Several years ago, I published an article entitled “The Evolution and Organization of Sentient Biological Behavior Systems” in one of the books edited by Wolfgang Yourgrau. In that article, I presented the rudiments of a theory to account for the “higher behaviors” that I had observed in the primitive flatworm, planaria. Although a variety of subsequent evidence, in addition to that which was available to me at the time, has lent further support for it and I am even more convinced now than then of its essential correctness, it was, I realize with hindsight, a pretty wild theory relative to the prevailing views of the time. Wolfgang exhibited a great deal of courage in acting as editorial midwife for its delivery. In his other role as “pediatrician” of ideas, I hope that he would not be displeased with this sequel describing the further growth of “the child.”

Planarians are probably similar to the first animals to evolve such features as bilateral symmetry, dorso-ventral asymmetry, encephalization, and a true brain in their head. Although planarians such as Dugesia dorotocephala (cf. Fig. 1) are only about 1/5,000,000th the mass of an adult human, their ratio of brain to body weight approximates that of a rat. Their brains, as well as those of their turbellarian relatives, the marine polyclad flatworms, are probably similar to those first evolved approximately a billion years ago.

When I first set out to train planarians in learning tasks over twenty years ago, with preconceptions shaped in terms of notions such as “tropisms,” “taxes,” “kineses” proposed by noted earlier investigators, I was surprised to find that planarians exhibited behaviors more like those expected from higher animals, i.e., more like those of a miniature psychological behavior system than the rigidly reflexive organism depicted in classical descriptions. I termed these behaviors “protopsychological” to
emphasize this similarity to higher animal behavior and the inadequacy of the oversimplified mechanistic descriptions, terminology, and interpretations of these early investigators. Such complex behaviors have also been noted independently by other investigators studying marine polyclad flatworms.\textsuperscript{7}

Various optical, electronmicroscopic, chemical, and physiological studies indicated corresponding similarities in the anatomical, neurochemical, and functional organization of the planarian nervous system, as well as a number of its other physiological systems, to those of higher animals. I suggested that the reason planarians appeared to manifest the behaviors of a miniature psychological behavior system was because their nervous system, in simplified miniature, shared many important features of organization with those of higher animals, that the brains of higher animals had, in their evolution, preserved, and merely enlarged upon, a basic foundation plan of organization that had been laid down in the primordial flatworm brain.

This idea further suggested that there was a basic plan of central nervous system organization, common to all bilaterally symmetric encephalized animals with brains,\textsuperscript{8,9} on the main sequence of evolution. I added the qualifier "main sequence" to exclude those species which have evolved into such specialized modes of existence, e.g., parasitism, involving degeneracy, loss, or such drastic specialization of these common features, that they represent evolutionary culs de sac.

These similarities in the organization of the central nervous system and the behavioral patterns it gives rise to are, I suggested, a special instance of a broader

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\textbf{Figure 1.} Photograph of normal asexual planarians of the species \textit{Dugesia dorotocephala}. The small bar indicates 1 mm. The two eyelike structures in the head really are eyes.