BOOKS: BEHAVIOR

The Emotional Ape

Andrew Whiten

A whole half century before the first significant discoveries about wild chimpanzees began to be published, three figures who studied chimpanzees in captivity laid the foundations of our modern understanding of the ape mind. Two of them, Robert Yerkes (in the United States) and Wolfgang Köhler (working on the then-German island of Tenerife), launched into a tough regime of experimentation; from the start, they prodded and probed the intellectual powers of their charges. The third, Nadezhda Ladygina-Kohts (at the Darwin Museum in Moscow), had a very different ideal, one she expressed in characteristic poetic fashion:

> Squeezed into the framework of an experiment, mental activity is like a free bird, accustomed to unhampered flights and unlimited spaces, that has been caught and put into a small cage. Like a live bird, the mental activity bumps into the walls of the experiment, unwilling to be confined by them, struggles to get out, and breaks the nets of theoretical expectations and the experimenter's plans. A contemplative observer who grants total freedom of expression to this kaleidoscopical change of mental conditions will be more likely to watch its development, follow it wherever it goes, catch it, and describe it more easily.

Kohts offered consummate confirmation that she was such an observer (and was occasionally tempted into supplementary experimentation as well) in her classic 1935 account of the infancy of the chimpanzee Joni, described in comparison with that of her son Roody. Yet until recently, only fragments of her achievement filtered through to the English-speaking scientific world. At long last, we have the first complete English-language edition of her classic work. *Infant Chimpanzee and Human Child*, translated by Boris Vekker and edited by Frans B. M. de Waal, sandwiches Kohts's text and photographs between context-setting historical introductions and updates on current knowledge provided by contemporary leaders in the field.

Infant Chimpanzee and Human Child
A Classic 1935 Comparative Study of Ape Emotions and Intelligence
by N. N. Ladygina-Kohts
Edited by Frans B. M. de Waal
Oxford University Press, New York, 2002. 468 pp. $65. ISBN 0-19-513565-2. Series in Affective Science.

Kohts's work represents a unique descriptive achievement because of the extraordinary way in which she ranges from microscopically detailed accounts of behavior to heroic attempts to perceive the larger mental and behavioral themes being revealed to her. She was very conscious of the effort required to achieve the latter, and she compared her quest with that of a mountaineer who reaches a minor peak to gain a bird's eye view of the broader landscape below together with a glimpse of higher summits beyond, which tantalizingly promise a still more global view.

When Kohts observed Joni (from 1913 to his death in 1916, at an age of about four years), the landscape of the developing ape mind was virgin territory. Part of the charm of the book is that it allows one to lean over the author's shoulder and share her sense of discovery as a multitude of similarities between the childhood preoccupations of ape and child were discovered for the first time by her and as the equally profound mental differences began to emerge. But the 20th century became the time during which our species at last achieved the privilege of an in-depth scientific understanding of our closest living relatives. Given the findings now described in hundreds of research papers, what does Kohts's lovingly documented record have to offer beyond an intriguing glimpse of scientific history?

Broad smiles. Kohts compared the laughter of Joni and Roody.

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For me, two things stand out. One derives precisely from the sheer freshness of Kohts's perceptions, which are untainted by the well-worn grooves of our current thinking on the minds of apes. For example, in attempting to delineate the principal motivations behind the myriad details of everyday behavior, Kohts identifies, among a long list of ape instincts, a "love of and struggle for freedom" and an "ownership instinct." Such categories are not typically found in the textbooks of today, and the ways in which Kohts carves the joints of the nature that she perceived offer a healthy provocation to the modern reader's habitual psychological pigeon-holing. (One might also wonder how the highlighting of anthropoid instincts for freedom and for property ownership were viewed at the time, in Stalinist Russia!)

The second present-day value of the work lies in the monumental documentation of important features of behavioral development, a wealth of details that remains unsurpassed today. Among these are the ways in which numerous aspects of behaviors now known from wild chimpanzees—including vocal patterns, stick-tool use, play, and systematic exploration—appeared so resiliently in this young chimpanzee as it grew up from early infancy out of contact with all other members of its species. But pride of place goes to Kohts's analysis of emotions and their expression—a topic that was nearly taboo during behaviorism's dominance and is still being only haltingly addressed by animal researchers today. Kohts's research was carried out before this scientific taboo took hold. Nonetheless, her work is a model of good science insofar as her first priority was to describe and document. Her text is supplemented by a photographic gallery that, amazingly, remains unequaled in our image-conscious times; I counted 130 drawings and photographs concerned solely with differentiating forms of emotional expression. One of Kohts's strengths, as noted above, is that she does not merely offer these forms as a list. Instead, she attempts to see the bigger patterns. For example, she considers the ways that different levels of certain emotions are expressed, as in the timidity-horror continuum. And she discusses the ways in which several emotions may simultaneously compete for expression, as when Joni expressed fear, aggression, and revulsion during his interactions with a lively and, apparently to him, odd-smelling hen.

Strangely, however, Kohts almost completely sidesteps the justification of which emotional labels should properly be ascribed to the varieties of expression she

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describes. Was she attributing emotions such as fear, joy, and anger, etc., on the basis of morphological similarity to the human repertoire or on the basis of other contexts (as, for example, we do when deciding the meaning of an alien expression like a cat's purr)? This is a fundamental omission. Indeed, a final major value of *Infant Chimpanzee and Human Child* is that today's students and other thoughtful readers should find in it an intriguing challenge: Much might be gained by convincingly filling the gap between the richness of the objective descriptions laid so generously before them and the justification of legitimate bases for ascribing particular states of emotion to these behaviors.

BOOKS: PLANETARY SCIENCE

Photochemical Smog Hides an Icy World

Darrell F. Strobel

Lifting Titan's Veil is an account of the exploration of Titan, Saturn's largest moon, and the joint effort by the European Space Agency (ESA) and NASA to reveal its secrets with the Cassini-Huygens mission. Why Titan? It is the solar system's second largest moon, with a radius about 60 km smaller than that of Jupiter's Ganymede. Whereas Ganymede's atmosphere is measured in picobars (10^{-12} times the surface pressure of Earth's atmosphere), the nitrogen atmosphere of Titan is about 1.5 bar. What really distinguishes Titan's atmosphere is its mildly reducing character, conditions similar to those many believe characterized Earth's prebiotic atmosphere, and its large suite of hydrocarbons, organic molecules, and nitriles. Among the nitriles, hydrogen cyanide is a known precursor of α-amino acids and nucleic-acid bases; thus, Titan's environment is of great importance for understanding chemical evolution in Earth's early atmosphere. Present-day Titan could be a natural laboratory for chemical synthesis analogous to the pioneering laboratory experiments on the origin of life that Urey and Miller carried out in the 1950s. As a result, Titan has been an object of intense interest to exobiologists and planetary scientists for more than three decades. Such considerations convinced European governments and the United States to fund the Cassini-Huygens project at a total cost of approximately $3 billion. The book documents what is so special about Titan, and what researchers hope to accomplish after Cassini reaches Saturn in 2004 and after the Huygens probe enters Titan's atmosphere the next year.

Lifting Titan's Veil
Exploring the Giant Moon of Saturn
by Ralph Lorenz and Jacqueline Mitton
Cambridge University Press, Cambridge, 2002. 268 pp. $29, £19.95. ISBN 0-521-79348-3.

Author Ralph Lorenz started with the Huygens project as an engineer. After returning to university to obtain his doctorate, he rejoined the project as a scientist, with an accompanying demotion from business class travel to discount economy travel. Lorenz's experiences, amplified in passages labeled "Ralph's Log," lend the book a personal flavor and give the reader insight into the inner workings of these complex missions. Coauthor Jacqueline Mitton is an astrophysicist, who now devotes her time to writing and media consulting in the field of astronomy. Their prose is, accordingly, lively and captivating.

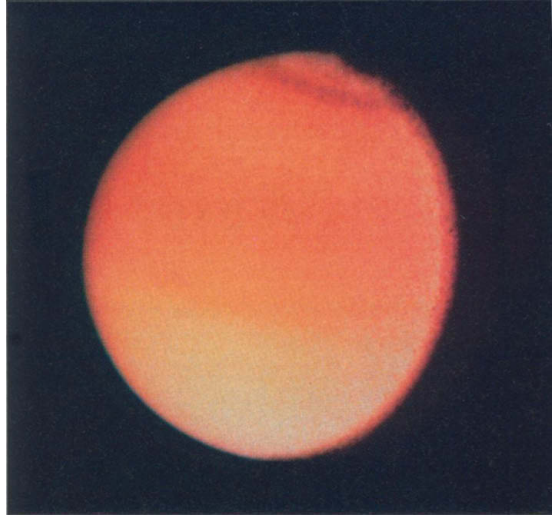
The book begins with a brief historical sketch that covers the 1655 discovery of Titan by the Dutch scientist Christiaan Huygens and essential aspects of planetary science (especially the satellites of Jupiter and Saturn). In the early 1980s, the scientific discoveries of the two Voyager spacecraft rewrote the textbooks on Titan by revealing a world completely shrouded in a photochemical haze. This smog elevates Titan's optical limb (the edge of its visible disk) some 200 km above the surface and prevented the Voyager cameras from seeing the surface. Although the Hubble Space Telescope and adaptive optics on the largest ground-based telescopes have offered glimpses of what might be on Titan's surface, the parting of this veil will fall to the Huygens probe and to the radar and remote sensing systems on the Cassini spacecraft. The last third of the book is devoted to this mission: its genesis, political aspects, design and construction, launch, operations; the plans for probing Titan and touring the Saturn system; and the problems with the radio relay that link Huygens with Cassini.

The authors also provide interesting discussions about what the mission may reveal. Titan's atmosphere, meteorology, and landscape each merit a chapter in the book. Based on our current knowledge, these chapters represent a progression from fact to speculation.

The economy of presentation required by the book's brief length means that details must be glossed over. For example, the authors are forced to omit many important details that a historian writing on the Cassini-Huygens mission would want for background. Some of us consider it a miracle that a spacecraft was delivered and launched, because ESA and NASA entered this cooperative mission in the "sink or swim together" mode. The book has very few glaring errors of the magnitude of the claim that "Voyager 1 reached Saturn in November 1980 after a journey lasting just over 13 years," which would be news to all who viewed the launch in the fall of 1977. Even the 2600-kg Cassini spacecraft, which needed three gravity assists by Venus and Earth before going on to Jupiter, will take only seven years to reach Saturn. On a more irritating level, I found the rekindling of the debate on the level of methane saturation at the tropopause and in the stratosphere (which I and my colleagues Michael Summers and Xun Zhu had sparked in a 1992 paper in *Icarus*) attributed to a French colleague, Régis Courtin. (During a 1993–94 Paris sabbatical, I had convinced Régis to reanalyze infrared data from the Voyager missions.)

The authors present some material at the level of *Scientific American* or *Sky and Telescope*, but most of the text would be appropriate in an introduction to astronomy for nonscientists. Consequently, the book is accessible to a wide audience despite a few figures, taken from research articles, that might not be understood by all readers. And even the professional scientist who wants a brief overview on Titan or an abbreviated history of the Cassini-Huygens mission will find the book worthwhile.

I recommend *Lifting Titan's Veil* to anyone having an interest in planetary exploration. With fewer than two years remaining until the arrival of the Cassini spacecraft and its insertion into orbit around Saturn, however, the book comes with a sunset clause. We expect exciting new discoveries and look forward to the authors reporting them in an equally informative sequel.



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Smoggy moon. The hydrocarbons in Titan's atmosphere give the moon an orange hue.

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