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THE MYTH OF THE WIN-WIN: MISDIAGNOSIS IN THE BUSINESS OF REASSEMBLING NATURE

William H. Rodgers, Jr.*

I. INTRODUCTION

This Article starts with a closer than customary look at the most serious obstacle to the ambitious campaign of environmental restoration that is the focus of this Symposium. That obstacle is the human brain. The Article contends that human cognitive processes are marvelous designers of serviceable self-deceptions. In the war on nature that we witnessed in the twentieth century the most functional of these is the firm belief in a non-zero sum world. This is the conviction that gains from economic development could be enjoyed without sacrifice of the natural world. This is a convenient, powerful, and serviceable myth although it happens to be faulty at its foundations.

The happy assumptions of win-win are contradicted wherever we look. This conference is focusing on the multi-faceted movement to restore—that is, to fix, repair, set right—that which went wrong. The environmental restoration movement thus rests on denial and repudiation of the win-win myth that allowed our predecessors to claim progress without a price. Predictably, though, the zero-sum mentality that allowed us to tear out the fabric of nature while retaining its shell is still in vogue. There is an overwhelming desire to retain the benefits of development while we repair the damage. The appealing beacon of the win-win remains tantalizingly attractive to the present generation.

Self-deception, by definition, is misdiagnosis. And misdiagnosis, by definition, is not where we should start in our campaigns to restore nature. The principal institutions we rely upon to resist misdiagnosis are law and science. This Article evaluates the performance of law and science in the field now loosely called environmental restoration. My examples are drawn mostly from the Columbia River, which is in the throes of an intense campaign to save populations of the great salmon.

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Neither law nor science has done well in these environmental restoration circles. Law's problem, this Article contends, is that it is dependent on other entities for the development of facts. Courts have responded by inventing a "deference" doctrine that allows them to withdraw from the fray at the first hint of conflicting scientific opinion. The problem of science, the Article argues, is that it is confined to attempts to answer questions put forth by somebody else—frequently the wrong questions. Scientists have responded to law's encroachments the same way courts have responded to the encroachments of science: adopting a policy of complete deference. No question is too absurd to attempt to answer if it has been asked by a responsible political entity.

It is a tall task to prescribe a fix for courts that defer too readily to science and for science that defers too readily to law. But the recommendation here is for courts to recommit themselves to the task of aggressive judging and for scientists to recommit themselves to pursuing the right questions.

II. THE BRAIN'S PROBLEM: SELF-DECEPTION

*"[H]iding the truth from the conscious mind
the better to hide it from others...."*¹

The claim that humans are disposed to misperceive reality is counter-intuitive to say the least. Virtually all theories of human behavior rest upon some calculus of self-interest that presumes an ability to discern what is in one's interest. It is hard to imagine a louse or a mouse making much of its life if it was seriously disposed to misread the intentions of predators that constrained its options.

Why are humans different? The evolutionary biologist, Robert Trivers, develops his theory of self-deception in three steps. Step one is to recognize that self-deception can be enormously valuable to an individual *in the service of deception*.² People hide the truth from their conscious minds to better hide it from others. This theory insists that deception is an important aspect of communication, especially among species with long memories and elaborate signaling. Convincing oneself of a falsehood is a useful way to sell the story to others.

Superior deceivers master this art of self-deception. They overcome the tell-tale signs of sweaty palms and shifty eyes by the simple expedient of convincing themselves of the plausibility of their self-serving fictions.

Thus, the "hallmark of self-deception in the service of deceit," according to Trivers, "is the denial of deception, the unconscious running of selfish and deceitful ploys..., the creation of self-serving social theories and biased internal narratives of on-going behavior which hide true intention.... The general cost of

1. ROBERT TRIVERS, SOCIAL EVOLUTION 415 (1985).
2. *See id.* at 395-420 (discussing deceit and self-deception).

self-deception then is misapprehension of reality, especially social, and an inefficient, fragmented mental system.”³

To substantiate the link to our present topic of environmental restoration, note that self-deception can thrive in environments of high uncertainty, complex interaction, low empirical feedback, and obscure second and third level adaptive responses. These characteristics are familiar domain to students of environmental degradation who stress cumulative effects, constant change, and sudden surprise.⁴ And these characteristics are the essence of all strategies of environmental restoration that presume that interventions *A* and *B* will yield process changes *C* and *D* along with adaptive responses *E* and *F* that allow us to aspire to different endpoints *G* and *H* that are conceded to be temporary in any event. This sort of ecological theory, like a social theory, Trivers warns, “inevitably embraces a complex array of facts and these may be very partially remembered and very poorly organized.... Contradictions may be far afield and difficult to detect.”⁵ In other words, in these arenas of deep mystery, self-deception may be expected to thrive.

Step two in Trivers’ theory of self-deception is to recognize that misapprehension of reality serves not only a negative function of deceit but also a positive function of optimism.⁶ As elaborated by Trivers, in the last twenty years an important literature has grown up that “appears to demonstrate that there are intrinsic benefits to having a higher perceived ability to affect an outcome, a higher self-perception, and a more optimistic view of the future than facts would seem to justify.”⁷ This mild form of self-inflation produces benefits for those who practice it. Trivers explains, “[l]ife is intrinsically future-oriented and mental operations which keep a positive future orientation at the forefront result in better future outcomes (though perhaps not as good as those projected).”⁸ Environmental lawyers would rush to confirm this speculation. Unwarranted optimism has triumphed in many corridors where careful calculators fear to tread. Environmental scientists would second the notion. The Corps of Engineers did not secure its reputation by calling itself a “Cannot Do” organization.

The third step in Trivers’ theory of self-deception reveals the theory’s relevance to modern environmental disputes. He adds the component of the modern bureaucratic state and shows how truth can become the first casualty in the multiple individual moves that add up to organizational behavior. Trivers’

3. Robert Trivers, *The Elements of a Scientific Theory of Self-Deception*, 907 ANNALS N.Y. ACAD. SCIENCES (forthcoming April 2000).

4. See generally, e.g., BARRIERS & BRIDGES TO THE RENEWAL OF ECOSYSTEMS AND INSTITUTIONS (Lance H. Gunderson et al. eds., 1995); NANCY LORD, DARKENED WATERS: A REVIEW OF THE HISTORY, SCIENCE AND TECHNOLOGY ASSOCIATED WITH THE EXXON VALDEZ OIL SPILL AND CLEANUP (1992).

5. Trivers, *supra* note 3.

6. See *id.*

7. *Id.*

8. *Id.*

example is drawn from Richard Feynman's analysis of NASA's Challenger disaster where the muting of safety concerns developed from the agency's broader aims to promote the space shuttle.⁹ According to Trivers, NASA "chose to minimize the problem and the unit within NASA that was consigned to deal with safety became an agent of rationalization and denial, instead of rational study of safety factors."¹⁰ "Note, however," Trivers adds, "that it is the astronauts who suffered the ultimate cost, while the upper echelons of NASA—indeed, the entire organization minus the dead—may have enjoyed a net benefit (in employment for example) from their casual and self-deceived approach to safety."¹¹

The suggestion that organizational collectives can slip into gross patterns of self-deception strikes a convincing note. There is a large selection of literature on the topic that includes my personal favorite entitled *Extraordinary Popular Delusions and the Madness of Crowds*.¹² Today, few environmental lawyers pass up an opportunity to elaborate upon the folly, foolishness, or self-deception that befall bureaucracies known to them. They do not deny the phenomenon. They embrace it, extend it, and embellish it.

The grand self-deception that contributed mightily to the steady demise of the Columbia River salmon was the serviceable belief that the hydropower dams could be made compatible with the salmon's survival needs. The Bonneville Dam was constructed in the lower river (River Mile 146) between 1934 and 1937. It was designed with adult fish ladders that proved serviceable beyond expectations.¹³ That some adult salmon made successful use of the fish ladders was taken as a harbinger of salmon-hydro coexistence. This "proof" that dams were compatible with fish buoyed later decisions to construct more dams. In 1945, Congress gave voice to this win-win philosophy with a declaration that the McMary Dam be constructed with full protection of the anadromous fish runs.¹⁴ Last to be built under this win-win philosophy were the four lower Snake River dams (the Snake joins with the Columbia at Pasco, Washington) that were completed in the 1970s. These facilities are now the focus of one of the most intense dam-removal debates in the United States.¹⁵ These dams with completion

9. See *id.* See also RICHARD P. FEYNMAN, "WHAT DO YOU CARE WHAT OTHER PEOPLE THINK?" FURTHER ADVENTURES OF A CURIOUS CHARACTER 113-237 (1988).

10. Trivers, *supra* note 3.

11. *Id.*

12. CHARLES MACKAY, EXTRAORDINARY POPULAR DELUSIONS AND THE MADNESS OF CROWDS (Harmony Books 1980) (1841).

13. See LISA MIGHETTO & WESLEY J. EBEL, SAVING THE SALMON: A HISTORY OF THE U.S. ARMY CORPS OF ENGINEERS' EFFORTS TO PROTECT ANADROMOUS FISH ON THE COLUMBIA AND SNAKE RIVERS 53-54 (1994). See also generally JIM LICHTOWICH, SALMON WITHOUT RIVERS: A HISTORY OF THE PACIFIC SALMON CRISIS (1999).

14. River and Harbor Act of 1945, Pub. L. No. 79-114, ch. 19, § 2, 59 Stat. 10, 22, *quoted in* THE NORTHWEST SALMON CRISIS: A DOCUMENTARY HISTORY 116 (Joseph Cone & Sandy Ridlington eds., 1996).

15. For discussion on removal of the four lower Snake dams, see the full-page ad of the Living Rivers Campaign, "Time line to Extinction: If we don't act, Snake River

dates are Ice Harbor (1961), Little Goose (1970), Lower Monumental (1969), and Lower Granite (1975).

Of course, it is impossible to say definitively how widely disseminated the win-win myth of dams *and* salmon was. It was most popular among the construction and power agencies¹⁶ that were promoters of the projects. It was quite serviceable among political supporters. The win-win certainty was not embraced by the fisheries agencies. Albert M. Day, Director of the U.S. Fish and Wildlife Service made the clearest objection to the "cumulative" losses that would attend construction of the four dams on the lower Snake:

If these [salmon] survivors are then confronted with a series of four dams in the Snake there is the strongest doubt that these added obstacles can be overcome. There is virtual assurance that only a fraction of existing runs could be gotten to the spawning grounds in the Snake River system, and that the progeny of this fraction would suffer further loss in its return movement to the sea. This situation raises the unavoidable question as to whether we should recommend the development in the Snake.¹⁷

Some would say "we chose dams *over* salmon" in the political decisions approving the lower Snake dams. Others would say "we chose dams *and* salmon in the decisions, but subsequent events proved us wrong." But with self-deception there are always two voices. The facts were that the dams would come at the price of salmon. But political decisionmakers preferred to believe that they could have dams *and* salmon.

To illustrate further the varying rates at which scientific "truth" can work its way into political collectives, I will use the concrete example of the following scientific proposition: *There is a fifteen percent loss of juvenile salmon in downstream passage at the Bonneville Dam.* This is a devastatingly depressing bit of scientific datum. A fifteen percent loss at each dam is a harbinger of extinction. With a number of refinements and qualifiers, the figure would be accepted as accurate in scientific circles today.¹⁸ How quickly would it have been embraced by Columbia River fishing constituencies? Almost certainly, the fishing Indians would have accepted this number, or rejected it as an understatement, in 1937 and

salmon will disappear forever," N.Y. TIMES, Oct. 20, 1999, at A23. For background, see generally KEITH C. PETERSEN & MARY E. REED, CONTROVERSY, CONFLICT, AND COMPROMISE: HISTORY OF THE LOWER SNAKE RIVER DEVELOPMENT (1994).

16. The U.S. Army Corps of Engineers and the Bonneville Power Administration.

17. Memorandum from Albert M. Day, Director, U.S. Fish & Wildlife Service to the Department of the Interior's Coordination Committee, Dec. 23, 1946 (Record Group No. 75, BIA, Box 1207, File Effects of the Upper Columbia and Snake River [Dams] on the Indian Fisheries, National Archives, Pacific Northwest Region).

18. The downstream mortality figure commonly mentioned today is seven percent per dam.

1938, based on their personal observations immediately after closure of the dam.¹⁹ This estimate would have become “truth” to the Columbia Basin Fisheries Development Association, the commercial fishing people, no later than 1945 with the noticeably dramatic declines in the commercial pack due to fall off in the returning adults.²⁰ This “truth” would have worked its way into acceptance within the U.S. Fish and Wildlife Service by 1950 when the first full salmon-cycle studies were completed to the satisfaction of scientists Barnaby and Holmes.²¹ This steady flow of “truth,” if we can continue the metaphor, eventually might have triumphed in the collective conscience of the Corps of Engineers by 1980 when the proposition was no longer deniable.²²

What can we do about these obstacles of institutional self-deception and pockets of cultural resistance to scientific findings? The only saviors nominated are the legal and scientific institutions or some combination of the two. Let us start with the law.

III. THE COURTS' PROBLEM: IGNORANCE

[C]ourts are confined to a “highly restricted form of knowing....”²³

The enduring challenge of the courts in contributing to better decisions on environmental restoration is that they must take their facts from somebody else. Courts must decide what knowledge is legitimate and they must adhere to processes for obtaining it. To evaluate the performance of the courts, I will start with the question posed by the organizers of this Symposium: “How well does the law integrate scientific findings into legal principles?” To elaborate further, I will

19. See generally INDIAN SERVICE, SURVEY OF INDIAN FISHERMEN (1937–38) (surveying Indian fishermen as the dam was closed at Bonneville circa Dec. 1, 1937) (Record Group No. 75, BIA, Box 125, File 115, Columbia River Fishing, 1938–50, National Archives, Pacific Northwest Region).

20. See Statement by James H. Cellars, Executive Secretary, Commercial Fishery Interests of the Columbia River, to the Northwest Governors Power Policy Meeting 5 app. B (Aug. 18, 1954) (stating that downstream losses may be “far higher” due to experimental limitations)) (Box 702, File #2, Pacific Northwest Governors’ Power Policy Committee—1954 and 1955, National Archives, Pacific Northwest Region).

21. See FREDERICK A. DAVIDSON, AQUATIC BIOLOGIST, THE EFFECT OF BONNEVILLE DAM ON THE SALMON POPULATIONS IN THE COLUMBIA RIVER 3 (circa 1953) (Record Group No. 75, BIA, Box 128, File 115, Fishing Reports, Effects of Bonneville Dam on Salmon in the Columbia River by F.A. Davidson, Aquatic Biologist, National Archives, Pacific Northwest Region).

22. The 1980 date is chosen arbitrarily as the year of enactment of the Pacific Northwest Electric Power Planning & Conservation Act of 1980, 16 U.S.C. §§ 839-839h (1994 & Supp. IV 1998). See MIGHETTO & EBEL, *supra* note 13, at 129–33.

23. SHEILA JASANOFF, SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA 9 (1995). See generally D.H. Kaye, *Proof in Law and Science*, 32 JURIMETRICS J. 313 (1992).

borrow from consensus descriptions of the role of courts in scientific disputes²⁴ to ask whether courts have delivered on expectations that they resolve disputes, serve the function of public education, pursue justice, and encourage vigorous and effective adversary processes.

To test these postulations, I have explored a case sample of thirty-nine decisions addressing fisheries conflicts on the Columbia River.²⁵ Have the courts met these high expectations that we have for them? Have they worked to overcome their ignorance? With rare exceptions, no. They have made ignorance a virtue and have disclaimed responsibility by deferring to the administrative agencies. Do these courts "integrate" scientific findings into law? Rarely. Their tolerance is so broad that if there is a hint of scientific "conflict" before the agencies,²⁶ the courts readily surrender their decisionmaking powers.

Do courts resolve disputes? No. They extend them. Do they fulfill the function of public education? They try. But how much educating can be done when these judicial explanations are nine parts arcane technicalities? Do these courts pursue justice? This goal figures so rarely in judicial decisionmaking that courts are more likely to disclaim it than embrace it.²⁷ Do they encourage vigorous and effective adversary processes? No. My survey of the cases convinces me that a cathartic and decisive trial on the merits is the exception not the rule.

On the Columbia, help for the salmon in the courts is thus thrice stunted. Litigators try to push balky agencies into marginal change by asking rigid formalists to pull procedural strings. All works by indirection. The fish can be helped only through the crude tool of an agency. It is like trying to paddle with a broom. The agency can be moved only with the fine threads of procedure. It is like trying to pull a barge with a rope. The procedures will issue only if the judge is so disposed. It is like trying to tempt a mule with a stone.

I have no solutions to this state of affairs. A generation of federal judges has been selected for their docility. Advancement and honors are reserved for those who show the greatest deference. Fortunately, there is a skeleton crew still

24. See generally STEVEN GOLDBERG, *CULTURE CLASH: LAW AND SCIENCE IN AMERICA* (1994); JASANOFF, *supra* note 23.

25. A ten-page summary of this case law appears in Law Seminars International, *Materials on The Mighty Columbia: A River in Transition*, Dec. 9-10, 1999, Seattle, Wa. (Continuing Legal Education materials prepared by William H. Rodgers, Jr.) (on file with the Author). See generally Michael C. Blumm & Greg D. Corbin, *Salmon and the Endangered Species Act: Lessons from the Columbia Basin*, 74 WASH. L. REV. 519 (1999).

26. See, e.g., WILLIAM H. RODGERS, *ENVIRONMENTAL LAW* § 9.3, at 851 (2d ed. 1994).

27. See *American Rivers v. National Marine Fisheries Serv.*, 109 F.3d 1484, 1492-93 (9th Cir. 1997), *amended by* 126 F.3d 1118 (9th Cir. 1997). The court applied mootness and the 60-day notice requirement to agencies that had been on notice for 20 years and said "we lack authority to consider the equities." *Id.* This language does not appear in the amended decision.

on the job.²⁸ Their work shows familiarity with the aggressive hard-look doctrine of judicial review that is at the foundation of modern environmental law. There are still some judges to be found who take seriously their duty to make science a part of their mandate. They have not forgotten that courts are supposed to resolve disputes, advance public understanding, and pursue justice.

IV. THE SCIENTISTS' PROBLEM: CONSTRAINT AND DIRECTION

*"[The turbines] are absolutely incapable of hurting the fish. If you could put a mule through there, and keep him from drowning he would go through without being hurt."*²⁹

This somewhat quaint example is offered to illustrate that the questions put to science are invariably constrained by legal and political choice. So far as I know, the mule experiment proposed by Colonel Robins for the Columbia was never conducted. Scientists used fish as the experimental animal rather than mules. The fish did not fare nearly as well as the mules in the mind of Colonel Robins. Though never answered by a decisive experiment, the issue of mule passage through the turbines somehow has lost its urgency.

The problem of being assigned the wrong question has haunted scientists who labor on the multiple fronts of environmental restoration. A number of years ago Alvin Weinberg invented the term "trans-scientific" to describe questions that could be asked of science but not answered.³⁰ In Weinberg's schema, "trans-scientific" questions were an oddity and a fluke. In today's world, "trans-scientific" questions are a common product of the political process. Pursuing unanswerable questions with a prolonged campaign of more study is a satisfactory outcome for many defenders of the status quo.³¹

Some lawyers are strongly interested in constraining scientific processes that show promise of asking the embarrassing questions. They much prefer inquiry into the safe questions. The entire apparatus of the National Research Council serves to provide independent advice to the federal agencies.³² But veteran observers know well that the choice of the chair and the shape of the questions and

28. For example, recent commendable decisions include *Oregon Natural Desert Ass'n v. Singleton*, 75 F. Supp. 2d 1139 (D. Or. 1999) (Redden, J.), *Pacific Coast Fed. of Fishermen's Ass'n v. National Marine Fisheries Serv.*, 71 F. Supp. 2d 1063 (W.D. Wash. 1999) (Rothstein, J.), *Oregon Natural Resources Council Action v. United States Forest Service*, 59 F. Supp. 2d 1085 (W.D. Wash. 1999) (Dwyer, J.).

29. MIGHETTO & EBEL, *supra* note 13, at 71 (quoting a 1941 statement by Thomas Robins, Assistant Chief of Engineers).

30. Alvin M. Weinberg, *Science and Trans-Science*, 10 MINERVA 209, 209 (1972).

31. See K. Norman Johnson, *Science-Based Assessments of the Forests of the Pacific Northwest*, in *CREATING A FORESTRY FOR THE 21ST CENTURY: THE SCIENCE OF ECOSYSTEM MANAGEMENT* 397 (Kathryn A. Kohm & Jerry F. Franklin eds., 1997).

32. See RODGERS, *supra* note 26, § 1.6, at 68-76.

the membership of the committee is open to debate and subterranean influence. There is something called a "good science" movement in many corners of environmental law, but its political agenda is anything but "good science."³³ On the Columbia, Senator Slade Gorton has championed the establishment of an Independent Science Review Panel ("ISRP") to review the various fish restoration projects. Critics claim the goal is not good science but superfluous review and obstructionism.³⁴

As we did with law, I will borrow from consensus descriptions of the scientific process³⁵ to evaluate the state of restoration science on the Columbia. Expectations of this science are progress orientation, falsifiable/testable conclusions, validation by normal processes, and conclusions subject to perpetual revision.

Does the science of the river meet these expectations? Erratically, at best. Progress on the most basic questions is grudging. After years of study, there is no consensus on flow-survival relationships for salmonids. There is no consensus on the efficacy of flow augmentation. There is no consensus on the use of artificially propagated fish to augment wild populations.³⁶

There is little incremental progress dictated by the use of falsifiable and testable conclusions. Fads change—for example, the use of hatcheries for production has fallen out of favor and woody debris is now left in streams rather than removed from them. But classical hypothesis testing is not easily done in the context of ecological modification. While "adaptive management" is part of the gospel of environmental restoration,³⁷ actual experimentation (where methodologies are put in competition) is only getting started.

Scientific approaches on the Columbia River are certainly subject to validation by many different processes—ordinary and extraordinary. But the

33. Holly D. Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1148 (1997); Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUM. L. REV. 1613, 1646 (1995).

34. See John M. Volkman, *How Do You Learn from a River? Managing Uncertainty in Species Conservation Policy*, 74 WASH. L. REV. 719, 749–56 (1999) (discussing the role of independent science).

35. See generally GOLDBERG, *supra* note 24; JASANOFF, *supra* note 23.

36. INDEPENDENT SCIENCE ADVISORY BOARD, LOOKING FOR COMMON GROUND: COMPARISON OF RECENT REPORTS PERTAINING TO SALMON RECOVERY IN THE COLUMBIA RIVER BASIN (Feb. 1, 1999) (ISAB 99-3) (ISAB Work-in-Progress Report).

37. See, e.g., KAI N. LEE, COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT 51–86 (1993); Kai N. Lee & Jody Lawrence, *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENVTL. L. 431, 441–60 (1986).

classical ideas of the gradual overthrow of paradigms are not telling and instructive.³⁸

Interestingly, the scientific establishment has responded to its problem of constraint the same way the legal establishment has responded to its problem of ignorance—by deference to other authorities. Obedience to political and legal instruction seems the best theory for explaining the quarter-century fixation on barging of juvenile salmon³⁹ as the scientific question of preeminence in the Columbia River salmon debates. The solution also, as with the courts' abandonment of deference, is some version of rediscovered skepticism. More people should remember that environmental law gave birth to the "hard look" doctrine that was the antithesis of deferential review.⁴⁰ The National Environmental Policy Act⁴¹ now gives all agencies explicit invitation to explore alternatives beyond those that are politically defined, contrived, and preferred.⁴² And the internet offers a new weapon of transparency in ongoing debates over the right questions to ask.⁴³ This sudden and dramatic overthrow of bureaucratic strategies of secrecy and control is a happening that should be celebrated. An open book has magically appeared. There is now on the scene a great outpouring of 'works in progress,' 'provisional' and 'preliminary' drafts, documents that we are not supposed to 'cite, quote, mention, or acknowledge.' This is institutional thinking in progress. These open agency deliberations still contain the double messages of self-deception. But contradictions are laid bare.

V. CONCLUSION

The myth of the win-win has done much to justify damage to nature, and it has put the despoilers in the enviable position of the holders of the status quo. The facility of the courts and the insights of science are indispensable allies to the recovery of these lost opportunities. Courts must overcome their informational limitations and scientists must resist their directional constraints. The strategies of the hard look and the open book can help achieve these welcome independencies.

38. See generally THOMAS KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (1962).

39. For a recent discussion about salmon barging on the Snake and Columbia Rivers, see Sam Howe Verhovek, *U.S. Giving Salmon a Lift, But Future of Aid is in Doubt*, N.Y. TIMES, May 6, 2000, at A1.

40. RODGERS, *supra* note 26, § 1.8, at 90–95.

41. National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321–4370d (1994 & Supp. III 1997).

42. See RODGERS, *supra* note 26, §§ 9.1–9.8, at 801–963.

43. Northwest Fisheries Science Center, *Cumulative Risk Initiative Home Page* (visited Dec. 10, 1999) <<http://www.nwfsc.noaa.gov/cri/>>.