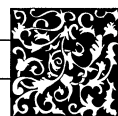


along the way to foraging ecology, sex ratio evolution, migration, and the evolutionary consequences of geographic variation. In fact, the only major questions in evolution it does not address are why sex exists (presumably because swallows are not parthenogenetic) and the evolution of sterile castes and eusociality (because swallows are not cooperative breeders).

Swallows are abundant and relatively easy to observe and have a sexually dimorphic trait that is amenable to experimental manipulation: the forked tail, which is on average 17 percent longer in males than females in the Danish population Møller studies. With an ingenious combination of field experiments and painstaking observation, Møller looks not only at the immediate consequences to males of having a longer tail, namely higher mating success, but also at the long-term outcome of female preference. More ornamented males are more likely to copulate with females in addition to their mates; they and their offspring live longer and have fewer parasites than shorter-tailed males; and their mates tend to invest more in the offspring than do the mates of shorter-tailed birds. Some of these attributes appear to be genetic, as demonstrated by elegant cross-fostering experiments, whereas others can be emulated through the use of birds with artificially extended tails. With all of these advantages, you might ask, why don't all males have long tails and, for that matter, why isn't the tail itself even longer? Møller anticipates these questions with a chapter discussing the constraints on ornament evolution. Long tails are costly to produce and maintain, and only high-quality males can display them. Females choosing a long-tailed male can therefore expect to have high-quality offspring, but the difficulty of flying with such an unwieldy extension probably places an upper limit to tail length in these aerial acrobats.

These findings are always carefully generalized to animals other than barn swallows, which is why this book is not simply a narrow study of a single species. Møller displays a remarkable opportunism in his research, losing no chance to turn the smallest piece of information into a test of a hypothesis. For example, over the course of five field seasons lasting from six weeks to four months, he found 69 roadkill juvenile swallows. Most researchers would have passed them by; after all, that's less than one dead bird per week, not much of a sample size. Møller, however, took advantage of the birds' deaths to determine their sex via dissection of the gonads, male and female juveniles not being morphologically distinct, and used the information to look for bias in the secondary sex ratio. This dedication to detail is combined with a thorough grounding in theory throughout the book.



## Vignette: Stellar Physiology

*Galaxies* are of course the island universes within which reside most of the stars, much of the gas, and a little of the mass in the cosmos. *Activity in Galaxies*, like that in animals, is defined by the metabolic rate. When this is well above the average "resting" (aka. basal) level, a galaxy or animal is said to be active. For an animal of mass  $m$  kg, the mass-specific basal metabolic rate is about  $m^{-1/4}$  cal s<sup>-1</sup>kg<sup>-1</sup>. . . . For galaxies, the mass-specific basal metabolic rate seems not to be strongly mass dependent, and is about  $0.1 - 1 L_{\odot} M_{\odot}^{-1}$  ( $5 \times 10^{-6} - 5 \times 10^{-5}$  cal s<sup>-1</sup>kg<sup>-1</sup>;  $1 L_{\odot} M_{\odot}^{-1}$  is the average rate of energy release per unit mass of cosmic baryons which fuse 10% of their hydrogen in a Hubble time). Animal athletes, such as horses running the Kentucky Derby, can reach metabolic rates 20 times their basal rate. Galaxy athletes like quasars and extreme star bursts are even more impressive, reaching  $\geq 10^3$  times their basal rates ( $\geq 10^5$  times in selected regions).

—E. S. Phinney, in *Mass-Transfer Induced Activity in Galaxies* (Isaac Shlosman, Ed.; Cambridge University Press)

The book is not without its drawbacks. The writing style is terse and dry, albeit clear. It is sometimes difficult to tell when assertions are supported by data and when they are merely suppositions. The literature citations on sexual selection in other birds are rather scanty, especially with regard to empirical studies; this adds to the impression of a book about sexual selection that happens to use barn swallows as examples, but could leave the reader with the erroneous conclusion that little else has been done. Of course, as one of the most prolific authors in evolution and ecology today (12 single-authored publications cited for 1991 alone), Møller has ample scope for using his own work.

Like many others who study sexual selection, Møller focuses almost exclusively on males; chapter titles include "Male mating advantages," "Options for unmated males," and "Paternal care and male ornamentation," with no corresponding attention to females. This bias, though understandable because of the conspicuousness of the male ornament, nonetheless neglects the other key player in the sexual selection process. Some recent work in the field has attempted to redress this omission, and it is too bad more of the book is not directed toward that aim.

Perhaps some of the biologists using *Drosophila* or *Caenorhabditis elegans* in their research might consider a shift toward the graceful and utilitarian subject of this book; Møller has demonstrated an ample payoff from his attentions.

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## Books Received

**Artificial Intelligence in Mathematics.** Jeffrey Johnson, Sean McKee and Alfred Vella, Eds. Clarendon (Oxford University Press), New York, 1994. x, 328 pp., illus. \$67.50. Institute of Mathematics and Its Applications Conference Series, new series, no. 51. Based on a conference, Glasgow, Scotland, April 1991.

**Associated Systems Theory.** A Systematic Approach to Cognitive Representations of Persons. Robert S. Wyer, Jr., Ed. Erlbaum, Hillsdale, NJ, 1994. x, 235 pp., illus. \$49.95; paper, \$22.50. Advances in Social Cognition, vol. 7.

**Atoms in Molecules.** A Quantum Theory. Richard F. W. Bader. Clarendon (Oxford University Press), New York, 1994. xviii, 438 pp., illus. Paper, \$37.50. International Series of Monographs on Chemistry, 22. Reprint, 1990 ed.

**Bioreactor System Design.** Juan A. Asenjo and José C. Merchuk, Eds. Dekker, New York, 1994. xvi, 620 pp., illus. \$195. Bioprocess Technology, 21.

**The Book of Man.** The Human Genome Project and the Quest to Discover Our Genetic Heritage. Walter Bodmer and Robin McKie. Scribner's, New York, 1995. xii, 259 pp., illus.

**The Bourbaki Gambit.** A Novel. Carl Djerassi. University of Georgia Press, Athens, 1994. xii, 233 pp., illus. \$19.95.

**The Collected Papers of Albert Einstein.** Vol. 5, The Swiss Years. Correspondence, 1902–1914. Martin J. Klein, A. J. Kox, and Robert Schulmann, Eds. Princeton University Press, Princeton, NJ, 1994. I, 724 pp., illus., + plates. \$85 or £65.

**A Compensation Approach for Queuing Problems.** I. J. B. F. Adan. Centrum voor Wiskunde en Informatica, Amsterdam, 1994. iv, 183 pp., illus. Paper, Dfl. 50. CWI Tract 104.

**Concepts in Protein Engineering and Design.** An Introduction. Paul Wrede and Gisbert Schneider, Eds. De Gruyter, Hawthorne, NY, 1994. xviii, 378 pp., illus. DM 128 or \$99 or sFr 124.

**Conformational Theory of Large Molecules.** The Rotational Isomeric State Model in Macromolecular Systems. Wayne L. Mattice and Ulrich W. Suter. Wiley, New York, 1994. xviii, 449 pp., illus. \$54.95.

**A Conspiracy of Optimism.** Management of the National Forest since World War Two. Paul W. Hirt. University of Nebraska Press, Lincoln, 1994. Ivi, 418 pp., illus. \$40. Our Sustainable Future, vol. 6.

**Defenders of the Race.** Jewish Doctors and Race Science in Fin-de-Siècle Europe. John M. Efron. Yale University Press, New Haven, CT, 1995. xiv, 255 pp., illus. \$30.

**Designing Engineers.** Louis L. Bucciarelli. MIT Press, Cambridge, MA, 1994. x, 220 pp., illus. \$24.95. Inside Technology.

**Dictionary of Cytokines.** Horst Ibelgauf. VCH, New York, 1994. xxii, 778 pp., illus. \$110 or DM 184 or £74.

**Dirichlet Forms and Symmetric Markov Processes.** Masatoshi Fukushima, Yoichi Oshima, and Masayoshi Takeda. De Gruyter, Hawthorne, NY, 1994. x, 392 pp. \$79.95 or DM 168 or öS 1.311 or sFr 161. De Gruyter Studies in Mathematics, 19.

**The Discourses of Science.** Marcello Pera. University of Chicago Press, Chicago, 1995. xii, 250 pp., illus. \$29.95 or £23.95. Translated from the Italian edition (1991) by Clarissa Botsford.

**The Equation of State in Astrophysics.** Gilles Chabrier and Evry Schatzman, Eds. Cambridge University Press, New York, 1994. xviii, 621 pp., illus. \$69.95. From IAU Colloquium no. 147, Saint-Malo, France, June 1993.

**Equations of Eternity.** Speculations on Consciousness, Meaning, and the Mathematical Rules That Orchestrate the Cosmos. David Darling. Hyperion, New York, 1995. xvi, 190 pp. Paper, \$10.95. Reprint, 1993 ed.

**Esterases, Lipases, and Phospholipases.** From Structure to Clinical Significance. M. I. Mackness and M. Clerc, Eds. Plenum, New York, 1994. x, 279 pp., illus. \$105. NATO ASI series A, vol. 266. From a workshop, Bordeaux, France, Sept. 1993.

**The First Nuclear Era.** The Life and Times of a Technological Fixer. Alvin M. Weinberg. AIP Press, Woodbury, NY, 1994. xii, 291 pp., + plates. \$24.95.

**Folding of Viscous Layers.** Mechanical Analysis and Interpretation of Structures in Deformed Rock. Arvid M. Johnson and Raymond C. Fletcher. Columbia University Press, New York, 1994. xviii, 461 pp., illus. \$95 or £70.

**Foundations of Cellular Neurophysiology.** Daniel Johnston and Samuel Miao-Sin Wu. MIT Press, Cambridge, MA, 1994. xxiv, 676 pp., illus. \$55.

**Fractal Physiology.** James B. Bassingthwaite, Larry S. Liebovitch, and Bruce J. West. Published for the American Physiological Society by Oxford University Press, New York, 1994. xii, 364 pp., illus. \$55. Methods in Physiology Series, 2.

**Gene Expression in Recombinant Microorganisms.** Alan Smith, Ed. Dekker, New York, 1994. xiv, 410 pp., illus. \$175. Bioprocess Technology, 22.

**Genetics and Biochemistry of Antibiotic Production.** Leo C. Vining and Colin Stutter, Eds. Butterworth-Heinemann, Stoneham, MA, 1994. xxiv, 679 pp., illus. \$89.95. Biotechnology Series, 28.

**The Geology of the Mexican Republic.** Dante Morán-Zenteno. American Association of Petroleum Geologists, Tulsa, OK, 1994. viii, 160 pp., illus. \$67. AAPG Studies in Geology, no. 39. Translated from the Spanish edition (1984) and with additional annotated bibliography by James Lee Wilson and Luis Sanchez-Barreda.

**Handbook of Geostationary Orbits.** E. M. Soop. Kluwer, Norwell, MA and Microcosm, Torrance, CA, 1994. vi, 309 pp., illus. \$94 or £60 or Dfl. 150. Space Technology Library, vol. 3.

**Handbook of Human Stress and Immunity.** Ronald Glaser and Janice K. Kiecolt-Glaser. Academic Press, San Diego, CA, 1994. xxii, 414 pp., illus. \$79.95.

**Handbook of Neurological Speech and Language Disorders.** Howard S. Kirshner, Ed. Dekker, New York, 1994. xiv, 533 pp., illus. \$175. Neurological Disease and Therapy, 33.

**In the Wake of Chaos.** Unpredictable Order in Dynamical Systems. Stephen H. Kellert. University of Chicago Press, Chicago, 1995. xiv, 176 pp., Paper, \$10.95. Reprint, 1993 ed.

**Industry's Future.** Changing Patterns of Industrial Research. Herbert I. Fustfeld. American Chemical Society, Washington, DC, 1994. xiv, 370 pp. Paper, \$24.95.

**Inhaled Particles.** Vol. 7. J. Dodgson and R. I. McCallum, Eds. Pergamon (Elsevier Science), Tarrytown, NY, 1994. xx, 1030 pp., illus. \$210 or £130. From a symposium, Edinburgh, Scotland, Sept. 1991. Reprinted from *Annals of Occupational Hygiene*, vol. 38, supplement 1 (1994).

**Jokes and Their Relation to the Unconscious.** Sigmund Freud. Norton, New York, 1994. xxiii, 321 pp. Paper, \$7.95. Translated and edited by James Strachey. Reprint, Standard edition.

**Laboratory and Scientific Computing.** A Strate-

gic Approach. Joe Liscouski. Wiley, New York, 1995. xii, 212 pp., illus. \$44.95. Wiley-Interscience Series on Laboratory Automation, vol. 1.

**The Law of the Land.** Two Hundred Years of American Farmland Policy. John Opie. University of Nebraska Press, Lincoln, 1994. xxx, 253 pp., illus. Paper, \$12. Reprint, 1987 ed.

**The Life Cycle Completed.** A Review. Erik H. Erikson. Norton, New York, 1994. 108 pp. Paper, \$8 or \$C10.50. Reprint, 1985.

**Methods in Carbohydrate Chemistry.** Vol. 10, Enzymic Methods. James N. BeMiller, Ed. Wiley, New York, 1995. xx, 332 pp., illus. \$69.

**Methods in Cell Biology.** Vol. 43, Protein Expression in Animal Cells. Michael G. Roth, Ed. Academic Press, San Diego, CA, 1994. xvi, 379 pp., illus. \$90; spiralbound, \$45.

**Methods in Enzymology.** Vol. 247, Neoglycoconjugates. Part B, Biomedical Applications. Y. C. Lee and Reiko T. Lee, Eds. AP Professional (Academic), Cambridge, MA, 1994. xxx, 450 pp., illus. \$40.

**Methods in Membrane and Transporter Research.** James A. Schafer *et al.* Landes, Georgetown, TX, 1994 (distributor, CRC Press, Boca Raton, FL). x, 402 pp., illus. \$105. Molecular Biology Intelligence Unit.

**Molecular Biology of Diabetes.** Part 2, Insulin Action, Effects on Gene Expression and Regulation, and Glucose Transport. Boris Draznin and Derek LeRoith, Eds. Humana, Totowa, NJ, 1994. xviii, 555 pp., illus. \$99.50.

**Mother-Infant Bonding.** A Scientific Fiction. Diane E. Eyer. Yale University Press, New Haven, CT, 1995. x, 237 pp., Paper, \$13. Reprint, 1992 ed.

**Nonpoint Source Pollution Regulation.** Issues and Analysis. Cesare Dosi and Theodore Tomasi. Kluwer, Norwell, MA, 1994. xviii, 174 pp., illus. \$75 or £52 or Dfl. 125. Fondazione Eni Enrico Mattei Series on Economics, Energy and Environment, 3.

**Norms, Values, and Society.** Herlinde Pauer-Studer, Ed. Kluwer, Norwell, MA, 1994. x, 346 pp., illus. \$115 or Dfl. 185 or £74. Vienna Circle Institute Yearbook, 2.

**Nucleophilic Aromatic Substitution of Hydrogen.** Oleg N. Chupakhin, Valery N. Charushin, and Henk C. van der Plas. Academic Press, San Diego, CA, 1994. x, 367 pp., illus. \$95.

**Organic Syntheses.** Collective Volumes 1-8 Cumulative Indices. Jeremiah P. Freeman, Ed. Wiley, New York, 1994. xvi, 620 pp. \$75.

**The Oxford Medical Companion.** John Walton, Jeremiah A. Barondess, and Stephen Lock, Eds. Oxford University Press, New York, 1995. xiv, 1038 pp., illus. \$50.

**Ozone Discourses.** Science and Politics in Global Environmental Cooperation. Karen T. Litfin. Columbia University Press, New York, 1994. x, 257 pp., illus. \$40.

**Philosophy in Mind.** The Place of Philosophy in the Study of Mind. Michaelis Michael and John O'Leary-Hawthorne, Eds. Kluwer, Norwell, MA, 1994. viii, 328 pp., illus. \$105 or £69 or Dfl. 165. Philosophical Studies Series, vol. 60.

**Plants, Genes, and Agriculture.** Maarten J. Chrispeels and David E. Sadava. Jones and Bartlett, Boston, 1994. xxvi, 478 pp., illus. \$50.

**Politics and Space.** Image Making by NASA. Mark E. Byrnes. Praeger, Westport, CT, 1994. xii, 212 pp., illus. \$55.

**Population Genetics, Molecular Evolution, and the Neutral Theory.** Selected Papers. Motoo Kimura. Naoyuki Takahata, Ed. University of Chicago Press, Chicago, 1995. xviii, 686 pp., illus. \$80 or £63.95; Paper, \$29.95 or £23.95.

**A Practical Guide to Membrane Protein Purification.** Gebhard von Jagow and Hermann Schagger. Academic Press, San Diego, CA, 1994. xviii, 166 pp., illus. Spiralbound, \$49.95. Separation, Detection, and Characterization of Biological Macromolecules.

**Quantum Mechanics.** An Introduction. Walter Greiner. 3rd ed. Springer-Verlag, New York, 1994. xx, 445 pp., illus. Paper, \$49.50.

**Quantum Mechanics.** Historical Contingency and the Copenhagen Hegemony. James T. Cushing. University of Chicago Press, Chicago, 1994. xvi, 317 pp., illus. \$65 or £51.95; paper, \$27 or £21.50.

**Raman and IR Spectroscopy in Biology and Biochemistry.** J. Twardowski and P. Anzenbacher.

Horwood (Prentice Hall), Englewood Cliffs, NJ and Polish Scientific Publishers PWN, Warsaw, Poland, 1994. 269 pp., illus. \$101.95. Ellis Horwood Series in Analytical Chemistry. Translated from the Polish edition by Andrzej Przyjazny. Mary Masson, transl. ed.

**Rangeland Ecology and Management.** Harold F. Heady and R. Dennis Child. Westview, Boulder, CO, 1994. xviii, 521 pp., illus. \$59.85. New edition of *Rangeland Management* (1975).

**The Rat Nervous System.** George Paxinos, Ed. 2nd ed. Academic Press, San Diego, CA, 1994. xviii, 1136 pp., illus. \$169.

**Real Numbers, Generalizations of the Reals, and Theories of Continua.** Philip Ehrlich, Ed. Kluwer, Norwell, MA, 1994. xxxii, 288 pp., illus. \$113 or £76 or Dfl. 195. Synthese Library, vol. 242.

**The Shape of Space.** Graham Nerlich. 2nd ed. Cambridge University Press, New York, 1994. xvi, 290 pp., illus. \$74.95; paper, \$22.95.

**Signal Peptidases.** Gunnar von Heijne. Landes, Georgetown, TX, 1994 (distributor, CRC Press, Boca Raton, FL). xii, 127 pp., illus. \$89.95. Molecular Biology Intelligence Unit.

**Six Easy Pieces.** Essentials of Physics Explained by Its Most Brilliant Teacher. Richard P. Feynman. Addison-Wesley, Reading, MA, 1994. xxx, 146 pp., illus. \$22; with tape package, \$49.95; with CD package, \$59.95. Excerpts from *Lectures on Physics*.

**Stability, Instability and Chaos.** An Introduction to the Theory of Nonlinear Differential Equations. Paul Glendinning. Cambridge University Press, New York, 1994. ix, 388 pp., illus. \$69.95; paper, \$29.95.

**Statistical Data Analysis for Ocean and Atmospheric Sciences.** H. Jean Thiébaux. Academic Press, San Diego, CA, 1994. xvi, 247 pp., illus., + diskette. \$74.95.

**Taurine in Health and Disease.** Ryan J. Huxtable and Dietrich Michalk, Eds. Plenum, New York, 1994. xii, 458 pp., illus. \$120. From a symposium, Cologne, Germany, Aug.-Sept. 1993.

**Thinking Computers and Virtual Persons.** Essays on the Intentionality of Machines. Eric Dietrich, Ed. Academic Press, San Diego, CA, 1994. xii, 363 pp., illus. \$49.95.

**Thinking in Complexity.** The Complex Dynamics of Matter, Mind, and Mankind. Klaus Mainzer. Springer-Verlag, New York, 1994. x, 329 pp., illus. \$34.50.

**Time.** Towards a Consistent Theory. C. K. Raju. Kluwer, Norwell, MA, 1994. xii, 260 pp., illus. \$114 or £76 or Dfl. 185. Fundamental Theories of Physics, vol. 65.

**Under the Spell of the Gauge Principle.** G. 't Hooft. World Scientific, River Edge, NJ, 1994. xii, 683 pp., illus. \$86; paper, \$48. Advanced Series in Mathematical Physics, vol. 19.

**Variability in Rangeland Water Erosion Processes.** Wilbert H. Blackburn *et al.*, Eds. Soil Science Society of America, Madison, WI, 1994. xvii, 106 pp., illus. Paper, \$24. SSSA Special Publication no. 38. From a symposium, Minneapolis, MN, Nov. 1992.

**The Variability of Large Alluvial Rivers.** Stanley A. Schumm and Brian R. Winkley, Eds. ASCE Press, New York, NY, 1994. ix, 467 pp., illus. \$44.

**Visual Science and Engineering.** Models and Applications. D. H. Kelly, Ed. Dekker, New York, 1994. xviii, 423 pp., illus. Optical Engineering, vol. 43.

**Vital Dust.** Life as a Cosmic Imperative. Christian de Duve. BasicBooks, New York, 1995. xxii, 362 pp. \$25.

**What is Controlling Life?** 50 Years after Erwin Schrödinger's *What is Life?*. Erich Gnaiger, Frank N. Gellerich, and Markus Wyss, Eds. Innsbruck University Press, Innsbruck, Austria, 1994. 335 pp., illus. Paper, \$48. Modern Trends in BioThermoKinetics, vol. 3. From a conference, Innsbruck/Schöcklen, Sept. 1994.

**Whatever Happened to "Eureka"?** Cartoons on Science. Nick Downes. Rutgers University Press, New Brunswick, NJ, 1994. vi, 157 pp., illus. Paper, \$10.95.

**Who Will Do Science?** Educating the Next Generation. Willie Pearson, Jr. and Alan Fechter, Eds. Johns Hopkins University Press, Baltimore, MD, 1994. xxii, 169 pp., illus. \$31.95.

**Zygmunt Zawirski.** His Life and Work With Selected Writings on Time, Logic and the Methodology of Science. Irena Szumilewicz-Lachman, Ed. Kluwer, Norwell, MA, 1994. xvi, 384 pp., illus. \$128 or £86 or Dfl. 225. Boston Studies in the Philosophy of Science, vol. 157. Translations by Feliks Lachman. Robert S. Cohen, Ed.