wildlife conservation was rarely a priority for private landowners, who simply cleared the land to make room for crops. As a result, the remaining wildlife habitat now exists as widely scattered patches of remnant vegetation. Furthermore, on most farms little is known about what species are present and how these species are using the existing landscape.

So Lambeck took a different approach. He begins with a field survey of existing species and those likely to occur in the region. Experts then review the list and eliminate species whose survival is not threatened. Vulnerable species are put into subgroups based on the kinds of management strategies and interventions needed to ensure their protection. Some species—a plant called the acorn banksia, for example—may only require fencing to exclude cattle from browsing, while other species, such as the yellow robin, may require more drastic reconstruction of the landscape.

The species with the most restrictive demands—those limited by area, by movement within the area, and by the availability of resources—are used to identify the critical elements of the landscape. The single species with the greatest area requirement, for example, becomes a "focal" species and sets the minimum area for patch size in the landscape design. Similarly, the species with the least mobility defines where in the landscape the patches are located and how they can best be connected, through corridor paths or other means. And looking at which species are absent from a region could suggest which native plants should be added to the landscape.

That, at any rate, is the theory. And while it's a plausible one, other conservation biologists note that reality can be more complex. Some worry that Lambeck's model does not pay sufficient attention to climatic variations over time within a single region. "He is taking a snapshot," says Steve Falconer, project officer for Rural Nature Conservation of the World Wildlife Fund, New South Wales. "I question whether it takes enough into consideration to ensure long-term viability of the ecosystem."

The focal model includes continuous monitoring of resident species populations, Lambeck responds, a strategy that should yield data on natural fluctuations and allow for appropriate readjustments of the conserved area. Any strategy "based on the needs of the focal species [that] is found not to be true" must be modified, he says.

Lambeck's model must also stand up to fiscal realities. Conservationists are concerned about the lack of money available in Australia to fund large-scale projects, such as buying land for habitat preserves. Nor do farmers receive any tax deductions for setting aside land for conservation.

But Lambeck says that farmers have shown interest in his plans as long as such plans don't conflict with their own. On the large wheat farms where Lambeck has worked, for instance, the land suffers from salinity due to high water tables. To lower the water table, farmers can devote marginal land to exotic trees or native vegetation or both instead of wheat. CSIRO ecologist Denis Saunders says this indicates that preservation and profits are not mutually exclusive. "Farmers use economic and planning models to increase production," he says. "We are now trying to integrate Lambeck's model with [existing strategies] so that both farm production and wildlife conservation can benefit."

–William James Davis

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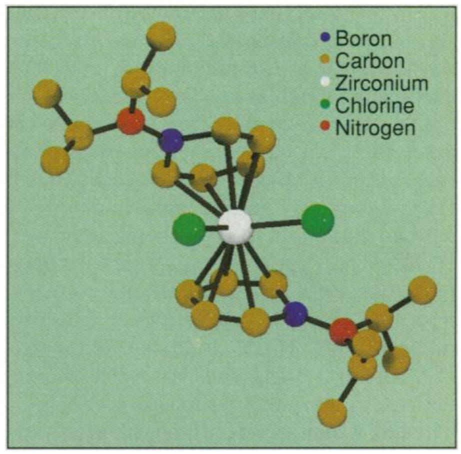
MATERIALS SCIENCE

Tuning a Catalyst for New Plastics

If plastics are big business, the catalysts that create many of them are the keys. Indeed, without them, plastic production, currently worth hundreds of billions of dollars annually, would be hobbled because there would be no way to link the small chemical building blocks from which plastics are made. One breed of catalysts that link building blocks called alpha-olefins typically employ rings of carbons to do their jobs. But now researchers, by inserting boron atoms into the carbon rings, are developing a new class of catalysts—and possibly whole new classes of polymers, too.



New tune. Adding boron to carbon rings lets researchers "tune," or adjust, the electronic behavior of this catalyst.

In the 6 March issue of the *Journal of the American Chemical Society*, a group of chemists at the University of Rochester in New York and the University of Michigan in Ann Arbor report that boron atoms, in combination with different chemical groups attached to them, can change how electrons are distributed throughout the catalyst molecule. That should give scientists a new way to "tune," or change, the catalyst's electronic properties. Because those properties help determine which olefins the catalyst will link together and how they assemble, increased tunability should lead to new types of polymers, possibly with different molecular weights or densities, says Guillermo Bazan, one author of the report. Just what those polymers will look like and how they will behave "is impossible to predict," he says. But although the researchers have not yet created a catalytic choir, just one compound humming a single note, it performs as well as current catalysts, and thus is "a promising first step," says Francis Timmers, a catalysis expert at the Dow Chemical Company's Central Research Laboratories in Midland, Michigan.

Catalysts of this type, known as metallocenes, typically consist of a single metal atom, such as zirconium, surrounded by a pair of all-carbon rings, which are in turn linked to other chemical groups. One end of the growing polymer chain binds near the metal, while together the rings and dangling groups control access of the olefin building blocks to that interior complex, forcing them to bind in one preferred orientation to the end of the chain. Bazan and his colleagues found that adding boron atoms to the rings shakes things up a bit. Boron is electron-hungry and tends to borrow electrons from other atoms in the catalyst, atoms either in the surrounding chemical groups or the core atom itself. That change in the distribution of electrons in the catalyst molecule is what alters the catalyst's interaction with the olefin building blocks.

Along with Arthur Ashe and his colleagues at Michigan, Bazan and his Rochester group found they could control this electron distribution by adding specific groups to the borons. The researchers linked the borons to nitrogen-containing amine groups and then inserted the borons into a pair of carbon rings surrounding a zirconium atom. As a result of this configuration, each boron grabbed a pair of electrons from the nearby nitrogen, leaving those around the metal undisturbed. That made the catalyst behave just like an ordinary catalyst with all-carbon rings and produce polyethylene and other polymers as effectively as conventional metallocene catalysts.

The researchers next plan to replace the amines with carbon-based phenyl rings. These rings should not give up electrons to the boron atoms, which should therefore scavenge electrons from the zirconium—altering the metal's electronic and catalytic behavior. If so, polymer catalysts may soon be singing some new tunes.

–Robert F. Service