EDITORIAL

The Brain's development and shaping

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The human brain is a biological engineering marvel created from the tip of a 3 millimeter neural tube. It expands at a rate of roughly 250,000 nerve cells per minute on average during pregnancy to reach more than 100 billion neurons that make up a newborn baby's typical complement. But it's not just the rate of growth that makes the production of human brains so astounding. Even though the brain dependably performs a large number of functions and the specificity with which these are allocated to one or another sort of cell or small place in the entire assembly, the feat of creating a human brain occurs in hundreds of millions of people each year. The brain's estimated 100 trillion interconnections form the physical foundation for its speed and intelligence. The proliferation of a large number of undifferentiated brain cells, migration of the cells to a predetermined location in the brain and the start of differentiation into the specific type of cell appropriate for that location, aggregation of similar types of cells into distinct regions, formation of numerous connections among neurons, both within and across regions and competition among these connections resulting in the selective removal of many and the stabilizing of the remaining 100 trillion or so. From roughly 5 weeks from conception onward, these events do not occur in a strict order, but rather overlap in time. No additional neurons are added beyond around 18 months, and the grouping of cell types into different regions is nearly complete. However, the process of pruning superfluous connections, which is undoubtedly important for the form of the adult brain, goes on for years. This concept of brain development has spawned a slew of new lines of research in the field of neuroscience. It can explain well-known congenital disorders of the brain or nervous system in terms of the stage at which development was disrupted, among other things. If the neural tube fails to shut properly at a very early stage, the cells that should form the forebrain and its underlying skull and scalp may not be created. The disease is basically known as anencephaly (without a brain), nearly often results in stillbirth or only a few hours of survival. Spina bifida (split spine) is a condition in which the spinal column lacks the bone covering of part of its vertebrae due to less severe neural tube anomalies. Early exposure to x-rays, high amounts of alcohol, and other medications, as well as the mother's infection with certain diseases like rubella, can all affect development (German measles). The number of brain cells in the cerebral cortex rapidly grows around the middle of pregnancy, from about 15 to 20 weeks after conception. By the seventh month, the foetus is sending its brain waves, which can be detected *via* the mother's abdomen. Several lines of evidence show that appropriate nutrition is most important for brain development at this point, though it is still important until birth and for some time following. Even when the developing brain is subjected to environmental insults such as starvation, it demonstrates a remarkable ability to recover and develop normally if the detrimental circumstances are reversed within the first three months of life. One of the difficulties that neuropathologists working on congenital neurological disorders face is that they typically investigate the brain after the aberrant processes have occurred. Another issue is that typical data in this field might encompass a large range of deviations. A fundamental grasp of normal brain development is necessary for recognizing and resolving problems that can obstruct the development of a healthy brain.

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