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Book Review

# *How Babies Think: The Science of Childhood* by Alison Gopnik, Andrew Meltzoff and Patricia Kuhl; Weidenfeld and Nicolson, 1999 *(*First published in the U.S.A. as*: The Scientist in the Crib;* William Morrow and Company, 1999*).*

Reviewed by Ann Dowker

"Most of us see a picture of innocence and helplessness: a clean slate. But, in fact, what we see in the crib is the greatest mind that has ever existed, the most powerful learning machine in the universe."

This book is an account of, and an attempt to explain, babies' and toddlers' capacities and methods of learning about the world. The central themes may be summarized as follows:

(1) The human brain is like a computer, but a far more sophisticated and powerful one than has ever yet been designed or programmed by human beings.
(2) Human brains are extremely flexible, plastic and sensitive to environmental influences. We are born with a considerable amount of pre-existing knowledge, but more importantly, we have a remarkable ability to learn and adapt.
(3) There is no dichotomy between 'nature' and 'nurture'. "For human beings, nurture *is* our nature." Cultural adaptations are as much the product of our brains as the control of universal physiological functions. Evolution has not only created babies with a remarkable ability to learn, but adults with a remarkable ability to teach their children.
(4) Other animals are born with a wider range of pre-existing adaptations to a specific type of environment; human beings are born with a greater capacity to develop adaptations to any of an extremely wide variety of environments: both social and physical.
(5) The price paid by human beings for this greater adaptability is that we are more helpless at birth than most other animals, and undergo a much longer period of immaturity and need for support from parents and other adults.
(6) Despite this helplessness and dependence, infants are not just 'blank slates' to be written on by adults. They "think, observe and reason. They consider evidence, draw conclusions, do experiments, solve problems and search for the truth...even the youngest babies know a great deal about the world and actively work to find out more" (p. 13).
(7) The things that children need to learn about come into three broad categories: knowledge about *people*, knowledge about *things*, and knowledge about *language*.

The authors' discussion of development of knowledge in these areas can be summarized as follows:

Some knowledge about *people* seems to be present from the beginning: newborn babies look at the human face in preference to other objects, and imitate facial movements such as opening the mouth and sticking out the tongue. By a year, babies point to attract other people's attention to objects, and look at things to which other people point. This involves some understanding of attention and communication. Babies also seem aware of others' emotional reactions and some of their implications: they will open a box that elicited a happy expression from their mother, but avoid one that elicited a disgusted expression. After 18 months, they become aware that others' desires may conflict with their own; their 'experiments' on this issue may be a factor in the rebellious behaviour of the 'terrible twos'. By four, they understand that others can have different beliefs from their own.

Babies are born with considerable knowledge about *objects*: they can match cross-modally between sight, hearing and touch; they can perceive and interpret movement and the third dimension. They do not, as Piaget had thought, always think that objects cease to exist when out of sight. However, they do have trouble in understanding what happens when one object is hidden by another, and may consider that the hidden object is thereby obliterated. From a very young age, they understand the basic principles of cause and effect, and realize that their own actions can influence external events. However, they can be confused about which causes produce which effects; and in particular may not differentiate between psychological and physical causality: they think that social signals such as smiling and cooing will influence the behaviour of objects as well as people.

Young babies are in some ways better than adults at discriminating the sounds of *language*. They can distinguish between any two sounds which represent distinct phonemes in *any* of the world's languages. Adults - and babies over about 10 months - can only make the distinctions that are relevant to their own language(s): e.g. American babies can no longer distinguish between the two Spanish 'b' sounds; and Japanese babies can no longer distinguish between English 'l' and 'r. They also show an early ability to distinguish between the intonation patterns of their own language and others. In the second half of the second year, they experience the *naming explosion*, where they show a serious interest in the names of objects, and start rapidly mapping objects to their names. But not all early words are object names: important early words include requests (more!), references to success (there!) and failure (oh dear!), motion (up! down!), and disappearances (all gone!). Words are soon combined, heralding the beginnings of grammatical production. In the preschool years, children show a strong tendency to over-regularize the rules that they learn; e.g. saying ‘childs’ for ‘children’.

The authors see important parallels between children and scientists: both work intensely and enthusiastically at gathering information and revising their theories in the light of new findings.

Children’s learning is not merely a function of the brain: it leads to important modifications in the connections and networks within the brain. A newborn baby’s brain has almost the same number of neurons as an adult brain, but far fewer connections between these neurons. Through learning and experience, connections are increasingly established between the neurons: by the end of the first three years, the child’s brain has *twice as many* neuronal connections as the adult brain. The number of connections then remains similar until the age of 9 or 10, when pruning begins.

Although this pruning appears to be necessary for the final stages of learning and development to occur, the authors speculate that perhaps we do lose something by it. They

suggest that the Romantic view of childhood has some validity: when we had twice as many neuronal connections as we do now, perhaps we did experience the world more intensely, and 'see the world in a grain of sand and a heaven in a wild flower'. However, they disagree with the Romantic view that a childlike sense of wonder is fundamentally opposed to scientific reasoning: in the view of the authors, scientists and poets resemble one another in their sense of wonder, and in the intense way in which they experience the world; and both groups share these characteristics with young children.

The book is one which will appeal considerably both to researchers in child development and to parents. It is interestingly and clearly written, and the theories about brain development, and the similarities between children and scientists, are very intriguing.

There are a few criticisms that could be made. Because the book is broad in its coverage, it does not cover all theories about child development, and there are places where it is not made entirely clear that a statement or viewpoint is still controversial: e.g. that there is as yet no consensus on the degree to which infants understand object permanence. The discussion in the last chapter about social policies and practices with regard to children and families could constitute a book in itself, and, in the opinion of the present reviewer, it might have been preferable either to omit or expand this section.

Despite this qualification, it is one of the best and most coherent recent books on early child development. I would strongly recommend it to anyone with an interest in this subject.

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