

what scene in the evolutionary mental drama of ancestral life does infant life correspond? The mere statement of such questions suffices to show that no application to infant education, and still less to the education of the embryo (I use the term "education" as implying any deliberate attempt to influence the growth of an organism), can at present be made of any such doctrine of parallelism of mental development between child and race, even were such a doctrine known independently to be true.

But, although observation and experiment have, as yet, supplied altogether insufficient data for trustworthy induction regarding so early a period of the human life, valuable conclusions may, I believe, be drawn respecting mental development during later years, which, while in no wise based on the validity of the parallelism in question, have been inspired by this analogy, and themselves in turn contribute independent support to its truth, while simultaneously indicating certain limitations to which it is subject. My inquiries have been directed to the bearings upon the education of the individual *qua* mathematical, of the genesis of geometrical science by the race. My aim is to exhibit a parallelism between the actual mode of evolution of geometrical knowledge in the race, from the earliest times at which we have authentic historical information, and that by which the school youth can most readily and efficiently assimilate this experience. It is to be specially remarked that I make no attempts to prove—what, indeed, I hold to be obviously incapable of proof—the existence of a necessary parallelism between the racial and individual development of geometrical knowledge. Nor am I here concerned with the very interesting question of the almost automatic genesis of space-perceptions in the first years of infancy. What I hope to do is something quite different,

viz., to show that, for educational purpose, the most effective presentation of geometry to youth, both as regards matter and spirit, is that which, in main outlines, follows the order of the historical evolution of the science.

A brief outline is desirable of the order in which I propose to deal with the inquiry. First, I epitomize (with such fulness of detail as I deem necessary for the avoidance of possible misunderstanding in the use of philosophical terms) the history of geometry from its existence as an empirical art amongst the Egyptians to its final development as a science by the Greeks, with definitions, axioms, theorems, and all the logical paraphernalia incident to a perfect science. The first part of the inquiry will be dealt with from two points of view—the order of development of the *matter* of geometrical knowledge, and, of equal importance, the *spirit* in which, at each stage, it was cultivated. In conclusion, I briefly appeal to modern educational experience to establish the doctrine I advocated above.

The earliest authentic knowledge we have of the state of geometrical knowledge before the Greeks applied their subtle intellects to its advancement is obtained from an ancient Egyptian papyrus, known as the Rhind Collection, in the British Museum, which has been deciphered only within the present generation. The date of this MS. has been variously estimated from 1700 to 1100 B.C. It is thought to be an epitome of all the mathematical knowledge at that time possessed by the Egyptians, in the persons of their priests. What kind of knowledge was this? Simply a set of *empirically discovered rules*.

It is necessary in these inquiries, where a clear mutual understanding of terms is of the first importance, to be quite definite, a result only to be obtained by a sufficiency of detail. What, then, precisely do I mean here