



page 780

INTRODUCTION

When to Go, Where to Stop

THE ABILITY TO MOVE, AT SOME STAGE IN THE LIFE CYCLE, IS FUNDAMENTAL TO SUCCESS in life. Passive drift in water columns conferred a selective advantage for early life, offering an escape from starvation and genetic uniformity. Since then, organisms have evolved many ways to disperse and migrate in response to the pressures of finding resources, escaping predators, seeking out mates and suitable breeding grounds, and distancing themselves from family. Dispersal in its broadest sense means movement away from the birthplace. Strictly speaking, migration involves travel in a periodically and geographically predictable way, whether it occurs just once or many times. In this issue, *Science* deals with what we know, what we need to know, and how we are going to find out more about both of these movement types.

In plants, the spore, seed, or fruit is typically the unit of dispersal. Although the many morphological adaptations for their dispersal are known, until now, researchers have been unable to determine the distances traveled or the proportion of dispersal events that lead to seedlings. In one Perspective (p. 786), Nathan describes recent developments in the modeling and measurement of the long-distance dispersal of plants. A News story by Holden (p. 779) discusses the push to come up with a theoretical framework, not just for plants, but for all moving organisms. Organisms also disperse in reaction to changing habitats and climate. The Perspective by Kokko and López-Sepulcre (p. 789) discusses the selective forces affecting this ability in animals and how dispersal translates into range expansions and contractions. Kintisch (p. 776) describes the challenges for marine scientists assessing how climate change may affect oceangoing species.

Humans have been great dispersers. Colonizing new habitat has been a hallmark of human ecology over the past million years or so. In a Review (p. 796), Mellars considers recent advances in archaeology and genetics that are illuminating the controversies over the routes taken by ancient peoples in the colonization of Asia 40,000 to 60,000 years ago. Two Perspectives consider migration: Holland *et al.* (p. 794) focus on migrating insects, which tend to travel in established geographical patterns across several generations rather than returning to their birthplace, and Alerstam (p. 791) discusses the accumulating and sometimes conflicting evidence about the navigational mechanisms used by animals (particularly birds) in long-distance annual migrations. In a related Report (p. 837), Muheim *et al.* describe the role of polarized light at dawn and sunset in calibrating the magnetic compasses of migrating birds. A News story by Morell (p. 783) describes a new model that will clarify the mix of genes and environmental responses underlying successful bird migration.

As News stories by Blackburn and Holden (p. 780) and Unger (p. 784) point out, ingenuity and persistence are beginning to pay off in new techniques for following organisms, be they fish, crabs, jellyfish, rhinos, or polar bears. Thanks to these advances, the study of the ecology and evolution of movement is charging ahead and unearthing the challenges faced by organisms in dispersing and migrating in a world undergoing anthropogenic change.

— ANDREW SUGDEN AND ELIZABETH PENNISI

Migration and Dispersal

CONTENTS

News

- 776 As the Seas Warm
Sound Sightings
- 779 Inching Toward Movement Ecology
- 780 Tag Team
Eye in the Sky
Crab Walk
In the Deep Blue Ocean
Jellyfish on the Run
On the Radar Screen
- 783 Arduous Journeys
- 784 Follow the Footprints

Perspectives

- 786 Long-Distance Dispersal of Plants
R. Nathan
- 789 From Individual Dispersal to Species Ranges: Perspectives for a Changing World
H. Kokko and A. López-Sepulcre
- 791 Conflicting Evidence About Long-Distance Animal Navigation
T. Alerstam
- 794 How and Why Do Insects Migrate?
R. A. Holland et al.

Review

- 796 Going East: New Genetic and Archaeological Perspectives on the Modern Human Colonization of Eurasia
P. Mellars

See also related Report on page 837.

Science