The Scientist in the Crib
by Alison Gopnik, Andrew N. Meltzoff and Patricia K. Kuhl.
Reviewed by Kristina Lerman
January 2003

How do children acquire the ability to take light signals and transform them into concepts of other things and people? How and when do they figure out that other people have desires different from theirs, and indeed may conflict with them? How do they transform sound waves into individual words, independent of the speaker, turn words into concepts, and concepts into meaning? These are the questions that have driven the professional as well as personal interests of the authors of "*The Scientist in the Crib*." Understandably the authors, developmental psychologists, focus on the behavioral, psychological and philosophical issues surrounding early learning rather than discussing the neurological basis for learning in the brain. While they can't present a complete picture of the learning process, the ideas and experiments they discuss are fascinating.

The book has two central theses – the first soundly backed by scientific evidence. The authors claim that three factors enable the incredible progress children make in the first few years of life: innate knowledge, superior learning ability, and dedicated teachers evolved to be ideally suited to the teaching task. The evidence that children are already born knowing certain things is extensive. For example, babies seem to be aware already from birth of some of the physical properties of objects. A newborn infant will follow a moving object behind a screen and anticipate where and when it will reappear. She will recognize a series of different smiling faces as being similar to one another and different from a sad face. Even more intriguing are the observations that infants, as young as few hours, will mimic facial expressions of adults, for instance, copy an adult sticking out his tongue. Think of the capabilities involved in imitation: the baby not only has to figure out that an adult's face is like hers, she has to make the association between the adult's tongue and her own and to know that she moved her tongue outside her mouth.

The second cog in the triumvirate of early learning – the powerful learning mechanism – is not addressed by the authors in great detail. Other books, such as "What's Going on in There" and "Magic Trees of Mind" do a much better job explaining the decades of neuroscience research about the brain's amazing plasticity. In short, our genes do not encode all the knowledge that we have. Instead, we have evolved to be supremely adaptable through the mechanism of neural plasticity. Experience shapes the brain. Though we are born with most, if not all, of our neurons, we have few connections between the neural cells. We spend the first few years of life growing massive numbers of these connections (axons and dendrites) – many millions a second – as well as the supporting matrix of glial cells. Learning, through experience and practice, strengthens some of these connections and weakens others, permanently altering the structure of the brain. The altered, specifically wired brain enables us to do things efficiently and quickly.

The final learning advantage that babies have are wonderful teachers – their parents – designed by millions of years of evolution to act in ways that enable babies to learn better and faster. Indeed, the relatively long period of human immaturity, which requires the adult to expend considerable effort on behalf of the child, gives children an opportunity

to learn a great deal about their physical and social environment, much of it from adults. This knowledge gives humans an advantage and ability to survive in many different kinds of environments. How do adults, specifically parents, function as teachers? There are many examples – the most compelling one from language learning. Until about the age of six months, babies can differentiate sounds much better than adults. For example, scientists can play a sound corresponding to "r" and slowly morph it into a sound corresponding to "l." English speakers will hear a sharp transition in this smooth sequence from one sound to another. Japanese speakers will often fail to detect a difference in sounds altogether. Young infants will actually hear each frequency in the range as a different sound… until the age of six months when they start hearing the same sounds as adults in their culture. What happens? It is the exposure to the local language, specifically the "motherese" in which adults, and even young children, instinctively address infants, that wires the brain to hear particular sounds. The comical sounding baby talk, with its exaggerated vowels and frequent repetition, offers a far purer and better example of the local language than the often sloppy speech we use when communicating with other adults.

Although babies come into this world well equipped for learning, thanks to their plastic brains and dedicated teachers, the authors of "The Scientist in the Crib" give most of the credit to babies themselves. As the title suggests, they advance a hypothesis that a baby is really like a scientist (and a scientist like a baby), forming ideas about the world, doing little experiments to test them, and refining or discarding ideas in light of experimental results. Indeed, the authors believe that babies are driven by a need to explain, to understand, and this drive manifests itself during every stage of baby's development. Play gives children an opportunity to practice the scientific method, for example, by pouring sand or stacking cups. A cantankerous two year old reaching for the forbidden power cord while watching his parent, is actually conducting an important psychological experiment, to learn about the nature of other minds. It is just an unfortunate consequence of the "terrible twos" that it is the parents who are the subjects of these experiments. Perhaps the knowledge that they are teaching their child a vital lesson will make this stage much easier to bear. Although the idea of a baby as a scientist is an attractive one, it is not as solid as the book's other claims. In the end, we don't know enough about how children think. Though we have learned much about how the brain works and how children learn, there is even more waiting to be discovered.