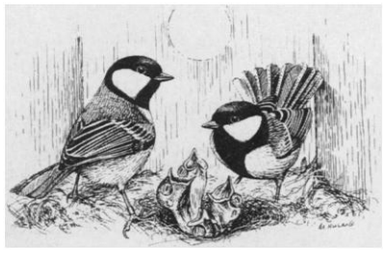
BOOK REVIEWS

Mating and Parenting

Partnerships in Birds. The Study of Monogamy. JEFFREY M. BLACK, Ed. Drawings by Mark Hulme. Oxford University Press, New York, 1996. xii, 420 pp., illus. $125 or £62.95, ISBN 0-19-854861-3; paper, $46.95 or £27.50, ISBN 0-19-854860-5. Oxford Ornithology, 6.

Although the prevalence of monogamy has long been recognized as one of the defining behavioral characteristics of birds, it has also long been considered a "bland" mating system by many avian behavioral ecologists. Monogamy in birds is related to the facts that both the male and the female members of the pair provide care to their offspring and that in a majority of birds biparental care is essential to the rearing of offspring. Avian monogamy-biparental care contrasts strikingly with the mating-parenting patterns of most other kinds of animals, including most members of our own group, the mammals.



A pair of great tits, *Parus major*, with young. At study sites in northern Belgium nestlings with different fathers have been found in about one-third of the nests of this species. [From Dhondt *et al.*'s paper in *Partnerships in Birds*]

Interpretations of avian monogamy usually have been framed in the context of constraints, particularly on males, rather than of the positive aspects of this kind of system. However, it has been shown for a number of species, including most of the ones featured in this book, that two cooperating parents can rear more young than could a single parent, and, moreover, that better options for either sex typically are not available. (In birds, both polygyny and polyandry are rare as compared to monogamy). This is not to say, however, that mating outside the social pair bond (generally referred to as extra-pair copulation, or EPC) is not a common phenomenon. To the contrary, thanks to techniques such as DNA fingerprinting, it has been clearly shown that EPCs leading to extra-pair fertilizations (EPFs) are common in many socially monogamous species of birds. Thus the social and genetic mating systems of birds frequently differ.

This discovery, which also showed that male birds often provide care to offspring that are not their own, has led to a dramatic shift in thinking about the issue of avian monogamy and leads to the question: Just what are the overall reproductive strategies of males and females of socially monogamous species? Answers require consideration of a number of related issues, such as the characteristics of successful and unsuccessful pairs, the benefits of long-term pair bonds, the adaptive significance of divorce, and the adaptive benefits that females obtain by mating outside, as well as within, the pair bond.

This book provides an impressive treatment, empirical and theoretical, of these and other issues related to avian monogamy. Fourteen fine chapters, based on long-term empirical studies of individual species in 12 different avian families, are sandwiched between opening and closing sections that deal with the theoretical issues related to monogamy.

Possibly the single most interesting issue addressed in the book is why individual females of many socially monogamous species engage in extra-pair copulations. This question forms the basis of the chapters by P. A. Gowaty and by T. R. Birkhead and A. P. Møller. The answer seems to center on the female's desire to produce high-quality young. Specifically, because most females do not have the opportunity to form a pair bond with the highest quality male (or males) in the area, their optimal reproductive strategy may be to seek sperm from such males while forming social mateships with an available lower quality male who will provide parental care. As part of her "constrained female hypothesis," Gowaty suggests that, within a species, females of intrinsically high quality or females in especially productive habitat might be better able to rear young without paternal assistance. As a result, such females would be expected to show higher levels of EPC than females more dependent on parental contributions by their mate.

Birkhead and Møller tentatively conclude that interspecific comparisons support this idea. Specifically, in species in which biparental care is essential for reproductive success, EPCs are rare or nonexistent. At the other extreme, in species in which the female is completely unconstrained by the need for male parental care, multi-male fertilizations also are rare; here females are free to mate solely with the single "best" male available. Many species, however, lie between these two extremes. In these cases, females practice both social monogamy and genetic polyandry. For this strategy to work, the female must "consider" her social mate's genetic interests, as well as her own. Commonly, the answer appears to be a compromise, with the brood containing some offspring sired by an extra-pair male and some sired by the social mate.

Thus, the long-standing view that the existence of extra-pair young reflects a strategy primarily driven by male interests clearly is in jeopardy. Although EPCs are indeed beneficial to males, they apparently are no less important to females. It is increasingly likely that an understanding of female reproductive strategies is required to explain the variation in multiple paternity seen both within and across species.

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Sciences of Matter

Before Big Science. The Pursuit of Modern Chemistry and Physics, 1800–1940. MARY JO NYE. Twayne (Simon and Schuster Macmillan), New York, 1996. xviii, 283 pp., illus. $32.95. ISBN 0-8057-9512-x. History of Science and Society Series, no. 1.

The teaching of the history of science has not been very well served by sophisticated, up-to-date, and usable textbooks. The more recent the science, especially among the physical sciences, the more critical is the lack of such texts. In what is the first of a new series of books designed to remedy this lacuna, Mary Jo Nye has taken on the daunting task of writing a history of virtually all of modern chemistry and physics—in 229 pages of text. A distinguished historian of 19th- and 20th-century chemistry, she is eminently well qualified for her task.

The terminal dates of the title refer principally to institutional stages in the develop-