The papers on aging of the visual system are a distinctive presence in the book. One of the most arresting is by John Werner, discussing the deleterious effect of light on the human eye. Werner makes it clear that ultraviolet light causes cumulative damage to the eye, especially to the short-wavelength–sensitive cones. This finding is poignant in this era of ozone depletion in the upper atmosphere and the resulting increase in ultraviolet light reaching our eyes.

Another paper on aging by Vittorio Porciatti and colleagues covers the spatiotemporal properties of the visual evoked potential (VEP). They show that VEP steady-state latency lengthens remarkably in aging human subjects who have no other visual abnormality. This may be a new way to study neural mechanisms in cerebral cortex that slow down as the brain ages. In a related paper, Cynthia Owsley and Kerri Burton demonstrate that human contrast sensitivity declines modestly with age and that both neural and optical changes are causes.

In another remarkable paper Kay Fite and colleagues discuss the relationship between age, sex, and light damage in the eye of the Japanese quail. The female eyes show more rapid aging than those of the males, and the eyes of mature females are damaged more by exposure to bright light than are those of males. This should be an interesting model system for studying the interplay of aging, hormones, and light.

This book contains many more papers of interest, and it is worth reading to find out how this scientific field is changing, aging, and developing.

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Beetle Model

Population Dynamics and the *Tribolium* Model. Genetics and Demography. ROBERT F. COSTANTINO and ROBERT A. DESHARNAIS. Springer-Verlag, New York, 1991. xii, 258 pp., illus. $89. Monographs on Theoretical and Applied Genetics, 13.

Recent efforts at modeling population dynamics have rapidly outstripped empirical tests of these theories. Costantino and Desharnais claim that we need more such empirical work and present the flour beetle *Tribolium* as an ideal experimental system, mostly because its populations can be so accurately sampled. If nothing else this book dramatically underlines their first contention.

Costantino and Desharnais have brought together much of their previous work on modeling and measuring *Tribolium* populations into a synthesis that addresses the effects of demographic structure, stochastic factors, genetic structure, and interspecific interactions on population dynamics. Their book is distinctive by its emphasis on the interaction between data and theory in evaluating these complex models.

Perhaps the major problem is that such complex models are often difficult to test because they can make predictions that are highly contingent on parameter values. Since the actual parameter values often aren't accurately known, any particular results can often be interpreted as either supporting or rejecting the theory.

For example, Costantino and Desharnais predict that steady-state distributions of adults, subject to stochastic variation in the per capita rate of change, should show a gamma distribution. They acknowledge that the model is statistically rejected by the observation that 7 of 31 tests, using a p value of 1%, that compare actual with "best-fit" gamma distributions are negative. However, they still conclude that the prediction of the gamma by the model is a "major success," implicitly suggesting that predictions from such models are not to be taken too literally.

In a contrasting example, the authors are more demanding when they reject simple density-dependent selection models by observing evolution that does not maximize the mean equilibrium population density of adults. They conclude that more complex density-dependent models with explicit age structure and stochastic genetic dynamics might provide better predictions. Another possibility, which the authors don't discuss, is that evolution might involve frequency-dependent processes. Thus, even when the data warrant rejecting the models, it isn't clear whether the models aren't appropriate or whether they just aren't complex enough.

The work Costantino and Desharnais describe has set new standards in this field by bringing a high level of theoretical sophistication to an excellent empirical system. It is thus striking that the conclusions end up being so subjective. It is likely that tests of this new generation of population models will continue to give ambiguous results unless researchers develop approaches that clearly identify those aspects of the theory that can be most rigorously tested, and develop a sense for the statistical and methodological criteria needed to evaluate such tests.

Until then empiricists working with ecological systems that are not as convenient as *Tribolium* will probably remain skeptical of the utility of these extremely rich and exciting models even while they acknowledge their validity. The conclusion that more work needs to be done along the lines sketched out in this book seems emphatically true, and this book serves to show us why.

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