to the Seville Strategy, 'Biosphere reserves offer such examples,' becoming theaters for reconciling people and nature by showing the way to a more sustainable future. The Seville Conference concluded that the three basic functions of biosphere reserves—conservation, sustainable development, and logistic support for research, education, and monitoring—will be as valid as ever in future years. The primary challenges to biosphere reserves today are adding new sites to improve world coverage and ensuring that biosphere reserves fulfill their designated functions.

See also: Conservation: Wetlands; Deforestation–Forestation; Environmental Challenges in Organizations; Environmental Planning; Environmental Policy; Environmental Policy: Protection and Regulation; Environmental Risk and Hazards; Environmentalism: Preservation and Conservation; Resource Geography

Bibliography

Batisse M 1982 The biosphere reserve: a tool for environmental conservation and management. *Environmental Conservation*. **9**(2): 101–11

Batisse M 1997 Biosphere reserves: a challenge for biodiversity conservation and regional development. *Environment* **39**(5): 7–33

Brandon K 1998 Perils to parks: the social context of threats. In: Brandon K, Redford K H, Sanderson S E (eds.) *Parks in Peril: People, Politics, and Protected Areas*. Island Press, Washington, DC, Chap.14

Gregg W P 1999 Environmental policy, sustainable societies, and biosphere reserves. In: Peine J D (ed.) *Ecosystem Management for Sustainability: Principles and Practices Illustrated by a Regional Biosphere Reserve Cooperative*. Lewis Publishers, Boca Raton, FL, Chap. 2

Gregg W P, McGean B A 1985 Biosphere reserves: their history and their promise. *Orion Nature Quarterly* **4**(3): 40–51

Halffter G 1985 Biosphere reserves: conservation of nature for man. *Parks* **10**(3): 15–18

Terborgh J 1999 *Requiem for Nature*. Island Press, Washington, DC

UNESCO 1984 Action plan for biosphere reserves. *Nature and Resources* **20**(4): 1–12

UNESCO 1996 *Biosphere Reserves: The Seville Strategy and the Statutory Framework of the World Network*. UNESCO, Paris

Walker R T, Solecki W D 1999 Managing land use and land-cover change: the New Jersey Pinelands Biosphere Reserve. *Annals of the Association of American Geographers* **89**(2): 220–37

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Biotechnology

In the closing decades of the twentieth century, biotechnology emerged as a site of rapid change in science and technology and as an arena of social and institutional transformation. The development of new techniques for studying, manipulating, and redesigning living things produced important applications in medicine and agriculture, and generated massive investment. In the world of research, biotechnology was often at the forefront of change in scientific institutions and practices. More broadly, biotechnology—widely perceived as having 'revolutionary' implications—inspired both intense enthusiasm and determined opposition. As an area of science and technology with the explicit goal of intervening in the machinery of life, biotechnology often disrupts traditional ways of distinguishing 'nature' from 'culture,' calling into question settled social arrangements and presenting societies with unfamiliar risks, unprecedented ethical dilemmas, and novel opportunities. As a result, biotechnology poses difficult challenges of governance. This article examines the rise of biotechnology and considers its technological and epistemic structure, its institutional dimensions, and its problematic position in contemporary politics.

1. The Term Biotechnology

Defining biotechnology poses challenges, for the word is less a tightly-defined, technical term than a loose umbrella category, or even a slogan, that conveys—sometimes simultaneously—visions of unbounded progress and unregulated tampering with nature. Many authors have tried to capture biotechnology within their own well-crafted definitions, but these attempts cannot neatly contain this expanding network of activities and its increasingly dense connections to diverse social worlds. Although the word has a long history (Bud 1993), in most contemporary contexts biotechnology refers to a novel and growing collection of techniques, grounded in molecular and cell biology, for analyzing and manipulating the molecular building blocks of life. The term also designates products, such as pharmaceuticals or genetically-modified foods, created using these techniques. At times, it refers not to products or techniques but to an economic sector or area of research. Biotechnology acquired these intertwined meanings toward the end of the 1970s, coming into widespread use in the early 1980s, as molecular biology was increasingly understood not only as a 'science' for learning about nature but also as a 'technology' for altering it.

2. The Biotechnology 'Revolution'

One of the ironies of the rise of biotechnology is that a sense of revolutionary potential energizes both the enthusiasm and the opposition it engenders. Supporters and critics alike often fit biotechnology into a narrative of radical discontinuity (e.g., Conway 1997, Kevles and Hood 1992, Rifkin 1983). Biotechnology advocates claim that it will completely transform medicine, spawn entirely new industries, and supply