involved in characterizing the complex interactions of mRNA with a spectrum of constitutive and specific nuclear and cytosolic proteins; identifying nucleases responsible for mRNA degradative events; and determining what constitutes a rate-limiting destabilizing cleavage in the degradation pathway, as opposed to a secondary or "cleanup" nuclease function. These problems have been exacerbated by the difficulty of devising genetic approaches to the identification of relevant cis and trans control elements.

Given the importance of the problem of mRNA stability, a book designed to review and integrate the various aspects of the topic is welcome; *Control of Messenger RNA Stability*, the first book dedicated to the role of mRNA stability in gene expression, is a significant contribution to the field. The first section deals with mRNA stability in prokaryotes, establishing a useful framework for the more extensive subsequent section dealing with eukaryotic systems. The book concludes with a brief summary of experimental approaches to the study of mRNA decay. The general problems addressed include the relative roles of endo- and exoribonucleases, the importance of secondary structure in defining RNA substrate specificity, the role of 5′ and 3′ terminal structures in the general scheme of mRNA turnover and nuclease resistance, and the identification of rate-limiting cleavage reactions and the nucleases involved. The prokaryotic and eukaryotic sections of the book both begin with a general overview of major themes and model systems in which mRNA stability plays a dominant role in the control of gene expression. Other contributions cover the development of in vitro systems for the study of mRNA turnover, the intimate relationship between mRNA turnover and translation, and the role of the poly(A) tail in eukaryotic mRNAs. Three comprehensive chapters on the biochemical characterization and function of ribonucleases underscore the general difficulty of assigning particular nucleases to specific steps in mRNA turnover. A separate chapter on yeast emphasizes the importance of tapping into the power of genetic selection to ferret out cis and trans determinants of mRNA stability. RNA binding proteins, about which our knowledge is expanding rapidly, will probably attract even more attention in the future.

Clearly written and with substantial background material, this book should make the subject of mRNA stability in gene expression accessible to an expanding audience. The chapters are cross-referenced, with references extending into 1993, and amply illustrated; a detailed subject index is included. Research on mRNA stability is accelerating rapidly, and this book paves the way for updates reporting on the revelations yet to come.

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Origins of Laterality

The Evolution of Lateral Asymmetries, Language, Tool Use, and Intellect. JOHN L. BRADSHAW and LESLEY J. ROGERS. Academic Press, San Diego, CA, 1993. xiv, 463 pp., illus. $72 or £58.

Functional differences between the left side of the brain (thought to be primarily responsible for speech, rationality, and analytic and linear thought) and the right side (associated with emotion, spatial perception, and holistic and parallel thought) were first described by French physicians in the 1800s and became entrenched in popular culture after accounts of the "split-brain" studies of Sperry and Gazzaniga fascinated scientists and the general public alike. The importance of cerebral asymmetry in the evolution of the cognitive abilities that we associate with our own species has been central to the work of such thinkers as MacNeilage, Corballis, and Jaynes; although their theories vary in many respects, all essentially argue that the existence of marked cerebral asymmetries in function is associated with, and may be necessary for, higher (human) cognitive abilities such as culture, art, language, and consciousness. In *The Evolution of Lateral Asymmetries, Language, Tool Use, and Intellect* John Bradshaw and Lesley Rogers examine the comparative, developmental, and evolutionary aspects of cerebral asymmetry and cognition, in the process developing two main arguments: that cerebral asymmetries are present in many species and that many cognitive abilities that have been postulated to be associated with brain asymmetries are not uniquely human.

"Left hand self-touching behavior by a young orangutan at the Orangutan Rehabilitation Center, Sepilok, East Malaysia." There is a significant left-hand predominance in face touching by orangutans and other apes as well as humans. [From *The Evolution of Lateral Asymmetries, Language, Tool Use, and Intellect*; photograph by L. J. Rogers and G. Kaplan]

Bradshaw and Rogers devote five chapters to a discussion of cerebral asymmetries in birds and mammals. Here they have attempted to provide a more comprehensive review than can easily be accomplished in the space available, with the result that clarity and readability are sometimes sacrificed. Perhaps because so much material is covered, a few errors in basic biology pop up (for example, uracil is said to be incorporated into protein), and there are some lapses in the interpretation of experimental results. The species and strains used in the various studies are not always indicated, even though it is well known that for some functions (for example, birdsong) the strength and direction of asymmetry vary from species to species. Such omissions make it difficult for the authors (and the reader) to construct a general framework in which to interpret results. Also, the gross size of specific brain areas is assumed here to be directly related to their function, but this connection should not be made without caveats. For example, the posterior portion of the corpus callosum of female mice, although smaller than that of males, contains more fibers connecting the two hemispheres, resulting in more, rather than less, interhemispheric communication. Despite these flaws, the encyclopedic nature of the coverage and the extensive list of references make this portion of this book a valuable contribution to the literature on brain asymmetries in animals. The review of Rogers's work on lateralization of visual behavior in chicks paves the way for the presentation of a plausible model for the development of cerebral asymmetries. In the egg, chicks' necks are

rotated so that the left eye is occluded, and neurons in the right eye, which projects to the left hemisphere, are more active early in development. This suggests that left-right asymmetries in sensory activity may entrain asymmetries in cerebral specialization.

The final three chapters of the book provide an account of the evolution of hominoids and hominids and examine the relationship between the physical evolution of brain structures and the evolution of such "behaviors" as culture, tool use, art, language, intellect, and self-awareness. This section is less densely packed with accounts of experimental design and results than previous sections and consequently is far more accessible to the general scientific reader. For each class of cognitive skills, the paleontological evidence of structural evolution is placed in the context of ethological and archeological evidence of the evolution of behavior. In the end, the authors have convincingly supported their primary argument: that although hemispheric specialization is most striking with regard to human speech and other advanced cognitive abilities, cerebral asymmetry is a quantitative rather than a qualitative distinction between humans and other animals.

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Vignettes: The Public Arena

The question becomes what today's comparative schools of "ideas" have to offer in domestic public policy. Models of capitalism, American style, are not persuasive in view of the faltering economy and the international competition that lies ahead. Models of revolution, neighborhood autonomy, republics in miniature, or little sovereign communities hold even less promise. . . . So, one turns again to the pragmatism and incrementalism of the painful progress of science.

—*Robert C. Wood*, in *Whatever Possessed the President? Academic Experts and Presidential Policy, 1960–1988* (University of Massachusetts Press)

Scientists are neither Gods nor charlatans; they are merely experts, like every other expert on the political stage. They have, of course, their special area of expertise, the physical world, but their knowledge is no more immaculate than that of economists, health policy makers, police officers, legal advocates, weather forecasters, travel agents, car mechanics, or plumbers. The expertise that *we* need to deal with them is the well-developed expertise of everyday life; it is what we use when we deal with plumbers and the rest. Plumbers are not perfect—far from it—but society is not beset with anti-plumbers because being anti-plumbing is not a choice available to us. It is not a choice because the counter-choice, plumbing as immaculately conceived, is likewise not on widespread offer.

—*Harry Collins* and *Trevor Pinch*, in *The Golem: What Everyone Should Know about Science* (Cambridge University Press)

The Developing Mind

Foundations of the Mind. Children's Understanding of Reality. EUGENE V. SUBBOTSKY. Harvard University Press, Cambridge, MA, 1993. xxii, 162 pp., illus. $22.50 or £35.

Ever since Jean Piaget's portrayal of the child as a "young scientist," cognitive development has been assumed to involve the supplanting of childhood "misconceptions" by a more rational, scientifically based understanding of the world. Much recent work has demonstrated that very young children exhibit rational thought and evince understanding of basic scientific principles such as gravity, causality, and the solidity of objects—concepts that are thought to replace earlier, more primitive ideas. It is widely held that once this more rational picture of reality is in place, it would represent an unusual, and perhaps even maladaptive, regression for a child (or an adult) to appear to espouse a more primitive belief.

In *Foundations of the Mind: Children's Understanding of Reality* Eugene Subbotsky turns this "replacement model" on its head, in the process calling into question one of the most basic assumptions in developmental psychology. Subbotsky's goal is to investigate the nature of consciousness—a topic that most Western developmental psychologists might consider beyond the scope of empirical investigation. His intriguing thesis is that rational, scientifically based beliefs and what we would consider more primitive or magical beliefs coexist in the human mind across the life-span, that "with the appearance of a new form of thinking, previous ones by no means disappear." On this view, development consists not of learning how to think in a different way but of learning what sorts of situations call for which kind of thinking.

What Subbotsky is challenging here is not simply Piaget's "young scientist" view but a long-standing commitment to rationality that has characterized philosophical and psychological thought since Aristotle. This commitment to rationality, or as Subbotsky prefers, "everyday reality," has been accompanied by a certain disdain for what Subbotsky refers to as "unusual realities"—the domain of myths, dreams, and imagination. Aristotle, Descartes, and Kant all extolled the superiority of everyday reality over unusual realities, with their logical flaws and contradictions. Subbotsky's mission is to draw the attention of psychologists to the significance of unusual realities and to give them an existential status comparable with that accorded to everyday reality.

Subbotsky grounds his thesis in an extensive set of experiments he conducted over the past 10 years to investigate how children's conceptions of objects, causality, space, and time—what he considers the basic structures of the mind—develop and change. In these experiments he would present subjects with an apparent violation of one or more of these basic structures and then observe their reactions. In one study children were shown a box and asked whether they believed that simply saying some magic words could cause a picture of an object placed in the box to turn into the object depicted. As expected, most of the subjects emphatically denied this possibility. They were then told a story about a girl who had a box very similar to the one in front of them and had achieved various magical results with it. Subsequently, each child was left alone in a room with this "magic box" and observed with the aid of a hidden camera. Subbotsky found that the children often proceeded to exhibit a variety of behaviors that seemed to reflect a conscious belief in magical phenomena: they chanted magic words, waved their hands, and looked surprised and disappointed when these actions did not produce results.

Subbotsky's claim is not simply that young children occasionally entertain beliefs in magic and other forms of fantasy but that these quasi-magical beliefs are a legitimate component of consciousness and are