

1-1-1999

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

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

*Holly Doremus**

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* Professor of Law, University of California at Davis. J.D., University of California at Berkeley (Boalt Hall); Ph.D., Cornell University; B.Sc., Trinity College (Conn.). I have greatly benefitted from the comments and suggestions of Diane Amann, Gordon Anthon, Alan Brownstein, Joel Dobris, Harrison Dunning, Jared Ficker, Thomas Joo, Daniel Simmons, and Richard Wydick, as well as the energetic research assistance of Keith Wagner and Jane Crue. Of course, all remaining shortcomings are entirely mine.

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INTRODUCTION

In 1997, the National Park Service staged a gala celebration of the 125th anniversary of Yellowstone National Park, recognized internationally as the world's first national park.¹ The celebration included the announcement of an agreement allowing Diversa Corporation, a biotechnology company, to sample Yellowstone microorganisms.² With the growth of the biotechnology industry, microorganisms have become valuable commodities.³ Companies like Diversa engage in "bioprospecting," exploring the world for microbes and other organisms with commercially exploitable traits.⁴ Bioprospectors are particularly drawn to Yellowstone National Park because of

1. See Thomas Kupper, *Tiny Treasures: Biotech Scours Park for Microorganisms with Practical Benefits*, SAN DIEGO UNION-TRIB., Aug. 19, 1997, at C1.

2. See *id.*; see also Elliot Marshall, *Yellowstone Opens the Gates to Biotech*, 227 SCI. 1027 (1997). Diversa describes itself as "a world leader in the discovery and commercialization of biocatalysts (enzymes) . . ." Diversa Corp., *Yellowstone Media Kit* (visited June 2, 1998) <<http://www.diversa.com/mediakit/yellow.html>>.

3. Bacteria and other microorganisms are the source of hundreds of products, with a total value of some tens of billions of dollars. See Charles C. Chester, *Controversy Over Yellowstone's Biological Resources*, ENV'T, Oct. 1, 1996, at 10.

4. Bioprospecting is the "exploration of biodiversity for commercially valuable genetic and biochemical resources." Walter V. Reid et al., *A New Lease on Life*, in BIODIVERSITY PROSPECTING: USING GENETIC RESOURCES FOR SUSTAINABLE DEVELOPMENT 1, 1 (Walter V. Reid et al. eds., 1993). Diversa has sent bioprospecting expeditions to Iceland, Costa Rica, and Indonesia. See Debbie Strickland, *Diversa's Enzyme Discovery Generates \$21M in Financing*, BIOWORLD TODAY, Sept. 1998, at 4.

its hot springs and other thermal features. Microbe hunters hope the organisms, known as thermophiles or thermophilic microbes, that thrive in the high temperatures and harsh chemical conditions of Yellowstone's hot springs will contain enzymes that can survive similarly harsh industrial conditions.⁵

Yellowstone has already yielded one extremely valuable microbe. In the 1980s, researcher Kary Mullis developed a novel technique for rapidly copying minute amounts of DNA. This technique, called polymerase chain reaction (PCR), made it possible to identify and manipulate extremely small quantities of genetic material. To make PCR work, Mullis needed a DNA polymerase (the enzyme that copies DNA) tolerant of high temperatures. He found a suitable polymerase in *Thermus aquaticus*, a bacterium discovered in Yellowstone hot springs in the 1960s.⁶ PCR brought Mullis the Nobel prize⁷ and has become an essential tool of molecular biology, medical research, and law enforcement.⁸ Patents on the technique and on Taq polymerase, the enzyme isolated from *T. aquaticus*, reportedly produce revenues exceeding \$200 million annually.⁹

Park officials present the Diversa bioprospecting agreement as an unqualified positive. Yellowstone will receive cash and research assistance as well as future royalties should the

5. See Chester, *supra* note 3, at 12.

6. See, e.g., MICHAEL GROSS, LIFE ON THE EDGE: AMAZING CREATURES THRIVING IN EXTREME ENVIRONMENTS 103-04 (1998).

7. See PAUL RABINOW, MAKING PCR: A STORY OF BIOTECHNOLOGY 4 (1996).

8. Nobel laureate James Watson ranks polymerase chain reaction with cloning and DNA sequencing as an indispensable tool of molecular biological research. See Chester, *supra* note 3, at 13. PCR also allows DNA fingerprinting from minute samples. For brief descriptions of various applications of PCR, see Frank Clifford, *Simpson Case Boosts Microbe Conservation*, L.A. TIMES, Aug. 31, 1994, at A1. See also GROSS, *supra* note 6, at 103-04; John D. Varley, *Saving the Parts: Why Yellowstone and the Research It Fosters Matter So Much*, YELLOWSTONE SCI., Summer 1993, at 13-14.

9. See GROSS, *supra* note 6, at 104; Chester, *supra* note 3, at 13. This number undoubtedly overestimates the value of Taq polymerase itself. Hoffmann-LaRoche holds more than 70 patents related to PCR, not all of which depend on the use of Taq polymerase. See J. St. George, *Status Report: Taq Patent Dispute*, 275 SCI. 1348 (1997). The worldwide market for Taq polymerase itself has been estimated at \$80 to \$85 million. See Marcia Barinaga, *Promega Wins Round in Fight Over Taq*, 273 SCI. 1039 (1996). However, the patent specific to purified Taq polymerase is currently the subject of litigation. See *id.*; J. St. George, *supra*. In addition to Taq polymerase, Yellowstone microbes reportedly have already yielded products useful in perfume manufacture, brewing, and wood-pulp production. See, e.g., Robin McKie, *The Bugs in a Cup of Old Faithful Can Eat Tyres, Copy DNA and Make Scent. But Now Business Must Pay Up*, THE OBSERVER, Mar. 29, 1998, at O13; Joby Warrick, *Yellowstone: A Gold Mine of Microbes*, WASH. POST, July 12, 1998, at A1.

venture lead to any commercial products.¹⁰ The money could help close gaps in the park's chronically inadequate budget.¹¹ Park officials are painfully conscious that Yellowstone has received no financial return from the discovery of *Thermus aquaticus* or its valuable DNA polymerase and anxious not to miss the next such opportunity.¹² They insist that the financial benefits of the agreement come at no cost because Diversa's activities will have no detectable physical or biological impact on the park. Only very small samples will be removed, under the supervision of park personnel and out of public view.¹³ Essentially, Diversa will take only genetic information, leaving the park ecosystem intact. Furthermore, Diversa and other companies have already been conducting exactly the same kind of sampling without giving the park anything in return.¹⁴

As park officials have framed the issues, any objection seems irrational. Bioprospecting will not harm the physical resources of the park. It will generate sorely needed revenue.

10. See Russ Hoyle, *In Hot Pursuit of Extremophiles*, 16 NATURE BIOTECHNOLOGY 312 (1998).

11. See Frank Clifford, *supra* note 8, at A1 (citing Park officials who describe budget as insufficient to protect park resources).

12. See generally Warrick, *supra* note 9, at A1. Yellowstone managers believe that some 13 thermophilic microorganisms already isolated from the park may have commercial applications. See Christopher Smith, *Yellowstone Park's Deal: Some Call It "Biopiracy"*, SALT LAKE TRIB., Nov. 9, 1997, at A1. The Park Service makes little effort to hide the dollar signs in its eyes. See, e.g., YELLOWSTONE CENTER FOR RESOURCES, 1995 ANNUAL REPORT 9 (1996) [hereinafter 1995 ANNUAL REPORT] ("[T]here is currently no mechanism by which the park can receive any compensation for [bioprospecting]."); Thomas D. Brock, *The Road to Yellowstone—and Beyond*, 49 ANN. REV. MICROBIOLOGY 1, 19 (1995) ("When you see the money that's being made," says Yellowstone research chief John Varley, "that's hard for a starving bureaucrat to overlook."); NATIONAL PARK SERVICE, YELLOWSTONE NATIONAL PARK STRATEGIC PLAN (unpaginated) (1997) (on file with author) ("Like all native park species, these microscopic organisms are preserved and protected within the public domain for the purposes of enjoyment and education. At present, however, the park and the tax-paying public receive no portion of the patent royalties associated with research and discoveries based on park specimens."). Interestingly, the parks are not alone in feeling cheated of PCR profits. See Nicholas Wade, *After the 'Eureka,' a Nobelist Drops Out*, N.Y. TIMES, Sept. 15, 1998, at B9 (stating that PCR inventor Mullis is angry because Cetus paid him only \$10,000 for discovering the technique, then sold the rights to Hoffmann-LaRoche for \$300 million).

13. See *infra* notes 28-33.

14. See, e.g., Christopher Smith & Stephen Siegel, *Microbe Deal Lands Park in Hot Water*, SALT LAKE TRIB., Mar. 6, 1998, at A1; Warrick, *supra* note 9, at A1. In 1995, Yellowstone National Park issued approximately 40 permits allowing collection of thermophiles in the park; about half of those projects were conducted or funded by biotechnology companies. See 1995 ANNUAL REPORT, *supra* note 12, at 9. Bioprospecting also has been ongoing in at least two other national parks, including Mammoth Cave and Carlsbad Caverns, without any payment. See Clifford, *supra* note 8, at A1.

Furthermore, it coincides with growing domestic and international enthusiasm for economic conservation incentives in general, and bioprospecting in particular.¹⁵ Nonetheless, objections surfaced even before the agreement was signed,¹⁶ and a lawsuit challenging the agreement was soon filed.¹⁷

The Diversa controversy is interesting on at least three different levels. At the most specific level, the agreement is a prototype for a host of future bioprospecting deals. Yellowstone officials estimate that Yellowstone alone could enter into as many as 30 or 40 such deals.¹⁸ Some 100 additional federal properties may be sources of thermophiles,¹⁹ and many others may harbor other potentially valuable organisms.²⁰ Before the Park Service jumps wholesale into the business of bioprospecting, some conscious reflection on the overall effects of this new policy on the national park system would be desirable.

15. See, e.g., WALTER V. REID ET AL., *BIODIVERSITY PROSPECTING: USING GENETIC RESOURCES FOR SUSTAINABLE DEVELOPMENT* v (Walter V. Reid et al. eds., 1993); Charles R. McManis, *The Interface Between International Intellectual Property and Environmental Protection: Biodiversity and Biotechnology*, 76 WASH. U. L.Q. 255, 270 (1998); Laura Tangley, *Ground Rules Emerge for Marine Bioprospectors*, 46 BIOSCIENCE 245, 245 (1996); Daniel M. Bodansky, *International Law and the Protection of Biological Diversity*, 28 VAND. J. TRANSNAT'L L. 623, 632-33 (1995); Victor M. Marroquin-Merino, *Wildlife Utilization: A New International Mechanism for the Protection of Biological Diversity*, 26 LAW & POLY INT'L BUS. 303 (1995); Karen Anne Goldman, *Compensation for Use of Biological Resources Under the Convention on Biological Diversity: Compatibility of Conservation Measures and Competitiveness of the Biotechnology Industry*, 25 LAW & POLY INT'L BUS. 695, 706-07 (1994); Michael A. Gollin, *Using Intellectual Property To Improve Environmental Protection*, 4 HARV. J.L. & TECH. 193, 216 (1991). At least two commentators expressed support for commercial bioprospecting in U.S. national parks prior to this agreement. See John R. Adair, *The Bioprospecting Question: Should the United States Charge Biotechnology Companies for the Commercial Use of Public Wild Genetic Resources?*, 24 ECOLOGY L.Q. 131, 133 (1997); Chester, *supra* note 3, at 10, 11 (arguing that Yellowstone's microorganisms offer a potential "win-win-win" situation for combining conservation, science, and economic development).

16. See Smith, *supra* note 12, at A1.

17. See *infra* notes 49-59 and accompanying text. Others, though not going quite so far, voiced their disapproval. See Smith, *supra* note 12, at A1. Two influential members of Congress demanded a detailed explanation of the financial arrangements and of the Park's authority to enter into the Diversa agreement. See Christopher Smith, *Hansen Demands Details of Deal Between Yellowstone and Bio Firm*, SALT LAKE TRIB., Mar. 17, 1998, at A6.

18. See Jim Robbins, *Putting Old Faithful to the Test*, HOUSTON CHRON., Oct. 20, 1997, at 6 (crediting John Varley, director of the Yellowstone Center for Resources, the park's research arm, with that estimate).

19. See Craig Elliott, *Yellowstone Wilderness Profile, Spring 1998* (last modified Apr. 6, 1998) <<http://www.yellowstoneassociation.org/wpspring98.htm>>.

20. See, e.g., Smith, *supra* note 12, at A1 (reporting other national parks that have geothermal features "are becoming increasingly attractive to 'microbe' hunters"). Bioprospecting reportedly is already in progress in at least two other national parks. See Clifford, *supra* note 8, at A1.

Moving to a broader picture, this agreement comes at a time when both the Park Service and Congress are reconsidering the place of science in the national parks.²¹ While both bodies have been deluged with calls for more and better science, the Diversa controversy reveals that scientific research in the parks is not a uniformly benign activity. In fact, scientific research has more than one face. It can be a means of appreciating nature or a means of putting nature to instrumental use for human benefit. It can be a strongly public activity, one which puts communication above almost all other considerations, or it can be an essentially private activity in which information is hoarded for individual gain. Appreciative, public science is entirely aligned with the functions of national parks but instrumental, private science is not. Existing Park Service regulations turn out to be roughly attuned to the distinction, but seem to be widely ignored. If this dispute does no more than catalyze careful review by the Park Service of those regulations and their underlying purposes, it will have served a useful function.²²

Finally, at the most general level this dispute teaches two lessons about the core purposes of the national parks. First, policymakers need a firmer grasp on the key functions of the park system in order to respond to novel developments like bioprospecting. Second, those key functions, as several commentators have forcefully argued, encompass far more than the physical resources of the parks.²³ The symbolism of the national parks is nearly as important to the nation as the natural resources they harbor. The fundamental purpose of the national parks is not merely to preserve nature. They should also inspire the populace with the wonder, awe and fascination of nature, express the nation's respect for its natural wonders, and make those wonders available to all on an equal basis.

This dispute, more than other park management controversies, brings the importance of the parks' intangible inspirational resources into sharp focus. As the Park Service has concluded, Diversa's bioprospecting activities probably will

21. After years of calls for an explicit mandate for scientific research in the parks, Congress has recently enacted one. See National Parks Omnibus Management Act, Pub. L. No. 105-391, tit. II, 112 Stat. 3497 (1998) (to be codified at 16 U.S.C. § 5932). The Park Service is presently considering revision of its regulations governing scientific research and collections in the parks, although it has not issued any formal proposal to revise those regulations.

22. The Park Service probably also should reconsider its broad delegation of decisions regarding extramural research to individual parks. See *infra* text accompanying note 423.

23. See *infra* notes 233-35.

not have any lasting impact on the physical or biotic resources of Yellowstone National Park. But that does not necessarily mean that bioprospecting will have no effect on the park. Allowing biotechnology companies to extract natural resources from the parks for profit may affect the ability of the parks to serve their inspirational and expressive functions. In deciding to enter into the Diversa agreement, the Park Service has framed the question as whether bioprospecting companies should pay for the right to seek their fortunes in the national parks.²⁴ The real question, however, is whether they should have that right at all. That question can only be answered in light of *all* the purposes of the parks, including their inspirational and expressive purposes.

This Article argues that companies like Diversa should not be permitted to bioprospect in the national parks, because commercial bioprospecting is inconsistent with the inspirational purposes of the parks. That conclusion is surely open to debate; reasonable persons might well disagree. But whatever the ultimate answer on this particular issue, recognition that the right question encompasses far more than the physical resources of the parks should help policymakers more effectively address other controversial issues of park management, including the commercial use of national park images.²⁵

I

BACKGROUND

A. *The Diversa Bioprospecting Agreement*

The agreement that has sparked the bioprospecting dispute is styled as a Cooperative Research and Development Agreement between Diversa Corporation, Yellowstone National Park and the National Park Service.²⁶ It calls for Diversa, working with park employees, to identify and assess the microbial diversity of the park's unique microbial habitats. The company will then, over a period of five years, systematically sample those habitats in

24. See Smith, *supra* note 12, at A1. Commentators who have supported the idea of bioprospecting agreements in the parks have accepted this framing of the agreement. See generally Adair, *supra* note 15.

25. See, e.g., Charles Pope, *National Parks, Private Funds: Trouble in Paradise?*, CONG. Q. WKLY., Oct. 31, 1998, at 2938 (stating that park officials have approved a national parks version of the popular board game Monopoly, but declined to allow a park ranger Barbie doll).

26. Cooperative Research and Development Agreement for a Project Between Yellowstone National Park/National Park Service and Diversa Corporation, May 1, 1998 (copy on file with author) [hereinafter *Diversa Agreement*].

order to assemble a representative collection of organisms.²⁷

The agreement imposes some limits on the company's sampling efforts. It requires that all collecting be done out of public view, that restricted areas of the park not be entered without separate authorization, and that a Park Service liaison be present during all sample collection.²⁸ It also purports to restrict sampling methods, but those restrictions turn out to be weak. The agreement mandates compliance with the most current "Yellowstone National Park Thermophilic Microorganism Collection Guidelines,"²⁹ but no such guidelines exist.³⁰ The agreement also calls for the use of techniques that will "ensure that there is no significant impact to park resources or to other appropriate park uses,"³¹ but does not specify what techniques might meet that requirement or how their use will be assured. Nonetheless, it does appear that the physical impacts of Diversa's sampling will be minimal. According to media accounts, Diversa collects samples by dragging small specimen cups attached to long poles across the bottom of thermal pools.³² It seems plausible, as both Diversa and the Park Service contend, that the pools and their biota will suffer no lasting physical impact from this technique.³³

Following sampling, Diversa employees will isolate nucleic acids (DNA and RNA) from the organisms collected and use those nucleic acids to create gene libraries,³⁴ collections of cloned DNA and RNA fragments containing all the genetic information of the sampled organisms.³⁵ Diversa will search the gene libraries for

27. See *id.* Statement of Work at 2.

28. See *id.* App. A (Research Authorization/Collection Permit).

29. See *id.* Statement of Work at 4.

30. Interview by Keith Wagner with John Varley, Yellowstone Center for Resources (Aug. 5, 1998).

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

32. See Laura Vandendorpe, *Abundant Life at Yellowstone Bears Investigation*, RES. & DEV., Feb. 1998, at 19.

33. See Elizabeth Pennisi, *Lawsuit Targets Yellowstone Bug Deal*, 279 SCI. 1624 (1998); Bob Lindstrom, *Biodiversity, Ecology, and Evolution of Hot Water Organisms in Yellowstone National Park: Symposium and Issues Overview*, PARK SCI., Winter 1996, at 12, 13 ("Since the small samples (a few milliliters) needed to start tissue culture collections are usually gathered with tweezers, and since the high growth rates of thermophiles revegetate disturbances quickly, no long-term harm to the resource is apparent.").

34. See Diversa Agreement, *supra* note 26, Statement of Work at 3.

35. See THE LANGUAGE OF BIOTECHNOLOGY: A DICTIONARY OF TERMS 124 (John M. Walker & Michael Cox eds., 1995); Larry L. Deaven, *Chromosome-Specific Human Gene Libraries*, in 2 ENCYCLOPEDIA OF HUMAN BIOLOGY 455 (Renato Dulbecco ed., 1991). In a somewhat ironic twist, the PCR amplification technique, the profitability of which seems to have motivated the Park to enter the deal, will be used to generate

commercially valuable compounds and proteins.³⁶ Diversa does not expect to produce a revolutionary breakthrough or medical miracle as a result of this research. It does hope that it can find genes or enzymes that will prove valuable as incremental improvements to processes such as industrial bleaching.³⁷ Nothing in the agreement confers any exclusive sampling rights on Diversa, and indeed, several other companies reportedly are negotiating similar bioprospecting agreements.³⁸

Yellowstone National Park expects to gain both revenue and scientific information from this agreement. Diversa will pay a flat fee of \$20,000 per year;³⁹ it will also pay as royalties a percentage of net revenues from any products based on Yellowstone samples. The details of the royalty arrangement have not been publicly released, but royalties reportedly will range from 0.5 to 10%.⁴⁰ At those royalty levels, a new Taq polymerase could generate hundreds of thousands of dollars per year for the park.⁴¹

Expected revenues, however, must be examined in light of the costs the agreement imposes on the park. Oversight of sample collection will require the assignment of park employees who could be engaged in other activities. Yellowstone may also provide logistical support, such as transportation, communications, and technical assistance, as it typically does for scientific researchers.⁴² The resulting costs to the park will

the gene libraries. See *Diversa Agreement*, *supra* note 26, Statement of Work at 3.

36. See *Diversa Agreement*, *supra* note 26, Statement of Work at 3.

37. See Cynthia G. Wagner, *Biotech Goes to Extremes*, *THE FUTURIST*, Oct. 1, 1998, at 11 (reporting that Diversa is working on a bleaching enzyme obtained from Yellowstone microbes). To date, Yellowstone microbes have also proved useful in perfume production and brewing. See *supra* note 9.

38. See Smith, *supra* note 12, at A1.

39. See *Diversa Agreement*, *supra* note 26, App. B (Payments) at 1.

40. See Smith, *supra* note 12, at A1; see also *Edmonds Inst. v. Babbitt*, 42 F. Supp. 2d 1, 5 (D.D.C. 1999). Those values lie in the range expected for a bioprospecting agreement. See Sarah A. Laird, *Contracts for Biodiversity Prospecting*, in REID, *supra* note 15, at 99, 111-12 (citing 1 to 5% as typical royalty rates for bioprospecting, with lower rates appropriate if the collector must isolate microbes from soil, higher if pre-existing ethnobotanical data suggest a market). As required by federal law, Diversa has agreed in advance to allow the federal government to license, at no cost, any patented inventions Diversa may develop from this work. See *Diversa Agreement*, *supra* note 26, § 7.2.

41. The market for Taq polymerase has been estimated at \$80 to \$85 million per year. See *supra* note 9. That number presumably represents gross revenue. If the net revenue were 5% of that gross, the potential royalties would be approximately \$20,000 to \$400,000 annually.

42. See 1995 ANNUAL REPORT, *supra* note 12, at 73 ("YCR provides logistical support to approved research projects . . ."); YELLOWSTONE CENTER FOR RESOURCES, INVESTIGATORS' ANNUAL REPORTS FOR 1996 at 2 (1997) [hereinafter INVESTIGATORS'

depend upon the extent of both Diversa's collecting activities and park assistance, neither of which is quantified in the agreement. Beyond these indirect costs, Yellowstone reportedly will pay \$200,000 to a nonprofit foundation for assistance in negotiating this and similar deals.⁴³ That cost is double the minimum cash return to the park. Unless this or other bioprospecting agreements yields significant royalties, therefore, the park will not see any notable improvement in its budget situation.

Yellowstone also stands to gain some scientific information through this agreement. Diversa will use its genetic libraries to prepare phylogenetic trees illustrating the likely evolutionary relationships among Yellowstone's microbes.⁴⁴ Diversa will also contribute equipment and scientific training, with an estimated value of \$75,000 annually, toward environmental research at Yellowstone.⁴⁵ In addition, the company will provide written reports of its research activities to the Park Service,⁴⁶ which will have the right to use the data for any governmental purpose.⁴⁷ Diversa may, however, prevent disclosure of proprietary information.⁴⁸

ANNUAL REPORTS FOR 1996) ("Scientists who wish to conduct research in the park are required to obtain a no-fee permit.")

43. Some of that money apparently came from private donations. See Smith, *supra* note 12, at A1. The foundation concerned is the World Foundation for Environment and Development, a non-profit organization which describes its major focus as international environmental conflict resolution. The Foundation has been closely involved in the development of international bioprospecting arrangements in Costa Rica. See World Foundation for Environment and Development, *WFED: The First 5 Years* (visited June 17, 1998) <<http://www.wfed.org/Fiveyear.html>>.

44. See Diversa Agreement, *supra* note 26, at Statement of Work 3-4. Diversa will generate comparisons of ribosomal RNA sequences using its genetic libraries. Divergence in ribosomal RNA can be used to measure the evolutionary distance between organisms. See Norman R. Pace, *A Molecular View of Microbial Diversity and the Biosphere*, 276 *SCI.* 734, 734 (1997).

45. Newspaper accounts indicate that Diversa will undertake genetic fingerprinting of Yellowstone's wolf population. See Jim Robbins, *Useful Microorganisms in Yellowstone's Hot Pools*, *PITTSBURGH POST-GAZETTE*, Oct. 20, 1997, at A8. The agreement itself does not explicitly so provide, but there may be an understanding between the company and the park that some of the equipment and training donated will be devoted to DNA fingerprinting. DNA fingerprinting has already proven useful to Yellowstone managers in several respects. See Varley, *supra* note 8, at 14. Yellowstone now has a PCR laboratory. See INVESTIGATORS' ANNUAL REPORTS FOR 1996, *supra* note 42, at 88. Diversa surely has the expertise to help Yellowstone make more efficient use of the research effort it puts into these areas.

46. See Diversa Agreement, *supra* note 26, § 4.1.

47. See *id.* § 10.1.

48. See *id.* §§ 10.1-10.4.

B. The Lawsuit

In March 1998, a coalition of plaintiffs including the Edmonds Institute, the Alliance for the Wild Rockies (AWR), and the International Center for Technology Assessment (ICTA) filed a lawsuit challenging the Diversa agreement.⁴⁹ Plaintiffs object both to the process by which the agreement was developed and to its substance. Procedurally, plaintiffs allege that the National Environmental Policy Act (NEPA)⁵⁰ required the Park Service to prepare an Environmental Impact Statement before entering into the Diversa bioprospecting agreement.⁵¹ Despite the Park Service's categorical exclusion for "non-destructive data collection, inventory . . . , study, research and monitoring,"⁵² the District Court recently agreed with plaintiffs that the Park Service must undertake some environmental analysis.⁵³ The Park Service has decided to prepare an environmental assessment rather than appeal the decision.⁵⁴ While the plaintiffs' NEPA victory will delay implementation of the agreement, it cannot ultimately prevent this or other bioprospecting agreements.⁵⁵

For purposes of this Article, plaintiffs' substantive claim that the Park Service does not have the authority to enter into a bioprospecting agreement, with Diversa or anyone else,⁵⁶ is more

49. See Complaint, *Edmonds Inst. v. Babbitt*, 42 F. Supp. 2d 1 (D.D.C. 1999) (No. Civ. A. 98-561(RCL)) (on file with author).

50. 42 U.S.C. §§ 4321-4370d (1994 & Supp. 1996).

51. See Complaint, *supra* note 49, at 27. Plaintiffs also object to the lack of public involvement in the process by which the Diversa deal was negotiated. See, e.g., Smith & Siegel, *supra* note 14, at A1 (quoting attorney Joseph Mendelson of ICTA as saying that "[t]he Park Service cut a backroom deal"). In a separate lawsuit under the Freedom of Information Act, 5 U.S.C. § 552 (1994 & Supp. 1996), the plaintiffs obtained the release of some documents concerning the agreement. See generally Smith & Siegel, *supra* note 14, at A1.

52. See National Park Service, U.S. Dep't of the Interior, National Environmental Policy Act Guidelines 42 (last modified Aug. 18, 1998) <<http://www.nps.gov/htdocs2/planning/nepa/index.htm>>; National Environmental Policy Act; Revised Implementing Procedures, 49 Fed. Reg. 21,437, 21,438 (1984). Categorical exclusions are classes of actions that an agency has determined do not individually or cumulatively have a significant effect on the human environment. See 40 C.F.R. § 1508.4 (1998). Because those actions do not have a significant effect on the environment, they do not require environmental review.

53. See *Edmonds Inst. v. Babbitt*, 42 F. Supp. 2d 1 (D.D.C. 1999).

54. See Andrew Pollack, *Judge Halts Yellowstone Royalty Agreement with Biotechnology Company*, N.Y. TIMES, Mar. 26, 1999, at A18.

55. See, e.g., *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989) (stating NEPA does not allow courts to review the substance of decisions).

56. Plaintiffs argue that agreements permitting bioprospecting in the national parks are not authorized by either the Federal Technology Transfer Act (FTTA), 15 U.S.C. §§ 3710a-3710d (1994), or the National Park Service Organic Act (Organic

intriguing. Although these plaintiffs are vulnerable to charges of extremism,⁵⁷ the substantive issues they raise deserve deeper reflection.⁵⁸ The District Court has not yet ruled on those substantive issues, although it has signaled some skepticism of the Park Service's claim that current law authorizes the Diversa agreement.⁵⁹ The Park Service should view this lawsuit not as a roadblock in the way of a clever deal to gain the parks needed revenue, but as an opportunity for reflection on the appropriate role of bioprospecting and other commercial scientific ventures in the national parks.

II

CURRENT LAW AND THE DIVERSA DEAL

The Diversa agreement cites both federal technology transfer law and the law governing national parks as authorizing this deal.⁶⁰ Either could be read to permit this agreement, but neither plainly does so. In fact, current Park Service regulations appear to prohibit it. The fit between existing law and this bioprospecting agreement is sufficiently uncomfortable, and sufficiently open to judicial disapproval, that it should spark closer examination of the deal in light of the purposes of technology transfer and, ultimately, of the national parks.

A. Technology Transfer Law

After World War II, the federal government assumed an increasing share of the burden of funding the nation's scientific research and development efforts, both directly through federal laboratories and indirectly through grants to academic

Act), 16 U.S.C. §§ 1-4 (1994). See *infra* Part III.A (FTTA) and Part III.B (Organic Act).

57. None of the plaintiffs is a large or "mainstream" group. The Edmonds Institute and ICTA appear radically anti-biotechnology. See *infra* note 259.

58. Like the implausible assertion that patenting human genes amounts to enslavement of persons, the rather extreme statements of these plaintiffs can be seen as indications of a more subtle but deep-rooted discomfort. Cf. Alain Pottage, *The Inscription of Life in Law: Genes, Patents, and Bio-politics*, 61 MOD. L. REV. 740, 744 (1998) (arguing that "extravagant" objections to gene patenting nonetheless "have identified a structural failing" in current law). Others not easily dismissed as cranks have echoed plaintiffs' concerns. Representatives Jim Hansen of Utah and Ralph Regula of Ohio, for example, have sought details of the Diversa deal and an explanation of its basis from the Park Service. See Smith, *supra* note 17, at A6; Christopher Smith, *Hansen Still Seeks Details of Yellowstone Bio-Tech Deal*, SALT LAKE TRIB., Mar. 24, 1998, at D2.

59. See *Edmonds Inst. v. Babbitt*, 42 F. Supp. 2d 1, 14-15 (D.D.C. 1999) (questioning whether FTFA applies and whether Park Service regulations permit this agreement).

60. See *Diversa Agreement*, *supra* note 26, § 1.1.

researchers.⁶¹ These expenditures were, and continue to be, justified not only on the basis of their contribution to the missions of individual federal laboratories and agencies, but also by claims that a strong basic research program would help ensure economic growth and national prosperity.⁶²

Through the 1970s, the government usually insisted on retaining intellectual property rights to inventions resulting from research it either conducted or funded.⁶³ From the outset, though, this policy was subject to considerable debate.⁶⁴ Critics charged that it inhibited full realization of the economic benefits of government research, pointing out that only a small proportion of government-owned patents had been commercialized.⁶⁵

61. See Kenneth Sutherlin Dueker, *Biobusiness on Campus: Commercialization of University-Developed Biomedical Technologies*, 52 *FOOD & DRUG L.J.* 453, 460 (1997) (arguing that growth in federal funding for research after World War II was accompanied by policy establishing the presumption that government held title to any resulting inventions).

62. Vannever Bush was one of the first to make this claim, noting in his influential postwar report:

The Government should accept new responsibilities for promoting the flow of new scientific knowledge and the development of scientific talent in our youth. These responsibilities are the proper concern of the Government, for they vitally affect our health, our jobs and our national security.

VANNEVER BUSH, *SCIENCE: THE ENDLESS FRONTIER* 4 (1945). Economists soon chimed in, pointing out that because knowledge is a public good, private firms may not produce it despite the potential for high social return. See, e.g., Lewis M. Branscomb & Richard Florida, *Challenges to Technology Policy in a Changing World Economy*, in *INVESTING IN INNOVATION: CREATING A RESEARCH AND INNOVATION POLICY THAT WORKS* 3, 30 (Lewis M. Branscomb & James H. Keller eds., 1998). By now, it is taken as an article of faith that science stimulates economic growth. See Paula E. Stephan, *The Economics of Science*, 34 *J. ECON. LITERATURE* 1199, 1199 (1996) (“[T]he economic impact of science is indisputable.”). That assumption still underlies federal research and development spending. See, e.g., S. REP. NO. 99-283, at 2 (1986) (“The ultimate purpose of Federal support for R&D is to develop the science and technology base needed for a strong national defense, for the health and well-being of U.S. citizens, and for a healthy U.S. economy.”), reprinted in 1986 U.S.C.A.N. 3442, 3443.

63. See Rebecca S. Eisenberg, *Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research*, 82 *VA. L. REV.* 1663, 1671-89 (1996) (describing the history of government vacillation over title to research results).

64. See *id.*; James V. Lacy et al., *Technology Transfer Laws Governing Federally Funded Research and Development*, 19 *PEPP. L. REV.* 1, 3-8 (1991).

65. See Dueker, *supra* note 61, at 461 (stating that the government spent over \$30 billion in 1978 to develop 28,000 patents but licensed only five percent of them). The critics' explanation for this shortfall was that “no company was willing to invest in a product that they would have to share with their competitors.” Barbara A. Duncombe, *Federal Technology Transfer: A Look at the Benefits and Pitfalls of One of the Country's Best Kept Secrets*, 37 *FED. B. NEWS & J.* 608, 608 (1990). There are alternative explanations, however, such as that the technologies developed in pursuit of federal laboratory missions simply did not lend themselves to broad commercial

In the 1980s, intent on encouraging industry to develop commercial products from government-generated knowledge,⁶⁶ Congress embarked on a policy of promoting "technology transfer," which it defined as the transformation of research into processes, products, and services.⁶⁷ The Stevenson-Wydler Technology Innovation Act⁶⁸ established a continuing federal duty "to ensure the full use of the Nation's Federal investment in research and development" through technology transfer to state and local governments and the private sector.⁶⁹ The Act also made technology transfer a mission of all federal agencies engaged in research and development.⁷⁰ To achieve that mission, the Stevenson-Wydler Act, as amended in 1986 by the Federal Technology Transfer Act (FTTA),⁷¹ authorized cooperative research and development agreements (CRADAs) between federal "laboratories" and public or private entities.⁷² It defined a "laboratory" as "a facility or group of facilities owned, leased, or otherwise used by a Federal agency, a substantial purpose of which is the performance of research, development, or engineering by employees of the Federal Government."⁷³

markets. See Eisenberg, *supra* note 63, at 1680-81.

66. See, e.g., 15 U.S.C. § 3701(3) (1994) ("Many new discoveries and advances in science occur in universities and Federal laboratories, while the application of this new knowledge to commercial and useful public purposes depends largely upon actions by business and labor."); S. REP. NO. 96-480, at 19 (1979) ("It has been well demonstrated over a number of years that Federal agencies are not as successful in delivering new products and inventions to the marketplace as the private sector."), quoted in Dueker, *supra* note 61, at 461.

67. See H.R. REP. NO. 96-1199, at 32 (1980), reprinted in 1980 U.S.C.C.A.N. 4892, 4921. Although some observers have criticized both the premises and the results of technology transfer policy, see, e.g., Eisenberg, *supra* note 63, at 1726-27, national politicians have shown no inclination to retreat from that policy. See, e.g., Wendy H. Schacht, Congressional Research Service Issue Brief, *Technology Transfer: Use of Federally Funded Research and Development* (last modified Aug. 28, 1997) <<http://www.cnle.org/nle/st-9.html>> ("The Clinton Administration has made expanded use of the federal laboratories and industry-government cooperation integral parts of its articulated technology policy.").

68. Pub. L. No. 96-480, 94 Stat. 2311, 2311-2320 (codified as amended at 15 U.S.C. §§ 3701-3714 (1994)). The other cornerstone of technology transfer policy was the Bayh-Dole Patent Act, Pub. L. No. 96-517, 94 Stat. 3015 (codified as amended in scattered sections of 35 U.S.C.), which allowed universities and small businesses to obtain title to inventions made with government financial support.

69. 15 U.S.C. § 3710 (1994 & Supp. 1996).

70. See 15 U.S.C. § 3710(a) (1994); H.R. REP. NO. 96-1199, at 32 (1980), reprinted in 1980 U.S.C.C.A.N. 4892, 4921.

71. Pub. L. No. 99-502, 100 Stat. 1785 (1986) (codified as amended at 15 U.S.C. §§ 3710a-3710d (1994)).

72. 15 U.S.C. § 3710a(a)(1) (1994).

73. 15 U.S.C. § 3710a(d)(2)(A) (1994). Government-owned, contractor-operated facilities may also qualify as federal laboratories. See *id.* § 3710a(d)(2)(A), (B). Since the national parks are operated by the government, those provisions are irrelevant to

Park officials have framed the Diversa agreement as a CRADA authorized by the FTTA⁷⁴ because that structure offers significant financial advantages. The FTTA allows federal laboratories to keep payments received pursuant to CRADAs.⁷⁵ Using that authority, Yellowstone National Park will keep both the small annual payment and the potentially much larger royalties provided for by the Diversa agreement. Yellowstone's managers make no secret of their urgent need for additional funding.⁷⁶ The park has few other opportunities to increase its available funds. By law, national parks must remit all revenues they collect to the United States Treasury; only a small portion of those revenues is returned to the park system or the individual park without further legislative action.⁷⁷

1. *The Statutory Text: Are Parks "Laboratories"?*

Plaintiffs challenge the ability of Yellowstone National Park to enter into a CRADA with Diversa. They assert that the FTTA

this dispute.

74. See *Diversa Agreement*, *supra* note 26, §§ 1.1, 2.3.

75. See 15 U.S.C. § 3710c(a) (1994 & Supp. 1996). Laboratories can keep all of the CRADA payments they receive up to a ceiling of 5% of the agency's total laboratory budget for the year. Above that ceiling, they can keep 25%. See *id.* CRADA revenues must be devoted to specific enumerated purposes, including expenses incurred in licensing inventions, rewards to scientific personnel, personnel exchanges between laboratories, education and training consistent with the laboratory mission, and other technology transfer activities. See 15 U.S.C. § 3710c(a)(1) (1994 & Supp. 1996). That list, though, is broad enough to please any creative laboratory (or park) manager.

76. See *supra* notes 11-12. The national park system faces an overall budget shortfall estimated at \$5 to \$8 billion. See *Vision 2020 National Parks Restoration Act: Hearings on S. 624, S. 1614, and S. 1693 Before the Subcomm. on National Parks, Historic Preservation, and Recreation of the Senate Comm. on Energy and Natural Resources*, 105th Cong. pt. 1, at 1 (1998) [hereinafter *Vision 2020 Hearings*] (statement of Sen. Craig Thomas).

77. See 16 U.S.C. § 452 (1994) (providing that all revenues of the national parks shall be deposited into the national treasury). Park entrance fees are strictly limited under 16 U.S.C. § 4601-6a (1994 & Supp. 1996). Under that section, entrance fees are deposited into a special account for the National Park Service and then allocated to various units of the parks on the basis of need, operating costs, and collection. See *id.* § 4601-6a(i), (j). A temporary program instituted in 1996 allows the Park Service to increase entrance fees at selected units and keep up to 80% of that increase for use in the collecting unit; that program will expire at the end of fiscal year 1999. See Pub. L. No. 104-134, § 315, 110 Stat. 1321, 1321-200 to 1321-202 (1996). An attempt to extend the program failed to make its way into the National Parks Omnibus Management Act of 1998. Compare S. 1693, 105th Cong. § 501(a) (1998), reprinted in S. REP. NO. 105-202, at 12-13 (1998), with Pub. L. No. 105-391, §§ 501-502, 112 Stat. 3497, 3518 (1998). That Act does increase park revenues, however, by making franchise fees collected under concessions contracts available to the National Park Service without further appropriation. See *id.* § 407(c), (d).

does not authorize this agreement because the park is not a federal laboratory.⁷⁸ This claim has considerable common-sense appeal. The term "laboratory" evokes the image of a drab, institutional building lined with fume hoods, peopled by figures in white coats measuring chemical reagents into test tubes. Yellowstone, with its spectacular scenery, rustic buildings and olive-uniformed park rangers, does not fit that image.⁷⁹

Furthermore, the Department of the Interior seems not to have thought of the national parks as laboratories for technology transfer purposes until it learned that Diversa would pay for access to the park's microbial resources. Interior did have a substantial number of CRADAs before this agreement, but virtually all were executed by the United States Geological Survey (USGS), Interior's research bureau.⁸⁰ The Park Service has never entered into a CRADA before this one, nor has it publicly expressed any desire to do so.⁸¹ Neither the Park Service nor Yellowstone has established an Office of Research and Technology Applications, as the Stevenson-Wydler Act directs each federal laboratory to do.⁸²

Nonetheless, a plausible argument can be made that the

78. See Complaint, *supra* note 49, at 24-25. Plaintiffs also assert that a CRADA "cannot limit or diminish existing statutory authority of any agency." *Id.* at 24. It is not entirely clear what plaintiffs mean by this claim, but it may rest on a misreading of the statute, which provides that "[n]othing in this section is intended to limit or diminish existing authorities of any agency." 15 U.S.C. § 3710a(f) (1994). That does not mean agencies cannot make CRADAs that in any respect limit the rights they would otherwise have. After all, CRADAs routinely confer intellectual property rights that would otherwise rest with the government agency on a nonfederal partner. Perhaps plaintiffs mean to refer to the requirement that CRADAs be consistent with the agency mission. See *infra* note 121 and accompanying text.

79. See *Edmonds Inst. v. Babbitt*, 42 F. Supp. 2d 1, 14 (D.D.C. 1999) ("[I]t seems absurd that an entire two-million-acre national park should be considered a 'laboratory' under the FTTA.").

80. The USGS describes its mission as providing "the Nation with reliable, impartial information to describe and understand the Earth." See United States Geological Survey, *U.S. Geological Survey Mission* (visited July 29, 1998) <<http://www.usgs.gov/bio/USGS/mission.html>>. A quick computer search turned up more than 40 notices published by USGS in the Federal Register since 1986 declaring its intention to enter into one or more CRADAs.

81. Unlike the USGS, for example, the Park Service does not devote any space in its pages on the world wide web to technology transfer. See United States Geological Survey, *U.S. Geological Survey Technology Transfer Information: What Is a CRADA?* (visited July 16, 1998) <<http://www.usgs.gov/tech-transfer/what-crada.html>>.

82. 15 U.S.C. § 3710(b) (1994). The Stevenson-Wydler Act contains its own definition of the term "federal laboratory," which seems broader than the definition used in the FTTA. See 15 U.S.C. § 3703(6) (1994) (defining a "Federal laboratory" as "any laboratory, any federally funded research and development center" or any Cooperative Research Center or National Science Foundation Cooperative Research Center).

national parks in general and Yellowstone in particular fit the FTTA's definition of "laboratories." The statutory definition is intended to be broad, encompassing "the widest possible range of research institutions operated by the Federal Government."⁸³ Although the national parks do not look much like the layman's vision of a laboratory, their unique potential for scientific research has long been recognized. The national parks have been described since their inception as natural laboratories.⁸⁴ Yellowstone is one of the most commonly cited examples. Because it is home to some two-thirds of the world's geysers and nearly 10,000 geothermal features,⁸⁵ Yellowstone National Park offers scientific opportunities not duplicated anywhere else.⁸⁶

Until recently, there was no explicit legislative mandate for scientific research in the national parks. The National Park Service Organic Act ("Organic Act")⁸⁷ does not mention research. Scientific study is listed as a purpose in the enabling legislation of only a few national park system units.⁸⁸

Nonetheless, scientific research has long been an important aspect of the parks' mission. Since the 1930s, it has been official Park Service policy to base natural resource management

83. See S. REP. NO. 99-283, at 11 (1986), *reprinted in* 1986 U.S.C.C.A.N. 3442, 3453.

84. John Muir may have been the first to describe Yellowstone as a collection of natural laboratories. See JOHN MUIR, OUR NATIONAL PARKS 44 (1901). Park Service Director Stephen Mather repeated that assessment in 1920. See U.S. DEPT OF THE INTERIOR, ANNUAL REPORT OF THE DIRECTOR OF THE NATIONAL PARK SERVICE 66 (1920), *quoted in* ALFRED RUNTE, NATIONAL PARKS: THE AMERICAN EXPERIENCE 111 (3d ed. 1997). Mather's successor as Director gave the natural laboratories description wide circulation in a popular scientific journal in 1933. See Horace M. Albright, *Research in the National Parks*, 36 THE SCIENTIFIC MONTHLY 483 (1933), *reprinted in* AMERICA'S NATIONAL PARK SYSTEM: THE CRITICAL DOCUMENTS 122 (Lary M. Dilsaver ed., 1994) [hereinafter CRITICAL DOCUMENTS] (noting that national parks are "equipped by nature with the most complete and magnificent laboratories imaginable"). The phrase continues to be widely used in official Park Service documents. See, e.g., National Park Service, U.S. Dep't of the Interior, *Science and Research in the National Parks* (visited June 2, 1998) <http://www.nps.gov/pub_aff/issues/scires.html>; National Park Service, U.S. Dep't of the Interior, *Management Policies* (visited Mar. 29, 1998) <<http://www.nps.gov/planning/mngmtplc>> [hereinafter *Management Policies*].

85. See T. SCOTT BRYAN, THE GEYSERS OF YELLOWSTONE 13, 196 (1979).

86. Moreover, unlike most of the world's other extensive geyser fields, Yellowstone's have not been heavily disrupted by development of energy resources. See PAUL SCHULLERY, SEARCHING FOR YELLOWSTONE: ECOLOGY AND WONDER IN THE LAST WILDERNESS 218 (1997).

87. Act of Aug. 25, 1916, ch. 408, 39 Stat. 535 (codified as amended at 16 U.S.C. §§ 1-4 (1994)).

88. See, e.g., 16 U.S.C. § 79a (1994) (Redwood National Park); *id.* § 410tt-3 (1994) (Salt River Bay National Historical Park and Ecological Preserve); *id.* § 460y-1 (1994) (King Range National Conservation Area).

decisions on scientific research.⁸⁹ While the Park Service has never done enough science to satisfy critics,⁹⁰ it has acknowledged that “[a] sound, professional science program is essential to the successful achievement” of its mission.⁹¹ In the National Parks Omnibus Management Act of 1998 (“Omnibus Management Act”), Congress explicitly recognized the critical need for research in the parks. The Act directs the Secretary of the Interior “to assure that management of units of the National Park System is enhanced by the availability and utilization of a broad program of the highest quality science and information.”⁹²

If any national park has a substantial research purpose it would be Yellowstone, which hosts roughly 200 research projects each year. Government agencies, academics, and private companies study geology, ecology, archaeology, and other topics in the park.⁹³ Even if Yellowstone National Park is not itself a federal research institution, it may encompass one. The Yellowstone Center for Resources, the park’s scientific arm, clearly counts among its primary purposes the carrying out and

89. See RICHARD WEST SELLARS, *PRESERVING NATURE IN THE NATIONAL PARKS: A HISTORY* 97-99 (1997). Today, that commitment is embodied in the Park Service’s formal management policies: “A program of natural and social science research will be conducted to support NPS staff in carrying out the mission of the National Park Service by providing an accurate scientific basis for planning, development, and management decisions.” *Management Policies*, *supra* note 84.

90. See, e.g., FREDERIC H. WAGNER ET AL., *WILDLIFE POLICIES IN THE U.S. NATIONAL PARKS* 198-99 (1995); NATIONAL RESEARCH COUNCIL, *SCIENCE AND THE NATIONAL PARKS* 2-4 (1992); NATIONAL PARKS AND CONSERVATION ASSOCIATION, *NATIONAL PARKS: FROM VIGNETTES TO A GLOBAL VIEW* 8 (1989); A.S. Leopold et al., *Wildlife Management in the National Parks*, in *TRANSACTIONS OF THE TWENTY-EIGHTH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE* 29, 31, 43 (James B. Trefethen ed., 1963) [hereinafter *Leopold Report*], reprinted in *CRITICAL DOCUMENTS*, *supra* note 84, at 237, 239, 250.

91. NATIONAL PARK SERVICE, U.S. DEPT OF THE INTERIOR, *SCIENCE AND THE NATIONAL PARKS II: ADAPTING TO CHANGE* vii (1993) [hereinafter *SCIENCE AND THE NATIONAL PARKS II*]; see also NATIONAL PARK SERVICE, U.S. DEPT OF THE INTERIOR, *NATIONAL PARKS FOR THE 21ST CENTURY: THE VAIL AGENDA* 4 (1992) [hereinafter *VAIL AGENDA*] (emphasizing the need for a more sustained program of scientific research to support management decisions).

92. Pub. L. No. 105-391, § 202, 112 Stat. 3497, 3499 (1998) (to be codified at 16 U.S.C. § 5932). The Act requires that Interior undertake at a minimum baseline inventory and monitoring of park resources. See *id.* § 204. It also explicitly permits the Secretary of the Interior to authorize the use of the parks for outside scientific research. See *id.* § 205.

93. See Chester, *supra* note 3, at 13. In 1991 there were more than 300 research projects in Yellowstone, more than half undertaken by outside investigators funded by sources other than the Park Service. See *YELLOWSTONE CENTER FOR RESOURCES, BRIEFING* (unpaginated) (Feb. 12, 1997) (on file with author). Some 286 research projects were accounted for in 1995, see 1995 ANNUAL REPORT, *supra* note 12, at 73, and 152 were reported in 1996, see INVESTIGATORS’ ANNUAL REPORTS FOR 1996, *supra* note 42, at 2.

overseeing of scientific research within Yellowstone National Park.⁹⁴

Nonetheless, neither the parks in general nor Yellowstone in particular seem to be what Congress had in mind when it suggested that federal laboratories collaborate with private industry. Congress intended to enhance the value of the research federal laboratories were established to conduct. Yellowstone and the other national parks are undoubtedly valuable research sites, but they do not exist in order to perform or facilitate scientific research. Neither the Organic Act nor the Omnibus Management Act mandates that the Park Service carry out scientific research.⁹⁵ Although research is needed to fulfill the mission of the parks, research itself is not their mission.

2. *Looking Deeper: The Diversa Agreement is not Technology Transfer*

Because the statutory definition of "laboratory" is broad enough that it could encompass Yellowstone National Park but does not unambiguously do so, that term alone does not resolve the question of whether the Park has the authority to enter into a CRADA. The obvious next source, the legislative history of the Stevenson-Wydler Act and FTTA, is similarly unhelpful. Most of the discussion during consideration of the Stevenson-Wydler Act focused on the need to establish links between generators of knowledge (universities and federal laboratories) and users of knowledge (industry).⁹⁶ The major issue was the appropriate treatment of intellectual property rights in federal inventions.⁹⁷ Not surprisingly, the legislative history of both acts is virtually barren of any mention of the national parks.⁹⁸

94. The Center describes itself as "the division assigned primary responsibility for the science and management of natural and cultural resources in the park." 1995 ANNUAL REPORT, *supra* note 12, at iv.

95. During consideration of the bill, the Department of the Interior objected to a provision that would have mandated that the National Park Service itself establish a scientific research program. The agency argued that its research efforts were appropriately centralized in the USGS, aided by the nation's academic institutions. See *Vision 2020 Hearings*, *supra* note 76, Pt. 2, at 9 (statement of Denis Galvin, Deputy Director, National Park Service). As a result, the Act requires that the Secretary of the Interior, not the National Park Service specifically, implement a research program.

96. See H.R. REP. NO. 96-1199, at 6-8, 18 (1980), reprinted in 1980 U.S.C.C.A.N. 4892, 4896-97, 4907-08.

97. See, e.g., S. REP. NO. 99-283, at 1-2 (1986), reprinted in 1986 U.S.C.C.A.N. 3442, 3442-44.

98. There is only one mention of the National Park Service or the national parks in the entire legislative history of either act. The National Park Service is included in

The ambiguity of the language and the silence of the legislative history could leave room for a court to determine that Yellowstone does have the authority to enter into CRADAs. Such a decision, however, is hardly inevitable, and would scarcely be beyond question. In light of the motivating purposes of federal technology transfer law, the Diversa agreement cannot comfortably be described as a technology transfer instrument. The primary purpose of the Stevenson-Wydler Act is to ensure full use of the federal investment in research and development through transfer of the products of that investment to the private sector.⁹⁹ The paradigmatic CRADA serves this purpose, increasing the social return on federal research dollars by giving industry access to ideas or inventions developed during the course of mission-oriented federal research.¹⁰⁰ For example, the Department of Energy's Oak Ridge National Laboratory spent more than \$1 million developing a remote-controlled robot to carry out maintenance tasks in radioactively contaminated areas of nuclear fuel reprocessing plants.¹⁰¹ When no plans materialized to build such plants in the United States, it appeared those funds would be wasted. But the laboratory found a partner company interested in developing a commercial version of the robot. In return for the right to profit from its modified robot, the company built one for the laboratory's use.¹⁰² Oak Ridge, the public and the company all benefitted from the exchange.

The Diversa bioprospecting agreement, unlike the Oak Ridge example, will not leverage added benefits from federal research. Instead, it will wrest a private economic benefit from the government's longstanding efforts to preserve Yellowstone's

a chart submitted for the record by Richard E. Eckfield, representing the U.S. Conference of Mayors, with his testimony in a 1979 hearing on technology transfer. See *The Role of the Federal Laboratories in Domestic Technology Transfer: Hearings Before the Subcomm. on Science, Research and Technology of the House Comm. on Science and Technology*, 96th Cong. 390 (1979). The chart, for which no source is given, lists federal agencies, their technology transfer objectives, and implementation. The entry for the National Park Service states: "Where possible, it is NPS policy to have results of research presented in such form that they are also transmitted to other agencies, the scientific community, and the general public." *Id.*

99. See 15 U.S.C. § 3710(a)(1) (1994). The Bayh-Dole Act similarly states the policy of "promot[ing] the utilization of inventions arising from federally supported research or development." See 35 U.S.C. § 200 (1994).

100. See S. REP. NO. 99-283, at 1-2 (1986), reprinted in 1986 U.S.C.C.A.N. 3442, 3442-44.

101. See Daniel Charles, *Labs Struggle to Promote Spin-Offs*, 240 Sci. 874, 875 (1988).

102. See *id.*

unique thermal habitats. The agreement itself acknowledges that the government's primary contribution is preservation of the site, not research or technical know-how.¹⁰³ Although it makes an effort to include knowledge in the park's contribution to the project, the agreement is not able to articulate what unique knowledge park employees will provide.¹⁰⁴ Information about the thermal and chemical characteristics of Yellowstone's waters will be useful, but Diversa could readily acquire that information directly. Similarly, information about the legends of Yellowstone's hot springs, such as the tale that handkerchiefs thrown into certain pools would come up clean,¹⁰⁵ is available from published sources. Nor is that information necessary for the Diversa project, which involves exhaustive sampling of park microbes rather than a targeted search of limited locations for organisms with particular properties.

Moreover, because the key to this agreement is the transfer of naturally occurring biological organisms, it cannot accurately be characterized as "technology" transfer. The Stevenson-Wydler Act does not define the word "technology." The ordinary dictionary meaning implies knowledge or the products of knowledge.¹⁰⁶ Legislators seem to have intended that ordinary meaning,¹⁰⁷ and government agencies and analysts have

103. Under the heading "Recognition of Contribution from Yellowstone National Park," the agreement provides: "Collaborator [Diversa] recognizes that the priceless nature of the research specimens at [Yellowstone National Park] and the efforts and expertise that [the National Park Service] has invested in the preservation, conservation, and protection of the research specimens will contribute significantly" to the potential for invention and development of products. Diversa Agreement, *supra* note 26, § 6.6; *see also id.* ("Collaborator agrees that efforts by the NPS to protect the physical, hydrological, and ecological integrity of YNP's thermal features, hot springs, and geysers, all of which contain globally unique microbial ecosystems, contributes significantly to the research and development of useful discoveries . . .").

104. *See id.* Statement of Work at 4 ("YNP's capabilities that enable the park to oversee, manage, and collaborate in the research program outlined herein include fundamental knowledge regarding the ecological, geophysical, geochemical and historical elements that concern the park's unique hot spring, geyser and fumarole habitats and other novel habitats in the landscape. These capabilities, unique to YNP staff, enable the best use of selection criteria for cooperative research sampling.").

105. *See Smith, supra* note 12, at A1 (citing an 1888 description of the Yellowstone thermal feature now known as the Devil's Laundromat).

106. Technology includes processes, inventions, and means of applying knowledge to a practical end. *See* RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARY 1371 (1995) (giving as first three definitions of technology: "the branch of knowledge that deals with applied science, engineering, the industrial arts, etc."; "the application of knowledge for practical ends"; and "a technological process, invention, or method").

107. *See supra* note 67 and accompanying text; *see also* H.R. REP. No. 96-1199, at 3 (1980), *reprinted in* 1980 U.S.C.C.A.N. 4892, 4893 (describing the primary purpose of the Stevenson-Wydler Act as the establishment of "links between generators of

proceeded on the assumption that it applied.¹⁰⁸ But nature, rather than knowledge, is the backbone of the Diversa deal. The company is not entering into this agreement to get access to the knowledge or skills of park employees or the results of earlier park research. What Diversa wants is access to the park's microorganisms. All the important know-how in this agreement comes from Diversa; the park provides only the raw materials.

The curious financial terms of this agreement confirm that the park is transferring natural resources rather than knowledge. As is typical of CRADAs, the Diversa agreement allows both Diversa and the Park Service to patent any inventions made solely by their employees in the course of the cooperative research and provides for joint ownership of joint inventions.¹⁰⁹ The Diversa agreement also contains a typical boilerplate provision allowing Diversa to obtain an exclusive license, on terms to be negotiated, to any government or joint inventions created under the agreement.¹¹⁰

At this point the Diversa agreement diverges from the typical

knowledge (universities and Federal laboratories) and users of knowledge (industry and State and local governments").

108. See, e.g., David H. Guston, *Technology Transfer and the Use of CRADAs at the National Institutes of Health*, in *INVESTING IN INNOVATION*, *supra* note 62, at 221, 221 ("Technology transfer is the process by which expertise and its embodiment in people, processes and artifacts move from one organization, sector, or country to another."); OFFICE OF TECHNOLOGY ASSESSMENT, *FEDERAL TECHNOLOGY ASSESSMENT AND THE HUMAN GENOME PROJECT* iii (1995) ("Technology transfer involves converting scientific knowledge into commercially useful products."); FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER, *COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT HANDBOOK 4* (1994) [hereinafter *CRADA HANDBOOK*] (explaining that the FTTA provides a mechanism for transferring not inventions per se, but the human skills and know-how that are essential to successfully practicing a patented invention); U.S. Geological Survey, *U.S. Geological Survey Technology Transfer Information: What Is Technology Transfer ?* (visited July 17, 1998) <<http://www.usgs.gov/tech-transfer/what-tt.html>> ("Technology Transfer is a process through which technical information and products developed by the Federal government are provided to potential users in a manner that encourages and accelerates their evaluation and/or use.").

109. See *Diversa Agreement*, *supra* note 26, §§ 7.2-7.3. Several model CRADAs published by other agencies contain similar terms. See EPA Model CRADA, Sept. 20, 1993, §§ 5.3 to 5.4 (visited Sept. 8, 1998) <<http://www.epa.gov/appcdwww/crb/apth/samplecrda.html>>; see also Public Health Service Model CRADA, Art. 4, Jan. 22, 1998 (visited July 22, 1998) <<http://www.nih.gov/od/ott/crada198.htm>>; *CRADA HANDBOOK*, *supra* note 108, at 8 ("As a general rule, any inventions made solely by a collaborating party will be owned by the collaborating party; any inventions made solely by the federal laboratory employees will be owned solely by the government . . . and any jointly made inventions will be owned jointly by the collaborating party and the government.").

110. See *Diversa Agreement*, *supra* note 26, § 7.6; EPA Model CRADA, *supra* note 109, § 5.10.2; Public Health Service Model CRADA, *supra* note 109, at Art. 5-6.

CRADA. Generating revenue for the government is not usually an important purpose of technology transfer agreements.¹¹¹ Any revenue the government does realize from such agreements comes indirectly through subsequent licensing of government- or jointly-owned inventions. Accordingly, CRADAs usually do not include royalty provisions; royalty arrangements are worked out later in separate agreements.¹¹² By the same token, the private partner to a CRADA ordinarily would not expect to pay for the right to use or license others to use inventions created solely by its employees.¹¹³

The Diversa agreement, though, imposes just such a requirement. It gives Diversa full intellectual property rights to inventions made by company employees based on work under the CRADA. At the same time, it calls for the company to pay the Park Service a share of any profit it makes from those inventions.¹¹⁴ Those payments cannot be intended to

111. See OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 108, at 2-3 (noting that CRADAs are useful for sharing resources but provide negligible income to the federal agencies involved); cf. Rebecca S. Eisenberg, *Technology Transfer and the Genome Project: Problems with Patenting Research Tools*, 5 RISK 163, 165 (1994) (noting that government revenue generation is not a viable justification for patenting the results of government-sponsored research because any savings to the public as taxpayers would come through burdening the public as consumers with higher prices).

112. See EPA Model CRADA, *supra* note 109, § 5.10.2; Public Health Service Model CRADA, *supra* note 109, at 5.

113. Typical CRADAs (and the Yellowstone-Diversa agreement) expressly give those partners exclusive rights to their own inventions, forestalling the need for any such payment. See *supra* note 109 and accompanying text. The Stevenson-Wydler Act also makes it clear that royalties are anticipated only from inventions made at least in part by federal employees. The Act directs federal agencies to pay the first \$2,000 and 15% of all additional royalties "to the inventor or coinventors." 15 U.S.C. § 3710c(a)(1)(A)(i) (1994 & Supp. 1996). That provision was intended to provide federal employees with an incentive to create and report their inventions. See S. REP. NO. 99-283, at 12 (1986), *reprinted in* 1986 U.S.C.C.A.N. 3442, 3454. Obviously, Congress anticipated that any inventions for which the government received royalties would have been invented by federal employees. The legislature had no intention of sharing government royalties with industry inventors. See *id.* at 13 (stating that the legislation is not intended to set a precedent mandating royalty sharing for private inventors).

114. The details of the royalty provisions have been withheld from public release. The agreement's provision calling for royalties, however, illustrates the oddities of this deal. Article 9 of the agreement, titled "Copyright Royalties," calls for Diversa to "compensate NPS [as detailed in the redacted appendix] from royalties produced from the sale or use of copyrighted materials." Diversa Agreement, *supra* note 26, § 9.1. But the products of the Diversa agreement, enzymes and other natural products useful in industrial processes, would be expected to be protected by patents rather than copyright. The copyright term was probably obtained from a model CRADA intended to produce computer software or other copyrightable material. Such CRADAs may call for payments by the collaborating party on income from the sale or use of copyrighted works because the government generally cannot hold a copyright

compensate the Park Service for its research contributions. Because they lack Diversa's expertise, Park Service employees are quite unlikely to play any role in commercialization of Yellowstone microbes. If Service employees did play such a role, the Service would hold joint patent rights to the results and could demand licensing fees on that basis.¹¹⁵ The only possible role of the royalties called for by this agreement is to compensate the Park Service for granting access to Yellowstone's microbial resources. That makes the FTTA's CRADA provisions an odd, if not outright impermissible, basis for this agreement.¹¹⁶

On the other hand, this agreement is not wholly inconsistent with the broad purposes of the federal technology transfer statutes. In addition to making the most of federal research dollars, those laws are intended to enhance the economic competitiveness of domestic technology-dependent industries.¹¹⁷ The biotechnology industry, regarded by many as crucial to the nation's economic success,¹¹⁸ will surely benefit from access to park resources. Providing that benefit at minimal cost might be

on works created solely or jointly by federal employees. Consequently, the government cannot realize revenue by licensing a jointly held copyright for works produced under a CRADA. See CRADA HANDBOOK, *supra* note 108, at 9.

115. The Agreement leaves for the future the negotiation of licenses for any government inventions under the CRADA, so the royalty provisions are not a pre-negotiated licensing deal. See Diversa Agreement, *supra* note 26, §§ 7.3-4, .6.

116. According to the Office of Technology Assessment, "the U.S. government insists that the federal investigator make an intellectual contribution to the joint work as part of the CRADA" in order to ensure that federal laboratories focus on basic scientific research. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 108, at 14. No authority is cited for that claim, and the basis for it is not clear. Although the Federal Grant and Cooperative Agreements Act directs agencies to use cooperative agreements only when there will be "substantial involvement" by both the federal agency and the nonfederal entity in "carrying out the activity contemplated in the agreement," 31 U.S.C. § 6305(2) (1994), that Act does not apply to CRADAs. 15 U.S.C. § 3710a (1994 & Supp. 1996).

117. See H.R. REP. NO. 96-1199, at 3 (1980), reprinted in 1980 U.S.C.C.A.N. 4892, 4893 ("Overarching thrusts of the bill [that became the Stevenson-Wydler Act] are . . . to build into the Federal Government a positive concern for the welfare of industry."); *id.* at 6-7, reprinted in 1980 U.S.C.C.A.N. 4892, 4896-97 (noting the need for technological innovation to create increased productivity and a favorable balance of trade).

118. See generally Dan L. Burk & Barbara A. Boczar, *Biotechnology and Tort Liability: A Strategic Industry at Risk*, 55 U. PITT. L. REV. 791, 796-803 (1994) (describing biotechnology as a strategic industry critical to U.S. economic development). On the importance of technology-dependent industries generally to the national economy, see, for example, Michael Borrus & Jay Stowsky, *Technology Policy and Economic Growth*, in INVESTING IN INNOVATION, *supra* note 62, at 40, 47-48; CONGRESSIONAL RESEARCH SERVICE, TRANSFER OF TECHNOLOGY FROM PUBLICLY FUNDED RESEARCH INSTITUTIONS TO THE PRIVATE SECTOR 3 (1991) ("It has been estimated that technology-based sectors generate approximately one half of the U.S. gross national product . . .").

just the kind of private leveraging of federal expenditures the technology transfer laws promote.¹¹⁹ If the FTFA were interpreted broadly to achieve the purpose of using pre-existing government expenditures (of whatever stripe) to promote key technology-dependent industries, this agreement might fit within its scope.

It is possible, then, to read the technology transfer laws either to permit or to forbid this agreement. In either case, the inquiry cannot stop there. If the technology transfer laws do not expressly authorize this deal, they do not explicitly forbid it either.¹²⁰ Even if the technology transfer laws encompass this agreement, they are not sufficient to validate it. CRADAs must be "consistent with the missions of the laboratory."¹²¹

B. *The Law Governing National Parks*

No matter how one reads the FTFA, evaluating the legality of the Diversa contract requires some consideration of the law governing national parks in general and Yellowstone National Park in particular. The Park Service does not need the FTFA to justify this agreement if it is a permissible exercise of the Park Service's general authority. Conversely, the FTFA will not validate the agreement if it is inconsistent with the Service's underlying obligations.

Like the technology transfer statutes, the law governing parks does not directly address bioprospecting. Although the recent Omnibus Management Act contains a provision that may

119. One criticism of federal technology transfer efforts is that federal research expenditures simply displace private dollars that would otherwise perform the same function. See, e.g., COMMITTEE ON CRITERIA FOR FEDERAL SUPPORT OF RESEARCH AND DEVELOPMENT, NATIONAL ACADEMY OF SCIENCES, ALLOCATING FEDERAL FUNDS FOR SCIENCE AND TECHNOLOGY 23 (1995). That criticism does not apply to this deal. No biotechnology company could or would take over the job of protecting Yellowstone's thermal features.

120. See 15 U.S.C. § 3710a(f) (1994 & Supp. 1996) (stating that FTFA does not limit existing statutory authority); see also H.R. CONF. REP. NO. 99-953, at 15 (1986), reprinted in 1986 U.S.C.C.A.N. 3442, 3458 ("This authority [to enter into CRADAs] is optional . . . and is not intended to affect previously existing cooperative agreement authority.").

121. 15 U.S.C. § 3710a(d)(1) (1994 & Supp. 1996); see also 15 U.S.C. § 3710a(g)(1) (1994 & Supp. 1996) (stating that agencies are to implement the CRADA provision in such a way as to "advance program missions at the laboratory"); S. REP. NO. 99-283, at 11, reprinted in 1986 U.S.C.C.A.N. 3442, 3453 ("[C]ooperative research and development arrangements must be consistent with the missions of the laboratories . . ."). Because the statute requires each federal agency to determine the missions of its laboratories, judicial review on this point would have to be deferential. See 15 U.S.C. § 3710a(e) (1994 & Supp. 1996).

have been intended to validate this agreement, it does not clearly do so. It is possible to read the applicable statutes as permitting the Diversa bioprospecting agreement, but that reading conflicts with Park Service regulations and interpretive policies.

1. *The Organic Act and Yellowstone Act Provide Broad Discretion*

Management of the parks generally is governed by the Organic Act, which applies to all units of the national park system except as otherwise provided by the enabling legislation of individual units.¹²² The Organic Act directs the Park Service to “promote and regulate” the use of park lands in accordance with their fundamental purpose, which is “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”¹²³ Park Service and Department of the Interior officials, as well as commentators, have long described this fundamental mandate as ambiguous at best, paradoxical at worst.¹²⁴ Because the mandate is so vague and flexible, it has been interpreted to afford the Park Service considerable discretion in determining the appropriate uses of the parks.¹²⁵

122. See 16 U.S.C. § 1c(b) (1994) (“Each area of the national park system shall be administered in accordance with the provisions of any statute made specifically applicable to that area. In addition, the provisions of [various general laws, including the Organic Act] shall, to the extent such provisions are not in conflict with any such specific provision, be applicable to all areas within the national park system . . .”).

123. 16 U.S.C. § 1 (1994 & Supp. 1996).

124. See, e.g., *Mausolf v. Babbitt*, 85 F.3d 1295, 1303 (8th Cir. 1996) (acknowledging that recreational and conservationist purposes of the parks “will sometimes, unavoidably, conflict”); RONALD A. FORESTA, *AMERICA’S NATIONAL PARKS AND THEIR KEEPERS* 100 (1984); SELLARS, *supra* note 89, at 45 (“The act did not resolve the central ambiguity in national park management—the conflict between use and preservation . . .”); Federico Cheever, *The United States Forest Service and National Park Service: Paradoxical Mandates, Powerful Founders, and the Rise and Fall of Agency Discretion*, 74 DENV. U. L. REV. 625, 628-29 (1997); Robert L. Fischman, *The Problem of Statutory Detail in National Park Establishment Legislation and Its Relationship to Pollution Control Law*, 74 DENV. U. L. REV. 779, 800 (1997) (“It may well be that the tension between providing for enjoyment (recreation) and leaving units unimpaired (preservation) creates an impossible paradox for the NPS to solve.”); T.H. Watkins, *National Parks, National Paradox*, AUDUBON, July 17, 1997, at 40, 42; Tom Kenworthy, *Babbitt Vows to Protect National Parks*, WASH. POST, May 24, 1994, at A5 (citing Interior Secretary Bruce Babbitt as asserting that Organic Act contains an inherent conflict). *But see* Robin W. Winks, *The National Park Service Act of 1916: “A Contradictory Mandate”?*, 74 DENV. U. L. REV. 575, 612-14 (1997) (arguing that there is no contradiction because preservationist purpose is paramount).

125. See, e.g., *Bicycle Trails Council v. Babbitt*, 82 F.3d 1445, 1454 (9th Cir. 1996) (noting that Park Service has discretion to determine what uses of park

The Yellowstone Park Act,¹²⁶ Yellowstone's enabling legislation, is similarly open to interpretation. It designates Yellowstone "as a public park or pleasuring ground for the benefit and enjoyment of the people."¹²⁷ The Secretary of the Interior is directed to make such regulations as may be necessary for the management and care of the park and "for the protection of the property therein, especially for the preservation from injury or spoliation of all . . . natural curiosities, or wonderful objects" within the park, and the maintenance of those resources "in their natural condition."¹²⁸ Like the Organic Act, the Yellowstone Act has been interpreted to give park officials broad management discretion.¹²⁹

The Diversa bioprospecting agreement could fall within the scope of the Service's broad discretion under these acts. The Service could argue that the microorganisms Diversa intends to take are not protected park resources. The Organic Act declares that the purpose of the parks is to conserve "the scenery and the wild life therein" and provide for their enjoyment.¹³⁰ The Yellowstone Act adds "curiosities" and "wonderful objects" as resources to be protected.¹³¹ Microorganisms, invisible to the naked eye, can hardly be considered "scenery." Yet they are natural and alive, which would seem to bring them within a common sense reading of both "natural objects" and "wild life." They also could easily be considered curious and wonderful. Nonetheless, thermophilic microorganisms undoubtedly were not among the wonders Congress intended to protect in 1872, when it created Yellowstone, or in 1916, when it enacted the Organic Act.¹³² If the Park Service were to carefully consider the issue

resources are proper); *Daingerfield Island Protective Soc'y v. Babbitt*, 40 F.3d 442, 446 (D.C. Cir. 1994) (noting that Organic Act gives Park Service broad but not unlimited discretion); *Greater Yellowstone Coalition v. Babbitt*, 952 F. Supp. 1435, 1441 (D. Mont. 1996) ("[T]he statutory purpose language obviously gives park managers broad discretion in determining how best to conserve wildlife and to leave them unimpaired for future generations."); *National Wildlife Fed'n v. National Park Serv.*, 669 F. Supp. 384, 391 (D. Wyo. 1987) ("[T]he Park Service is empowered with the authority to determine what uses of park resources are proper and what proportion of the park's resources are available for such use.").

126. Act of Mar. 1, 1872, ch. 24, § 1, 17 Stat. 32, 32.

127. 16 U.S.C. § 21 (1994).

128. 16 U.S.C. § 26 (1994).

129. See *Frost v. Garrison*, 201 F. Supp. 389, 390 (D. Wyo. 1962); *Greater Yellowstone Coalition v. Babbitt*, 952 F. Supp. 1435, 1443 (D. Mont. 1996). The mandates of the Organic Act and the Yellowstone Act have been described as essentially synonymous. See *SELLARS*, *supra* note 89, at 22.

130. 16 U.S.C. § 1 (1994 & Supp. 1996).

131. *Id.* § 26.

132. Scientists did not learn that microbes could live at the high temperatures of

and conclude that these resources are not among those it must protect, a reviewing court might be hard pressed to overturn that determination. Without that consideration, however, a court might well hold the Park Service to a broad interpretation, requiring protection of these resources. Even so, the Park Service could make a strong case that Yellowstone's microflora will not be "impaired," "injured," or "spoiled" by the removal of a few small samples, as population levels will undoubtedly recover quickly.¹³³

In light of the broad discretion the Park Service exercises in implementing the Organic and Yellowstone Acts, the inconspicuous nature of microbial resources, and the probability that they will suffer no lasting physical harm, a considered Park Service decision that bioprospecting will not impair protected park resources would likely survive review. So far, however, the Park Service has not made such a considered decision. Furthermore, its own regulations stand in the way of that interpretation.

2. *The National Parks Omnibus Management Act of 1998*

On November 13, 1998, President Clinton signed the Omnibus Management Act,¹³⁴ dealing in part with the place of science in the national parks. Title II of the Act, "National Park System Resource Inventory and Management," states as its purposes both to provide "clear authority and direction for the conduct of scientific study in the National Park System" and to "encourage others to use the National Park System for study to the benefit of park management as well as broader scientific value, where such study is consistent with" the Organic Act.¹³⁵ In order to achieve those goals, the Act explicitly directs the

Yellowstone's hot springs until the 1960s. See Brock, *supra* note 12, at 10-13. It is quite unlikely that Congress was interested in any microbes at the time of the Yellowstone and Organic Acts. Not until the 1880s did scientists begin to recognize the ecological role of soil microorganisms. See, e.g., PAUL J. VANDEMARK & BARRY L. BATZING, *THE MICROBES* 25 (1987); MICHAEL J. PELCZAR, JR. ET AL., *MICROBIOLOGY* (5th ed. 1986). Their potential value as antibiotics first became apparent in the 1940s. See JACQUELYN G. BLACK, *MICROBIOLOGY* 18 (3d ed. 1996).

133. See *supra* note 33. Clearly not every removal of park resources is prohibited. The Yellowstone Act, for example, specifically allows recreational fishing in the park. See 16 U.S.C. § 26 (1994) ("[The Secretary of the Interior] shall make rules and regulations governing the taking of fish from the streams or lakes in the park."). It seems unlikely that a Congress willing to allow removal of fish would automatically balk at the removal of small numbers of microorganisms.

134. Pub. L. No. 105-391, 112 Stat. 3497, 3499 (1998) (to be codified at 16 U.S.C. § 5932).

135. *Id.* § 201.

Department of the Interior to ensure that "a broad program of the highest quality science and information" supports park management,¹³⁶ and to inventory and monitor park resources.¹³⁷ It also directs the Department to enter into agreements with universities to create cooperative study units to conduct research on park resources¹³⁸ and authorizes the Secretary of the Interior to consider requests from "public or private agencies, organizations, individuals, or other entities" to conduct scientific studies in the parks.¹³⁹ Such requests are to be approved only if the proposed studies are "consistent with applicable laws and management policies" and will "pose no threat to park resources or public enjoyment derived from those resources."¹⁴⁰ The Secretary is further authorized to "enter into negotiations with the research community and private industry for equitable, efficient benefit-sharing arrangements."¹⁴¹

Very little formal legislative history underlies these provisions. They were not discussed on the floor of either the House or the Senate, nor do the House or Senate reports elaborate on them.¹⁴² A 1992 Park Service report, popularly known as the Vail Agenda,¹⁴³ provided the impetus for these sections and others in the Omnibus Act.¹⁴⁴ That report emphasized the importance of scientific information for park management, but said little about the specific conditions under which scientific research should be permitted in the parks. The scientific research provisions were discussed at a hearing of the Subcommittee on Parks, Historic Preservation, and Recreation of the Senate Energy and Natural Resources Committee, but that discussion sheds little light on the specific provisions ultimately adopted.¹⁴⁵ Nonetheless, it seems clear that the Act was not intended to relax the conditions under which extramural scientific research could be conducted in the parks. As

136. *Id.* § 202.

137. *See id.* § 204.

138. *See id.*

139. *See id.* § 205(a).

140. *Id.* § 205(b).

141. *Id.* § 205(d).

142. *See* S. REP. NO. 105-202, at 18 (1998) (stating simply that Title II "directs the Park Service to implement a broad scientific research mandate to ensure that park managers have the highest quality science and information available when making resource management decisions"); H.R. REP. NO. 105-767, at 20 (1998).

143. VAIL AGENDA, *supra* note 91.

144. *See* S. REP. NO. 105-202, at 17 (1998).

145. The witnesses concentrated on the need for scientific information to support effective park management and on the appropriate administrative structure for a research program. *See generally* Vision 2020 Hearings, *supra* note 76, at 1-33.

originally drafted, the bill would have allowed use of the national parks for scientific study if that study would pose "no significant threat to or broad impairment of national park resources and public enjoyment."¹⁴⁶ Representatives of the Park Service, National Parks and Conservation Association, and Natural Resources Defense Council argued against this language, claiming it was inconsistent with the general requirement of the Organic Act that park resources be protected against any impairment.¹⁴⁷ The bill was changed in accordance with these comments, so that the enacted legislation requires that scientific research in the parks pose no threat to park resources.¹⁴⁸ The Omnibus Act, therefore, does not radically change the terms under which scientific research may be permitted in the national parks. Rather, it is a legislative endorsement of, and explicit mandate for, science in the national parks.

Although section 205(d), providing that the Secretary of the Interior "may enter into negotiations with the research community and private industry for equitable, efficient benefits-sharing arrangements,"¹⁴⁹ seems to have been directed at the Diversa situation, it does not change the background law governing what research may be done in the parks and under what conditions. This provision did not appear in the bill originally considered and passed by the Senate. It was added by the House Resources Committee, without public explanation,¹⁵⁰ after the Diversa lawsuit had been filed. The provision appears to be intended to shore up Park Service authority to accept money from Diversa, allowing the Park Service to share the benefits of the Diversa arrangement, in light of the substantial doubt that the technology transfer statutes provide that authority.¹⁵¹ It does not, however, address the issue of whether Diversa or other researchers may be allowed to conduct any particular research in the parks. Nor does it undermine or question existing Park Service regulations governing research in the parks. Rather, this provision of the Omnibus Management

146. See *id.* at 10 (quoting language from the bill).

147. See *id.* at 10 (statement of Denis Galvin, Deputy Director, National Park Service), 20, 23 (statement of William J. Chandler, Vice President, Conservation Policy, National Parks and Conservation Association), 32 (statement of Charles M. Clusen, Senior Policy Analyst, Natural Resources Defense Council).

148. See *supra* text accompanying note 140.

149. Pub. L. No. 105-391, § 205(d), 112 Stat. 3497, 3499 (1998) (to be codified at 16 U.S.C. § 5932).

150. Compare S. REP. NO. 105-202, at 3 (1998), with H.R. REP. NO. 105-767, at 4 (1998).

151. See *supra* text accompanying notes 78-121.

Act simply gives the Park Service greater discretion to distribute the benefits of research that is carried out in the parks. It could be cited to support an argument that the Park Service enjoys the discretion to permit bioprospecting, but it does not, of its own force, validate the Diversa agreement.

3. *Current Regulations are Inconsistent with the Diversa Deal*

Although it would be possible to read the relevant legislation in such a way as to permit this agreement, the Park Service has established a different interpretation. The Park Service's regulations adopt a broad view of the scope of park resources subject to protection and characterize any commercial use of those resources as an unacceptable impairment.

The Park Service's regulations generally prohibit the removal from their "natural state" of wildlife, fish, plants, cultural or archaeological resources, and mineral resources or their parts.¹⁵² The regulations also bar the gathering, possession, and unauthorized removal from the park of "natural products."¹⁵³ Thermophilic bacteria might not be wildlife, fish, plants, or mineral resources within the meaning of these regulations,¹⁵⁴ but they do seem to be "natural products." The Diversa agreement itself uses that term to refer to the specimens the company will collect,¹⁵⁵ and certainly bacteria are natural. Although the Park Service has never formally defined the term "natural product," the history of the bar on removing objects from the park suggests a broad interpretation. The earliest formal park regulations prohibited disturbance or removal of "any tree, flower, vegetation, rock, mineral, formation, stalactite, stalagmite, phenomenon of crystallization, incrustation in any

152. See 36 C.F.R. § 2.1(a)(1) (1998).

153. See *id.* § 2.1(c)(3)(i).

154. "Wildlife" and "fish" are defined terms. The former means "any member of the animal kingdom . . . except fish" and the latter is limited to "any member of the subclasses Agnatha, Chondrichthyes, or Osteichthyes, or any mollusk or crustacean found in salt water." 36 C.F.R. § 1.4 (1998). Although not defined by the regulations, the term "plants" in ordinary usage is limited to organisms that use photosynthesis to convert sunlight to chemical energy and in common usage is often further limited to multicellular organisms. The Yellowstone thermophilic bacteria do not fit either of those criteria. "Minerals" is also not a defined term, but its ordinary usage would not encompass living organisms like the Yellowstone thermophiles.

155. Diversa Agreement, *supra* note 26, § 2.11 (defining "natural product" as "any naturally occurring Research Specimen located in or taken from" the park). Other portions of the Diversa agreement make it clear that the Park Service believes a permit is required to remove these specimens. *Id.* Statement of Work at 4 (describing the permit requirement as a constraint on the research activity contemplated); see also *id.* App. A (Yellowstone National Park Research Authorization/Collection Permit).

lava tube, cave, steam vent, or cone, or of any animal, bird, or other wildlife, or of any ruins or relics, or of any other public property of any kind."¹⁵⁶ Although the current regulations are differently phrased, there is no reason to think they are intended to have any narrower coverage. Whatever their biological category, Yellowstone's hot spring microbes, which spend all their life on federal land or in federal waters, would seem to be "public property" of some kind.¹⁵⁷

Although it agrees that thermophilic microorganisms are natural products, the Park Service believes it may authorize their removal from the park. Park Service regulations provide several exceptions to the general prohibition on removal of natural products. One such exception allows park superintendents to issue permits for the collection of research specimens.¹⁵⁸ Research collection permits are limited to government agencies and representatives of "reputable scientific or educational institutions."¹⁵⁹ The park superintendent must find that collection is necessary to the stated scientific and resource management goals of the applicant and will not damage park resources.¹⁶⁰ No permit may be issued "if the specimen is readily available outside of the park area."¹⁶¹ Specimens and data derived from consumed specimens must be made available to the public, and copies of reports and publications must be filed with the park superintendent.¹⁶² The Park Service is disposed to

156. Department of the Interior, National Park Service, Rules and Regulations, 1 Fed. Reg. 672, 673 (1936).

157. There is very little law on the ownership of naturally occurring microbes. In general, the common law considered plants, which are sessile, to be the property of the person who owned the land upon which they grew. See Linda McMahan, Comment, *Legal Protection for Rare Plants*, 29 AM. U. L. REV. 515, 526-28 (1980). Animals, which are freely mobile, were not owned by anyone until captured. See, e.g., MICHAEL J. BEAN, *THE EVOLUTION OF NATIONAL WILDLIFE LAW* 8 (3d ed. 1997). States, however, have a property-like interest in the animals within their jurisdiction, and the federal government has a similar interest in the animals that inhabit federal lands. See *id.* at 14-15, 19-22; *Kleppe v. New Mexico*, 426 U.S. 529, 537 (1976). The logic of the common law differentiation between animals and plants suggests that micro-organisms, because they are not mobile, should be considered the property of the landowner. By that logic, Yellowstone's thermophiles are surely federal property.

158. See 36 C.F.R. § 2.5(b) (1998). Permits have been formally required for scientific collection in the parks at least since the 1930s. See Department of the Interior, National Park Service, 1 Fed. Reg. at 673 (1936) ("Collections for scientific or educational purposes shall be permitted only in accordance with written permits first had and obtained from the superintendent.").

159. 36 C.F.R. § 2.5(b) (1998).

160. See *id.*

161. *Id.*

162. See 36 C.F.R. § 2.5(g)(2) (1998). In a policy statement obviously adopted with the *Diversa* agreement, and perhaps Taq polymerase, in mind, the Park Service

approve requests for research permits so long as they will not threaten park values.¹⁶³ Park Service policies, however, state that manipulative or destructive research will not be permitted unless "the impacts will be short-lived, the park is the only area where such research can be conducted, the value of the research is greater than the resource impacts, or the research is essential to provide information for resource management."¹⁶⁴

Prior to the Diversa agreement, Yellowstone and other national parks had relied on this authority to allow bioprospecting.¹⁶⁵ The Diversa agreement continues that reliance; it is accompanied by a scientific research collection permit.¹⁶⁶ But close examination shows that the authority to issue scientific collection permits does not cover this agreement.

The first problem is that other Park Service regulations flatly forbid the sale or commercial use of natural products.¹⁶⁷ Research specimen permits do not provide an exception to that prohibition. In fact, Park Service policies forbid the use of research specimens for commercial profit.¹⁶⁸ Park Service officials argue that the Diversa agreement will commercialize only the end products developed by the company, not the

asserts that it has a right to any royalties "that may accrue from present and yet to be discovered applications from the collected specimen." National Park Service, U.S. Dep't of the Interior, *Special Park Use Guidelines*, A9-2 (Release No. 2, Sept. 1997) (visited Mar. 30, 1998) <<http://www.nps.gov/refdesk>> [hereinafter *Special Park Use Guidelines*].

163. See General Regulations for Areas Administered by the National Park Service, 48 Fed. Reg. 30,252, 30,266 (1983) (to be codified at 36 C.F.R. pts. 1-7, 12) ("[C]ollection for scientific purposes should be allowed unless prohibited by the enabling legislation for a park area and when such collection will not result in derogation of park values, and has the potential of conserving and perpetuating such biota."); *Management Policies*, *supra* note 84 ("In recognition of the scientific value of parks as natural laboratories, investigators will be encouraged to use the parks for scientific studies when such use is consistent with NPS policies.")

164. *Management Policies*, *supra* note 84.

165. See *supra* note 14 and accompanying text.

166. See *Diversa Agreement*, *supra* note 26, at app. A.

167. See 36 C.F.R. § 2.1(c)(3)(v) (1998) ("The following are prohibited: . . . Sale or commercial use of natural products.")

168. See *Special Use Guidelines*, *supra* note 162, Ex. 3, at A18-10 ("Collected specimens may be used for scientific or educational purposes only, shall be dedicated to public benefit, and shall not be used for commercial profit."). These guidelines, which have not been formally promulgated as regulations in accordance with the requirements of the Administrative Procedure Act, probably are not directly judicially enforceable against the Park Service. See, e.g., *Western Radio Servs. Co. v. Espy*, 79 F.3d 896, 901 (1996); *Chrysler Corp. v. Brown*, 441 U.S. 281, 315-16 (1979). Nonetheless, they reinforce the most natural reading of the Park Service's regulations, that research specimens are not exempt from the general prohibition on commercial use.

microbial resources removed from Yellowstone,¹⁶⁹ but this contention is not persuasive. Although it does not plan to sell Yellowstone specimens, Diversa is using those specimens to produce products it will sell for profit, a commercial purpose. Moreover, the financial terms of the Diversa agreement strongly suggest that the park is selling microbial samples to Diversa.¹⁷⁰

But that is not the only shortcoming of this agreement. The Diversa permit also may be inconsistent with the regulation limiting collection permits to reputable scientific or educational institutions. The Park Service has never directly explained the purpose of this limitation. The provision's history, though, suggests that it is intended at a minimum to assure that specimen collection in the parks benefits the public, rather than the collector alone. When it was added in 1941, this limitation was coupled with a prohibition on collection for personal, as opposed to public, use.¹⁷¹ Limiting permits to institutions effectively excludes individual collectors, whose collections are more likely to serve their personal aesthetic and financial interests than to add to the public knowledge base.¹⁷²

The regulation's drafters undoubtedly were thinking of universities and research institutions like the Smithsonian as the kinds of "reputable" institutions whose scientists should be encouraged to carry out research projects in the park. The regulatory language does not explicitly rule out collection by a commercial entity, probably because the Park Service simply had not envisioned the possibility that research in the parks could be commercially valuable. The regulation suggests, however, that

169. See Smith, *supra* note 12, at A1; see also 1995 ANNUAL REPORT, *supra* note 12, at 9 ("These tiny research specimens represent not a biological commodity, but a piece of 'intellectual property' in the form of a genetic code that the park has protected.").

170. See *supra* notes 109-16 and accompanying text.

171. The 1941 regulation forbade permits for collecting for personal use, and required that specimens collected from the parks "be made permanently available to the public." National Park Service, General Rules and Regulations, 6 Fed. Reg. 1626, 1629 (1941).

172. Some individual collectors may be amateurs dedicated to the promotion of science and quite capable of producing important scientific knowledge. See, e.g., Arthur M. Shapiro, *The Morality of Collecting: Who Cares and Why?*, NEWS OF THE LEPIDOPTERISTS' SOC'Y, Mar./Apr. 1993, at 54, 54-55 ("[S]ome amateurs ('hobbyists') have made and continue to make superb contributions to science, and some professionals have made at best trivial, insignificant, redundant or grossly wrongheaded contributions."). Many individual collectors, however, will be more bent on advancing their collections for personal aesthetic or financial reasons. If the latter are numerous, and if institutional scientists will pick up much of the work of the former, excluding all individual collectors will be more cost-effective than trying to separate "good" individuals from "bad" ones.

commercial collecting is not permissible. The term "institution" usually connotes a public service organization, not a for-profit corporation like Diversa.¹⁷³ That connotation is consistent both with the preference for public rather than private benefits and with the prohibition on commercial use of park resources.

In addition, limiting permits to reputable scientific and educational institutions may help ensure, with minimal expenditure of Park Service resources, that the science carried out is worthwhile and the collecting done is necessary to accomplish that science. Serious scientists from reputable institutions are likely to know what science can usefully be done in the parks. With their own and their institutions' reputations at stake, they may generally be trusted to limit their collecting to the extent necessary. Given the reality of limited administrative resources for oversight of collection permits, the restriction to "reputable institutions" can help effectuate the additional requirement that collection be necessary to a scientific purpose.¹⁷⁴

That requirement points out another problem with the Diversa agreement. Implicit in the mandate that collection serve stated scientific goals is the assumption that collecting will be done only for scientific purposes. But Diversa's purpose is not primarily "scientific." It is, instead, commercial. Science is the quest for knowledge about nature, and the process used to gather such knowledge.¹⁷⁵ Although Diversa undoubtedly will generate some new knowledge about nature pursuant to this agreement, that is not the purpose of its microbial sampling. The company's purpose is to find valuable enzymes that will increase its profits; it is not particularly interested in increasing the world's store of knowledge about thermophilic organisms.

173. See RANDOM HOUSE WEBSTER'S COLLEGIATE DICTIONARY 698 (1995) (giving the first definition of institution as "an organization or establishment devoted to the promotion of a cause or program, esp. one of a public, educational, or charitable character"); THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE 680 (New College ed. 1976) (listing as one definition of "institution" "an established organization; especially one dedicated to public service, as a university").

174. See *supra* note 160 and accompanying text. The parks, notoriously short of personnel with scientific expertise, see NATIONAL RESEARCH COUNCIL, *supra* note 90, at 73-76, are not likely to be very good at evaluating the extent to which collection is needed to achieve any particular scientific goal.

175. See, e.g., Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1057 (1997) (describing science as a process for gathering knowledge about the world, and the body of knowledge produced by that process); RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARY (1995) (defining "science" as among other things "systematic knowledge" or "knowledge gained by systematic study").

Furthermore, a distinctive feature of science is that the knowledge it generates is made widely available.¹⁷⁶ Diversa, like other industrial research operations, has little incentive to reveal what it learns from its Yellowstone work.¹⁷⁷ There is some science in this agreement, but it is incidental to the commercial purpose.¹⁷⁸

In addition, the Diversa agreement does not comfortably square with the requirement that a permit be denied if the specimen sought is readily available outside the park.¹⁷⁹ That requirement presupposes that the collector knows what specimen it is seeking, but less than 1% of Yellowstone's microorganisms have been identified.¹⁸⁰ Thus, neither Diversa nor the park can know in advance what organisms will be collected or whether those organisms could be found elsewhere. Whether Diversa's work complies with this requirement, therefore, depends upon which side has the burden of proof. Because Yellowstone has a unique range of thermal habitats,¹⁸¹ it might seem plausible that many specimens available in Yellowstone would not be available elsewhere. History, however, provides grounds to doubt that supposition. Yellowstone's most famous microbe, *Thermus aquaticus*, turned up in many thermal sites, including water heaters, following its discovery at Yellowstone.¹⁸² Undoubtedly many of the microbes in Yellowstone's hot springs are also available elsewhere.

The Diversa agreement may also conflict with the regulatory

176. See, e.g., ROBIN DUNBAR, THE TROUBLE WITH SCIENCE 31 (1995) (stating that part of the process of science is putting ideas into the arena of public debate); JOHN ZIMAN, RELIABLE KNOWLEDGE: AN EXPLORATION OF THE GROUNDS FOR BELIEF IN SCIENCE 31 (1978) (noting that results must be made publicly available for testing and extension).

177. See *infra* text accompanying note 309.

178. Justice Mosk of the California Supreme Court drew a similar distinction in his dissent in *Moore v. Regents of the University of California*, 793 P.2d 479 (Cal. 1990). The statute in question allowed only the "scientific use" of excised human body parts. Justice Mosk agreed that "scientific use" would include examination of the tissue for the purposes of medical diagnosis and treatment as well as "purely scientific study by a disinterested researcher for the purpose of advancing medical knowledge." *Id.* at 508 (Mosk, J., dissenting). Because the researchers allegedly sought to promote their own economic, financial, and competitive interests by establishing a cell line from Moore's cells, however, Justice Mosk would have found that their use was commercial rather than "scientific." *Id.* at 508-09; cf. *American Geophysical Union v. Texaco, Inc.*, 60 F.3d 913, 916, 920 (2d Cir. 1994) (distinguishing between commercial and noncommercial research for purposes of fair use analysis under copyright statute).

179. See 36 C.F.R. § 2.5(b) (1998).

180. See Smith, *supra* note 12, at A1.

181. See *supra* notes 85-86 and accompanying text.

182. See Brock, *supra* note 12, at 14.

requirement that collected specimens and the data derived from consumed specimens be made available to the public.¹⁸³ The agreement calls for Diversa to destroy all collected specimens in order to extract their DNA.¹⁸⁴ But Diversa will be culturing at least some samples,¹⁸⁵ and presumably could grow enough to make some specimens available to the public.¹⁸⁶ Some data, specifically the phylogeny constructed for the park, will be made available to the public. But the extent to which additional information generated under the agreement, such as descriptions of the genes or enzymes isolated from the samples, will be made publicly available is unclear. The agreement flatly forbids the public release of data Diversa designates as proprietary.¹⁸⁷ Furthermore, the major product of this research will not be *information* but rather *things*, genes or enzymes that can be produced in commercial quantities. Those are not likely to be made available to the public on the free-access terms contemplated by the regulation.

In sum, the Diversa bioprospecting agreement probably could be permitted under the legislation governing Yellowstone and other parks, but it is inconsistent in several respects with Park Service regulations designed to preclude commercial exploitation and to assure that any science performed in the parks yields public, rather than private, benefits. The obvious next question is which should be reconsidered, the agreement or the regulations with which it conflicts. Answering that question requires a clearer picture of the functions of the national parks.

III

THE IMPORTANCE OF NATIONAL PARKS AS SOURCES OF INSPIRATION

The Organic Act provides only the vaguest explanation of the fundamental purposes of national parks. It speaks of both use and conservation.¹⁸⁸ It tells the Park Service not to "administer the parks in derogation of the purposes for which they have been established."¹⁸⁹ More than three-quarters of a century after the establishment of the Park Service, the fundamental purposes of

183. See 36 C.F.R. § 2.5(g)(2) (1998).

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

185. See *id.*

186. The American Type Culture Collection offers a mechanism for making specimens widely available. See *infra* note 340.

187. See *Diversa Agreement*, *supra* note 26, Statement of Work at 11.

188. See 16 U.S.C. § 1 (1994 & Supp. 1996).

189. 16 U.S.C. § 1a-1 (1994).

the national parks remain surprisingly unclear.¹⁹⁰ It is clear, however, that the parks are more than simply physical resources. Those who fought most strongly for establishment of the national parks saw them as places that could inspire and refresh the populace and express the nation's special respect for its unique national resources.¹⁹¹ In today's world, the parks should be places where the populace can be inspired with the wonder of nature and the understanding that some things are too special to be sold.

A. *Historic Background*

1. *The Ideal of Parks as Inspirational and Symbolic Places*

The precise reason why the earliest national parks, beginning with Yosemite¹⁹² and Yellowstone,¹⁹³ were set aside was not directly stated in their enabling legislation nor was it made clear in the political debates at the time.¹⁹⁴ Most observers

190. Park officials admit that they do not know quite why the parks exist. See, e.g., VAIL AGENDA, *supra* note 91, at 13 ("Why would a nation want a system of national parks? If we can answer this question, it will help define the purpose of the National Park Service as it looks beyond its seventy-fifth anniversary into the next century."); WAGNER ET AL., *supra* note 90, at 159 (quoting a "veteran NPS biologist" as asking "what are we managing the parks for?"). Of course, the Park Service has some incentive not to clarify the precise purposes of the parks, as doing so might constrain their currently broad managerial freedom. See Cheever, *supra* note 124, at 638-39 ("Paradoxical mandates were a particularly useful form of legislative carte blanche. They appear to have substance because they speak of general values in mandatory terms. However, they do not significantly constrain agency action."). But outsiders also seem uncertain about the purposes of the parks. See, e.g., Ted Williams, *Deregulating the Wild*, AUDUBON, July 17, 1997, at 56, 56-57 (stating that it is as true today as when Theodore Roosevelt said it that "we are not yet sure as a people just what we want [national parks] for").

191. See *infra* notes 197-217.

192. The United States conveyed Yosemite Valley and the surrounding peaks to the state of California in 1864 for "public use, resort and recreation." Act of June 30, 1864, ch. 184, 13 Stat. 325. The land was returned to the United States and designated a national park in 1906. See Act of June 11, 1906, ch. 27, § 1, 34 Stat. 831, 831.

193. Yellowstone was "set apart as a public park or pleasuring ground" in 1872. Act of March 1, 1872, ch. 24, § 1, 17 Stat. 32, 32.

194. See JOSEPH L. SAX, MOUNTAINS WITHOUT HANDRAILS: REFLECTIONS ON THE NATIONAL PARKS 5 (1980) ("What exactly was meant to be accomplished by these unprecedented reservations is a mystery that will never be fully solved."). Yosemite was set aside for "public use, resort and recreation." See *supra* note 192. Yellowstone's enabling act simply stated that the designated land "is reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people." Act of March 1, 1872, ch. 24, § 1, 17 Stat. 32 (codified at 16 U.S.C. § 21 (1994)). Virtually the same language was repeated in the 1890 Act

have concluded that these areas were designated for preservation primarily on account of their spectacular natural scenery.¹⁹⁵ Government action was thought necessary to prevent the physical destruction of these scenic wonders because private caretakers, driven by the exigencies of the economic market, might be unable to resist the temptation to destroy them for short-term profit.¹⁹⁶

But that was not the only basis for preferring public control. Park advocates believed these magnificent areas should be made available to all members of the public, which required that they be kept out of the hands of profiteers who would charge exorbitant access fees.¹⁹⁷ Moreover, there seems to have been a sense that the encroachments of vulgar commercialism were themselves a form of despoliation. The desire to avoid repeating the failures of Niagara Falls, the epitome of crass commercialization, proved an important motivating force for the national parks movement.¹⁹⁸

Why was it so desirable to protect these special places not only against physical destruction but also against rampant commercialism and elitism? Because they offered the nation far more than mere scenery. In his seminal history of the national

that created Sequoia National Park. Act of Sept. 25, 1890, ch. 926, § 1, 26 Stat. 478, 478 (codified at 16 U.S.C. § 41 (1994)).

195. See SELLARS, *supra* note 89, at 30; RUNTE, *supra* note 84, at 29. The earliest public statement of Park Service policy, a 1918 letter from Secretary of the Interior Franklin Lane to Park Service Director Stephen Mather emphasized the importance of scenery in park selection. See *Letter from Franklin Lane to Stephen Mather, May 13, 1918*, in CRITICAL DOCUMENTS, *supra* note 84, at 48, 51 [hereinafter *Lane Letter*] (urging that new parks be limited to "scenery of supreme and distinctive quality or some national feature so extraordinary or unique as to be of national interest and importance").

196. For example, Frederick Law Olmsted, a leading proponent of national parks, argued that the market would lead, rather than follow, public tastes, inducing private owners to convert these areas to more profitable uses than the contemplative reflection Olmsted preferred. See Joseph L. Sax, *America's National Parks*, 85 NAT. HIST. 57, 75 (1976).

197. The House Committee on the Public Lands explained the need for the legislation by reference to the danger that private claimants might "fence in these rare wonders so as to charge visitors a fee, as is now done at Niagara Falls, for the sight of that which ought to be as free as the air or water." H.R. REP. NO. 42-26, at 69 (1872). "By the 1860s not a single point remained in the United States from which the falls could be viewed without paying a landowner an entry fee." Joseph L. Sax, *supra* note 196, at 64. Such a fate simply could not be permitted for other spectacular areas. Park chronicler John Ise expressed this idea forcefully in 1961: "Private monopoly of such unique scenic wonders would be repugnant to all sense of justice and propriety." JOHN ISE, *OUR NATIONAL PARK POLICY: A CRITICAL HISTORY* 5 (1961).

198. See RUNTE, *supra* note 84, at 5-9 (describing European condemnation of the commercialization of Niagara Falls as an embarrassment to the nation).

parks, Alfred Runte attributes the national park movement of the 19th century to the search of a still-young nation, whose human works could not compare with those of Europe, for a national identity in which it could take pride.¹⁹⁹ Surely national pride is an important product of our national parks. But the mere existence of natural wonders like Yosemite and Yellowstone could not justify much pride, though it might inspire a feeling that the nation was blessed by fortune. What could justly fuel national pride was the preservation of such wonders. Americans, in addition to envying Europe its history and cultural achievements, had been stung by criticism of American materialism.²⁰⁰ Preservation of the country's spectacular national wonders for public enjoyment allowed America to show the world that it recognized values other than money.²⁰¹ In this way, creation of the national parks allowed America to take pride in its national character.²⁰² The parks symbolized what was best in the nation, not just in its natural beauty but also in its human character.

The parks were not only intended to express the most noble

199. See *id.* Not everyone, however, is persuaded that the search for national pride was an important aspect of the national park movement. See, e.g., SCHULLERY, *supra* note 86, at 62-63.

200. In his study of America, Alexis de Tocqueville noted that the Americans refused to condemn, and sometimes even praised, traits "that common sense and the universal conscience of mankind condemn," such as "the love of money." ALEXIS DE TOCQUEVILLE, *DEMOCRACY IN AMERICA* 621 (J.P. Mayer ed., Anchor Books 1969) (1835). Although de Tocqueville regarded the immoderate American desire for wealth as useful in the context of American society, see *id.* at 284, he condemned it in the abstract as ultimately degrading to humanity, see, e.g., *id.* at 543-44. Some Americans also criticized their compatriots' materialistic excesses. For example, a Californian protested the cutting of giant redwoods for exhibit in Europe and New York, protesting that in Europe the trees would have been protected by law "but in this money-making, go-ahead community," they were sold for cheap amusement. RUNTE, *supra* note 84, at 27.

201. During the battle over Hetch Hetchy, John Muir wrote: "Dam Hetch Hetchy! As well dam for water-tanks the people's cathedrals and churches, for no holier temple has ever been consecrated by the heart of man." John Muir, *Hetch Hetchy Valley*, in JOHN MUIR, *NATURE WRITINGS* 810, 817 (William Cronon ed., 1997). Muir also wrote that "Nothing dollarable is safe, however guarded." *San Francisco and the Hetch Hetchy Reservoir: Hearings on H.R.J. Res. 184 Before the House Comm. on the Pub. Lands*, 60th Cong. 32 (1909) (memorandum from John Muir, President, Sierra Club). Establishment of the national parks was a declaration that these areas, at least, were not and never would be "dollarable." Runte points out that the early parks appeared to have little economic value other than as tourist destinations. See RUNTE, *supra* note 84, at 48-64. That made it politically easier to make the initial declaration that their resources were not for sale, but it does not diminish the moral force of the declaration.

202. Runte sees this function in today's national parks, although he seems to miss it in their origins. See RUNTE, *supra* note 84, at xvi.

aspects of the national character, they were expected to play a role in creating and passing on that character. Although the parks were often referred to as playgrounds,²⁰³ that term was not intended to connote cheap mass amusement.²⁰⁴ The parks were supposed to offer recreation of a kind not available elsewhere, "healthful" recreation that could inspire, educate and improve those who engaged in it.²⁰⁵ As Gifford Pinchot, the first director of the Forest Service, pointed out in opposition to the proposal to create a national park service distinct from the Forest Service, the national forests provided opportunities for ordinary outdoor recreation.²⁰⁶ Parks, to justify their distinct status, had to provide special recreational opportunities.

Park advocates insisted that parks would offer a form of recreation that would make people better citizens. Stephen Mather, the first director of the Park Service, envisioned the parks as places where people could renew their spirits and become better citizens through clean living in the outdoors.²⁰⁷ Frederick Law Olmsted, a leading advocate of the parks ideal in the late 19th century and one of the first commissioners of the Yosemite Valley,²⁰⁸ believed that the parks should "draw people out of the routine of daily life, to create a total and encompassing experience, to change the entirety of their pace and permit the rhythm of the park to take over."²⁰⁹ Olmsted was convinced that spectacular natural scenery would stimulate healthy contemplation and pure reflection, which in turn would regenerate spirits dulled by the constant labor of the ordinary

203. See, e.g., SELLARS, *supra* note 89, at 58 (quoting Stephen Mather); *Letter from Secretary of the Interior Hubert Work to Park Service Director Mather, March 11, 1925*, reprinted in CRITICAL DOCUMENTS, *supra* note 84, at 62 [hereinafter *Work Letter*].

204. The term "the nation's playgrounds" signified places where the public might enjoy rest, solitude, and recreation. It was used in preference to "resort" because the latter was thought to have an undemocratic ring. See Winks, *supra* note 124, at 585.

205. See *Superintendents' Resolution on Overdevelopment*, reprinted in CRITICAL DOCUMENTS, *supra* note 84, at 57 [hereinafter *Superintendents' Resolution*] (describing parks' mission as "healthful recreation and education"). Nonetheless, a great many activities were apparently considered sufficiently healthful, or at least sufficiently compatible with self-improvement to be permitted. Director Mather "personally encouraged construction of golf courses in Yosemite and Yellowstone, believing that tourists would stay longer in the parks if they had more to entertain them." SELLARS, *supra* note 89, at 63.

206. See SELLARS, *supra* note 89, at 36 (describing Pinchot's opposition to the Organic Act proposal on grounds that national forests could provide needed recreation).

207. See *id.*

208. See RODERICK NASH, *WILDERNESS AND THE AMERICAN MIND* 106 (1st ed. 1967).

209. Sax, *supra* note 196, at 81.

citizen's life.²¹⁰ John Muir,²¹¹ Robert Marshall,²¹² and Horace McFarland²¹³ agreed that parks would help instill in citizens the vigor, patriotism, and productivity the nation needed.

An important aspect of this civilizing recreational experience was its availability to all, rich and poor alike. Olmsted, an advocate of urban parks as well as national parks, noted in the context of the former that the congregation of all classes in the outdoors could create a sense of community, helping to combat the isolation of increasingly urban life.²¹⁴ Introduction of visitors to the wonders of nature was a key element of this socializing function.²¹⁵ It was hoped that exposure to the spectacular wonders of the national parks would encourage people to notice the myriad smaller wonders that fill the natural world.²¹⁶ Recognizing that the messages parks conveyed to visitors, as well as their physical resources, deserved protection, the early Park Service included the "dignity" and "grandeur" of the parks in the list of attributes it vowed to protect.²¹⁷

210. See SAX, *supra* note 194, at 19-21.

211. See, e.g., MUIR, *supra* note 84, at 1 ("Thousands of tired, nerve-shaken, over-civilized people are beginning to find out that . . . mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life.")

212. See RUNTE, *supra* note 84, at 95-96.

213. See *id.* at 88-89; see also *id.* at 96 (setting forth 1909 statement of the director of the USGS that parks could help maintain "industrial supremacy"); VAIL AGENDA, *supra* note 91, at 73 (citing the idea that wholesome recreation is necessary for worker productivity as one basis for creation of the national parks).

214. See Frederick Law Olmsted, *Public Parks and the Enlargement of Towns*, in CIVILIZING AMERICAN CITIES 75-77 (S.B. Sutton ed., 1979); Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711, 779 (1986). While inaccessibility to daily use prevented the national parks from substituting for community parks in this respect, they could reinforce the social cohesion developed in more local parks.

215. See *Superintendents' Resolution*, *supra* note 205, 58-59 ("A vital part of the education of every individual is to acquire at least a partial understanding and appreciation of nature and scenery. . . . The study of nature develops power of observation, quickens the senses, increases the usefulness of an individual in any line of work or occupation, and makes his life broader, deeper, happier. . . . [N]ot all of Nature's treasures are to be seen from the seat of an automobile; one does not receive at twenty miles an hour, the inspiration that results from a pilgrimage on foot. . . . The national parks should be a real factor in the building of a better, stronger race.")

216. See RUNTE, *supra* note 84, at 31 (citing John Muir's hope that the public, which would be drawn to the spectacular, would then learn to see smaller wonders).

217. See, e.g., *Superintendents' Resolution*, *supra* note 205, at 57 (noting that parks preserve fine scenery for future generations, "that they may always know the quiet dignity of our forests and the rugged grandeur of our mountains"); Lane Letter, *supra* note 195, at 51 (noting that "[t]he national park system as now constituted should not be lowered in standard, dignity, and prestige by the inclusion" of less magnificent new areas); Work Letter, *supra* note 203, at 65 ("Our existing national

2. *The Reality of Parks as Cheap Amusement*

Nonetheless, from their very inception the national parks fell short of the goal of presenting nature's wonders in a way that would inspire visitors rather than simply amuse them. Even before Yosemite was formally designated as a national park, it gave way to what Runte calls "carnivalism."²¹⁸ James McCauley, the builder of a hotel at Glacier Point, began the tradition of the firefall, pushing smoldering embers over the cliff. As they fell, the embers glowed brightly, delighting observers with the illusion of a flowing river of fire.²¹⁹ "Tunnel trees" were invented in the same era; to attract publicity and attention, carriage roads were carved through living redwood trees.²²⁰ There was even talk of "improving" Yosemite's signature waterfalls by building reservoirs to augment their flow in California's dry summers.²²¹ Yellowstone received similar undignified treatment, with colored spotlights highlighting the evening eruptions of Old Faithful geyser and "performances" in which bears were fed garbage in an amphitheater for the amusement of visitors.²²²

Some of the unnatural treatment of parks in this era can be attributed to a lack of understanding of nature's complexities. Early park managers freely manipulated nature to make the parks more aesthetically pleasing and appealing to recreational visitors.²²³ They seem to have assumed that a pleasing appearance would reflect a healthy land.²²⁴

But the failure to achieve in practice the ideal of protecting the parks as symbols of the nation's respect for nature was also due to the undeniable fact that other, incompatible, goals were always part of the political mix. In order to win political support for their cause, advocates of the national park system early on moved away from strict reliance on the inspirational possibilities of parks. In order to win passage of the Organic Act, for example, they argued that a national park system would boost the nation's economic health by encouraging Americans to spend

park system is unequalled for grandeur.").

218. RUNTE, *supra* note 84, at 163.

219. *See id.* at 164-65.

220. *See id.* at 165.

221. *See id.* at 166.

222. *See id.* at 168.

223. *See generally* SELLARS, *supra* note 89, at 22-90. Sellars calls this practice of preserving the scenic facade of nature without concern for the reality of naturalness "facade management." *Id.* at 70. For examples of this management philosophy, one need look no further than the *Lane Letter*, *supra* note 195, at 49, which endorsed such steps as tree removal to improve scenic vistas.

224. *See* SELLARS, *supra* note 89, at 88.

their tourist dollars at home.²²⁵ The commitment to attracting tourists inevitably pulled the parks away from their founding principles, encouraging a proliferation not only of roads but also of tawdry amusements. Despite his calls for inspirational recreation, director Mather hired a publicity chief to promote the parks, inevitably degrading the experience offered by the parks to that demanded by the crowds.²²⁶ By the mid-1930s, Bob Marshall observed that artificiality and luxurious development had thoroughly overtaken the primitive experience in the parks.²²⁷ Inspiration, while touted in theory, was clearly taking a back seat in practice.

B. *Inspiration and Today's National Parks*

1. *The Core Purpose of Parks in the Modern World*

In the years since 1916, the national park system has greatly expanded and diversified. It now includes historic sites as well as spectacular natural areas.²²⁸ Nonetheless, Congress continues to treat the park system as a collection of unique resources deserving special respect. In 1970, the legislature reaffirmed that the purposes of the 1916 Organic Act—allowing the use and enjoyment of parks while preserving them unimpaired for the enjoyment of future generations—remain the organizing principles for all units of the national park system.²²⁹ At the same time, Congress expressly recognized both the importance of the parks' inspirational function, and their peculiarly public nature. The national park system, Congress declared, is to be "preserved and managed for the benefit and inspiration of all the people of the United States."²³⁰

225. See RUNTE, *supra* note 84, at 82-105.

226. See MICHAEL FROME, REGREENING THE PARKS 48-49 (1992).

227. See *id.* at 9.

228. The system now includes units as far removed from Yellowstone as Wolf Trap Farm Park, a performing arts center in the suburbs of Washington, D.C., see 16 U.S.C. §§ 284-284j (1994), and Steamtown, a railroad museum in Scranton, Pennsylvania, see Steamtown National Historic Site Act of 1986, Pub. L. No. 99-500, tit. I, 100 Stat. 1783 (1986).

229. Congress explicitly reaffirmed the primacy of these purposes in 1970. See 16 U.S.C. § 1a-1 (1994) ("Congress . . . reaffirms, declares, and directs that the promotion and regulation of the various areas of the National Park System . . . shall be consistent with and founded in the purpose established by section 1 of this title, to the common benefit of all the people of the United States.").

230. *Id.* This same section further declares that "the promotion and regulation" of the units of the national park system shall be consistent with the purpose established by the Organic Act "to the common benefit of all the people of the United

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 Leskovic, *Academic Freedom and the Quality of Sponsored Research on Campus*, 13 *REV. LITIG.* 401, 402 (1994).

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

306. See 35 U.S.C. §§ 200-212; Leskovic, *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 Burress, *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 Eliot Marshall, *Ethics in Science: Is Data-Hoarding Slowing the Assault on Pathogens?*, 275 SCI. 777 (1997); Marlene Cimons & 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; Keiter, *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); Keiter, *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. The 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 Pabelle, *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.