

only in definite modifications. Fishes are nearer the type than mammals and especially man. Naturally therefore the embryos of mammals resemble fishes. If we recognize in the fish merely the slightly developed vertebrate (which is the unfounded assumption) we must interpret the mammal as a highly developed fish, and then of course it is consistent to say that the embryo of a vertebrate is at first a fish. For this reason the prevailing view of the law of individual development necessarily implies a progressive series in the animal kingdom. But the fish is more than an imperfect vertebrate. It has undoubted piscine characters as its development abundantly shows, and this development, as in all animals, is governed by two conditions:

1. By progressive diversification of tissues and of form, accompanied,

2. By the passage from a general, indifferent and indefinite state into a definite and particular one.

OTTO C. GLASER.

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SCIENTIFIC BOOKS.

La géométrie Non-Euclidienne. Par P. BARBARIN. Paris, C. Naud. Scientia, Février. 1902. Phys. Mathématique, No. 15. Pp. 79.

It is peculiarly appropriate that from Bordeaux, made sacred for non-Euclidean geometry by Hoüel, should emanate this beautiful little treatise, decorated with a 'gravure' reproducing part of a manuscript of Euclid, also with the official portrait of Lobachevski, but best of all, with a portrait of Riemann.

It begins from the hackneyed position: 'Experience therefore it is which has furnished to the ancient geometers a certain number of primitive notions, of axioms, or fundamental postulates put by them at the basis of the science.' But now we know there never was any pure receptivity. In all thinking enters a creative element. Every bit of experience is in part created by the subject said to receive it, but really in great part making it.

Professor Barbarin continues: 'From the epoch of Euclid, this number has been reduced to the strict minimum necessary, and all the others not comprised in this list, being capable of demonstration, are put in the class of theorems.' Now we know that Euclid omits to notice many of the assumptions he unconsciously employs, for example all the 'betweenness assumptions,' while Hilbert has at last rigorously demonstrated Euclid's assumption 'All right angles are equal,' and in turn one of Hilbert's assumptions has just been proved (see *Amer. Math. Monthly*, April, 1902, pp. 98-101).

The 'Elements' of Euclid, says Professor Barbarin, enjoyed throughout all the middle ages and still enjoy a celebrity that no other work of science has attained; this celebrity

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