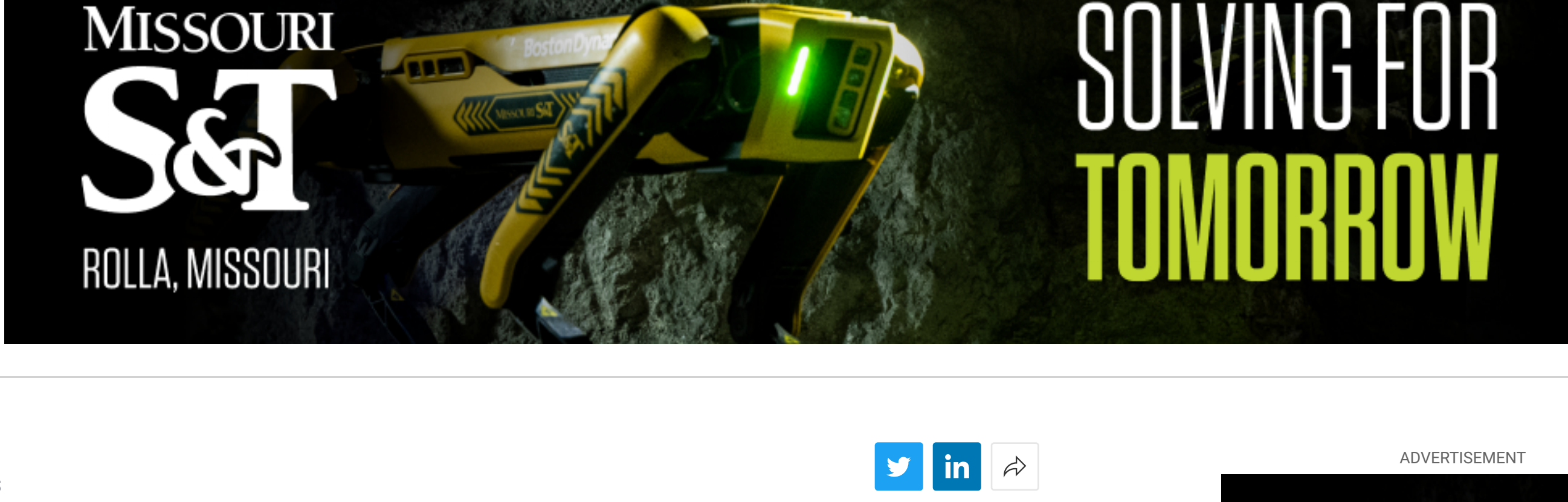


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NEWS



The Impending Extinction of Natural History

By David S. Wilcove and Thomas Eisner | SEPTEMBER 15, 2000

Imagine you are a naturalist with a liking for insects. You are interested in how insects make a living, in how they are fit for survival. You marvel at how protected they are as adults, when they are able to fly. And you think of how helpless they are as eggs and pupae, when they are stuck in place, unable to take evasive action. True, pupae are sometimes enclosed in protective cocoons, or hidden in dugouts in the soil, but some live out in the open, where they are exposed to a world of predators. How, for instance, do the pupae of ladybird beetles (family Coccinellidae) manage to survive? They are typically affixed to stems or leaves, where one would imagine they don't stand a chance against ants. Might they have special weaponry? You look closely and find that they do. They have what are essentially biting devices, in the form of clefts along the backs of their abdomens that they can open and close and use to snap at ants that come too close.

As a naturalist with a Darwinian bent, you wonder whether such snapping devices are present in every ladybird-beetle pupa or whether, in the best evolutionary tradition, different ladybird species have come to possess variants of this defense. You look at different species and find that, yes indeed, the beetles of one genus, *Epilachna*, which includes among others the Mexican bean beetle and the squash beetle, have evolved a remarkable alternative defense. Instead of the pinching devices, *Epilachna* pupae have a dense covering of tiny glandular hairs, the secretion of which forms a potent deterrent to ants.

You get in touch with chemists, whom you provide with a sample of the secretion, and in due course you find out that you have stumbled upon a unique group of chemicals. The substances include some fascinating new ring structures of enormous size -- so novel, in fact, that the paper you eventually write on the secretion with your colleague chemists attracts wide attention.

The discovery may look serendipitous, but it was not. It was driven by rational inference from pure, old-fashioned natural history, the close observation of organisms -- their origins, their evolution, their behavior, and their relationships with other species. That kind of close, scrupulous observation of nature has a long and illustrious history, but it is now sliding into oblivion.

The scenario we describe actually happened to one of us (Thomas Eisner). The impending extinction of natural history is very real as well. In schools and universities, in government agencies and research foundations, natural history has fallen out of favor. What was once considered a noble field of inquiry -- no less a figure than Charles Darwin proudly called himself a natural historian -- is now viewed as a relict discipline, a holdover from the era of Victorian cabinets and private butterfly collections. A knowledge of, or even an avowed interest in, natural history is no longer a prerequisite for admission to a graduate program in ecology or any other branch of biology. Financial support for basic natural-history research has all but evaporated. Even the field trip, long a staple of science education from the primary grades through graduate school, has become increasingly uncommon.

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This deinstitutionalization of natural history looms as one of the biggest scientific mistakes of our time, perpetrated by the very scientists and institutions that depend upon natural history for their well-being. What's at stake is the continued vibrancy of ecology, of animal behavior and botany, of much of molecular biology, and even of medicine and biotechnology. A knowledge of natural history enables the professional ecologist to see functional relationships in nature, to uncover the broader patterns that lead to critical scientific advances. Natural history also provides the "nuts and bolts" information necessary for managing wildlife and other natural resources. As the president of the Society for Conservation Biology recently lamented, "How can we possibly construct ... a successful recovery plan for an endangered bird when we lack basic information on such things as what it eats, where it nests, and so on?" For the molecular biologist, natural history is often the path to finding something truly strange and wonderful, like the elaborate chemicals that protect the pupae of certain ladybird beetles. Even the search for new medicines can benefit from natural history. Was it not in his capacity as a natural historian that Alexander Fleming saw significance in the observation of a zone of bacterial inhibition around a *Penicillium* mold growing in a petri dish, a discovery that launched the era of antibiotics?

Perhaps the strongest argument in support of natural history is simply the magnitude of our current ignorance about nature. To date, scientists have discovered and described approximately 1.5 million species. That tally represents only a small fraction of the total number, perhaps less than a tenth. Even in the United States, where approximately 200,000 species (terrestrial, freshwater, and marine) have been described to date, an additional 100,000 to 400,000 may await discovery. And only a tiny fraction of the described species have been studied in any detail. Given how little we know about nature, it hardly makes sense to discourage its further exploration.

Several factors have contributed to the demise of natural history. As any field of scientific inquiry matures, it has a tendency to become more theoretical. Previously unconnected observations are brought together under the mantle of a set of unifying principles. Scientists who contribute to that body of theory emerge as the leaders in the field; they are the ones who are hired by research universities, who receive tenure, and who then encourage their graduate students to follow in their footsteps. (This is not to say that one cannot be both a first-rate natural historian and a first-rate theoretician, but such individuals are the exception rather than the rule. Most scientists tend to be strong in one or the other.) No one can blame the universities for wanting to hire the rising stars in each discipline, but with respect to the natural sciences, the practice has led to an unanticipated but regrettable result: The traditional natural historian has been pushed to the margins of academe. Moreover, the institutions that finance scientific research, be they governmental or private, are drawn to the leaders in any given field and may wrongly assume that the natural historian has comparatively little to contribute. Unable to obtain support for their research, the natural historians drop even lower in the academic pecking order.

At universities, the key to reversing the situation lies in hiring (and eventually granting tenure to) scientists with an abiding affection for natural history. Unfortunately, a Catch-22 applies here. Administrators and senior professors who are uninterested in or even hostile to natural history are not likely to value it when judging candidates for junior faculty positions. And without access to entry-level positions, a new generation of natural historians will never emerge to become tomorrow's administrators and senior faculty members. The institutions that pay for research, however, could assume a leadership role in rescuing natural history. Were more money available for basic natural-history studies, we are convinced that more graduate students and faculty members would incorporate natural history into their researching and teaching.

An even more fundamental step would be to reinstate natural-history studies in elementary and secondary schools. Most children are fascinated by plants and animals -- from dandelions to dinosaurs. That seemingly innate interest, if nurtured by adults, can become a lifelong joy or even the path to a career. Untended, it usually atrophies as a child grows older. For the price of a stereo microscope, now less than \$250, a science teacher can turn a pinch of soil into a bustling world of springtails, oribatid mites, and nematodes, creatures as bizarre and engaging as anything to appear in a Star Wars movie.

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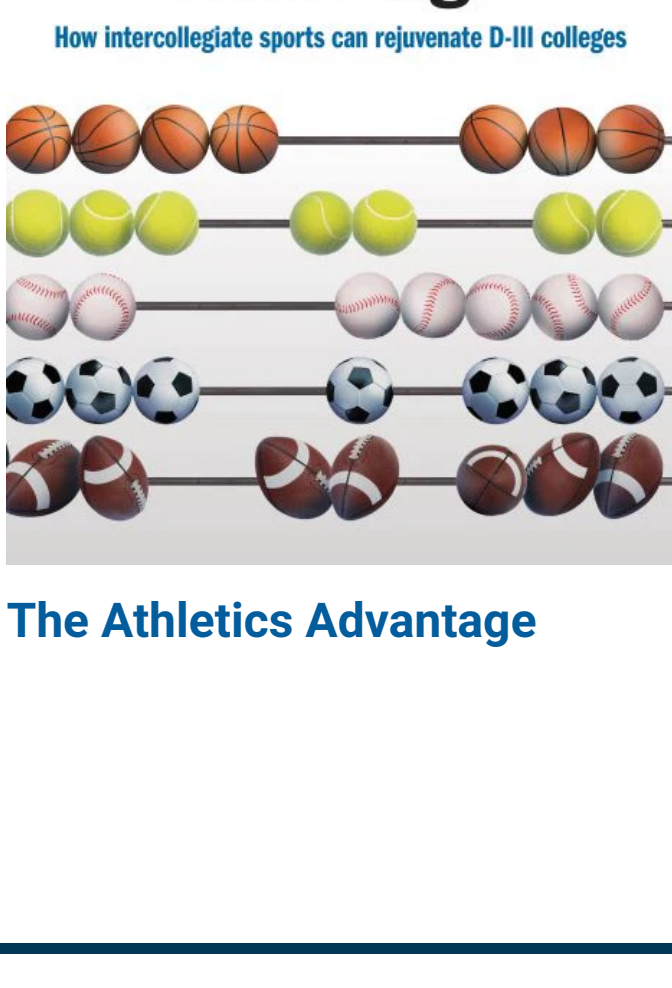
The current push to connect every classroom in America to the Internet demonstrates how quickly elected leaders and the public can be galvanized to address what is rightly perceived to be a critical educational need. Meanwhile, the demise of natural history goes unnoticed, increasing the likelihood that future generations of schoolchildren will spend even more time indoors, clicking away on their plastic mice, happily viewing images of the very plants and animals they could be finding in the woods, streams, and meadows they no longer visit.

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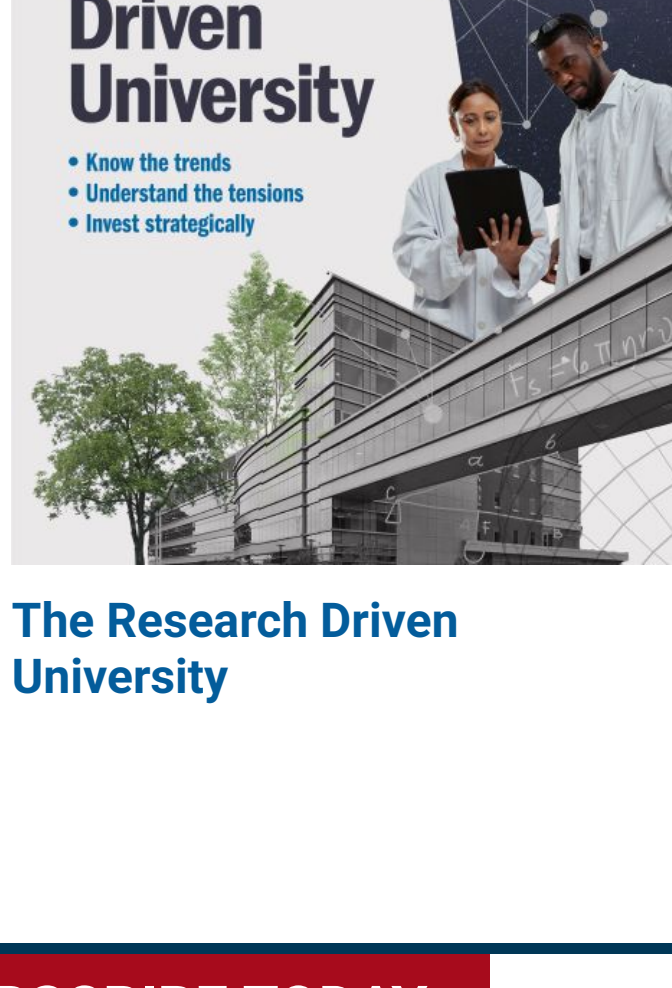
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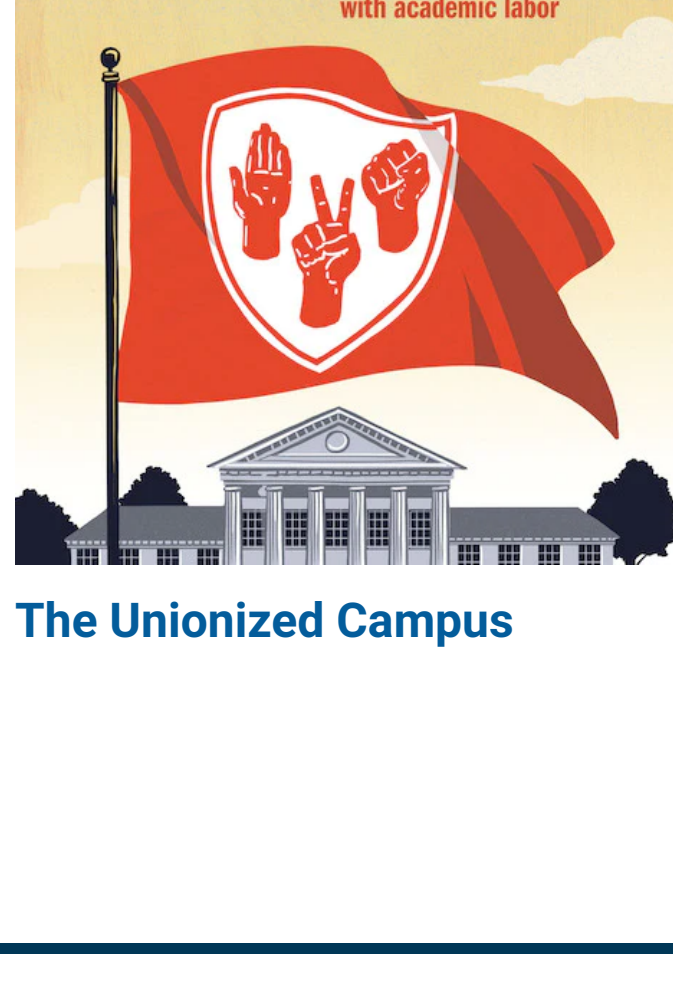
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