decay bacteria encapsulated by iron carbonate. Such discoveries provide unique evidence for the chemistries of the bottom waters themselves. Also directly evidenced are advanced states of parasitism and other forms of symbiosis.

Equally fascinating are biogeographical surprises from Messel. Diverse as the biota was, very few European endemics have been recognized. Most elements of the flora and fauna seem characteristic of other continents, especially North and South America and southeastern Asia. The composition of the pre-passerine avifauna is particularly eye-opening paleogeographically. Messel eloquently shows how primitive our understanding of Eocene intercontinental dispersal pathways really is.

Until 1990, the Messel pit was threatened as a scientific resource by local municipal plans to use the site as a refuse pit. Every town in the world has its garbage dump, but there is only one Messel. This book is dedicated in part "to the politicians who, in the conflict between science and refuse disposal decided in favour of science, as a testament for others." I suggest that all of us in the sciences should tip our hats in respect for their wisdom.

Jason A. Lillegraven
Departments of Geology/Geophysics and Zoology/Physiology,
University of Wyoming,
Laramie, WY 82071–3006, USA

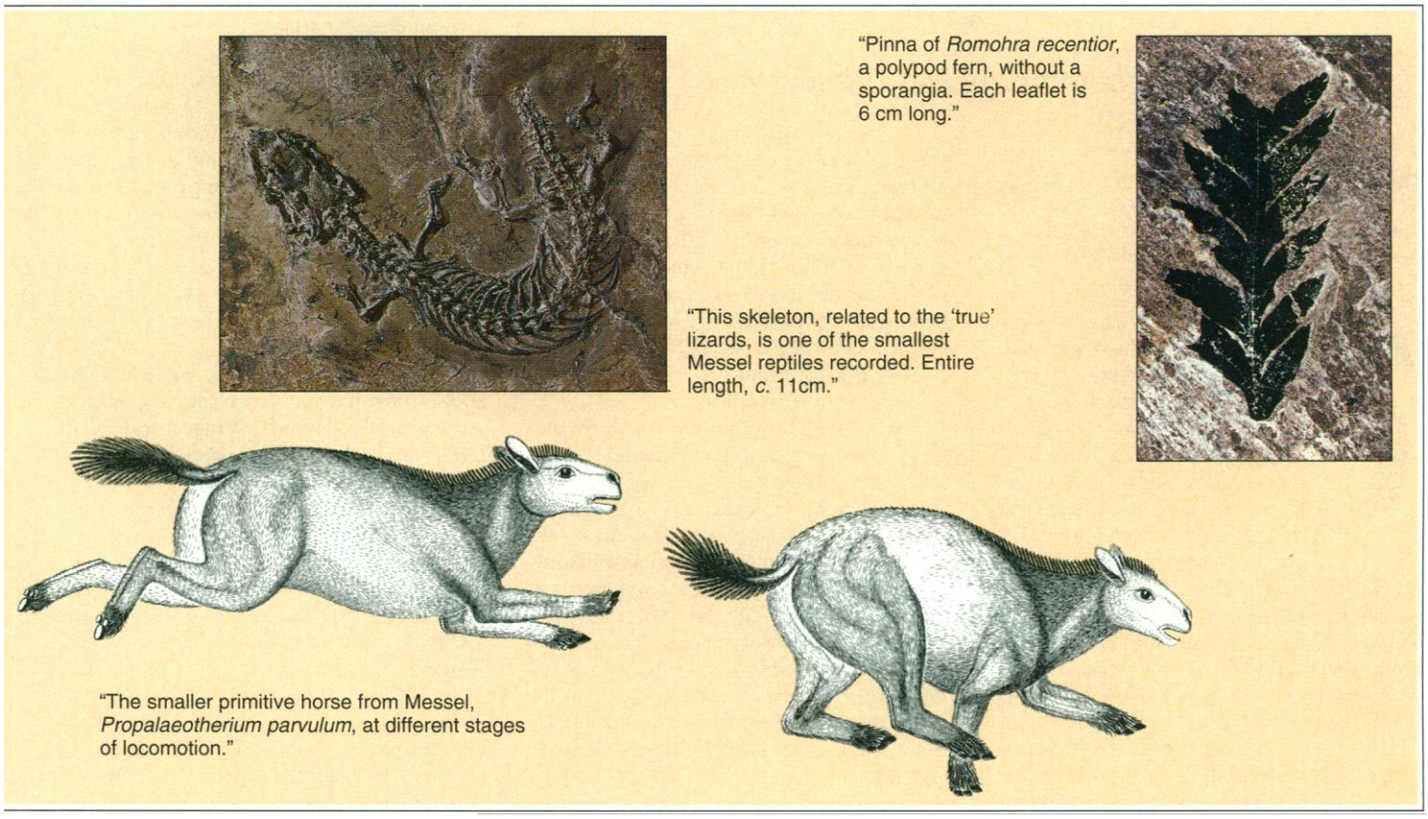
Big Cats in Situ

The African Leopard. Ecology and Behavior of a Solitary Felid. THEODORE N. BAILEY. Columbia University Press, New York, 1994. xviii, 429 pp., illus. $65 or £45. Biology and Resource Management in the Tropics Series.

Theodore N. Bailey has previously produced important works on the bobcat (*Lynx rufus*) and Canadian lynx (*Lynx canadensis*). With the present work, he has provided the most detailed account of the ecology, behavior, and conservation of the African leopard (*Panthera pardus*) yet published.

The setting for Bailey's study was two contrasting study sites within South Africa's 19,485-square-kilometer Kruger National Park, one of Africa's oldest and largest national parks. Adjacent to the border with Mozambique, Kruger is a "boundary park" that buffers the international boundary from agricultural, developed, and native-trust lands. Despite its great size, Kruger was never an ecological unit, and the "balance of nature" as a park management concept has been challenged here. The international boundary was fenced three decades ago, interrupting traditional east-west "game" migrations; the park is now completely fenced. With fire suppression over the last century, much of the park's vegetation has shifted from open grassland to savanna to woodland-savanna to woodlands and thickets. The vegetation shifts have been accompanied by a decline in grazing ungulates and an increase in browsing species. There have been culling programs and waves of mortality in Kruger's "game" from epizootics, such as rinderpest, hoof-and-mouth disease, and anthrax, and from periodic droughts. To protect the ungulates, there have been rather vigorous carnivore control programs in the past. Poaching in Kruger was not thought by the park management staff to be a significant problem. After a prolonged drought, populations of the leopards' prey were rebounding during Bailey's study period, 1973–1975, with the rains and the increased vegetation growth that resulted. Bailey's study population had not been subject to control since 1960.

Bailey used direct and indirect observation, capture-mark(n = 30)-recapture, and radiotelemetry to follow most of the leopards living on and around his study sites. Using direct-observational census methods, he quantified the dynamics and the behavior of the leopard's larger prey species. Following such a large and dynamic predator-prey system nearly single-handed was challenging, and Bailey must have put in 18- to 24-hour days for the nearly three years he was in the field. His great effort is our gain, as detailed a picture as has yet



been produced of any large, solitary-living cat and its principal prey.

Leopards are difficult to identify as individuals and, living as they do mostly in closed habitat and moving over many square kilometers of landscape in the course of the day and their lives, they are not easily amenable to detailed behavioral and ecological study. Few good studies were available prior to Bailey's work. Aided by radiotelemetry, Bailey was able to follow closely the leopards' movements and activities and to quantify the proximate conditions that influenced their behavior. The leopard has great ability to adapt to diverse environments—it has the largest geographical range of any mammal in the Old World—and a strength of this book is Bailey's identification of the leopard's behavioral and phenotypic adaptations to local conditions. I found his findings in regard to the dispersal system particularly insightful. Leopards, particularly subadults, regularly went on exploratory forays of up to 24 kilometers outside their normal home areas, presumably looking for better home areas. Knowledge of the dispersal system is important to understanding how a species will persist and spread or decline in the fragmented landscapes that are the leopard's range today. Bailey also addressed community- and ecosystem-level questions. For example, he concludes that leopard populations are "self"-regulating and that leopards do not "control" the numbers of impala (*Aepyceros melampus*), their most abundant ungulate prey, but may influence the numbers of less numerous species, such as steenbuck (*Raphicerus campestris*). History has taught, however, that a three-year study of a natural system of this size gives only a partial picture of how the system works over time.

Bailey concludes with a "synthesis." "The adaptable leopard" is a summary of behavioral and ecological adaptations to the diverse habitats the leopard inhabits through its vast range and a comparison of leopards with other large, solitary-living cats. In "The conservation of leopards," Bailey addresses factors affecting leopard numbers today, leopard status surveys, including those that have been highly controversial, and conservation strategies. He comes down on the side of tightly controlled trophy hunting as one means of making leopard conservation palatable to those who would otherwise simply poison or shoot leopards to be rid of them. His own data are from an unhunted population, and the numerical and behavioral response of a leopard population to the harvest regime he proposes remains untested. By the Adolf Murie standard and tradition of detailed descriptive studies of the large mammals living in national parks, Bailey has added a substantial and high-quality work.

John Seidensticker
National Zoological Park,
Smithsonian Institution,
Washington, DC 20008, USA

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Saccharomyces and Company

The Early Days of Yeast Genetics. MICHAEL N. HALL and PATRICK LINDER, Eds. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1993. x, 477 pp., illus. $75.

The Early Days of Yeast Genetics is a work modeled on the very successful *Phage and the Origins of Molecular Biology* of 1966, also published by Cold Spring Harbor. *Phage and the Origins* was both a celebration of Max Delbrück's impact on the students of the phage school and a history of the science. Given a single person as a focus, the earlier work had a theme tying together the reminiscences of the essayists in a way that made the whole much more than the sum of the parts.

The Early Days of Yeast Genetics is by necessity a very different book because the field of yeast genetics has quite a different historical base from phage genetics. Like the phage volume, however, *Early Days* is a collection of essays by and about key figures in the development of the field. Some essays have the personal-reminiscence style of the earlier model, whereas others are much more focused on the science of their authors. The editing was light, allowing the styles of the contributors to show through, but at some cost in clarity.

The essays are grouped into eight sections: Beginnings; Recombination, Gene Conversion, Mutation, and Repair; Mitochondria and Cytoplasmic Inheritance; Mating; Cell Cycle; Gene Structure and Expression; Molecular Biology; and Institutions. All but two focus on *Saccharomyces cerevisiae*. Readers of the two essays on *Schizzosaccharomyces pombe*, by Urs Leupold and Murdoch Mitchison, will be amused that the remarkable development of *S. pombe* genetics came about as a result of a casual comment made by Øjvind Winge to Leupold.

From the standpoint of 1994, the reader will be struck both by the differences and by the similarities between the yeast genetics of yesteryear and today. Among the similarities are the accidental routes that have led so many of the major yeast geneticists to the subject. In several cases, an inspired teacher made a critical difference to a student, as reflected in the essays of Leupold, Donald Hawthorne, Elizabeth Jones, and Rochelle Esposito. Some came to yeast genetics as a result of being unable to grow corn in Seattle (Herschel Roman) or because their cornfield was converted to a parking lot (Seymour Fogel). Others made more deliberate decisions, choosing the expanded opportunities with a familiar technological base that yeast cells offered to former phage and bacterial workers (David Botstein, John Carbon, Benjamin Hall). A few conspired to convince anyone not working on yeast genetics to start (Fred Sherman, Gerald Fink). Among the differences, two stand out. First, the size of research groups was small by today's standards, with the norm being a few graduate students. Postdocs didn't figure prominently until the '70s. Second, people working on one aspect of yeast biology worked in isolation from those studying a different aspect. There was no common thread such as is provided today by DNA sequence matches. With the promise of complete genome sequence in the offing, the era when different biologists can study the same gene without realizing it will be gone. We will soon be able to learn immediately whether anyone else has stumbled into any particular corner of the genome by using the genome sequence as a bulletin board to report our own activities. This luxurious situation will give yeast geneticists the first chance to define how complete genome sequences can be used to improve existing experiments and open new possibilities. This stunning progress in the short time between the work of these essayists and today is ample evidence of the unpredictability of the course and extent of progress in science.

The two most revealing essays in the book, in my judgment, are the biographical sketches of Øjvind Winge and Carl Lindgren, both by Robert Mortimer. In his capacity as director of the physiology department at the Carlsberg Laboratory, Winge made many contributions to early yeast genetics, from working out the life cycle of yeasts and discovering the HO gene to characterizing the genes controlling the ability of yeasts to grow on different sugars. Winge's views on his work were remarkably modern and, although they preceded the molecular era, are completely congruent with everything that has come since. In contrast, Lindgren, a contemporary of Winge's, was clearly brilliant, yet for rea-