



An Agricultural Law Research Article

**Nature, Knowledge, and Profit: The Yellowstone
Bioprospecting Controversy and the Core
Purposes of America's National Parks**

Part 2

by

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Despite this clear declaration that inspiration and collective public benefit are important functions of the parks, Congress has never quite focused on what form that inspiration should take or on what might interfere with it. Unquestionably, the legislature itself has on occasion strayed from an inspirational vision. It has, for example, created a national park that is little more than an undistinguished railroad museum.²³¹ And it has authorized some uses in parks that stray far from inspirational recreation.²³²

Nonetheless, the ideal of the park system remains both powerful and remarkably unchanged from the vision espoused by park advocates before passage of the Organic Act. Inspiration remains the key to the national parks ideal as expressed by its leading modern advocates. Alfred Runte writes that the national parks "should inspire Americans to care for every landscape."²³³ Michael Frome explains that "[r]aising the sights and standards of society, by appealing to and serving the higher emotions of humankind, is the singular mission of the national parks."²³⁴ Joseph Sax argues that the parks exist to change attitudes, not just to provide particular experiences.²³⁵

Attention to the inspirational role of the parks can help explain both the Organic Act's apparently paradoxical mandate and the place of parks in the modern world. The national parks today encompass the most spectacular natural scenery in the

States." *Id.* The enabling acts of several individual units of the system echo this public inspirational purpose. See, e.g., 16 U.S.C. § 79a (1994) (Redwood National Park); *id.* § 90 (1994) (North Cascades National Park); *id.* § 121 (1994) (Crater Lake National Park); *id.* § 159 (1994) (Saratoga National Historical Park).

231. Steamtown National Historic Site is widely derided as a prime example of "park barrel" politics. See Fischman, *supra* note 124, at 810 n.178. Steamtown was created essentially without the knowledge of the Park Service by a powerful congressman who was able to slip it into a bill in conference. See James M. Perry, *A Shrine Suffers as Pork for Parks is Larded Unevenly*, WALL ST. J., Jan. 11, 1991, at A1. Located in an old rail yard in Scranton, Pennsylvania, the park houses a collection of steam locomotives and railroad cars. Many of the cars are unrestored, and many lack any historical connection to Scranton. Furthermore, Scranton was never an important national railroad center. See James M. Perry, *GOP Congressman Shows How to Keep Power, Even While Under Indictment for Corruption*, WALL ST. J., June 14, 1994, at A16; *'Pork' Attack is Uninformed and Unfair* (editorial), ALLENTOWN (Pa.) MORNING CALL, Apr. 2, 1998, at A16. Although there is not much in the way of historic inspiration at Steamtown, it reportedly rates highly as an amusing tourist destination. See Dwayne Yancey, *Chugging Along in Steamtown*, ROANOKE (Va.) TIMES & WORLD NEWS, Oct. 4, 1998, at 6.

232. See, e.g., 16 U.S.C. §§ 410aaa-46 to 410aaa-50 (1994) (allowing hunting, fishing, trapping, mining, and grazing in Mojave National Preserve).

233. RUNTE, *supra* note 84, at xvi.

234. FROME, *supra* note 226, at 7.

235. SAX, *supra* note 194, at 13.

nation, just as they did in 1916. But they are unique at the end of the millennium in a different sense than at the turn of the last century. The national parks are no longer essential as a source of either national pride or national economic prosperity.²³⁶ Plenty of other places and things provide both of those. Nor are the parks a unique source of healthy outdoor recreation. Both the Forest Service and the Bureau of Land Management provide opportunities for members of the public to hike, camp, fish and hunt pursuant to their multiple-use missions.²³⁷ The national wilderness system, which includes some park areas, is expressly dedicated to the vision shared by Olmsted and Sax of contemplative recreation in a natural setting to heal the spirit and strengthen the body.²³⁸

But a special role does remain for the national parks, which are without doubt special places. The flagship natural parks, the best-known and most beloved units of the system, have a particularly important inspirational role.²³⁹ As examples of nature that is both (relatively) pristine and (relatively) accessible, they are unique today as places people may come to experience and study the wonders of nature. They contain the most striking natural scenery in the nation, along with the most

236. Individual parks remain important to their local economies, but the impact of the park system on the national economy is no longer viewed by the public as an important justification for that system. See National Parks and Conservation Association, *National Parks and the American Public* (visited June 17, 1998) <<http://www.npca.com/98posurv/execsum.html>> (reporting that only 14% of those surveyed thought providing income to the tourist industry was an important reason to have national parks).

237. See, e.g., 16 U.S.C. § 528 (1994) (“[T]he national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes.”); 43 U.S.C. § 1701(a)(8) (1994) (declaring that it is national policy that “the public lands be managed in a manner . . . that will provide for outdoor recreation”).

238. See 16 U.S.C. §§ 1133-1136 (1994); Howard Zahniser, *The Need for Wilderness Areas*, *LIVING WILDERNESS*, Winter-Spring 1956-57, at 37.

239. Winks argues that the 1970 statutory reference to “inspiration” includes “the re-creation of the spirit that comes from gazing upon or walking amidst a sublime scene,” and the simple feeling of well-being that healthy physical recreation can bring. Winks, *supra* note 124, at 614. But that kind of inspiration can come as well from recreation in wilderness areas or national forests; it is not enough to justify the treatment of parks as distinct from other public lands. The same can be said of the legislative statement that the parks are unique and irreplaceable because they were not created by deliberate human action. See H.R. REP. NO. 91-1265 (1970), *reprinted in* 1970 U.S.C.C.A.N. 3785, 3785 (noting that “[p]laces where nature prevails, or where history has been made, or where some phenomena occurred, or where outdoor recreation needs can be satisfied, cannot be made by man”). While undoubtedly true, that provides no justification for the unique status of parks. All of the public lands (and indeed all the lands in the nation) are unique and irreplaceable constructs of nature rather than of man.

illustrative and unspoiled examples of many of the country's native natural habitats. Those assets serve to lure the populace, even those who are not already nature sophisticates, to the parks, where they may be exposed to nature's wonders.

At the same time, as the potential economic value of park resources becomes increasingly apparent, the symbolic importance of holding them immune from economic exploitation grows. Runte has argued that establishment of the early national parks was made politically palatable by the forceful claims of park advocates that the lands being withdrawn from settlement were worthless for any other purpose.²⁴⁰ Today it is obvious that many, if not most, of the lands protected as national parks would command a good price on the real estate market, either for their scenic value or for the resources they harbor. The knowledge that these striking examples of nature are preserved wholly for their natural values, without regard to the revenue they could potentially bring to the national coffers, tells visitors and the world that the nation views nature, at least in these few special places, as more important than money.

"Publicness" also remains important to the national parks today. The founders of the park system were intent on protecting broad public access in part for its civilizing value. It remains true today that common recreation may be a socializing activity.²⁴¹ But many opportunities exist outside the national parks for people from all walks of life to mingle. What seems more important today is the symbolism of shared access, and its continuity in these particular places.²⁴² The national parks are the most public of our public lands. By making *all* their benefits as widely available as possible, the nation reaffirms its commitment to sharing at least some portions of its national wealth with all citizens. Accordingly, strict adherence to the Organic Act's injunction that "no natural curiosities, wonders, or objects of interest shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public"²⁴³ is an important aspect of the parks' inspirational function.

Properly understood, the special function of the natural

240. See RUNTE, *supra* note 84, at 48-55.

241. See Rose, *supra* note 214, at 780-81.

242. Cf. PRESIDENT'S COMMISSION ON AMERICANS OUTDOORS, AMERICANS OUTDOORS: THE LEGACY, THE CHALLENGE 29 (1987) (noting that outdoor settings can serve as points of continuity, fostering connections among individuals and between generations).

243. 16 U.S.C. § 3 (1994).

units of the park system today is to expose all visitors to nature in a way that inspires wonder, awe and respect. John Muir's hopes can still be realized; if the parks perform their functions well, visitors will leave with a new or renewed understanding of the value of nature not only in the parks but in their own daily lives.²⁴⁴ Understanding that this is the core purpose of the national parks renders the dual use and preservation mandate of the Organic Act not only understandable but inescapable. People must be allowed and even encouraged to visit the parks in order to experience their inspirational power. At the same time, the resources of the parks must be protected so that they retain the ability to fill the visitor with awe and wonder.

2. *Modern Park Management and Inspiration*

In some respects, the Park Service's understanding of the purposes of the natural units of the park system has become considerably more sophisticated since 1916. Quite appropriately, the Park Service now emphasizes nature in all its dynamic glory, rather than simply static scenery, in the parks. It recognizes that nature, relatively undisturbed by the modern human world, is the outstanding feature of the large natural parks. The rhythms of nature's processes, so hidden in most of the modern world, provide the scenery of the parks with a significant inspirational quality.²⁴⁵

In the early days the Park Service's management of the parks reflected little understanding of, or concern for, anything

244. See RUNTE, *supra* note 84, at xvi ("National parks should be more than reservations separating wilderness from the grasp of civilization. Rather, they should inspire Americans to care for every landscape, especially those enveloping their daily lives."); see also FRANCIS N. LOVETT, NATIONAL PARKS: RIGHTS AND THE COMMON GOOD 9 (1998) ("The experience of nature through the parks can instill positive environmental values in community members, without which protecting the environment . . . might not be possible."); WAGNER ET AL., *supra* note 90, at 11-15 (stating that the committee commissioned by the Wildlife Society notes that the unique recreational experiences available in the parks can inculcate in the public environmental ethics and other desirable values).

245. The Park Service now claims to manage the flagship natural parks, particularly Yellowstone, as ecological systems, concentrating on their dynamic natural processes rather than just their scenic facades. See *Management Policies*, *supra* note 84 ("Managers . . . will try to maintain all the components and processes of naturally evolving park ecosystems."); Robert B. Keiter, *Preserving Nature in the National Parks: Law, Policy, and Science in a Dynamic Environment*, 74 DENV. U. L. REV. 649, 657 (1997) ("[T]he Park Service now defines its statutory preservation responsibilities in terms of maintaining and restoring native species and processes, while minimizing human intervention into natural ecological processes."). Professor Keiter provides a thorough review of the Park Service's natural management policy, focusing particularly on Yellowstone.

other than scenery. That began to change with the influential Leopold Report of 1963, which declared that “[a]bove all other policies, the maintenance of naturalness should prevail.”²⁴⁶ That same year, the National Academy of Sciences issued a report that reached a similar conclusion: “The [Park] Service should be concerned with the preservation of nature in the national parks, the maintenance of natural conditions, and the avoidance of artificiality”²⁴⁷

As nature has come to be seen as the key resource of the parks, it has also become more consciously the center of the visitor experience. Beginning with the Leopold Report, recreational facilities such as golf courses and ski lifts were recognized as inconsistent with park purposes.²⁴⁸ The unnatural displays the parks staged for the amusement of visitors have decreased in importance. Even before the Leopold Report, the parks had begun to phase out wildlife spectacles such as bear feedings at garbage dumps.²⁴⁹ Today, fewer visitors see bears, but those that do see them in their natural habitat. Those lucky visitors get a closer glimpse of nature, and a far more inspiring experience.

Although it has come to understand the importance of nature in the parks, the Park Service still lacks a deep understanding of the parks’ inspirational function. The Park Service endorses that function frequently in its public statements. In the Vail Agenda, for example, it noted that the parks have a purpose “higher and apart” from providing

246. Leopold Report, *supra* note 90, at 242. The report recognized, however, that because most parks were not large enough to be ecologically self-regulating, active management intervention would be necessary. Naturalness did not mean that the parks would be left entirely untouched. *See id.* at 250.

247. NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL, A REPORT BY THE ADVISORY COMMITTEE TO THE NATIONAL PARK SERVICE ON RESEARCH (1963), *partially reprinted in* CRITICAL DOCUMENTS, *supra* note 84, at 253 [hereinafter NAS 1963 REPORT].

248. Such facilities were strongly criticized in the 1963 Leopold Report, *supra* note 90, at 242, and the NAS 1963 REPORT, *supra* note 247, at 256. Today, the American public seems to agree that “unnatural” recreation is not appropriate in the national parks. *See* National Parks and Conservation Association, *supra* note 236 (reporting that in a 1998 survey of representative American households 92% believed jet skis should be banned or limited in national parks, 89% had that view with respect to snowmobiles, and 87% with respect to air tours).

249. In the mid-1940s, Yellowstone dropped its exhibition of captive bison, opting instead to manage bison as wild animals in their natural environment even if that meant fewer visitors would see them. *See* SELLARS, *supra* note 89, at 157-58. About the same time, Yellowstone and Yosemite both began to phase out the bear shows at garbage dumps. *See id.* at 160-61.

recreation, entertainment, or economic growth.²⁵⁰ The parks embody the shared national experiences and values of the American people²⁵¹ and should be managed so that their scenery "provokes sentiments of wonder and good fortune."²⁵² The Service has recognized in its written management policies that the intangible values of the parks, as well as their physical resources, deserve protection.²⁵³ Unfortunately, it does not seem to understand what those intangible qualities are. In its management policies, for instance, the Park Service cites such concrete features of parks as the sounds of nature and clear night skies as examples of intangible qualities.²⁵⁴ Natural sounds and starry skies are undoubtedly important aspects of the parks, but they are not intangibles. The key intangible quality of the parks is their ability to inspire a sense of wonder, awe, and respect in the presence of nature. That quality is even more fragile than a star-filled night sky.

In light of its lack of understanding of the parks' inspirational quality, it is not surprising that the Park Service has not found an effective means of protecting that quality. Lacking a better measure, the Service has often relied on tradition and a vague sense of aesthetics to determine whether or not a particular activity belongs in the parks.²⁵⁵ While these indicators may sometimes lead park managers to the right conclusion, they are not adequate measures of impacts on the ability of the parks to inspire visitors with wonder and pride. Relying on these inadequate measures in this particular controversy, the park officials have fulfilled their duty as stewards of the parks' physical resources, carefully considering the impact of Diversa's proposed sampling on those resources.²⁵⁶ But they have not seen the need to consider the potential effects of the agreement on the park's intangible qualities.

250. VAIL AGENDA, *supra* note 91, at 74.

251. *Id.* at 10, 14.

252. *Id.* at 20. Similar sentiments were expressed in a recent planning document for Yellowstone National Park. See NATIONAL PARK SERVICE, *supra* note 12 (describing Yellowstone as "a refuge not only for wildlife, but for the human soul").

253. See *Management Policies*, *supra* note 84, Introduction.

254. See *id.* (listing as intangible qualities "natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies").

255. See SCHULLERY, *supra* note 86, at 255.

256. There is good reason to suppose that Diversa's bioprospecting will leave no discernible environmental trace. See *supra* note 33 and accompanying text.

IV

COMMERCIAL SCIENCE AND THE NATIONAL PARKS

The objections to the Diversa agreement should suggest to the Park Service that at least some observers perceive the deal as having unacceptable impacts on the park. Instead of simply repeating that microbial sampling will not harm the park's physical resources, the Park Service should consider the underlying objections, which are more closely tied to the parks' inspirational role.²⁵⁷

Plaintiffs in the Diversa lawsuit object to the science it contemplates. Some of the plaintiffs object generally to genetic engineering, which they see as the ultimate human domination of nature.²⁵⁸ They object even more to genetic engineering in the context of the national parks, which should be a refuge for unspoiled nature. In addition, they object to the commercial nature of the agreement, which they see as a bartering of national park resources for revenue.²⁵⁹

Those objections deserve more attention than the Park Service has given them. Once staunchly opposed to science, the Park Service now embraces science, particularly when performed by outsiders, sparing the Service's scanty budgets. But the Park Service's view of science remains too simplistic. Just as it was wrong to reject all science in its early days, the Service is wrong to embrace all science today. Some science belongs in the

257. The complaint clearly reveals that plaintiffs are seeking to protect the intangible as well as the physical qualities of the park. In order to demonstrate standing plaintiffs argue, among other things, that this agreement will harm their members by reducing the ability of Yellowstone National Park to provide aesthetic, spiritual, and artistic inspiration. See Complaint, *supra* note 49, at 11.

258. In a 1997 presentation in Ireland, for example, Edmonds Institute director Beth Burrows characterized genetic engineering as "violent intervention into the structure of life in order to reshape it." *Debate Sought Over Plant Genetics Experiment*, IRISH TIMES, June 18, 1997, at 2. The International Center for Technology Assessment (ICTA) has joined a lawsuit against the Food and Drug Administration seeking mandatory testing and labeling of foods produced with genetically engineered organisms. See Jim Puzanghera, *Genetically Engineered Foods Are Target of Coalition's Lawsuit*, PHILA. INQUIRER, May 28, 1998, at A3. Other groups that have not joined the lawsuit have expressed qualms about the Diversa deal based on their uneasiness with the patenting of genes or organisms. See, e.g., Smith, *supra* note 12, at A1 (reporting that Rural Advancement Foundation International opposes the deal on the grounds that the patenting of genes or organisms is undesirable).

259. Beth Burrows of the Edmonds Institute has said, for example, that the "bartering of living organisms" is not an appropriate activity for the National Park Service. Smith & Siegel, *supra* note 14, at A1. Alliance for the Wild Rockies has said it objects to any efforts to commercialize national parks. See Christopher Smith, *Park's Secret Dealing Draws Fire*, SALT LAKE TRIB., Dec. 5, 1997, at A26.

national parks and some does not. Attention to the parks' inspirational and expressive functions could help the Service make that distinction.

A. *Science for Parks and Parks for Science*

The Park Service was founded on the conviction that science does not hold all the answers to the question of how human beings should relate to nature. At the dawn of the twentieth century, preservationists, led by John Muir, and conservationists, epitomized by Gifford Pinchot, engaged in a fierce debate over a proposal to dam the Hetch Hetchy Valley in Yosemite National Park to create a water supply reservoir.²⁶⁰ Speaking for the preservationists, who believed nature should be protected in a state unaltered by man, Muir argued for preservation of the valley simply for its special beauty.²⁶¹ He was adamantly opposed to the economic exploitation of park lands.²⁶² Pinchot, in contrast, spoke for the conservationists, who believed in the wise use of all nature's resources for the greatest benefit of humanity. The conservationists believed in the exploitation of natural resources, albeit under the careful guidance of science and reason.²⁶³ That principle led Pinchot to conclude that the resources of the national parks, like others, should be available for harvest.²⁶⁴

Pinchot and his conservationists won the Hetch Hetchy battle, and that valley disappeared beneath a reservoir. But the controversy inspired the preservationists to demand that the national parks be managed separately from Pinchot's forest reserves.²⁶⁵ The preservationists eventually prevailed in that larger battle with the passage of the Organic Act, which created

260. See, e.g., RUNTE, *supra* note 84, at 78-81.

261. As Muir put it, "Everybody needs beauty as well as bread, places to play in and pray in, where Nature may heal and cheer and give strength to body and soul alike." Muir, *supra* note 201, at 814.

262. After extolling the beauty of Hetch Hetchy, Muir excoriated those who would drown that beauty as "temple destroyers, devotees of ravaging commercialism, [who] seem to have a perfect contempt for Nature, and, instead of lifting their eyes to the God of the mountains, lift them to the Almighty Dollar." *Id.* at 817; see also *supra* note 201 (Muir's statement to Congress that "Nothing dollarable is safe, however guarded.").

263. See, e.g., DAVID A. CLARY, *TIMBER AND THE FOREST SERVICE* 16 (1986); JAMES L. PENICK, JR., *PROGRESSIVE POLITICS AND CONSERVATION: THE BALLINGER-PINCHOT AFFAIR* 188 (1968); SAMUEL P. HAYS, *CONSERVATION AND THE GOSPEL OF EFFICIENCY: THE PROGRESSIVE CONSERVATION MOVEMENT 1890-1920*, at 71 (1959).

264. See, e.g., HAYS, *supra* note 263, at 195.

265. See RUNTE, *supra* note 84, at 95; HAYS, *supra* note 263, at 196-97; SELLARS, *supra* note 89, at 35-36.

the National Park Service and placed it under the supervision of the Secretary of the Interior.²⁶⁶

Founded as it was in opposition to Pinchot's scientific conservation movement, it is not surprising that the early Park Service was nearly devoid of scientists.²⁶⁷ Instead, its ranks were full of park rangers and landscape architects, experts in the aesthetics the Park Service saw as its primary focus.²⁶⁸ The Park Service did not commit itself to any serious scientific studies until George Wright, a Yosemite naturalist of independent means, offered to fund a survey of park wildlife in 1928.²⁶⁹

Beginning in the early 1960s, though, the new emphasis on nature as the centerpiece of the parks brought new calls for the Park Service to make science the foundation of its management strategy. Since the 1963 Leopold Report, several influential observers have urged the Park Service to expand and improve its scientific research program in order to improve its ability to manage the parks effectively.²⁷⁰

In 1992, a committee of the National Academy of Sciences weighed in with a report that recommended a scientific strategy with two distinct components, which it dubbed "science for the parks" and "parks for science."²⁷¹ "Science for the parks" encompassed research directly aimed at supporting management goals. The committee stressed the need for baseline inventory and monitoring of park resources, as well as research designed specifically to develop, evaluate, or support management practices.²⁷² Under the rubric of "parks for science," the

266. 16 U.S.C. § 1 (1994).

267. The Park Service appointed its first research scientist in 1928 to study large mammals in Yellowstone. See R. GERALD WRIGHT, *WILDLIFE RESEARCH AND MANAGEMENT IN THE NATIONAL PARKS* 13 (1992).

268. See SELLARS, *supra* note 89, at 49-52.

269. See *id.* at 86-87.

270. The Leopold Report urged a "greatly expanded research program" to support scientific park management. Leopold Report, *supra* note 90, at 250. That call was repeated in a 1989 report commissioned by the National Parks and Conservation Association, a nonprofit group dedicated to promoting and defending the national park system. See NATIONAL PARKS AND CONSERVATION ASSOCIATION, *supra* note 90, at 8. A blue-ribbon committee convened by the National Research Council echoed the same concerns in 1992, concluding that NPS did not even know what resources were found in the parks, much less understand their dynamics or the threats they faced. See NATIONAL RESEARCH COUNCIL, *supra* note 90, at 2-4. Most recently, the Wildlife Society issued a report citing the need for long-term basic research "to provide a deep understanding of park ecosystem structure and function, which will then thoroughly enlighten management." WAGNER ET AL., *supra* note 90, at 199.

271. NATIONAL RESEARCH COUNCIL, *supra* note 90, at 91.

272. See *id.* at 91-96. Others have also called for increased inventory and monitoring efforts. See, e.g., NATIONAL PARKS AND CONSERVATION ASSOCIATION, *supra*

committee recommended a program of research using the parks, and particularly their large undisturbed natural areas, as tools to address major scientific questions.²⁷³

The Park Service has explicitly embraced the "parks for science" concept,²⁷⁴ offering two justifications for opening the parks to research by outside scientists. First, outside research can provide data needed for the long-term protection of park resources.²⁷⁵ Second, the knowledge that could be generated through outside research, whether or not it was put to work directly in the parks, would itself be "a resource of inestimable value."²⁷⁶

From a scientific standpoint, the latter point is not an exaggeration. The national parks are unique natural resources for scientific study. They include areas relatively untouched by human activity in the past and guaranteed to stay that way in the future. As such, they are particularly attractive sites for long-term and large-scale environmental research.²⁷⁷ In addition, many parks harbor unique biotic and geologic features that attract researchers.²⁷⁸ Some studies can only be conducted in parks, while others are better suited to parks than to any alternative sites.

Although the Park Service has something of a reputation as unreceptive to outside research, it has long appeared to encourage outside scientists to use the parks.²⁷⁹ As early as

note 90, at 10, 12.

273. NATIONAL RESEARCH COUNCIL, *supra* note 90, at 96-100. This suggestion was not new, having been made by the National Academy itself in its 1963 Report on research in the parks. See NAS 1963 REPORT, *supra* note 247, at 261 ("Universities, private research institutions, and qualified independent investigators should be encouraged to use the national parks in teaching and research."). The Wildlife Society, a professional society for wildlife scientists and managers, has recently endorsed a similar dual role for science in the parks. See WAGNER ET AL., *supra* note 90, at 199.

274. The Service wrote that "the recommendations of *Science and the National Parks* are sound, and should be strongly endorsed . . ." SCIENCE AND THE NATIONAL PARKS II, *supra* note 91, at vii.

275. *Id.* at 5-6.

276. *Id.* at 6.

277. See NATIONAL RESEARCH COUNCIL, *supra* note 90, at 96-97.

278. More than thirty U.S. national parks have been designated biosphere reserves or world heritage sites in recognition of their scientific significance. See *id.* at 98-99.

279. The Park Service has expressed the hope that its formal endorsement of "parks for science" might help overcome that image. See SCIENCE AND THE NATIONAL PARKS II, *supra* note 91, at 6. However, the problem seems not to rest with the official pronouncements of the Park Service leadership, which have long been pro-science, but rather with the individual actions of park superintendents, who have effectively controlled access to their parks.

1933, Park Service Director Horace Albright wrote that the national parks were "equipped by nature with the most complete and magnificent laboratories imaginable,"²⁸⁰ suitable for use by outside scientists. The Park Service, he explained, "welcomes the many investigations inaugurated and carried through by organizations and individual scientists."²⁸¹ Again in 1945, a Park Service report encouraged use of the parks as field laboratories by outside scientists.²⁸² The Park Service's earliest formal regulations permitted scientific collection in the parks, subject to the requirement that the collector obtain a permit from the park superintendent.²⁸³

This encouragement has borne fruit in at least some parks. Research by outside scientists has established a tradition of scientific collecting in the parks that undoubtedly contributes to the willingness of modern park managers to entertain bioprospecting proposals. Most of the studies detailed in a 1933 bibliography of scientific investigations in Yellowstone, for example, were carried out by scientists outside the Park Service.²⁸⁴ That catalog includes numerous studies by other government agencies, including the USGS, the Forest Service, the U.S. Weather Bureau, and the U.S. Biological Survey. It also attributes a handful of studies to scientific institutions such as the New York Botanical Garden, the Smithsonian Institution, and the Milwaukee Public Museum. Finally, the report details a number of studies carried out by individuals, some associated with universities or research institutes and others not.²⁸⁵

Today the national parks are frequently used by outside researchers for scientific studies not directly related to park management. Yellowstone National Park, for example, is the site of some 200 extramural projects every year.²⁸⁶ Many of these projects involve collection of specimens, and would appear likely to have more significant direct physical impacts on park

280. Albright, *supra* note 84, at 122.

281. *Id.* at 131.

282. See SELLARS, *supra* note 89, at 165.

283. See Department of the Interior, National Park Service, Rules and Regulations, 1 Fed. Reg. 672, 673 (1936). In 1941, the Service added the provision that permits could be issued only to "persons officially representing reputable scientific or educational institutions." General Rules and Regulations, 6 Fed. Reg. 1626, 1629 (1941).

284. See generally CARL P. RUSSELL, A CONCISE HISTORY OF SCIENTISTS AND SCIENTIFIC INVESTIGATIONS IN YELLOWSTONE NATIONAL PARK (1933).

285. The studies listed cover a range of subjects in the physical, life and social sciences, including a precursor of today's thermophile work, a 1903 study of the plants of the park's hot waters by Dr. W.A. Satchell. See *id.* at 16.

286. See *supra* note 93 and accompanying text.

resources than Diversa's collecting.²⁸⁷ Until recently, the Park Service seemed to take a very relaxed approach toward outside science, apparently assuming that scientific research in the parks was always beneficial.²⁸⁸ Oversight of extramural research has been spotty. Notwithstanding the general Park Service regulations, individual parks have largely followed their own policies with respect to the issuance of research permits, and the conditions attached to those permits.²⁸⁹ The Diversa controversy should alert the Park Service to the need both to rethink its assumption that extramural scientific research is uniformly benign and to standardize the treatment of scientific research in the various parks.

B. Science and the Inspirational Purpose of the Parks

Clearly, science has a crucial role to play in the national parks. As numerous scientific observers have pointed out, scientific research is essential to effective management of park resources.²⁹⁰ At least some of the knowledge needed to understand and protect park resources can only come from research within the parks. No one has challenged the authority or obligation of the Park Service to perform, contract for, or allow others to perform that sort of scientific research in the parks, subject always to the requirement that the benefits to park protection outweigh any adverse impacts on park resources.

The parks also are appropriate sites for some scientific research not directly intended to serve current park management needs. Basic research in the parks can generate knowledge that may prove helpful for future management. More importantly, the parks are unique resources for scientific studies, and those studies can directly serve the mission of the parks by inspiring precisely the wonder and awe of nature the parks are intended to promote. But science is not a homogenous activity, and not all science is compatible with the inspirational purpose of the

287. See, e.g., INVESTIGATORS' ANNUAL REPORTS FOR 1996, *supra* note 42, at 19 (willow twigs collected); *id.* at 45 (vascular plants collected); *id.* at 57 (cutthroat trout eggs collected); *id.* at 106 (mushrooms collected).

288. See, e.g., WAGNER ET AL., *supra* note 90, at 186 (answering globally yes to Park Service question whether research is a valid use of parks); NAS 1963 REPORT, *supra* note 247, at 261; see also *supra* note 163 and accompanying text.

289. See, e.g., *Special Park Use Guidelines*, *supra* note 162, at A18-3 ("Units of the National Park System currently use a variety of permits to authorize conducting of natural and social science research in parks, and to permit collecting in parks of natural resource specimens for scientific purposes This practice is not authorized.").

290. See *supra* note 270 and accompanying text.

parks.

1. *Appreciation and Manipulation of Nature*

Modern science turns two distinctly different faces to nature, one of profound awe, the other of total domination.²⁹¹ On the one hand, science can be a powerful force for facilitating appreciation of nature's wonders. Science provides a uniquely intimate view of nature. Love for, and fascination with, nature draws many scientists to their craft. Indeed, a "fascination with mystery" has been said to be the motivation for all great science.²⁹² This fascination does not necessarily entail an urge to solve the mystery, uncovering all of nature's secrets. Rather, it is simply the product of the scientist's awe in the face of nature's infinite insoluble mysteries.

Science can provide its practitioners with the same sense of grandeur and mystery others seek in religion.²⁹³ The knowledge it provides reinforces the emotional connection to nature that often draws scientists to their work. Although there is a popular perception that science destroys mystery and wonder, it can have precisely the opposite effect. The mysteries of nature only deepen with increased knowledge. That knowledge reveals nature as ever more complex and ever more miraculous, calling forth feelings of reverence and awe.²⁹⁴ This face, which both expresses and enhances devotion to nature, can be called "appreciative" science.

The appreciative face of science is as old as observational science itself. Aristotle, Copernicus, Linnaeus, and Darwin all practiced appreciative science, seeking to understand nature in order to better appreciate nature and the forces (whether conceived as spiritual or not) that shape it. In the modern era,

291. Both Aldo Leopold and Evelyn Fox Keller have noted the dual nature of science. See EVELYN FOX KELLER, *Feminism and Science*, in *THE PHILOSOPHY OF SCIENCE* 279, 285 (Richard Boyd et al. eds., 1991); ALDO LEOPOLD, *The Land Ethic*, in *A SAND COUNTY ALMANAC WITH ESSAYS ON CONSERVATION FROM ROUND RIVER* 237, 260 (1966) (noting the paradox of "science the sharpener of [man's] sword versus science the searchlight on his universe").

292. Douglas R. Hofstadter, *Popular Culture and the Threat to Rational Inquiry*, 281 *Sci.* 512 (1998).

293. See CHET RAYMO, *SKEPTICS AND TRUE BELIEVERS* 8 (1998).

294. See EDWARD O. WILSON, *BIOPHILIA* 10 (1984) ("Our sense of wonder grows exponentially: the greater the knowledge, the deeper the mystery . . ."). Raymo makes the same point with an anecdote of a scientist describing to an artist how the layers of understanding science brings enhance the aesthetic appreciation of a flower, allowing the scientist to see not only the surface beauty of the flower, but the beauty of its cells and even its molecules. See RAYMO, *supra* note 293, at 52-53.

this tradition has been continued by such scientists as Aldo Leopold, E.O. Wilson, and Rachel Carson. These and other scientists feel compelled not only to learn all they can about the natural world, but to communicate that knowledge to others. Driven by their own devotion to nature, their work is consciously aimed at increasing public understanding in order to inspire greater public appreciation of, and concern for, nature.²⁹⁵ The popularity of the writings of this group suggests that at least this talented few can effectively communicate the excitement and inspiration science brings them to a broader public ready to share those reactions.

Appreciative science is well suited to the national parks. It carries respect for the natural objects of its study; they merit close attention precisely because they have inherent value in their raw form. Thus, appreciative science expresses and fosters the respectful attitude toward nature that parks are intended to instill. As an example of the contribution this sort of science can make to the parks, science conducted in this tradition helped convince the Park Service to move away from unnatural and undignified displays of wildlife feeding at open garbage dumps toward more respectful and authentic treatment of park wildlife.²⁹⁶

The other face of science is newer. It dates to the scientific revolution of the early seventeenth century, which brought experimentation to the fore. Francis Bacon, the best known advocate of experimental science, saw science as a means for man to conquer and command nature, establishing human dominion over the universe.²⁹⁷ For Bacon, science produced knowledge in order to facilitate the manipulation of nature to serve human ends.²⁹⁸ Experimentation was the means to that end; the experimenter interrogated nature, forcing her to reveal her secrets and allowing man to mold nature to his ends.²⁹⁹ The Baconian face of science, which seeks to wrest knowledge from

295. As Wilson, a distinguished evolutionary biologist and the author of several popular books, has written, "to the degree that we come to understand other organisms, we will place a greater value on them, and on ourselves." WILSON, *supra* note 294, at 2.

296. See SELLARS, *supra* note 89, at 160-62.

297. See, e.g., PEREZ ZAGORIN, FRANCIS BACON 40, 227 (1998).

298. See, e.g., *id.* at 45-46, 78-79, 227-28.

299. See FRANCIS BACON, THE GREAT INSTAURATION, *reprinted in* NEW ATLANTIS AND THE GREAT INSTAURATION 1, 27-28 (Jerry Weinberger ed., 2d ed. 1989) (calling for a natural history of nature when "by art and the hand of man she is forced out of her natural state, and squeezed and moulded" because "the nature of things betrays itself more readily under the vexations of art than in its natural freedom").

nature in order that humanity might more completely subject nature to human control, can be called its "instrumental" aspect.

The instrumental face of science seeks knowledge for the power that knowledge can bring. It treats nature as a raw material, not as an entity with intrinsic value in its unaltered form.³⁰⁰ As such, it communicates a different message than appreciative science. The message of instrumental science is that nature has value not in itself, but only as a means toward human ends. That is not the message parks should communicate.

Instrumental science is undoubtedly of great value. It has extended human life spans, increased the comfort of those longer lives, even taken humans to the moon. Notwithstanding the value of instrumental science, it is not appropriately conducted in the national parks, which have been consciously set aside for the admiration and love of nature. The exploitation of nature instrumental science condones should be left to other places.

The contrast between the instrumental and appreciative scientific traditions closely parallels that between Gifford Pinchot's conservationist and John Muir's preservationist views of the function of parklands.³⁰¹ Pinchot felt that the resources of parks, like those of other lands, should be available for consumption or use to serve human ends. Science could enable land managers to use resources frugally, for the maximum human benefit. Muir, in contrast, felt that the parks should not be changed or consumed on human whim. Instead, they should be available for observation and enjoyment in their raw form. Strictly instrumental science, like Pinchot's scientific conservationism, is incompatible with the wondering, respectful attitude toward nature that the national parks are intended to foster and express. But, like Muir's preservationism, appreciative science is at home in the parks.

2. *Public and Private Science*

Another aspect of science is relevant to its role in the national parks. Traditionally, science has been a strongly public activity. Scientific progress comes not from individuals working in isolation, but from the robust give and take of the scientific

300. Ecofeminists argue that treating nature strictly as a raw material inevitably leads to its devaluation. See, e.g., Vandana Shiva, *Reductionism and Regeneration: A Crisis in Science*, in *ECOFEMINISM* 22, 25 (Maria Mies & Vandana Shiva eds., 1993).

301. See *supra* notes 260-66 and accompanying text.

community.³⁰² The advancement of science depends upon the willingness of individual scientists to make their own observations, results, and interpretations available to the entire community. Not surprisingly, science has developed both norms and a formal reward structure tailored to encourage such open communication; scientists gain reputation and respect by rapidly sharing the results of their work with their colleagues.³⁰³ Once disclosed, scientific information becomes part of the public domain, available not only to other scientists, but to inventors and educators. This public model of science has made it easy to justify public and quasi-public financial support of scientific research through grants and university salaries.

In recent years, however, science has become increasingly privatized. Industry money, once shunned, has become an important source of research support for academic scientists, especially in fields related to biotechnology.³⁰⁴ Businesses that provide financial support for university science typically demand some return, such as early or exclusive access to results or ownership of some or all intellectual property rights to the work and its spin-offs.³⁰⁵ In addition, federal technology transfer law has made it possible for universities and individual researchers to own, and consequently profit from, the results of federally-funded research.³⁰⁶ In turn, that has allowed universities to develop deals with industry, granting exclusive access to research results or products in return for research funding.³⁰⁷

302. See, e.g., Doremus, *supra* note 175, at 1057-63 and sources cited therein.

303. See, e.g., Rebecca Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 YALE L.J. 177, 183-84 (1987).

304. See, e.g., Dueker, *supra* note 61, at 455-85 (noting the change from one hundred years ago, when "[t]he world of academia seemed to be hermetically isolated from the hustle and bustle of the business world," to today, when the University of California earns more than \$57 million annually in royalties); Helen Leskovac, *Academic Freedom and the Quality of Sponsored Research on Campus*, 13 REV. LITIG. 401, 402 (1994).

305. See, e.g., Leskovac, *supra* note 304, at 402.

306. See 35 U.S.C. §§ 200-212; Leskovac, *supra* note 304, at 405. The University of California, which reportedly produces more research leading to patented inventions than any other public or private institution, received \$67 million from patented inventions in 1996-97. See UNIVERSITY OF CALIFORNIA, ANNUAL FINANCIAL REPORT 1996-97, at 8 (1997). A substantial portion of that revenue is shared with the individual inventors. See DEAN C. JOHNSON, *THE UNIVERSITY OF CALIFORNIA: HISTORY AND ACHIEVEMENTS* 310 (1996) (stating that in 1993 the University of California distributed to inventors \$10.5 million of a total of \$44 million in licensing revenues).

307. As an example, Novartis, a Swiss drug and agri-business company, will provide \$25 million in funding for plant science research at the University of California at Berkeley. In return, Novartis will have the first right to negotiate a license for any resulting discoveries. Critics of the deal tossed pies in the faces of

Besides raising doubts about the purity of the scientific endeavor and the propriety of federal support,³⁰⁸ the increasingly close financial connections between the world of industry and the world of research science are pulling science away from its historically public nature.

The commercialization of science tends to inhibit broad public sharing of the benefits of scientific advancement. Universities once automatically contributed the knowledge they produced to the public domain. Today, increasingly driven by pressures to license their discoveries for profit, they donate far less of their research product to the public domain.³⁰⁹ In both universities and commercial laboratories, the profit motive works against the open communication norm of science, because secrecy can allow researchers to retain all the financial benefits of their discoveries.

Patent law seeks to counter the incentives for secrecy, granting inventors exclusive rights to profit from their inventions for a limited time in return for public disclosure of sufficient information to enable others to reproduce the invention after the patent expires.³¹⁰ But patent disclosure requirements do not completely counter secrecy incentives. Patent protection is limited to discoveries meeting the statutory requirements of patentable subject matter, novelty, utility, and nonobviousness,³¹¹ and patents are costly to obtain. Researchers whose results either do not meet the statutory requirements or are not sufficiently valuable to justify the costs of obtaining a patent may only be able to capture the financial benefits of their research through secrecy.³¹² Uncertainty about

university and company officials at the signing ceremony. See Charles Burruss, *UC Finalizes Pioneering Research Deal with Biotech Firm*, S.F. CHRON., Nov. 24, 1998, at A17.

308. See, e.g., PAUL B. THOMPSON, *FOOD BIOTECHNOLOGY IN ETHICAL PERSPECTIVE* 167-71 (1997) (examining the philosophical objections to science-for-profit); Christopher Anderson, *Genome Project Goes Commercial*, 259 SCI. 300 (1993) (noting that the links between the biotechnology industry and academic researchers may make it "difficult to avoid the appearance that public funds are being used for private gain"); Leskovac, *supra* note 304, at 406-07 (reporting that NIH director protested agreement giving Sandoz first rights to market technology developed at Scripps Research Institute as effectively constituting a taxpayer subsidy of the corporation).

309. See, e.g., Leskovac, *supra* note 304, at 407.

310. See Keith Aoki, *Authors, Inventors and Trademark Owners: Private Intellectual Property and the Public Domain, Part II*, 18 COLUM.-VLA J.L. & ARTS 191, 192-96 (1994).

311. See generally 35 U.S.C. §§ 101, 102 (1994).

312. See Eisenberg, *supra* note 303, at 190-95. Secrecy is tenaciously maintained in the biotechnology industry, even in the face of serious public health risks. As an example, three biotechnology companies known to have sequenced the genome of the

the availability or scope of patent protection, which is rampant in the biotechnology area, exacerbates the incentives for companies to keep information to themselves.³¹³ Even when patents are sought, financial incentives continue to discourage disclosure beyond the mandatory minimum, including the sharing of information that might suggest other productive research routes.³¹⁴ Furthermore, disclosure comes only at the successful completion of the patent process, which may be years later than traditional norms of scientific sharing would dictate.³¹⁵

While patent law does give the public the right to use a patented invention freely after the patent expires, the value of early use, which is the exclusive province of the patent holder, is likely to dwarf the value of later use in a fast-moving field like biotechnology. Consequently, although some benefits of patented discoveries or inventions may spill over to the public through increases in economic prosperity and use after the patent term,³¹⁶ the lion's share of the benefits of commercial science are likely to be captured by private actors.

Whether and to what extent the government should encourage commercial science is a complex question. Financial incentives may encourage commercial development of ideas that would otherwise languish in the ivory tower, or conversely they may drive academic researchers to concentrate to excess on research with short-term profit potential.³¹⁷ But whatever its role

bacterium *Staphylococcus aureus* have declined to provide that information to researchers who believe it could help solve the problem of drug-resistant staph infections in hospitals. See generally Elliot Marshall, *Ethics in Science: Is Data-Hoarding Slowing the Assault on Pathogens?*, 275 SCI. 777 (1997); Marlene Cimon & Paul Jacobs, *Biotech Battlefield: Profits vs. Public*, L.A. TIMES, Feb. 21, 1999, at A1.

313. See, e.g., Aoki, *supra* note 310, at 226-27.

314. Cf. Stephan, *supra* note 62, at 1208 (describing contrasting incentives for information disclosure and concealment as the fundamental difference between science and technology).

315. See, e.g., Aoki, *supra* note 310, at 206-07 (stating that patent applications process can delay circulation of scientific information by up to five years); Eisenberg, *supra* note 303, at 216-17 (explaining that disclosure through the patent process often occurs much later than the ordinary norms of scientific communication would dictate); Gretchen Vogel, *A Scientific Result Without the Science*, 276 SCI. 1327 (1997) (noting that biotechnology companies often announce research breakthroughs by press release, without supporting scientific data).

316. The expectation of this sort of spillover is the declared justification for federal financing of scientific research. See *supra* note 62 and accompanying text.

317. Difficult issues about "ownership" of scientific information arise in a variety of contexts. For an interesting exchange on the question of whether allowing journals to copyright scientific papers contributes to or interferes with the wide dissemination of scientific information, see Steven Bachrach et al., *Who Should Own Scientific Papers?*, 281 SCI. 1459 (1998), and Floyd E. Bloom, *The Rightness of Copyright*, 281 SCI. 1451 (1998).

in the larger society, commercial science does not belong in the national parks. Unlike other federal lands, the national parks are expressly dedicated to use by the general public, rather than merely to use for public purposes.³¹⁸ Egalitarian public access to park resources should include the informational resources gathered by scientists. The results and direct products of scientific research conducted in the national parks, therefore, should be placed in the public domain where they are available for all to draw upon.

3. *Drawing Lines*

Encouraging appreciative and public science while discouraging instrumental and private science can be a difficult task because research projects may have both appreciative and instrumental aspects, and may serve public as well as private goals. However, the Park Service's regulations and policies with respect to extramural science in the parks are roughly attuned to the relevant distinctions.

It is rare to find a research project that can be classified as either strictly instrumental or strictly appreciative. Even Bacon, a favorite target of critics of instrumental science, was not a thoroughgoing instrumentalist. He saw knowledge of nature as a pathway not only to human control of nature but also to understand God and God's creations.³¹⁹ True knowledge of nature was for Bacon both a means to power, consistent with an instrumental perspective, and a goal in itself, consistent with an appreciative perspective.³²⁰ Like Bacon, most modern scientists, even those closely associated with instrumental goals, share an appreciation of nature's mysteries and a sense of the wonder that scientific knowledge brings. For instance, the scientist and science historian Evelyn Fox Keller tells of the mixed motives of Warren Weaver, a physicist she credits with coining the term "molecular biology."³²¹ In his memoirs, Weaver noted that while physics sought to give man control of the physical universe, the aim of biology was to give man control of himself.³²² That view of the aims of science is straight from Bacon. But in the same document, Weaver also spoke of understanding itself as the

318. See 16 U.S.C. § 3 (1994).

319. See ZAGORIN, *supra* note 297, at 48-49, 224.

320. *Id.* at 88-89.

321. Evelyn Fox Keller, *Physics and the Emergence of Molecular Biology: A History of Cognitive and Political Synergy*, 23 J. HIST. BIOL. 389, 393-94 (1990).

322. See *id.* at 394.

ultimate end of science, surpassing any technological products. Science, Weaver wrote, "has given life a dignity and a beauty, because of its recognition of an order in the universe."³²³

Nor are scientists in the appreciative camp immune from instrumental impulses. E.O. Wilson, for example, has written that "[n]ature is to be mastered, but (we hope) never completely. A quiet passion burns, not for total control but for the sensation of constant advance."³²⁴ Virtually all modern scientists embrace experimentation, which entails deliberate manipulation of the subject, as the fount of reliable knowledge.³²⁵

Most scientists harbor both instrumental and appreciative views, and most science has elements of both. Methodology does not cleanly distinguish between the instrumental and appreciative aspects of science. Bacon's emphasis on experimentation has frequently been cited as the source of a radical change from appreciative to instrumental science.³²⁶ But experimentation is not necessarily incompatible with a respectful attitude toward nature. Just as physicians may conduct controlled studies of new medications without infringing on the dignity of their human subjects, natural scientists can conduct controlled experiments without compromising the dignity of the objects of their study. Although nonhuman subjects cannot be asked to consent to experimentation, appreciative scientists can and should weigh the extent to which their research will infringe on the dignity of their subject against the value to the subject itself (or its species or ecosystem) of the results that may be obtained.

323. *Id.*

324. WILSON, *supra* note 294, at 10.

325. Experimentation is not always possible. When they can be done, however, experiments are generally considered the strongest source of scientific knowledge. See, e.g., Doremus, *supra* note 175, at 1059-60.

326. According to some observers, the emphasis experimentation requires on objective, controlled evaluation loosens any emotional attachment experimental scientists might feel toward their subjects. Carolyn Merchant is the best known proponent of this view. She has argued that the scientific revolution robbed nature of its spiritual essence, transforming it from a living spiritual being to a machine which could be broken down into its component parts and manipulated without moral consequences. See CAROLYN MERCHANT, *THE DEATH OF NATURE* 164-215 (1980). Other feminist writers have articulated similar critiques. See, e.g., EVELYN FOX KELLER, *REFLECTIONS ON GENDER AND SCIENCE* 37 (1985) (explaining that experimental science "controls by following the dictates of nature, but [scientists believe] these dictates include the requirement, even the demand, for domination"); Maria Mies, *Feminist Research: Science, Violence and Responsibility*, in *ECOFEMINISM* 36, 47 (Maria Mies & Vandana Shiva eds., 1993) (arguing that scientists "cannot, it seems, understand nature and natural phenomena if they leave them intact within their given environment").

Rather than the methods employed, the key distinction between the appreciative and instrumental faces of science lies in the attitude and goals of the researcher. The ultimate goal of instrumental science is the control of nature for the fulfillment of human ends. It approaches nature as a means to those ends, as an object to be manipulated rather than as an entity deserving of respect in its own right. Instrumental scientists need not worry about the dignity of their subjects. The most extreme example of instrumental science today is science for profit, the scientific research conducted by biotechnology and other companies with the primary aim of developing profitable new products. Appreciative science, in contrast, approaches nature with a respectful, humble, loving attitude. Its ultimate goal is increased understanding of nature for its own sake or for the sake of attaining and maintaining healthy self-regulating natural systems.

Even the conscious intent to use research results to manipulate nature is not a clear marker of instrumental science. The national parks are not isolated islands of pristine nature. All are affected by human activities within and outside their borders. Active management is often necessary to substitute for aspects of nature that have been lost or to return to a state in which nature can more effectively regulate itself.³²⁷ Park officials might, for example, study the Yellowstone elk population to determine whether the elk are damaging other park resources.³²⁸ That research could help park managers devise a strategy for culling the elk population by artificial means in the absence of a robust natural predator population. Despite its manipulative intent and focus on the uses of knowledge, such a project would be primarily appreciative because its purpose would be the protection rather than the exploitation of nature.³²⁹

327. See, e.g., WAGNER ET AL., *supra* note 90, at 17-40; Ketter, *supra* note 245, at 670-75; Leopold Report, *supra* note 90, at 238-42, 244-49.

328. Yellowstone's elk are a subject of continuing controversy. See, e.g., ALSTON CHASE, *PLAYING GOD IN YELLOWSTONE: THE DESTRUCTION OF AMERICA'S FIRST NATIONAL PARK* (1986); Ketter, *supra* note 245, at 659-60; Leopold Report, *supra* note 90, at 247-49; Williams, *supra* note 190, at 60; George Reiger, *Yellowstone Elk*, *FIELD & STREAM*, Oct. 22, 1997, at 22.

329. Prohibiting primarily instrumental science, therefore, does not mean that park officials must avoid all manipulation of nature, or all manipulation that might offend park visitors. In the past, park officials have been accused of subordinating the best scientific knowledge to uninformed public reactions. See SCHULLERY, *supra* note 86, at 172 (lamenting that public wonder over Yellowstone's elk led park managers to ignore the best knowledge of their ecology); Hofstadter, *supra* note 292. Instead of bowing to such reactions, if protection of park resources requires manipulating wildlife or other resources, park managers should make an effort to

To a rough approximation, the difference between appreciative and instrumental science equates with the fuzzy distinction between "pure science," generally understood as the accumulation of knowledge for its own sake, and "applied science" or "technology," generally understood as the quest for knowledge with a particular application or the exploitation of existing knowledge.³³⁰ The analogy is not perfect, however. Research geared toward the "applied" end of improving the ability of park managers to protect the physical and biological resources of the parks is appreciative, rather than instrumental, because its goal is to protect nature rather than to exploit nature for human ends. So, for example, tagging, radio-collaring, or removing blood samples from park wildlife is not primarily instrumental if its goal is to understand and counter threats to wildlife survival.³³¹

The public versus private distinction also corresponds roughly to pure or basic science versus technology. Basic science has long been seen as the realm of the university, while technological application has generally been carried out in the private sector. Patent doctrine has attempted to distinguish between fundamental discoveries or laws of nature, which remain in the public domain, and applications of those discoveries, which can be owned.³³² But, as explained above, the line between public and private science has blurred with the rise of the biotechnology industry.³³³ At one time, academic scientists could be counted on to do public work, while private science was concentrated in industrial settings. Today, university-sponsored science may have a strong private component. The two can still be distinguished, however, by their attitude toward communication of data. Practitioners of public science are eager to communicate the results of their studies

explain to the public the need for those steps.

330. See, e.g., F. JAMES RUTHERFORD & ANDREW AHLGREN, *SCIENCE FOR ALL AMERICANS* 4, 23 (1990) (defining science as "a process for producing knowledge" and technology as the application of knowledge gained through that process).

331. Sellars reports that Yellowstone officials, responding to objections from the public, ordered an end to an experiment in which grizzly bears were fitted with colored ear tags in order to track their dispersal patterns. SELLARS, *supra* note 89, at 251-52; see also *id.* at 273-74 (noting that managers of Isle Royale National Park authorized blood-sampling and radio tracking of wolves in the 1980s, in an effort to understand the causes of the park's declining wolf population). Ultimately park managers chose not to vaccinate the Isle Royale wolves against a canine virus that had somehow infected the population. See Williams, *supra* note 190, at 92.

332. See, e.g., Eisenberg, *supra* note 303, at 186-87; Aoki, *supra* note 310, at 219-20.

333. See *supra* notes 304-08 and accompanying text.

without any financial strings attached. Private scientists guard their information, or share it only when they can profit thereby.

While purely appreciative, purely public science may not exist today, it is feasible to identify science that is primarily appreciative and primarily public. That should be the goal of park managers who wish to ensure that outside science is consistent with park purposes. Appreciative public science of course includes the many research projects in the parks that are directly geared toward generating knowledge needed in the short term to protect park resources.³³⁴ Outside this context, the existing regulation limiting scientific collection permits to representatives of reputable academic and research institutions³³⁵ comes close to drawing the right line. Both instrumental and private science today, in the national parks and elsewhere, are typically coupled with a profit motive. Limiting research permits to researchers associated with nonprofit institutions will help keep the profit motive out of national park science. Because academic researchers today are increasingly likely to be entangled with industry, however, limiting park research to academics will not be sufficient to keep out commercial science. The regulation requiring that specimens and results be made available to the public³³⁶ should be extended to require that those conducting research in the parks place all results of their work in the public domain. This would directly ensure that the science conducted in parks benefits primarily the public. In addition, it should discourage primarily instrumental science.

Although the science done in the national parks should be primarily appreciative and primarily public, indirect connections between parks and commercial science are not objectionable. Appreciative public science at its best produces knowledge that is placed in the public domain, making it available for use by all. Even if some subsequent uses of that knowledge are instrumental, its availability for any use affirms the parks' public character.

The discovery and subsequent exploitation of *Thermus aquaticus* is an example. Dr. Thomas Brock first visited Yellowstone National Park in 1964. Fascinated by the microbial life he saw in the outflows of the hot springs, he took a few

334. See, e.g., INVESTIGATORS' ANNUAL REPORTS FOR 1996, *supra* note 42, at 4 (survey of stream ecosystems); *id.* at 9 (archeological inventory); *id.* at 14 (population dynamics of Yellowstone grizzly bear).

335. See *supra* note 159 and accompanying text.

336. See *supra* note 162 and accompanying text.

samples.³³⁷ Driven by intellectual curiosity (and perhaps the desire for scientific recognition) rather than any hunger for profit, Brock obtained a research grant to study basic questions of microbial ecology at Yellowstone.³³⁸ He and a student soon isolated and managed to culture *Thermus aquaticus*.³³⁹ When they had worked out the taxonomy of this novel organism, they published a paper in a scientific journal and deposited representative cultures with the American Type Culture Collection (ATCC).³⁴⁰ When Kary Mullis needed a heat-stable DNA polymerase for his new PCR technique, he was able to get *T. aquaticus* from the ATCC.

The appreciative science done by Thomas Brock and his colleagues at Yellowstone National Park thus eventually provided an important contribution to the instrumental science of Kary Mullis. Nonetheless, Thomas Brock's work produced significant public benefits without diminishing the inspirational value of Yellowstone. The national parks are no more diminished by the development of Taq polymerase than they are by the domestication of the descendants of bison exported from Yellowstone years ago to supply additional herds.³⁴¹ The Park

337. See Brock, *supra* note 12, at 10-13.

338. See *id.*

339. See *id.* at 12-14. The most important element of the work on *T. aquaticus* may have been the discovery that it could be cultured through the use of much higher temperatures than had previously been tried. That discovery made it possible to culture many other thermophiles.

340. See *id.* at 15. Brock also freely shared cultures of *T. aquaticus*, which generated substantial interest long before the development of PCR, with scientific colleagues. See *id.* The ATCC is a non-profit entity that acts as a repository for preservation and distribution of cell lines and other biological materials. See M.J. EDWARDS, ATCC MICROBES & CELLS AT WORK vi (2d ed. 1991); Rochelle Sharpe, *A Peek Inside a Giant Germ Warehouse*, WALL ST. J., Mar. 10, 1998, at B1. Scientists who discover intriguing new organisms or create new cell lines often donate specimens to the ATCC, which makes them available for a small fee to other researchers. See *id.*

341. By the same token the Park Service, which contributed nothing to the development of PCR, has neither a legal nor a moral claim to remuneration from Hoffmann-LaRoche based on the success of that patent. The park's desire to obtain funds from Hoffmann-LaRoche cannot by itself justify the Diversa agreement. Cf. Smith, *supra* note 12, at A1 (quoting memo from Yellowstone scientist Robert Lindstrom to John Varley: "My ultimate purpose . . . is . . . so we can present it to Hoffmann-LaRoche, the only visible user of [Yellowstone] research specimens with deep pockets."). On the other hand, if Hoffmann-LaRoche offers a donation, as it reportedly has in the past, the park should certainly accept it. See Michael Milstein, *Yellowstone Managers Stake a Claim on Hot-Springs Microbes*, 270 SCI. 226, 226 (1995) (reporting that Yellowstone had turned down donations offered by Roche). There is far less danger of a conflict of interest in accepting Roche's money than there is in accepting Diversa's. See National Park Service, *Director's Order #21: Donations and Fundraising* § 4.6 (visited Sept. 16 1998) <<http://www.nps.gov/refdesk/DOrders/DOrder21.html>> (stating that "NPS will not

Service need not (and should not) attempt to prevent downstream manipulative or commercial use of the appreciative science generated in national parks.

C. *Private Profit and Public Parks*

The commercial nature of the Diversa agreement also invites a general objection to commerce in the national parks that has been made in a variety of contexts. Although commercial uses have been a part of our national parks since their inception, they have long aroused misgivings in park advocates, who have always believed both that profiteering has no place in the parks and that the natural resources of the parks should not be treated as market commodities.

1. *History and Extent of Commercial Uses*

The profit motive played an important role from the inception of the national parks. The railroads lobbied hard for national park status for Yellowstone and other early parks.³⁴² From the earliest days of the parks, the role of providing accommodations and travel services for park visitors was turned over to commercial ventures.³⁴³

Outside the context of visitor accommodation, park managers vociferously opposed commercial uses. In 1918, the Secretary of the Interior stated categorically that commercial use of the parks "except as specially authorized by law, or such as may be incidental to the accommodation and entertainment of visitors, will not be permitted under any circumstances."³⁴⁴

accept a direct donation from persons or entities . . . (b) that have or are seeking to obtain a contract, lease, grant or other business, benefit or assistance from the NPS (including concessioners); (c) that conduct operations or activities that are regulated by the NPS"). Diversa would fall into those categories. Roche, unless it has current bioprospecting operations in the parks, would not.

342. See, e.g., SELLARS, *supra* note 89, at 9-10 ("From the first, then, the national parks served corporate profit motives, the Northern Pacific having imposed continuous influence on the Yellowstone park proposal, beginning even before the 1870 expedition that gave birth to the campfire tradition.").

343. The Yellowstone Act, for example, assumed that private businesses, rather than the Park Service, would provide visitor accommodations. Act of Mar. 1, 1872, ch. 24, § 2, 17 Stat. 33, 34 ("The secretary may, in his discretion, grant leases for building purposes . . . at such places in said park as shall require the erection of buildings for the accommodation of visitors . . ."). Privately operated hotels were in place in Yellowstone by 1886, and in Yosemite and the Grand Canyon by the early 1900s. See RUNTE, *supra* note 84, at 94, 164.

344. Lane Letter, *supra* note 195, at 48. Under the extreme pressure of World War II, the Park Service did permit some extraction of resources from the national parks. See SELLARS, *supra* note 89, at 151-53.

Stephen Mather, who became the first Director of the Park Service, fought off Pinchot's attempts to gain control of the parks with the argument that the Forest Service's mission of commercial exploitation of natural resources would destroy the parks.³⁴⁵ Today, the Park Service forbids the conduct of any business in the parks unless specifically authorized by permit or regulation.³⁴⁶

This apparent anti-commercial zeal was always muted by the Park Service's broad interpretation of what commercial uses might be "incidental to the accommodation and entertainment of visitors"³⁴⁷ and its willingness to turn a blind eye as concessionaires wrung large profits from the parks.³⁴⁸ At least in these cases one could argue, even if unpersuasively, that concession excesses like the sale of all manner of kitschy souvenirs might subsidize the provision by concessionaires of less profitable but more necessary services such as lodging.³⁴⁹

Congress, however, went even further, openly endorsing some commercial uses utterly unconnected to visitor services. The Organic Act, for example, authorized the leasing of park lands for cattle grazing in any park other than Yellowstone.³⁵⁰ Although Yellowstone was spared this encroachment, it soon succumbed to commercialism as well. The Yellowstone Act was amended in the 1920s to authorize the sale of surplus buffalo and elk, with the proceeds going to the United States Treasury.³⁵¹ Nor was the Park Service above using financial incentives to

345. See SELLARS, *supra* note 89, at 58.

346. See 36 C.F.R. § 5.3 (1998).

347. In Yellowstone, for example, commercial ventures early on were permitted to tap the waters of the hot springs for their medicinal or therapeutic value. See SCHULLERY, *supra* note 86, at 142. And it can hardly be contended that the mountain of tawdry souvenirs and curios offered for sale in parks by concessionaires today are necessary to the park experience. By the mid-1960s, for example, one gift shop in Yellowstone carried thousands of cheap imports from Asia with little if any connection to the park. See FROME, *supra* note 226, at 204.

348. See SCHULLERY, *supra* note 86, at 179.

349. See FROME, *supra* note 226, at 204. Since 1965, legislation has declared it to be national policy that the development of concession facilities be limited to those necessary and appropriate for public use and enjoyment of the parks. See Pub. L. No. 89-249, § 1, 79 Stat. 969, 969 (1965); see also Pub. L. No. 105-391, § 402, 112 Stat. 3497, 3503 (1998) (to be codified at 16 U.S.C. § 5932).

350. See 16 U.S.C. § 3 (1994). Professor Fischman points out that grazing was an established use in Great Basin National Park prior to its creation. Fischman, *supra* note 124, at 803-04. Allowing it to continue may have been more of a concession to political reality than a retreat from the view that parks should be above commercial use.

351. See 16 U.S.C. §§ 36, 36a (1994). Using this authority, Yellowstone managers slaughtered bison for market for many years. See SELLARS, *supra* note 89, at 76.

accomplish goals unrelated to visitor enjoyment, even without such congressional prodding. During the era of stringent predator control in the parks, for example, park managers often allowed rangers to profit from selling the hides of predators they had killed.³⁵²

Today the national parks host a wide variety of commercial activities beyond the sale of food, lodging and souvenirs by concessionaires. Snowmobiles and horses are available for rental, commercial guides take visitors through the parks, merchants sell firewood and hot showers, and shuttle buses transport visitors around the parks.³⁵³ Even commercial fishing is permitted in a few parks.³⁵⁴ The Park Service does try, however, to limit commercialism to activities bearing some connection to park purposes. For example, Park Service policies forbid the use of parks for special events which involve commercialization unless those events are directly related to the purposes for which the park was established.³⁵⁵

The Park Service also tries to limit exploitation of the image of individual parks or of the parks system as a whole for financial gain. Pictures of national parks can be used in advertisements, but those ads must not suggest Park Service endorsement.³⁵⁶ The Park Service is concerned about the potential effect on its public image of association with commercial interests. It is Park Service policy, for example, to reject donations from persons or entities "associated with any product, service, or enterprise that would reflect adversely on the NPS mission and image such as alcohol or tobacco products."³⁵⁷ The National Park Foundation, the charitable organization that acts as the Park Service's fund-raising partner,³⁵⁸ appears to be less worried about implicit endorsements. It has, for example, authorized production of a Monopoly board game based on the

352. See SELLARS, *supra* note 89, at 72.

353. See, e.g., George Cameron Coggins & Robert L. Glicksman, *Concessions Law and Policy in the National Park System*, 74 DENV. U. L. REV. 729, 737 (1997) (citing a variety of commercial activities performed under concession permits); National Park Service, *Role of Private Enterprise in the Parks* (last modified May 1, 1997) <http://www.nps.gov/pub_aff/issues/privent.html> ("In addition to concessions, over 1,200 commercial use licenses were issued in 1993 for businesses that went into or through a park.")

354. See *Alaska Wildlife Alliance v. Jensen*, 108 F.3d 1065, 1070 (9th Cir. 1997) (upholding NPS rules permitting commercial fishing in Glacier Bay National Park).

355. See *Management Policies*, *supra* note 84, Special Park Uses.

356. See *id.*

357. National Park Service, *supra* note 341, § 4.6.

358. The Foundation is congressionally created. See 16 U.S.C. §§ 19e-19n (1994).

national park system.³⁵⁹ Even the Foundation is somewhat solicitous of the parks' image, although the distinctions it draws may escape others. While allowing national park Monopoly, the Foundation reportedly rejected a park ranger Barbie doll.³⁶⁰

2. *Objections to Commerce in the National Parks*

Commercial uses of the parks have long been controversial, but like so much in the parks context the reasons for the controversy are largely unexplained. At least three objections might be raised to commercial activities in the national parks: (1) they may send the parks skidding down a slippery slope; (2) commodification will produce direct negative impacts on the parks; and (3) commerce allows a small portion of the public to capture benefits that should be available to all. Each of these objections deserves attention in the bioprospecting context.

The slippery slope argument is connected principally to concern for the physical resources of the parks. The fear is that, if commercial use is allowed at all, it may prove impossible to restrict it. Commercial use, because of the financial stakes, will inevitably produce focused political pressures for expansion. If the use generates revenue for the United States or the parks, the political pressures to continue and increase it will be even greater. Because park officials, as political actors, may not be able to resist these pressures, the slippery slope argument suggests that the end result of any commercialization may be blatant marketing of park resources for economic gain.

Fear of this slippery slope seems to have been a primary concern of early park advocates,³⁶¹ and it persists today.³⁶² Fear

359. See Pope, *supra* note 25, at 2938; Susan English, *I'm Selling Yosemite-Cheap*, SPOKANE SPOKESMAN-REV., Dec. 20, 1998, at E1. The Foundation receives a portion of the proceeds from sales of the game. See Linda Kulman & Anna Mulrine, *Santa, Baby! Holiday Gifts with a Hollywood Twist*, U.S. NEWS & WORLD REP., Dec. 14, 1998, at 63.

360. See Pope, *supra* note 25, at 2938.

361. See *supra* note 201 (Muir's statement that "nothing dollarable is ever safe"); *Superintendents' Resolution*, *supra* note 205, at 59 ("[Parks] are to be held free from commercial exploitation. The standing forests will prove more valuable than the lumber they would produce, the graceful waterfall will prove more precious than the power it would yield, the unscarred beauty of the mountain is worth more than the mineral wealth that may be buried in its heart. . . . Scenery must often be destroyed by commerce, beauty must often be sacrificed to industry. But in order that we shall not squander all of our birthright, a few jewels of scenery are set aside for ourselves and for posterity to enjoy."); ISE, *supra* note 197, at 6-7 (citing a 1949 statement by Newton Drury, then Director of the National Park Service, to the effect that multiple use of park resources would inevitably whittle away at them).

362. See, e.g., Warrick, *supra* note 9, at A1 (stating that Greater Yellowstone

of uncontrolled commercialism is a primary reason why visitor service concessions have been subjected to special legislative control.³⁶³ That fear gathers force from history. In the early days of the parks, officials who believed they had been instructed to promote tourism for the economic good of the nation honeycombed the parks with roads and filled them with bland amusements.³⁶⁴ Today, as then, when park officials perceive that the political or economic future of the parks is tied to revenue production or economic use of the parks, both the physical resources of the parks and the inspirational quality of the park experience are likely to suffer.

A second objection is that commercial transactions rob the parks of their special status as resources removed from the marketplace. Objects that can be traded in the marketplace are necessarily regarded as fungible. Fungibility implies that the holder of the object would trade it for something else of equal value and, therefore, that the object itself has no unique claim on its holder.³⁶⁵ But some objects or events have a claim on persons far beyond whatever their market value may be. Entangling those objects or events with the commercial market encourages people to lose sight of their special status. As Mark Sagoff has written:

The things we cherish, admire, or respect are not always the things we are willing to pay for. Indeed, they may be cheapened by being associated with money. It is fair to say that the worth of the things we love is better measured by our *unwillingness* to pay for them.³⁶⁶

Religion is one area many people think should be separate from the marketplace. Thus, it is not surprising that commercial sponsorship of a recent papal visit to Mexico caused great

Coalition program director Michael D. Scott "fears the day when federal managers are forced into a competitive sell-off of public assets to meet operating expenses").

363. See, e.g., 16 U.S.C. § 1 (1994) (Congress finds that visitor services should be provided "only under carefully controlled safeguards against unregulated and indiscriminate use"); *id.* §§ 5951-5963 (1994 & Supp. 1999) (National Park Service Concessions Management Improvement Act of 1998). Concessions policy remains highly controversial both because excessive development by concessionaires may threaten the physical resources of the parks and because the public objects to what it perceives as excessive concessions profits. For a recent thorough discussion of concession policy in the parks, see generally Coggins & Glicksman, *supra* note 353.

364. See *supra* text accompanying notes 218-22.

365. See Margaret Jane Radin, *Property and Personhood*, 34 STAN. L. REV. 957, 959-60 (1982) (noting that the market vision implies that goods are held for purely instrumental reasons).

366. MARK SAGOFF, *THE ECONOMY OF THE EARTH* 68 (1988) (emphasis in original).

discomfort in the religious community.³⁶⁷ Nature is another thing which does not always fit comfortably into the market mentality. Of course we are quite used to treating natural resources as market commodities. But nature itself, in the larger sense, is not a fungible article of trade. Critics of instrumental science, for example, criticize the expansion of capitalism for fostering a detached, exploitive attitude toward nature.³⁶⁸ This criticism need not be accepted generally to be persuasive in the context of the national parks, which should be special refuges for the protection of nature's most unique expressions. One of the earliest arguments for the creation of national parks was that these particular areas were nature's holiest temples and should therefore be outside the market. John Muir, for example, railed against the conversion of these sacred places to commercial use.³⁶⁹ Commodification of nature in these special places threatens to rob nature everywhere of its special capacity to inspire human wonder.³⁷⁰

Constraining the Park Service's ability to introduce into commerce the resources it protects, on the other hand, communicates and thereby reinforces the special value the nation has assigned to unexploited nature in the national parks.³⁷¹ Foregoing opportunities for profit by exploitation of nature in the parks sets them apart from other lands. Thus set apart, the parks can serve as powerful, very public symbols of the nation's high respect for these unique natural places.

367. See, e.g., John Ward Anderson, *This Papal Visit is Brought to You By . . .*, WASH. POST, Jan. 22, 1999, at A27. Most upsetting to many observers was the placement of the Pope's picture on bags of potato chips, leading to the Spanish-language pun "las papas del Papa" (the potatoes of the Pope).

368. See, e.g., MERCHANT, *supra* note 326, at 185. This is also a common objection to the biotechnology industry's treatment of genes, biomolecules, and even organisms as intellectual property. See, e.g., Rick Weiss, *Mice Made Defective to Decode Human Ills*, WASH. POST, June 7, 1998, at A1 (quoting Paul Thompson, professor of philosophy, as saying "[t]his notion that we can own, buy, sell, and exchange fundamental life processes can lead to a fundamental transformation of how we understand life as sacred"). Similar concerns arise in a variety of other contexts as well. See, e.g., Richard Stone, *Fight Erupts Over Rights to Profits from Holdings*, 281 SCI. 773 (1998) (reporting objections to creation of a new Russian agency dedicated to licensing rights to exhibition and commercial exploitation of scientific collections).

369. See *supra* note 262.

370. See JACK TURNER, THE ABSTRACT WILD 36 (1996) ("Muir could not have understood that setting aside a wild area would not in itself foster intimacy with the wild . . . He could not have known that the organization and commercialization of anything, including wilderness, would destroy the sensuous, mysterious, empathic, absorbed identification he was trying to save and express.").

371. Cf. Michael H. Shapiro, *Regulation as Language: Communicating Values by Altering the Contingencies of Choice*, 55 U. PITT. L. REV. 681, 690-92 (1994).

The American public, which views the national parks as secular shrines, seems to instinctively understand the importance of protecting parks from commercialism. The furor over a 1996 proposal to allow advertisers to display a national park logo in return for payment of a fee³⁷² illustrates the visceral public reaction to commercialization of the parks. That controversy also illustrates the Park Service's insensitivity to the parks' intangible purposes. Park Service officials supported the proposal because it would provide revenue to the parks.³⁷³ They argued that the program, which would not have placed any advertising in the parks themselves, would neither affect the visitor experience nor compromise park integrity.³⁷⁴ But the public did not share that view; even the whiff of corporate capture of the venerated national parks doomed the proposal.³⁷⁵ The public understands that national parks should not suffer the indignities of corporate hucksterism.³⁷⁶

Finally, one may object to commercial activity in the national

372. See S. 1703, 104th Cong. (1996); H.R. 3819, 104th Cong. (1996).

373. See, e.g., *A Bill to Amend the Act Establishing the National Park Foundation: Hearings on S. 1703 Before the Subcomm. on Parks, Historic Preservation and Recreation of the Sen. Comm. on Energy and Natural Resources*, 104th Cong. 2 (1996) (statement of Roger G. Kennedy, Director, National Park Service). Officials expected the program to raise some \$100 million annually, helping to clear a national maintenance backlog of \$4 billion. *Bill Would Set Up Corporate Sponsors for National Parks*, ST. LOUIS POST-DISPATCH, June 9, 1996, at B5.

374. See *Public Lands: Washita Battlefield: Hearings Before the National Parks, Forests and Lands Subcomm. of the House Resources Comm.*, 104th Cong. (1996) (statement of Donald Rumsfeld, National Park Foundation), available at 1996 WL 418938; Timothy Egan, *Park Service Desperate for Cash, Wary of Change*, DALLAS MORNING NEWS, July 21, 1996, at A33.

375. See, e.g., Arthur Caplan, *Money Can Lessen the Value of Things*, ALBANY TIMES UNION, Sept. 26, 1996, at A10 ("There ought to be a few acres of land and a couple of sacred sites that no one can buy, sell, or infest with advertising. . . . Sometimes the mere existence of private money and marketing makes things lose their value."). This argument also includes a slippery slope element. See *id.* ("For now, the idea is that the corporations would not be allowed to erect billboards or even small plaques on National Park grounds. For now. Once major corporations are footing the bill, how long do you think it will be before the advertising rules change?"); *Bill Would Set Up Corporate Sponsors for National Parks*, *supra* note 373 (describing Sierra Club as worried that revenue from corporate sponsorships would be counterbalanced by withdrawal of public funds, and that corporations would expect return from their investment in the parks). Similar objections followed another seemingly innocuous proposal, to raise money from private companies to tear down existing strip-mall-style development in Grand Canyon National Park. See Mitchell Pacelle, *Needy National Parks Seek Commercial Ties*, WALL ST. J., July 15, 1998, at B1 ("[T]o some purists, cutting deals with private companies smacks of selling out one of the nation's most cherished natural wonders.").

376. See, e.g., *Old Faithful, Brought to You By . . .*, BUFF. NEWS, July 10, 1996, at B2 (arguing that proper care of the parks includes "a proper measure of dignity" which will be lost if corporate sponsorships are introduced).

parks on the grounds that commerce serves private interests, while the resources of the parks should be reserved for the benefit of the public as a whole.³⁷⁷ Allowing a few to exploit the parks to line their own pockets is inconsistent with the parks' tradition of shared use and access.

Commercial activity in the parks may be justified under four circumstances. First, commerce may be necessary to provide for and enhance the visitor experience. This is the justification for concessions, and it may also apply to certain activities which the Park Service itself is unable or unwilling to offer.³⁷⁸ What will enhance the visitor experience, and what the Park Service can and cannot effectively provide, are unavoidably difficult questions. But because commodification cheapens the parks, the presumption should be against allowing commercial activity on this ground unless the activity is expressly authorized by Congress or will clearly contribute to the parks' inspirational mission. Second, commerce can be used to spread the inspirational message of the parks through, for example, the sale of books, photographs, and videos about the parks.³⁷⁹ Third, commercial activity may be unavoidable. Constitutional doctrine may require that some parks be open to some commercial expressive activities.³⁸⁰ Finally, in certain limited circumstances,

377. See *supra* notes 241-43 and accompanying text.

378. The national parks are often relatively remote from ordinary tourist services. Many visitors simply could not experience the parks if there were no visitor accommodations. It may be that the private market is better suited than the government to provide those services at reasonable cost, and certainly there is a long tradition to that effect. Guided hiking, horseback, or rafting trips can make the special inspirational qualities of nature in the backcountry of the parks available to visitors who lack the experience or confidence to explore those areas on their own.

379. No doubt far more people have seen Ansel Adams' photographs of Yosemite, which beautifully communicate the wonder of its mountains, waterfalls, and forests, than have actually set foot in the park.

380. The Constitution is not a strong limitation on Park Service authority to regulate commercial activity in the parks. Commercial activities may constitute speech protected by the First Amendment, and some national park areas qualify as public fora for First Amendment purposes. See, e.g., *ISKCON of Potomac, Inc. v. Kennedy*, 61 F.3d 949, 953-54 (D.C. Cir. 1995). The Park Service may not be able to entirely exclude such activities from those parts of the national parks, although it does have the power to impose time, place, and manner restrictions. See *id.* at 954-57 (striking down Park Service regulation prohibiting face-to-face solicitation of charitable payments in the parks as applied to bar solicitation of donations in a small area of the National Mall in Washington, D.C. but upholding regulation prohibiting sale of audio tapes and beads). Even in a traditional public forum such as the Mall, the Park Service "is at liberty to determine how much commercial activity may be permitted . . . without significant erosion of [the parks] fundamental purposes." *Id.* at 957; see also *Friends of the Vietnam Veterans Mem'l v. Kennedy*, 116 F.3d 495 (D.C. Cir. 1997) (upholding regulation barring sales of t-shirts and other items on the National Mall); *Henderson v. Lujan*, 964 F.2d 1179, 1184 (D.C.

commercial exploitation of park resources may be justified by a public need strong enough to overcome the determination to set park resources aside. During World War II, for example, the Park Service permitted the mining of salt in Death Valley and of tungsten in Yosemite.³⁸¹ Commercial bioprospecting in the parks could perhaps be justified if it promised to reveal a cure for cancer or some other widespread human disease.³⁸² In order to ensure that the public benefits do indeed outweigh the infringement of the parks' inspirational purposes, however, the Park Service, contrary to its World War II history, should wait for Congressional direction before authorizing commercial uses on this theory.³⁸³

D. *Bioprospecting in Perspective*

In revising its regulations concerning science in the parks, the Park Service should keep the Diversa agreement in mind as an example of the kind of science it should not permit. As its inconsistency with current regulations suggests, the Diversa bioprospecting agreement is not an appropriate use of park resources. Understanding why commercial bioprospecting is inappropriate can help the Park Service draft regulations that will facilitate appreciative science in the national parks without promoting instrumental science.

There are some desirable aspects to the science Diversa is doing in Yellowstone. The microbial sampling the CRADA calls for undoubtedly will produce some knowledge that park staff can put to good use. One author has described thermophilic bacteria as "a window into the history of life on our planet."³⁸⁴ Whenever possible, the Park Service should offer its visitors views through such windows. Including information about these

Cir. 1992) (holding that government has substantial interest in preserving tranquil, contemplative mood near Vietnam Veterans Memorial).

381. See SELLARS, *supra* note 89, at 151. Even during this era, however, the Park Service managed to successfully oppose timber harvest in Olympic National Park. See *id.* at 152.

382. No such justification exists for the Diversa agreement. See *supra* note 37; *infra* note 403 and accompanying text.

383. When it is permitted, commerce should be strictly regulated in order to protect the parks' physical and expressive resources. The National Park Omnibus Management Act of 1998 embodies the appropriate attitude toward commercial uses of the parks, declaring that concession accommodations, facilities, and services should be provided only under carefully controlled safeguards so that they are "consistent to the highest practicable degree with the preservation and conservation of the resources and values" of the parks. Pub. L. No. 105-391, § 402(a)(2), 112 Stat. 3497, 3503 (1998) (to be codified at 16 U.S.C. § 5932).

384. GROSS, *supra* note 6, at 141.

unique organisms in interpretive programs can give visitors a sense of the wonders of microscopic nature, and of nature's awesome ability to adapt to even the most hostile environments.³⁸⁵ Quite apart from its direct impact on visitors, the study of Yellowstone's thermophiles may bring high scientific value. Already it has changed the conventional view of the basic evolutionary tree.³⁸⁶

The benefits of the science Diversa proposes, however, do not outweigh its costs. The aim of Diversa's science is explicitly instrumental; the company seeks to exploit Yellowstone's microbial life for commercial purposes. Indeed, the biotechnology that underlies the Diversa agreement is the most instrumental kind of modern science, treating organisms essentially as chemical reagents.³⁸⁷ That kind of science does not belong in the national parks, even if it is willing to buy its way in. Furthermore, Diversa's instrumental purpose has skewed its offer of appreciative science, reducing that offer's value. Although Diversa will necessarily culture some of the samples it removes from Yellowstone in order to gather the information it wants, it does not propose to culture enough to provide samples to the park or make samples available through a culture collection.³⁸⁸ Nor does the agreement provide that Diversa will make public the techniques it uses to culture these organisms. Indeed, under the National Parks Omnibus Management Act of 1988, even the specific location from which Diversa obtains valuable organisms may not be revealed.³⁸⁹ The

385. Indeed, programs to educate visitors about thermophilic organisms are already being developed. See Vandendorpe, *supra* note 32, at 19.

386. RNA analysis of bacteria from extreme environments, including thermophiles from Yellowstone hot springs, has helped redraw the tree of life, adding a third major branch. The old tree was divided into two major branches, the prokaryotes (organisms without a nucleus) and eukaryotes (organisms with a nucleus). The new tree adds the archaea, which include Yellowstone's thermophiles, as a third major branch. See GROSS, *supra* note 6, at 135; Edward DeLong, *Archaeal Means and Extremes*, 280 SCI. 542, 542 (1998).

387. See, e.g., HILARY ROSE, LOVE, POWER AND KNOWLEDGE: TOWARDS A FEMINIST TRANSFORMATION OF THE SCIENCES 232 (1994) (describing biotechnology as treating living organisms as if they were chemical reagents). Others agree that biotechnology is the ultimate manipulative science. See, e.g., ROBERT BUD, THE USES OF LIFE: A HISTORY OF BIOTECHNOLOGY 207 (1993) (suggesting that opposition to biotechnology is attributable to the perception that nature should be exempt from industrial practice); Shiva, *supra* note 300, at 28 (noting that "[t]he ultimate step in converting nature into a resource" is genetic engineering and patenting for corporate profit).

388. See Diversa Agreement, *supra* note 26, Statement of Work at 2.

389. The Act provides that "[i]nformation concerning the nature and specific location of a National Park System resource which is endangered, threatened, rare, or commercially valuable . . . may be withheld from the public" in response to a

secrecy embraced by the Diversa agreement sharply limits its benefits to science and the public.

All three of the potential objections to commercial use of the parks discussed above apply in this context. The slippery slope problem is perhaps the least troubling, because the physical impacts of microbial bioprospecting are so minimal. Nonetheless, the history of concession expansion shows that commercial activities, once allowed into the parks, quickly become entrenched and produce pressure to expand. There is, therefore, reason to fear that park officials hungry for revenue will emphasize bioprospecting to the exclusion of other uses more consistent with park purposes. If large numbers of bioprospecting contracts are granted, the physical impacts of access to sensitive areas for sampling purposes could well become significant.³⁹⁰ Rather than risk sliding down that slope, it would make sense to stop bioprospecting in the national parks now, before it has the opportunity to become established.

More serious in the context of this particular commercial use are the commodification and private benefit objections. Bioprospecting brings both objections squarely to the fore. The very concept of ownership of nature's inventions is discomfiting, both because it seems inconsistent with a respectful attitude toward life,³⁹¹ and because it may facilitate monopolization of resources that should be available to all in the natural commons.³⁹² Patent doctrine, developed in other

Freedom of Information Act request. 16 U.S.C.A. § 5937 (West Supp. 1998). While presumably intended to help the Park Service prevent acts of theft or vandalism, this provision could allow Diversa to treat its sampling sites as trade secrets. Whether the company would have to reveal the exact location at which an organism was discovered in order to obtain a patent is an open question. A patent applicant must disclose sufficient information to enable a skilled practitioner to make and use the invention. See 35 U.S.C. §§ 111, 112 (1994). If a written description is insufficient to enable replication of patented biological material, samples of the material itself must be made available. See Eisenberg, *supra* note 303, at 208. Presumably Diversa would have to choose between providing a written description sufficient to allow others to locate any organisms on which it bases a patent application or depositing those organisms themselves with a recognized depository. Of course, it is also an open question whether Diversa will need to seek patents in order to profit from its Yellowstone discoveries. If not, it would have no obligation to disclose sites of interest.

390. The Park Service's hunger for bioprospecting revenue is such that it is already envisioning a large number of contracts in as many parks as possible. See *supra* note 14 and accompanying text.

391. See, e.g., Richard Stone, *Religious Leaders Oppose Patenting Genes and Animals*, 268 Sci. 1126, 1126 (1995).

392. See, e.g., William Raspberry, *Cornering the Market on Life*, WASH. POST, June 8, 1998, at A23.

contexts to encourage invention and improvement, has proven difficult to apply to biotechnology, where "inventions" blur into "discoveries," and raw materials shade into products.³⁹³ Although the U.S. patent system was developed to confer property rights to products of human ingenuity and effort rather than "phenomena of nature,"³⁹⁴ naturally occurring genes, proteins, and other biochemicals have long been treated as patentable once isolated or purified.³⁹⁵ Thus, for example, Hoffmann-LaRoche holds a patent on the purified DNA polymerase from *Thermus aquaticus*.³⁹⁶ Diversa or other bioprospectors intend to "own" the genetic material or proteins of organisms they extract from Yellowstone, which in turn would

393. See, e.g., Aoki, *supra* note 310, at 229 (describing DNA sequences as biological "facts" and noting the difficulty of applying existing legal doctrines in this context); John J. Doll, *The Patenting of DNA*, 280 SCI. 689 (1998) (arguing that DNA-related inventions should be patentable); Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698 (1998). These issues have drawn widest public attention in the context of the human genome project and the abortive attempt several years ago by NIH to patent a large number of human gene sequences. See, e.g., Rebecca S. Eisenberg, *A Technology Policy Perspective on the NIH Gene Patenting Controversy*, 55 U. PITT. L. REV. 633 (1994) (discussing policy issues surrounding gene patenting); Eliot Marshall & Elizabeth Pennisi, *Hubris and the Human Genome*, 280 SCI. 994 (1998) (describing the private, for-profit venture to sequence the human genome launched by J. Craig Venter and Perkin-Elmer Corp.); Rebecca S. Eisenberg, *supra* note 111, at 163; Christopher Anderson, *NIH Drops Bid for Gene Patents*, 263 SCI. 909 (1994) (discussing controversy surrounding applications to patent gene fragments); Justin Gillis, *Scientists Speed Up Timetable for Mapping Human Genes*, WASH. POST, Sept. 15, 1998, at A2 (explaining that competition from private firms has encouraged acceleration of the Human Genome Project, which plans to put information it gathers into the public domain). But the PCR patents that have caught the eye of Yellowstone's managers have themselves created considerable controversy in the research community. See, e.g., Jon Cohen, *May I See Your License Please?*, 276 SCI. 1488 (1997) (noting concerns that machine that employs the PCR technique might violate licensing agreement with Hoffmann-LaRoche); Eliot Marshall, *Battling Over Basics*, 277 SCI. 25 (1997) (discussing attempts by Cetus to impose high licensing fees for use of PCR, and noting that although Hoffmann-LaRoche has not pursued researchers it does keep track of those who use Taq polymerase without taking out a license); Marcia Barinaga, *Scientists Named in PCR Suit*, 268 SCI. 1273 (1995) (explaining how individual research scientists were drawn into lawsuit by Hoffmann-LaRoche alleging infringement of its PCR patents by Promega Corp. through sales of Taq polymerase to research labs allegedly for PCR use).

394. *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948).

395. See Michael D. Davis, *The Patenting of Products of Nature*, 21 RUTGERS COMPUTER & TECH. L.J. 293, 320-34 (1995); Rebecca S. Eisenberg, *Genes, Patents, and Product Development*, 257 SCI. 903, 904 (1992). Europe had more strongly resisted the patenting of biological resources, but recently passed legislation that allows the patenting of human gene sequences. See Helen Gavaghan, *EU Ends 10-Year Battle Over Biopatents*, 280 SCI. 1188 (1998).

396. U.S. Patent No. 4,889,818. This patent, acquired from the now defunct Cetus Corporation, is currently the subject of litigation. See *supra* note 9.

allow them to restrict use of that material by others for the patent term.³⁹⁷

Private capturing of the economic value of the natural information in organisms like Yellowstone's thermophilic bacteria makes even the strongest advocates of private property rights queasy, and for good reason. As Richard Epstein has pointed out, allowing the first person who decodes a particular DNA sequence to patent that sequence is analogous to giving the first successful fox hunter exclusive rights to capture all foxes.³⁹⁸ Genetic information, like other natural resources, seems to belong in the intellectual public domain, where it can provide the raw material for future inventions and discoveries.³⁹⁹

Whatever the merits of allowing DNA patenting in general, allowing companies to use this quirk of the law to capture the economic benefits of park resources is inconsistent with the parks' status as, quite literally, the public domain. It is also inconsistent with the purposes of the parks, as expressed in the Organic Act's injunction that "no natural curiosities, wonders, or objects of interest shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public."⁴⁰⁰

The Park Service contends that because it is willing to enter into multiple bioprospecting agreements Diversa is getting no special privileges.⁴⁰¹ As a practical matter, however, bioprospectors are getting special access to park resources not available to the general public because they are being allowed to remove organisms from the parks. Moreover, the patent system will allow them to capture the financial benefits of those resources to the exclusion of the public, at least for a limited time. Just as no individual or corporation should control access

397. The Park Service is aware of this possibility. See Smith, *supra* note 12, at A1 ("Although not fitting the classic image of inventions, the products of bioprospecting in national parks can be patentable intellectual property." (quoting memorandum authored by Lindsey McClelland of the Park Service's Washington office)). If Diversa goes through the patent process, it will at least have to disclose what it learns from Yellowstone organisms. But it might choose instead to protect its investment through secrecy, not disclosing anything about the organisms it finds. The extent to which Diversa's products might be subject to "reverse engineering" that could defeat such secrecy is unclear.

398. See Richard A. Epstein, *Property Rights in cDNA Sequences: A New Resident for the Public Domain*, 3 U. CHI. L. SCH. ROUNDTABLE 575, 578 (1996).

399. Cf. Jessica Litman, *The Public Domain*, 39 EMORY L.J. 965 (1990) (arguing in the copyright context for robust protection of the public domain, which provides the raw material used by authors).

400. 16 U.S.C. § 3 (1994).

401. See Smith & Siegel, *supra* note 14, at A1.

to Yellowstone's scenery, none should control access to its molecular resources.

Americans, and perhaps the Park Service, still envision science as an overwhelmingly public activity, conducted by disinterested researchers willing and even eager to dedicate the fruits of their labors to the public good. Given the unique dedication of the parks (as opposed to other federal assets) to broad public use, subsidizing private profits through special research access to park resources is inappropriate, even if such a subsidy may be desirable in other contexts.

The Diversa agreement cannot be justified on the basis of countervailing benefits, either to the park experience or to the public at large. Beyond the relatively small amount of information the agreement will generate about the park's microbial resources, the company's bioprospecting will not enhance the visitor experience at Yellowstone. Nor will it spread the wonder of the parks to those unable to visit them. Members of the public may well benefit from the use of any products Diversa develops, just as the public has already benefitted from the development of PCR, but that is not the type of benefit to which the parks are dedicated. Instead, the parks exist to protect a small portion of the nation's natural resources from exploitation so that everyone might enjoy nature in its raw form.

Nor does this agreement offer other strong public benefits. Diversa will use Yellowstone's biotic riches to make incremental improvements to fairly mundane existing technologies, not to produce some revolutionary breakthrough or medical miracle.⁴⁰² It is not clear that Yellowstone's resources are even essential to creating these products. It may be possible to produce them from conventional sources using existing knowledge of thermophiles generated by appreciative science.⁴⁰³ Even in those few cases in which thermophilic enzymes are necessary, suitable sources may be available outside the national parks.⁴⁰⁴

402. See *supra* note 37 and accompanying text. Even PCR is only an incremental improvement over earlier methods for DNA sequence analysis and amplification. For many purposes, the older technique of restriction fragment length polymorphism (RFLP) may still be preferable. See, e.g., Rachel Nowak, *Forensic DNA Goes to Court*, 265 *SCI.* 1352, 1353 (1994) (stating that RFLP is preferred for forensic purposes if there is a large enough DNA sample).

403. Glen Nedwin of Novo Nordisk, a leading producer of enzymes for commercial applications, opines that thermophiles are useful primarily as sources of information that can help chemists learn to tailor enzymes from conventional bacteria to industrial conditions. See Elizabeth Pennisi, *In Industry, Extremophiles Begin to Make Their Mark*, 276 *SCI.* 705, 706 (1997).

404. See *supra* note 182 and accompanying text.

Conventional economics is driving the bioprospecting rush to Yellowstone. Because Yellowstone is "the most accessible location where a wide variety of thermal habitats are available,"⁴⁰⁵ sampling for thermophiles there is cheaper and easier than anywhere else. That incremental advantage does not justify invading the park's dignity.

Furthermore, this is not a decision that the Department of the Interior should undertake without Congressional authorization, and certainly not one that Yellowstone National Park should make alone. Only Congress, which created the park system and continues to endorse its inspirational function, has the perspective to weigh the utilitarian advantages of this economic exploitation of park resources against the symbolic costs of commercializing the park's biota.⁴⁰⁶ Congress, which has created some park units that seem more laughable than inspirational and opened others to extractive uses,⁴⁰⁷ surely has the power to permit bioprospecting in Yellowstone. Until Congress so directs, however, the Park Service would be wise to err on the side of caution.

The Park Service's tolerant attitude toward bioprospecting may have developed by analogy to commercial photography, an activity toward which it exhibits similar tolerance.⁴⁰⁸ Photographers who confine their activities to those allowed of ordinary park visitors need not obtain a permit.⁴⁰⁹ To go beyond such activities, a permit must be obtained for motion picture filming other than for news purposes,⁴¹⁰ and for photography "for the purpose of commercial advertising."⁴¹¹ Other types of

405. Brock, *supra* note 12, at 19. Yellowstone is thought to hold "the world's greatest concentration of thermophilic biodiversity." Lindstrom, *supra* note 33, at 13. Among the world's geyser fields, Yellowstone enjoys unique protection. SCHULLERY, *supra* note 86, at 218.

406. Cf. Zygmunt J.B. Plater, *The Embattled Social Utilities of the Endangered Species Act-A Noah Presumption and Caution Against Putting Gasmasks on the Canaries in the Coalmine*, 27 ENVTL. L. 845, 872 (1997) (arguing that intense political pressures in Washington can lead to unnecessary erosions of environmental protection).

407. See *supra* note 231 and accompanying text.

408. Like the regulations governing scientific collection, those affecting commercial photography are currently in flux. Congress recently considered, but ultimately did not adopt, a requirement that fees be charged for most commercial filming in the parks. See S. REP. NO. 105-202, at 13 (1998).

409. See *Special Park Use Guidelines*, *supra* note 162, at A20-1 ("The NPS will not require a permit for photographers, commercial or non-commercial, to go anywhere or to do anything that members of the public are generally allowed to go or do without a permit.").

410. See 43 C.F.R. § 5.1(a) (1998).

411. See 36 C.F.R. § 5.5 (1998).

photography are freely permitted. No fee is charged for such a permit,⁴¹² and there appears to be a presumption in favor of issuing a permit provided the activities proposed will not threaten unacceptable physical impacts or impede visitor use.⁴¹³ In fact a number of popular movies, including *Raiders of the Lost Ark*, *Dances with Wolves*, *Star Wars*, and *Butch Cassidy and the Sundance Kid* have included scenes shot at units of the national park system.⁴¹⁴ The permit requirement is used to protect against physical damage to park resources as well as damage to the parks' image.⁴¹⁵

Should filming fees be imposed and filming become an important revenue source, a slippery slope problem could develop.⁴¹⁶ Short of that, however, there are good reasons for treating photography in the parks, even commercial photography, more leniently than bioprospecting. Like bioprospecting, photography does not threaten the physical well-being of park resources. Also like bioprospecting, much of the value of the photographic product is attributable to the intellectual or creative input of the photographer. Nonetheless, the differences between the two activities outweigh these similarities. Photography does not remove any tangible resources from the parks. Many visitors engage in precisely the same activities as commercial photographers. By contrast,

412. See 43 C.F.R. § 5.1(b)(1) (1998). Parks may recover from permit applicants any costs incurred in supervising or managing the project. See NATIONAL PARK SERVICE, DRAFT GUIDANCE FOR FILMING AND PHOTOGRAPHY 23 (1998).

413. See *Special Park Use Guidelines*, *supra* note 162, at C3-1 (stating that "[i]t is the policy of the National Park Service to allow special park uses" that do not threaten park values or resources).

414. See Charles Pope, *What Price Hollywood? For Filmmakers*, *Lights, Camera, Checkbook*, CONG. Q. WKLY., Sept. 19, 1998, at 2451.

415. The first purpose is served by requirements that the scope of the activity be disclosed to the responsible official; that the utmost care be taken to avoid injury to the natural features; that the applicant post a bond to ensure compliance, see 43 C.F.R. § 5.1(b)(2), (d) (1998), and that wildlife not be disturbed through filming, see 43 C.F.R. § 5.1(d)(3)(iii) (1998). The second is served by requirements that identifiable Park Service equipment, uniforms, or insignia not be portrayed in a way that would imply Park Service endorsement of a product, see Management Policies, *supra* note 84 (Special Park Uses), that a courtesy credit be given to the Department of the Interior and National Park Service, unless the Park Service determines that it does not desire such a credit, see 43 C.F.R. § 5.1(d) (1998), and by the prohibition on filming captive wildlife, see 43 C.F.R. § 5.1(d)(3)(iii) (1998).

416. On the other hand, experience with commercial filmmaking demonstrates why commercial activities, if they are to be allowed in the parks at all, should have to pay their way. Because the parks, unlike other public and private lands, are open to filming without charge, filmmakers who might be able to go elsewhere are attracted to them. See S. REP. NO. 105-202, at 66 (1998) (statement of Destry Jarvis, Ass't Director for External Affairs, National Park Service).

bioprospectors who deliberately remove samples from parks are doing something other visitors are not allowed to do. In addition, even when they are used for commercial purposes, photographs and motion pictures of the national parks at least carry the possibility of conveying some sense to their audience of the wonders of raw nature in those parks. Bioprospecting does not offer the same possibility. Finally, commercial photography does not threaten monopoly control over any park resources. Although a photographer can own the pictures she takes, she cannot own the right to take similar pictures. By contrast, bioprospectors can potentially capture broad rights to restrict future use by others of genes or proteins from park organisms.

If photography fails to provide the correct model, how should the Park Service treat bioprospecting? Its existing regulations of scientific collections make a very good start. Limiting scientific collection permits to scientific or educational institutions, properly interpreted to prohibit the granting of permits to industrial researchers,⁴¹⁷ will help screen out instrumental science. That screen, however, will not be entirely effective, given the extensive ties between academic scientists and the biotechnology industry.⁴¹⁸ Academic collectors these days could well be motivated as much by the desire for financial gain as by the desire to increase knowledge of nature.

Other features of the current regulations will help screen out objectionable projects that survive this first coarse filter. The prohibition on the sale of natural products, broadly construed,⁴¹⁹ will prevent commodification. The requirement that collected specimens and research data derived from them be made available to the public⁴²⁰ will ensure against inordinate private capture of research benefits and will limit instrumental science by limiting its profitability. To adapt this requirement to microbiological specimens, the Park Service should require that those who collect microorganisms in the parks do two things: first, make samples of any organisms they manage to successfully culture freely available through the American Type Culture Collection (ATCC)⁴²¹ or a similar repository; and second, place all the results of their research in the public domain. Enforcement of the Park Service's existing regulations and these additional requirements is not likely to drive out needed

417. See *supra* text accompanying notes 171-74.

418. See *supra* notes 304-07 and accompanying text.

419. See *supra* note 167.

420. See *supra* note 162 and accompanying text.

421. See *supra* note 340.

appreciative public science. Nor is it likely to simply drive bioprospectors underground. Although Diversa's sampling techniques are relatively benign, they are sufficiently outside the realm of permitted visitor behavior that attempts to collect without a permit would carry a high risk of detection. Furthermore, if Diversa wanted to obtain a patent based on biological materials collected at Yellowstone it would probably have to disclose the source of those materials.⁴²²

Finally, the bioprospecting controversy points out a general problem with the Park Service's tradition of decentralized management. Yellowstone National Park, rather than the National Park Service leadership, seems to have driven decisions on the Diversa deal. Yet the Diversa deal marks an important departure in park policy, and one with potentially broad implications. Park superintendents are more likely than Washington staff to feel strong budgetary pressures to enter into this or other commercial deals, perhaps without full consideration of the long-term consequences. While decisions about scientific research in the parks, both intra- and extra-mural, are generally suitable for delegation to the regional offices or individual parks,⁴²³ the Washington office must maintain a strong supervisory and policy-setting role. Revising existing Park Service regulations and insisting that individual parks follow those regulations are crucial elements of that role.

CONCLUSION

Bioprospecting is often touted as a positive force for conservation because it creates financial incentives for the protection and sustainable use of biological resources.⁴²⁴ Yellowstone officials have appealed to this vision of bioprospecting in defending the Diversa agreement.⁴²⁵ In America's national parks, however, the financial incentive justification is fundamentally misplaced. In other locations, the hope of profitable bioprospecting may encourage conservation

422. See *supra* note 389 and accompanying text.

423. See NATIONAL RESEARCH COUNCIL, *supra* note 90, at 61.

424. See *supra* note 15; Warrick, *supra* note 9, at 41 (quoting a Diversa spokesperson defending the Diversa bioprospecting agreement with the statement that "[w]e're interested in protecting the environment, and one of the best ways to do that is to show there's value in it").

425. See NATIONAL PARK SERVICE, *supra* note 12 ("The park is now examining ways to link the monetary and academic incentives affiliated with scientific research to incentives for conserving biodiversity. In this way, the money needed to manage microscopic wonders like thermophiles might also support their preservation for future study and enjoyment.").

and sustainable use of resources otherwise vulnerable to loss through development. No such financial encouragement is needed, however, to induce the United States to protect Yellowstone or its other national parks.

Indeed, the declaration that parks need not pay their own way in order to be worth protecting is an important element of their inspirational value. From the inception of the national park system preservation, rather than economic use, of park resources has been its goal. Where exploitation is permitted, bioprospecting may represent a valuable sustainable form of exploitation.⁴²⁶ But exploitation, even sustainable exploitation, is not what the parks are about. Our willingness to hold nature above commercial exploitation in these few special places is a crucial aspect of their symbolic importance to the nation and the world, not to be lightly sacrificed.

Historically, it is no doubt true that the parks have never fully measured up to the ideal they have come to represent. Alfred Runte points out, for example, that the proponents of Yellowstone and other early parks were anxious to show legislators how little value those lands had for any other purpose.⁴²⁷ Firefalls, bear feeding, and developments nearly indistinguishable from strip malls have sullied the reality of the parks. Nonetheless, the ideal vision for the parks endures. The parks remain an important statement of the nation's sincere intention to seek a dignified accommodation with nature. Even if that goal can never fully be achieved, the struggle to achieve it has significant value.

Bioprospecting agreements like that with Diversa are inconsistent with the primary purposes of federal technology law, the purposes of the national parks, and current Park Service regulations. Rather than trying to find some way to shoehorn these agreements into the current law, the Park Service should use the Diversa dispute to refresh its understanding of, and commitment to, the inspirational function of the resources it protects. That deeper understanding, in turn, should inform the Park Service's reexamination of its regulations governing scientific research in the parks generally. Although the ramifications are beyond the scope of this paper, the inspirational purpose of the parks should also inform

426. But see Edgar J. Asebey & Jill D. Kempenaar, *Biodiversity Prospecting: Fulfilling the Mandate of the Biodiversity Convention*, 28 VAND. J. TRANSNAT'L L. 703, 716-19 (1995) (questioning the ability of bioprospecting as practiced in the developing world to fulfill the hopes pinned on it by the Biodiversity Convention).

427. See *supra* note 240 and accompanying text.

management decisions concerning concessions, fire suppression, and other thorny park issues.

The Park Service's hunger for funds, although understandable, does not justify overlooking the inspirational purposes of the parks. Undoubtedly the Park Service's already difficult job as steward of the nation's premier natural places is complicated further by congressional reluctance to provide generous funding. The appropriate response to funding shortfalls, however, is to make the case for additional resources to the legislature and the public, appealing directly to the parks' status as unique inspirational resources. Trading those inspirational qualities for funds to protect the physical resources of the parks might bring some short-term gains, but in the long run the Park Service and the nation are likely to regret the choice.