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The following is the established format for referencing this article:

Holling, C. S. 2000. Policy Dialogue: Genetically modified organisms in agriculture. *Conservation Ecology* 4(1): 14. [online] URL: <http://www.consecol.org/vol4/iss1/art14/>

Perspective, part of Special Feature on [Genetically Modified Organisms](#)

Policy Dialogue: Genetically Modified Organisms in Agriculture

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Published: March 27, 2000

The editorial [Two cultures of ecology](#), which inaugurated the journal *Conservation Ecology*, remarked on two cultures in science: one that analyzed parts of a system and one that integrated the parts. This policy dialogue on the significance of genetically modified crops in agriculture is an example of the tension between those two cultures and the society that receives the benefits of science or endures the burdens. The consequences of developing and using genetically modified crops are novel and transforming, not just to agriculture but also to ecosystems and societies.

This dialogue begins with papers by authors and commentators whose intellectual roots lie in the biological sciences and in the traditions of analytical, experimental science. They have all subsequently become major investigators into the integrative dimensions of science and its application. Gordon Conway is the author of the lead article, [Genetically modified crops: risks and promise](#). His early research was the first work that moved modern views of resilience (e.g., [Ludwig et al. 1997](#)) into tested designs for integrated agricultural systems. Subsequently, his career has balanced research with leading programs for sustainable development in the Ford Foundation. Recently, he became President of the Rockefeller Foundation. Now, that is something to note: an ecologist leading a major foundation. Some sort of sea change is in the offing. Read on.

The Rockefeller Foundation is noted for its founding role in launching developments of technology for the green revolution, a development that has enhanced agricultural production in many developing nations. It is only natural, therefore, that the Foundation might see in genetic engineering the hope of another huge advance in improving the lives of people. And it is also only natural that large corporations with ties to agricultural industry would actively develop and disseminate genetically modified crops as a profit possibility that would tie to a social good. One of those companies is Monsanto. Shortly after Conway became President of the Rockefeller Foundation

early in 1999, Monsanto invited Conway to present a lecture to their Board of Directors on the subject of genetically modified organisms in agriculture. It is that speech that is the substance of the lead article by Conway in this *Conservation Ecology* policy dialogue.

Conway's (2000) cautionary words and warnings to Monsanto in 1999 were prophetic. Not long after, the public opposition to GMOs in Europe reached such a point that agricultural exports of U.S. GMO crops was threatened. Monsanto's stock plummeted in value. Politicians expressed alarm, and intervened.

Why is that meaningful for conservation ecology? The results of developing and using GMO crops will be full of surprises. And the surprises will not likely be the health aspects that so much define present public controversy. The important surprises will be ecological and social. They will therefore emerge from integrated relationships between nature and people, among science, economics, and social sciences; among theory, discovery, and practice.

Conway's lead article in this issue is followed by five Commentaries that explore the integrated nature of the new technology and its consequences. All of the authors are noted biologists: four are ecologists and one a geneticist. Each brings something different to the table.

Pimentel is the pioneer of agroecosystem research whose work reflects the development of the integrated approach that has come from North American applied ecology (Pimentel 2000). Gadgil, a noted scholar of ecosystems, history, and cultures in India, has the wisdom to use theory, practices, and example to teach us what sustainability can mean (Gadgil 2000). Krebs is the noted behavioral ecologist who is among that group of ecologists in the UK who have combined outstanding research with administrative skills to shape much of UK science and application (Krebs 2000). Walker has literally been the creator and nurturer in science and government of a regional ecosystem science and application that is uniquely Australian, but one that leads the world in its insights and integrative nature (Walker and Lonsdale 2000). Ellstrand is a plant population geneticist who has studied the issue of gene flow from engineered crops to wild relatives for a number of years (Ellstrand 2000).

These Commentaries are followed by the summary of another Young Scholars Dialogue (Peterson et al. 2000). This is a wonderful group of scientists and scholars, early in their career, who bring a breadth of knowledge of science and a vital sense of values to issues. They all had access to the lead article and commentaries and, over a two-week period, explored the issue in a private on-line dialogue. Led by Garry Peterson, they produced a series of drafts leading to a final summary, published as the capstone to this series. It is not meant to be a consensus. It is meant to extend and focus the separate streams of experience for an integrated assessment. They have done this admirably.

We anticipate publishing a follow-up article that will address the policy actions that are in process and proposed. As another example, Ian Scoones, one of the editors of *Conservation Ecology*, has recently organized such a policy assessment. The results are published in a report, "The Politics of GM Food. Risk, Science and Public Trust," available at www.susx.ac.uk/Units/gec/gecko/gm-brief.htm (ESRC 2000). It explores how policy decisions are made about new GM technologies. The report suggests more effective ways of handling political decisions in the face of uncertainty, and emphasizes the need for public involvement in issues that are inherently ethical in nature, rather than purely scientific. Based on research undertaken under the UK Economic and Social Research Council's Global Environmental Change Programme, the report argues that new forms of decision making are required that are both deliberative and inclusive, requiring significant shifts in the way regulatory approaches and policies are developed. The report has generated considerable interest in the UK, but clearly offers broader lessons for discussions about the future the new biotechnology globally.

RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow [this link](#). To read comments already accepted, follow [this link](#).

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