverse diameter, than a hyperopic or emmetropic eye. This preponderance of length over width was characteristic of the left half of the cranium of O—S—. But myopia was not at all present in the horizontal meridian of the left eye in that skull, and there was but one dioptre of myopia in its vertical meridian. Hence the relation seems to have been lacking in this case. But it has been assumed that hyperopia is comparable with the optical condition of an eye which is incompletely devel-



oped. O—S— was not hyperopic in either eye; but his left eye was less affected by myopia, and the left side of his cranium was the one presenting imperfect development. Hence, whatever similarity may be expected to exist between a non-myopic eye and the corresponding lack of development of the side of the cranium containing it, is to be found in the case under consideration.

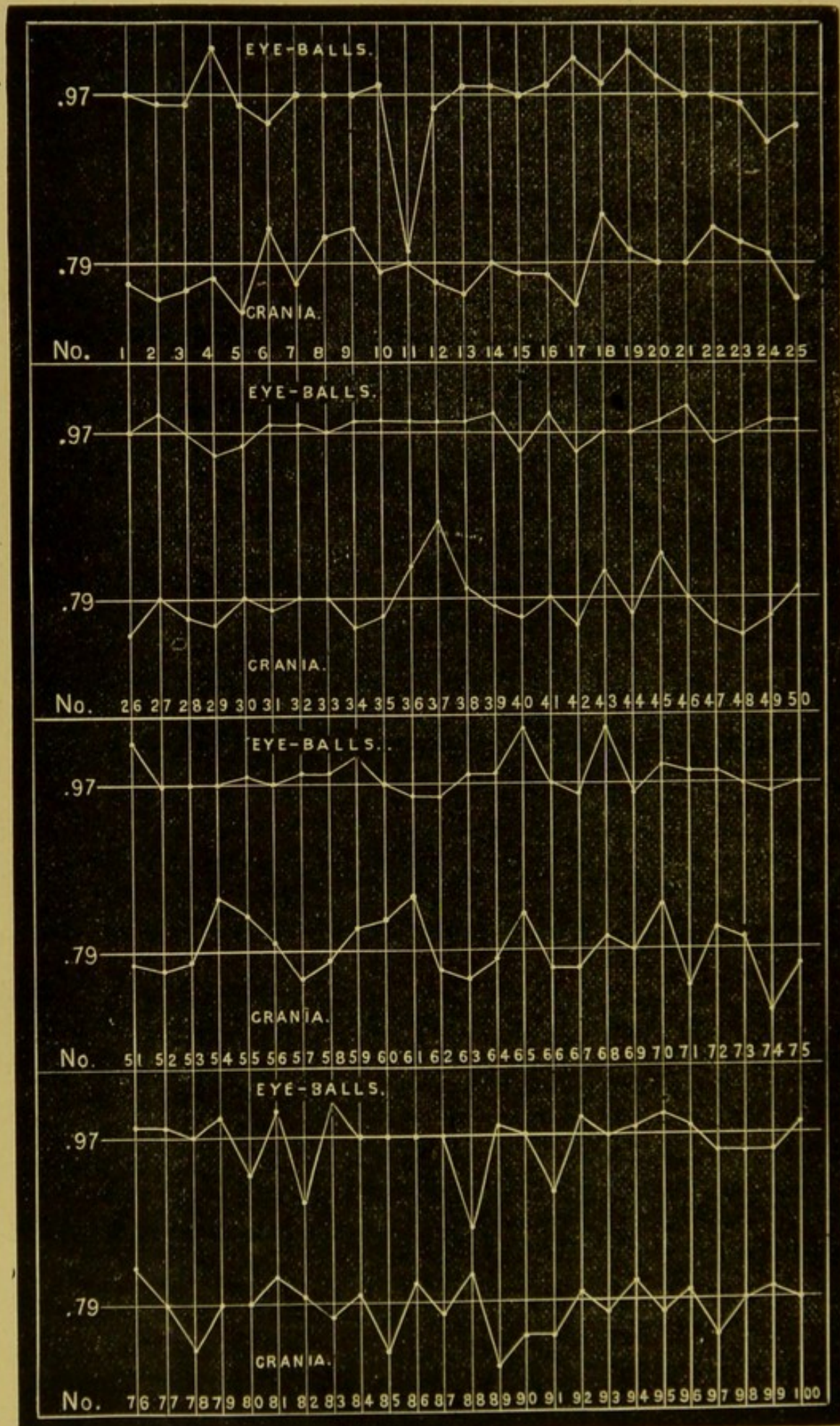
With a view to investigating this matter, to determine, if possible, if a uniform correlation of the ratios in question exists, I bought what hatters term a *conformateur* (mine being of the kind made by Allié, of Paris). With it the crania of some hundreds of my patients were measured.

From appropriate experiments I adopted 0.79 as the ratio of the transverse to the antero-posterior diameter of the average skull. From the classical works of Merkel<sup>1</sup> and Noyes,<sup>2</sup> 0.97 was adopted as the ratio of the similar diameters of the emmetropic eye. Then, in the case of each patient whose skull was measured, the diameters of the eyeballs were estimated according to the *data* to be found on pages 58 and 62 of the first edition of Dr. Noyes' work, just cited. After having arranged several pages of figures in columns, I thought that such a presentation of the ratios would not be striking. Hence they were reduced to the graphic form shown in the annexed plate. Only one hundred cases were used, at first, from which to estimate ratios, because of the facility of calculating percentages from that number. Accordingly, the plate shows only one hundred cases. Many more records are preserved, making their use possible should it be demanded by interest in the topic. In these cases there seems to be no correspondence between the degrees of variation, of the tracings, from the normals.

Among the measurements not represented in those herewith presented, are those of two successive cases, in one of which the patient's myopia amounted to twenty-eight dioptries, while the other's hyperopia was of six dioptries. The length of the myope's head, from before backward, was one millimetre less than that of the hyperope, while the transverse diameter of the myope's skull was by one millimetre greater than the corresponding diameter of the hyperope's, the ratios being, therefore, directly opposite to what might be expected, if a myope were to have a specially long, and a hyperope a specially wide, skull. In corresponding with Landolt concerning these cases, he writes that the cases are worthy of note, adding: "But you will find still more marked differences, and those in the same sense. Hence I say, in my work, that the rule requiring that the larger eye shall be in the larger half of the cranium, is subject to many exceptions, and that the influence exercised by the

<sup>1</sup> Merkel, "Handbuch der Topographischen Anatomie," page 282.

<sup>2</sup> Noyes, "Diseases of the Eye," pages 2, 58, and 62, first edition; pages 2, 89, and 90, 1890 edition.



skeleton on the development of the eye, is not immediate, but rather indirect."

However, it seems that any relation between cranial and oculo-bulbar conformations (especially any that is to be of sufficient utility to make us care to be acquainted with it) ought to be most readily susceptible of expression in terms of ratios of the transverse and longitudinal diameters.

Professor Ripton, of Union College, has earned my gratitude, which I wish now to express, by reviewing the figures, from which the accompanying diagram was made. He pronounced them correct.

My conclusion, from this investigation, is that, if there exist any correlation between the ratios of the transverse and longitudinal axes of a cranium and the eyeballs it contains, it is not direct or practically useful.

