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PRENATAL DEVELOPMENT OF THE FACE AND AIRWAY

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Biomechanical embryology offers insights into the normal development of the human face and respiratory structures that are unsurpassed for clarity and clinical relevance. By providing a spatiotemporal framework for the early growth-movements of the cells and cellular ensembles that contribute to facial and respiratory anatomy, biomechanics can complement other approaches to human ontogeny, such as studies in molecular biology and evolution. Errors, such as Haeckel's "law" (that ontogeny recapitulates phylogeny), or the idea that human pharyngeal folds are somehow related to the gills (branchia) of fishes, can be avoided. The presentation will concentrate on the development of respiratory components of the middle third of the face, larynx, and thorax. The development of the brain and heart play definite biomechanical roles in the formation of cranial respiratory components: it will be shown that no single respiratory structure can be understood in isolation, but only as an element in a whole, growing, moving embryo. It will also be shown: (i) that new structures and organs arise in a conceptus as a consequence of the reaction of cellular metabolism to otherwise disruptive influences (from both external environment and the growth of the conceptus itself), (ii) that these reactions in metabolism cause further growth-movements that lead to the formation of new structures and organs, (iii) that there is no need to invoke the notion of independent cell "migration" to account for the massive displacements of cells that occur in embryological development, (iv) that all adult functions must be preceded by normal growth-movements, and (v) that frequently there is a reversal between the embryological growth function and the normal adult function. The embryo (as a part of the conceptus) is a dynamic system of mobile equilibrium: some aspects of the embryo's behaviour are shared by the dynamic physicochemical equilibrium systems described by Le Châtelier in 1884.