Letter from the Embryo

From the Corner of My Eye

By Konrad Obermeier, Basic Rolfing® Instructor

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ABSTRACT *This is article is a discussion of embryological development of the face and in particular the space for the eyes. The face starts out pinched between the tissue becoming the brain and the tissue becoming the heart, Konrad Obermeier examines the role of fluid dynamics as part of the forces shaping the face.*

The face is a dynamic event between the glabella and the hyoid. Squeezed short and wide, the early face folds up horizontally. The face is situated in a compressed area in between the relentlessly expanding hemispheres of the brain from above, and a massive, pulsating heart manifestation from below (see Figure 1). The developmental movement of the embryo is composed of *differentiation* and *growth.* Beginning with the mysterious achievement of implantation, the fluidic metabolic field of the embryo begins to expand and encompass a continuously increasing volume of circulating fluids. With the greater volume of fluids comes a correlative increase in fluidic pressure. This early circulatory system is organized by metabolic gradients and oriented by the potential of growth. This system initiates an increase in blood pressure and manifests the necessary, metabolic *premovement* that inevitably precedes the development of the heart (see Figure 2).

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Figure 1: Original form of the face (Embryo,16 mm – week 6). All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Munich).

This means that the heart itself develops as an answer to increasing fluid volume and rising blood pressure. Fascinatingly, in apparent response to the rising fluid pressure in the field, the nascent heart begins to throb with a rhythmic muscular contraction. This movement only appears to initiate and maintain circulation by 'pumping' blood through the vessels. Seen in a biodynamic perspective, it is the other way around: the circulatory system already functions perfectly before the heart exists. It is worthwhile here to recall that the circulatory system of the embryo includes the placenta. The latter emerges from embryonic cells and is engaged in mediating between the metabolic gradients of the maternal and embryonic systems. If you intend to insist that the heart is a 'pump', keep in mind that the heart has to serve the placenta as well, not just the embryo itself (see Figure 3). And then do the math while respecting the laws of fluid dynamics. In a biodynamic perspective the heart adds rhythm to the already active metabolic movements, an apparently indispensable necessity for all organisms approaching elaborate complexity and a critical size.

In this early stage of embryonic development, one of the primary functions of the heart is to supply the rapidly expanding brain with nutrition. Actually, the heart forms as a response to the metabolic needs of the brain. The developing brain demands and successfully attracts massive amounts of nutrients and displays a correlative increase in volume. How and where can this volume manifest? Together with the blood vessels, the first cranial nerves (V and VII) are beginning to anchor the face to the brain anteriorly. This implies that the posterior/ superior space offers the least amount of resistance to cranial expansion (see Figures 4 and 5). As a sidenote for anyone who wishes to understand the architecture of the cranial sutures: visualize the area of the face as the dynamic fulcrum for an expanding cranium. When the still-fibrous capsule of the brain morphs into individual (desmal) bones, then the expanding brain is lawfully pushing (by force of increasing fluid pressure) the tectonic plates of these cranial bones apart. The predominant direction of forces inevitably will be posterior/superior. The locally forming sutures reflect this primary direction of growth.

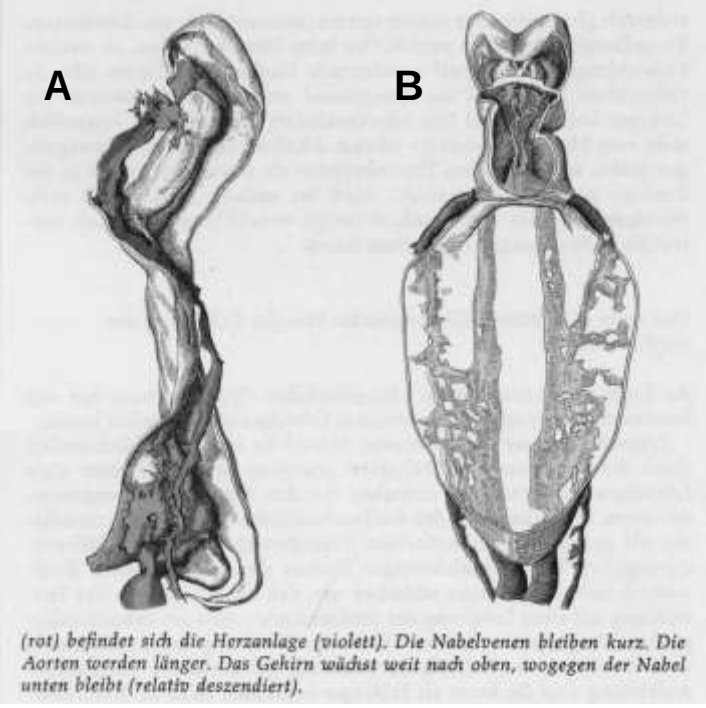

Figure 2: Vessels of the circulatory system (A - lateral view; B - frontal view), prior to the developmental manifestation of the heart. All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Munich).

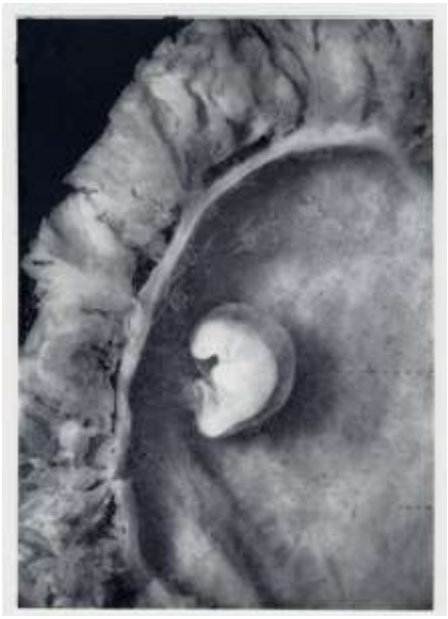

Figure 3: Embryo, 3.4mm, (wrapped in the membrane of the amnion) floating in the huge chorionic cavity. The enormous placenta (left and on top) is an integrated part of the circulatory system of the embryo. All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Munich).

Figure 4: Embryo, lateral view, 11.4mm, week 6. The face is squeezed between the expanding brain and pulsating heart, the eyes are still in a lateral position. Rapidly expanding brain posterior/ superior. All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Munich).

One compressional region that results from the rapidly expanding brain forms a horizontal furrow between the forehead and the nose. As a result, fluids are squeezed out of this horizontal strand of tissues. This area of compression differentiates into the *interorbital ligament,* which stabilizes the as of yet laterally-positioned eyes towards the midline and towards each other. It is important to emphasize that ligaments are nonelastic. Because of this, they restrain and limit movement. The *interorbital ligament* firmly binds the eyes together in their medial aspect. In the larger context of a posteriorly-expanding cranium, the eyes maintain a relatively stable, actively restrained position, bound as they are to each other in the anterior cranium. As the capsule of the brain keeps expanding, this ligament creates an increasing resistance and the skin covering the region of the eyes yields under this pull, and then finally breaks open, forming the lateral folds of the eyelids: "Let there be light!" The interorbital ligament does not act on the surface only but also limits the potential of the developmental movement

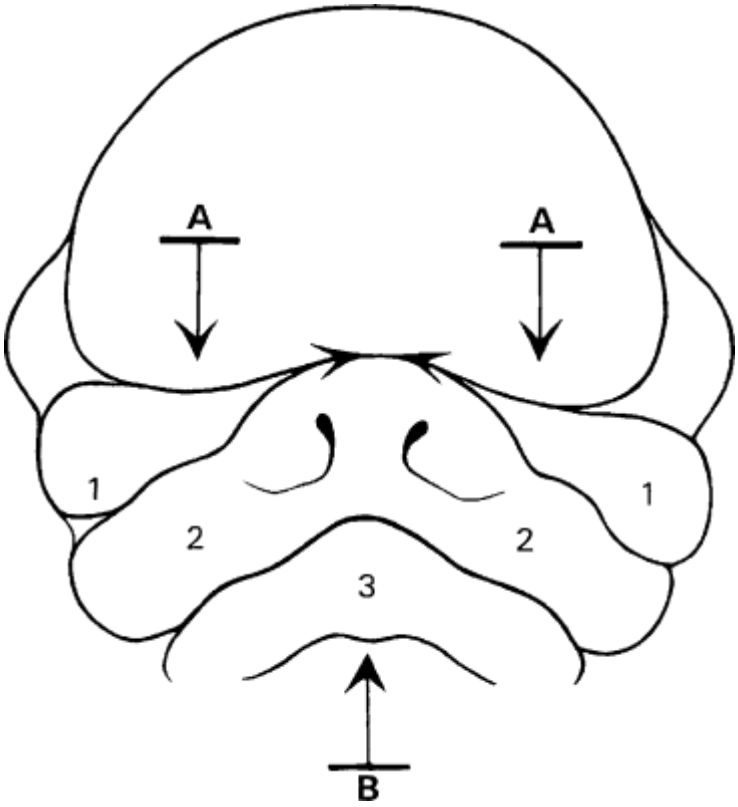

Figure 5: A – Expanding hemispheres; B – Expanding heart; 1 – Eye region; 2 – Naso-zygomatic region; 3 – Mandibular region; Arrows A & B - Pressure direction; Double arrow - Interorbital ligament. All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Muni

Figure 6: Embryo, 18.2mm, end of week 6; massively expanding capsule of brain; eyes starting to 'migrate' into the frontal plane. All images are originals from different publications by Dr. Erich Blechschmidt, used with permission. Specifically see Studies in Biodynamic Embryology (Kiener Verlag, Munich).

of the three-dimensional space in which the eyes are forming (see Figure 6).

With a globally expanding cranial capsule, this relatively 'silent' anterior area in which the eye development transpires ends up in the frontal plane. From their originally lateral position, the eyes are gradually migrating forward as a result of the interaction between the growing brain and the local resistance of the interorbital ligament. The eyes are relocated passively from a lateral position towards the place, where there is a perspective, a point of view, for the potentially focal eyes of a predator.

Author's Note: *If you wish to learn more about the embryo, and in particular, the developmental movement of the face, see:* Studies in Biodynamic Embryology, *Kiener Verlag, Munich, 2020.*

Konrad Obermeier holds a degree in communications from the University of Munich and has been a Rolfer since 1991. Currently, he serves as chair of the anatomy faculty for the European Rolfing® Association. He is the editor of a series of books on the biodynamic embryology of Erich Blechschmidt.