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Cover Story

Features

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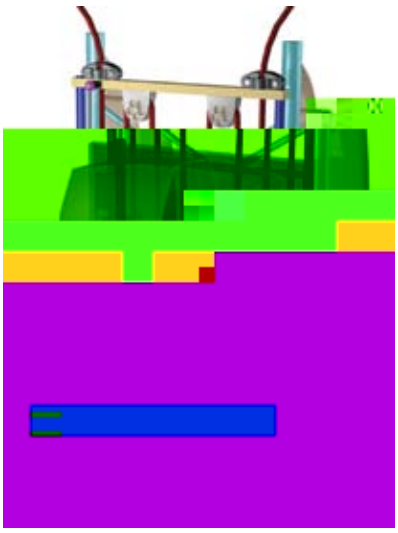
For three decades, MBL Arctic research programs have taught us how high-latitude ecosystems work. But there is still much to learn about how these rapidly changing environments will influence our climate.



T e e's N Sce L e H e

Tiny larval fish living among Australia's Great Barrier Reef spend the early weeks of their lives swept up in ocean currents that can disperse them far from their birthplaces. Given such a life history, one might assume that these fish would be genetically homogeneous within their dispersal area. Yet diversity is found to be surprisingly high and individual reefs contain different fish populations. For such rich biodiversity to have evolved, some form of population isolation is required. Research published this year in the *Proceedings o he Na ional Academ o Sciences* by MBL scientists Gabriele Gerlach and Jelle Atema and their colleagues showed that many fish species can discriminate odors in ocean currents and that some species can use home reef scent to return to the reefs where they were born. The homing behavior could support population isolation and slow genetic divergence, thus possibly favoring the ultimate formation of new species.

"This research shows that the spatial distribution of these aquatic organisms is far from being random despite long larval dispersal stages of several weeks," says Gerlach. "Apparently, these larvae use sensory mechanisms to orientate and find their way to appropriate habitats or express successful homing behavior to their natal spawning sites. This might play a major role in processes of population separation and, eventually, of speciation." The research could also have important management implications not only for the Great Barrier Reef, but marine environments in general.

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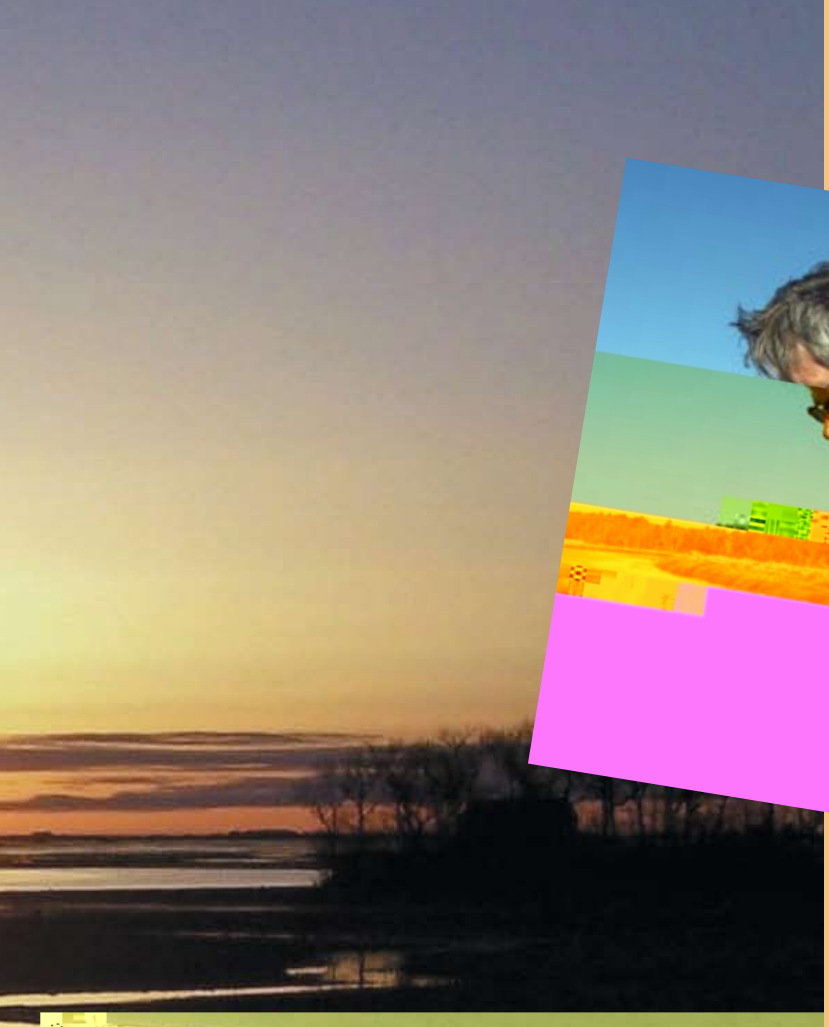
Chuck Hopkinson isn't your average outdoorsman. Whenever this avid hiker, boater, skier, and swimmer is in nature, he takes in a lot more than just the scenery. What he sees is the literal value of what nature provides us for free: oxygen to breathe, water to drink, and natural resources to harvest.

In fact, Hopkinson, a senior scientist with the MBL's Ecosystems Center, has recently helped create a novel way to evaluate the natural resources too many of us take for granted. In a paper published last February in *BioScience*, he and several colleagues describe a balance-sheet approach known as "ecosystem services-based management," a promising new tool that links ecology and economics.

The new method assigns absolute values to the services that ecosystems provide to society and the human actions that degrade these services. "It's a way for natural resource managers to quantify the change in value of ecosystem services so they can base their actions on minimizing the value of service reductions," says Hopkinson.

One area that could benefit from this approach is Plum Island Sound in northeastern Massachusetts, where Hopkinson is the lead principal investigator on the Plum Island Ecosystem Long Term Ecological Research project.

Since the mid-1980s, MBL Ecosystems Center scientists and their collaborators have been documenting environmental changes in the Plum Island Sound estuary, which is heavily affected by rapid rates of development. The suburbanization is occurring in two watersheds that run through 26 towns and drain into the sound.



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Evidence that Earth's ecosystems are changing is mounting to say the least. One way to understand the effects of these changes is through extended scientific assessments known as Long Term Ecological Research (LTER) projects. With funding from the National Science Foundation, LTER scientists study model ecosystems over many years, then use math and computer modeling to predict how environmental changes will affect them—and similar ecosystems—in the future. Such research is crucial to the wise management of our planet for the benefit of future generations.

MBL Ecosystems Center scientists currently have leadership roles in LTER projects located in the Alaskan Arctic (Toolik LhRs,cas

...with

Hugh Ducklow

incoming director of the MBL Ecosystems Center

Hugh Ducklow is a marine ecologist who studies plankton dynamics and biogeochemistry and works regularly at Palmer Station in Antarctica. In May he will become the director of the MBL's Ecosystems Center. He is currently the Glucksman Professor of Marine Science at the Virginia Institute of Marine Science (VIMS) at the College of William and Mary. His research centers on the interactions between climate change and ecosystem function, especially on the Antarctic Peninsula, a region that is warming especially fast. Hugh has conducted research in the North Atlantic, central North Pacific, equatorial Pacific, Arabian Sea, Red Sea, Southern Ocean, Great Barrier Reef, Caribbean, Black Sea, Baltic Sea, Hudson River, and Chesapeake Bay.

MBL Why should we study polar regions that most people don't think much about on a regular basis?

HD

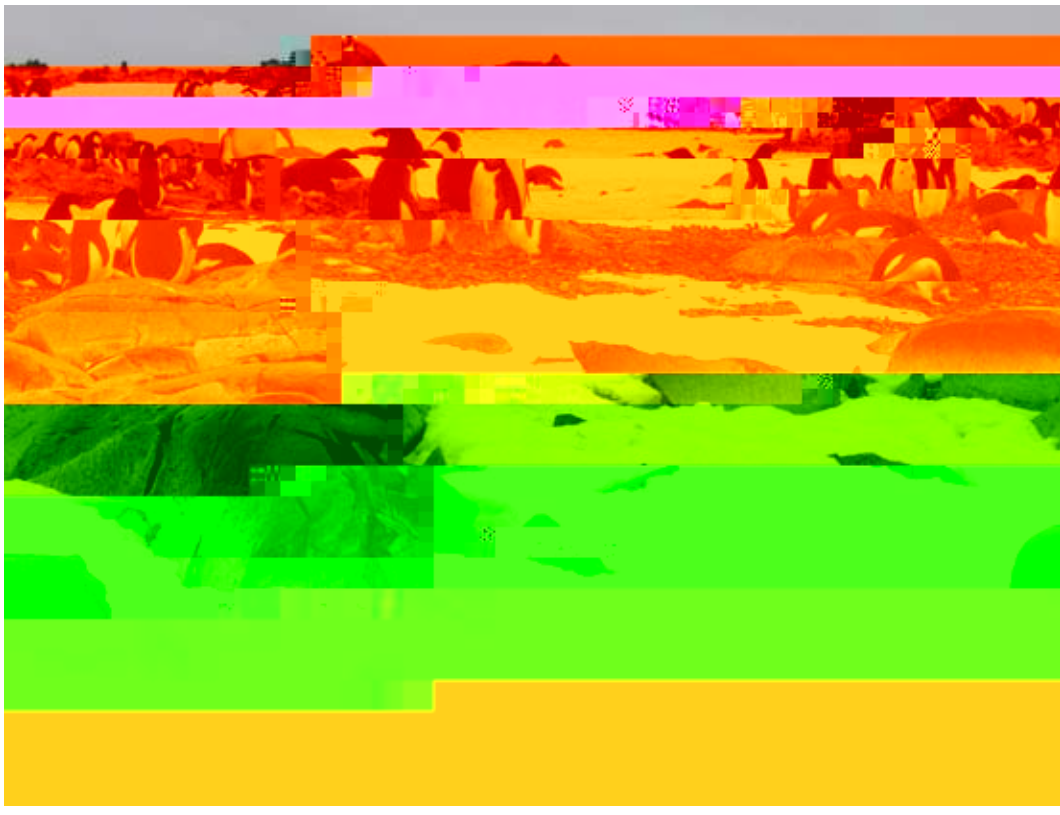
MBL What is the importance of the International Polar Year and how is the MBL participating?

HD

"[Antarctica] is changing at all levels, from melting glaciers and shrinking sea ice to changes in phytoplankton and zooplankton, to declining poplulations of ice-adapted Adèlie penguins, seals, and whales."

MBL Your research is based in Antarctica. What do you study there, how did you get interested in this work, and is it really as cold as it looks?

HD



MBL As incoming director, what do you think are the Ecosystems Center's strengths and what do you hope to accomplish in your new role?

HD

Accolades

- MBL Corporation member **Thomas D. Pollard**, chair and Sterling Professor of Molecular, Cellular and Developmental Biology at Yale University, and former MBL Physiology course faculty member **Joan Steitz**, Sterling Professor of Molecular Biophysics and Biochemistry and a Howard Hughes Medical Institute Investigator at Yale, received the 2006 Gairdner International Awards, which are among the most prestigious in science.

- MBL Corporation member and former Physiology course director **Joel Rosenbaum** (Yale University) received the

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