

Space Environmentalism, Property Rights, and the Law

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I. INTRODUCTION

A considerable body of academic literature exists on the subject of space law, despite the fact that very few human beings have ever been to outer space, and substantial presence beyond the earth’s orbit still seems to be in the rather distant future.¹ Among

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1. Others have been more optimistic about the rate of growth in outer-

those proposing detailed, centralized regulatory regimes for a realm that so far has little, if any, need for them are anti-market² environmentalists who, not content to attend merely to the earth's pollution problems, are concerned about the possible future pollution of the moon and other celestial bodies such as Mars. This article considers the ideas of these individuals—whom we will call socialist space environmentalists³—and rejects them.

We find proposed environmental programs for outer space not only philosophically ill-founded, but also economically and pragmatically unjustified. In their place, we propose an alternative: a regime of pure private property and strict liability. Though our approach might be considered radical if proposed for the earth,⁴ we

space activities. See, e.g., Amanda L. Moore & Jerry V. Leaphart, *Manipulation and Modification of the Outer Space Environment: International Legal Considerations*, in PROCEEDINGS OF THE TWENTY-FIFTH COLLOQUIUM ON THE LAW OF OUTER SPACE 15, 17 (1982) (“Experts assure that lunar surface mining can be accomplished in the near term future defined as no later than 2000 A.D. and perhaps as soon as 1990.”).

2. We include this modifier on the ground that some environmentalists favor private property rights and free enterprise. In our view, “free market environmentalism” is not a contradiction in terms. See TERRY L. ANDERSON & DONALD R. LEAL, *FREE MARKET ENVIRONMENTALISM* (1991); Walter Block, *Environmentalism and Economic Freedom: The Case for Private Property Rights*, 17 J. BUS. ETHICS 1887 (1998); Walter Block, *Environmental Problems, Private Property Rights Solutions*, in *ECONOMICS AND THE ENVIRONMENT: A RECONCILIATION* 281 (Walter Block ed., 1990); Walter Block & Roy Whitehead, *The Unintended Consequences of Environmental Justice*, 100 FORENSIC SCI. INT'L 57 (1999); Thomas DiLorenzo, *Does Capitalism Cause Pollution?*, 38 WASHINGTON UNIVERSITY CENTER FOR THE STUDY OF AMERICAN BUSINESS CONTEMPORARY ISSUES SERIES (1990); Murray N. Rothbard, *Law, Property Rights, and Air Pollution*, 2 CATO J. 55 (1982); RICHARD L. STROUP ET AL., NAT'L CTR. FOR POL'Y ANALYSIS, *PROGRESSIVE ENVIRONMENTALISM: A PRO-HUMAN, PRO-SCIENCE, PRO-FREE ENTERPRISE AGENDA FOR CHANGE* (1991); Roy Whitehead & Walter Block, *Environmental Takings of Private Water Rights: The Case for Full Water Privatization*, 32 Env'tl. L. Rep. 11162 (2002); Roy Whitehead & Walter Block, *Environmental Justice Risks in the Petroleum Industry*, 24 WM. & MARY ENVTL. L. & POL'Y REV. 67 (2000).

3. In contrast, the present authors characterize themselves as free market private property space environmentalists.

4. Nonetheless, a substantially similar scheme *has* been proposed for the earth. See, e.g., Rothbard, *supra* note 2.

maintain that it is an entirely appropriate policy for outer space and celestial bodies.

A. Types of Environmentalism

Few, if any, human beings would self-identify as enemies of “the environment.” After all, everyone wants clean air to breathe and clean water to drink, and does not want anyone to invade his person or property with harmful substances without permission. People who go this far—and only this far—with their environmentalism probably comprise the majority of humanity. They can be said to be adherents of *anthropocentric* environmentalism.⁵ Anthropocentric environmentalists can be found across the political spectrum. For example, voices ranging from the right⁶ to the extreme Marxist left⁷ have called for unprecedented global government intervention to combat perceived environmental threats to human well-being. Others, however, have advocated *laissez-faire* capitalism as the appropriate means to protect the environment to maximize human well-being on Earth.⁸ For the anthropocentric environmentalist, non-human creatures and objects are valuable to the extent that humans value them—they have no “intrinsic” value apart from this.⁹

5. Alyson C. Flournoy, *In Search of an Environmental Ethic*, 28 COLUM. J. ENVTL. L. 63, 80 (2003).

6. See, e.g., RICHARD A. POSNER, *CATASTROPHE: RISK AND RESPONSE* (2004).

7. See, e.g., BARRY COMMONER, *MAKING PEACE WITH THE PLANET* (1990); PAUL EHRLICH, *THE POPULATION BOMB* (1968); PAUL EHRLICH & ANNE EHRLICH, *EXTINCTION: THE CAUSES AND CONSEQUENCES OF THE DISAPPEARANCE OF SPECIES* (1981); AL GORE, *EARTH IN THE BALANCE: ECOLOGY AND THE HUMAN SPIRIT* (1992).

8. See *supra* note 2; see also Louis De Alessi, *Private Property Rights as the Basis for Free Market Environmentalism*, in *WHO OWNS THE ENVIRONMENT?* (Peter J. Hill & Roger E. Meiners eds., 1998); Tibor R. Machan, *Pollution and Political Theory*, in *EARTHBOUND: NEW INTRODUCTORY ESSAYS IN ENVIRONMENTAL ETHICS* (Tom Regan ed., 1984).

9. For an economic critique of the notion of intrinsic value, see JAMES M. BUCHANAN, *COST AND CHOICE: AN INQUIRY IN ECONOMIC THEORY* (1969). See generally L.S.E. *ESSAYS ON COST* (James M. Buchanan & George F. Trilby, eds., New York Univ. Press 1981) (1973); William Barnett, II, *Subjective Cost*

In the second half of the twentieth century, another type of environmentalism came to the fore: *ecocentric* environmentalism. (Ecocentric environmentalism is also sometimes referred to as “deep ecology,” to contrast it with the “shallowness” of anthropocentric concern for the environment.)¹⁰ Originated by Aldo Leopold, who conceived the idea of the “land ethic,” ecocentric environmentalism holds that the environment itself is intrinsically valuable, and that human beings themselves have value only to the extent that they play a role in, and support, this environmental whole.¹¹ According to radical ecocentrism, only “ecological wholes (such as species, ecosystems, the land or the biotic community) . . . have a value in themselves . . . and . . . the value of the ecological parts . . . is determined by how far they contribute to the survival and well-being of the ecological whole.”¹² The ecocentric view is not limited to concern for animals or even plants, but extends to the entire Earth, dirt and rocks included.¹³ Everything on Earth, except for humans, is seen as possessing “intrinsic value”

Revisited, 3 REV. AUSTRIAN ECON. 137, 137–38 (1989); Roy E. Cordato, *Subjective Value, Time Passage, and the Economics of Harmful Effects*, 12 HAMLIN L. REV. 229 (1989); Thomas J. DiLorenzo, *The Subjectivist Roots of James Buchanan's Economics*, 4 REV. AUSTRIAN ECON. 180 (1990); Jacob Halbrooks, *Value and the Environment*, MISES.ORG, Mar. 27, 2002, <http://www.mises.org/story/922>.

10. See TAL SCRIVEN, *WRONGNESS, WISDOM, AND WILDERNESS: TOWARD A LIBERTARIAN THEORY OF ETHICS AND THE ENVIRONMENT* 147 (1997).

11. See Flournoy, *supra* note 5, at 81–82; John Grim, *Indigenous Traditions and Deep Ecology*, in *DEEP ECOLOGY AND WORLD RELIGIONS: NEW ESSAYS ON SACRED GROUND* 35, 40–41 (David Landis Barnhill ed., 2001).

12. MIKAEL STENMARK, *ENVIRONMENTAL ETHICS AND POLICY MAKING* 85 (2002); see also Holmes Rolston, III, *Ethics on the Home Planet*, in *AN INVITATION TO ENVIRONMENTAL PHILOSOPHY* 107, 133 (Anthony Weston ed., 1999) (“Earth does not belong to us; rather we belong to it Earth is really the relevant survival unit.”).

13. The land ethic “enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.” Gary D. Meryers, *Old-Growth Forests, the Owl, and Yew: Environmental Ethics Versus Traditional Dispute Resolution Under the Endangered Species Act and Other Public Lands and Resources Laws*, 18 B.C. ENVTL. AFF. L. REV. 623, 657 (quoting ALDO LEOPOLD, *A SAND COUNTY ALMANAC* 202–03 (1949)).

(i.e., value somehow derived from itself, not from man) that is destroyed or threatened by any human tampering at all.¹⁴

The real-world implications of this philosophy can be seen, for example, in the activities of the Earth First! organization, which is known for, among other things, putting spikes in trees so lumberjacks or mill workers who cut them may be injured or killed.¹⁵ Earth First! leader Richard Foreman states the ends of ecocentric environmentalism bluntly: “We advocate bio-diversity for bio-diversity’s sake. That says man is no more important than any other species It may well take our extinction to set things straight.”¹⁶

To be fair, not all ecocentric environmentalists go this far. Advocates of what could be called “strong” (but not “radical”) ecocentric environmentalism value both the environmental whole (independently of its value to humans) and human beings as individuals.¹⁷ “Weak” ecocentric environmentalists similarly value both, but ultimately are willing to put humans first.¹⁸

Ecocentric environmentalists typically speak in terms of the Earth, “bio-diversity,” and the “biosphere.”¹⁹ Indeed, radical environmentalists who subscribe to the “GAIA hypothesis” consider the Earth itself to be a “superorganism” and see the Earth goddess Gaia (or “Mother Earth”) as “an embodiment and distinctly a personification of the intrinsic value of the Earth.”²⁰

Considering this strong focus on the Earth, one might expect that we would be spared the down-with-humans-up-with-dirt-and-

14. See George Reisman, *Environmentalism in the Light of Mises and Menger*, 5 Q.J. AUSTRIAN ECON. 3, 11 (Summer 2002).

15. Block, *Environmentalism and Economic Freedom: The Case for Private Property Rights*, *supra* note 2, at 1896 n.5.

16. Robert James Bidinotto, *Environmentalism: Freedom’s Foe for the 90s*, THE FREEMAN, November 1990 (quoting M. John Fayhee, *Earth First! and Foremost*, BACKPACKER, September 1988, at 21).

17. STENMARK, *supra* note 12, at 85.

18. *Id.* at 89.

19. See, e.g., Mary Anne Warren, *The Rights of the Nonhuman World*, in ENVIRONMENTAL PHILOSOPHY: A COLLECTION OF READINGS 109 (Robert Elliot & Arran Gare eds., 1983) (stating that environmentalists show concern for the “planetary biosystem” and the “biotic community” as a whole).

20. ERAZIM KOHÁK, THE GREEN HALO: A BIRD’S-EYE VIEW OF ECOLOGICAL ETHICS 129 (2000).

rocks rhetoric with respect to man's activity beyond the earth. Many ecocentrists, however, appear ready to expand their area of concern to any place man might travel. Thus, as we are arguably poised to move significantly into outer space and other celestial bodies in the next few decades, we already have calls for "cosmo-centric" environmentalism²¹ or "astroenvironmentalism."²² Howard A. Baker writes approvingly, "With an environmental approach, protection of the outer space environment and its subsystems is the priority," not "ensuring that outer space can be used for [human] space activities."²³ "Outer space, a source of wonder and inspiration for centuries, deserves to be preserved *in its original pristine state, for its own sake* and for future generations to enjoy," writes Bernard K. Schafer.²⁴ Another writer states, "[W]e must ensure that our presence [in space] does not defile what remains one of the few accessible pristine areas."²⁵

21. Ulrike M. Bohlmann, *Planetary Protection in Public International Law*, in PROCEEDINGS OF THE FORTY-SIXTH COLLOQUIUM ON THE LAW OF OUTER SPACE 18, 27 (2003).

22. See Ryder W. Miller, *Astroenvironmentalism: The Case for Space Exploration as an Environmental Issue*, 15 ELECTRONIC GREEN J. (2001), available at <http://egj.lib.uidaho.edu/egj15/miller1.html>.

23. Howard A. Baker, *Protection of the Outer Space Environment: History and Analysis of Article IX of the Outer Space Treaty*, in 12 ANNALS OF AIR & SPACE L. 143, 166 (Nicolas Mateesco Matte, ed., 1987).

24. Bernard K. Schafer, *Solid, Hazardous, and Radioactive Wastes in Outer Space: Present Controls and Suggested Changes*, in LAW, VALUES, AND THE ENVIRONMENT: A READER AND SELECTIVE BIBLIOGRAPHY 395, 399 (Robert N. Wells, Jr. ed., 1996) (emphasis added). One wonders whether the "future generations" of which he speaks are intended to be human beings. If so, this represents an inconsistency in his world view, which, presumably, denigrates human beings of whatever generation, now *or* in the future. This author seems to think humans (now and in the future) can "enjoy" outer space—apparently by looking at it and knowing it is there—as long as they leave it in its pristine state. But, people cannot own views. If they did, there would be an over-determination of property rights: millions of people would own Disney World and the Grand Canyon, and it would no longer be clear as to who had rights to alter these amenities. See Walter Block, *Homesteading, Ad Coelum, Owning Views and Forestalling*, (unpublished).

25. April Greene Apking, Comment, *The Rush to Develop Space: The Role of Spacefaring Nations in Forging Environmental Standards for the Use of Celestial Bodies for Governmental and Private Interests*, 16 COLO. J. INT'L

Ryder W. Miller lists among space environmentalism's goals the declaration of "celestial bodies [as] pristine wildernesses that need to be protected rather than frontiers to conquer"; prohibition of "terraforming" of celestial bodies (e.g., attempting to transform Mars into an earthlike planet where humans could live); "safeguarding against the introduction of non-terrestrial life to and from celestial bodies"; and prohibiting all property ownership by both governments and private parties²⁶ in space.²⁷

Space environmentalists Paul F. Uhler and William P. Bishop, quoting Harry H. Almond, Jr., suggest five principles to guide space environmental policy: (1) "environmental balance" (with "substantial weight given to intrinsic environmental values"); (2) conservation of resources ("The natural resources of outer space must not be exploited in a wasteful or environmentally damaging way."); (3) "*Absolute liability for wrongful or negligent acts to the space wilderness and the duty to restore conditions to the status quo ante*";²⁸ (4) demilitarization; and (5) permission for "states" to

ENVTL. L. & POL'Y 429, 433 (2005).

26. Even NASA is calling for more private initiatives in space travel and exploration. See Lucy Sherriff, *Private Enterprise Needed in Space: NASA*, THE REGISTER, Nov. 17, 2005, available at http://www.theregister.co.uk/2005/11/17/nasa_private_investment/; see also George Knapp, *The Ultimate Public-Private Partnership*, LAS VEGAS MERCURY, July 8, 2004, available at <http://www.lasvegasm Mercury.com/2004/MERC-Jul-08-Thu-2004/24250261.html>. On the other hand, nothing in this paper should be interpreted as our support for any such initiative. In our view, the market should be left alone to determine just how much investment should go to this area. Certainly, no government subsidies would be justified. For a general critique of NASA as a socialist enterprise and support of private entrepreneurial decision making in this arena, see, for example, William L. Anderson, *The Trouble with NASA*, THE FREE MARKET, Apr. 2003, available at http://www.mises.org/freemarket_detail.asp?control=434. See also Robert Murphy, *A Free Market in Space*, THE FREE MARKET, Jan. 2005, available at http://www.mises.org/freemarket_detail.asp?control=525.

27. Miller, *supra* note 22.

28. This suggests a legal system in which rocks, dirt, and other inanimate objects somehow have standing to sue those who have disrupted them. Presumably environmentalists would bring these claims on the rocks' behalf, as they did for trees in *Sierra Club v. Morton*, 405 U.S. 727 (1972). On that case and some economic problems of standing to sue for "existence value," see Donald J. Boudreaux & Roger E. Meiners, *Existence Value and Other of Life's Ills*,

use and explore space, provided they abide by the first principle of “environmental balance.”²⁹ They also call for zoning laws for celestial bodies to restrict the uses to which land can be put.³⁰

Even relatively moderate, generally anthropocentric observers appear to have been influenced by the ecocentrists’ views and have called for preservation of pristine “wilderness” areas on celestial bodies. Glenn H. Reynolds and Robert P. Merges, for example, generally favor private property rights, but make an exception for “environmental research and conservation preserves,” which would place “10 to 15 percent of the area capable of being developed” off limits.³¹ They offer no argument to support this notion but instead state, “It should not be necessary at this point to defend such an idea.”³² Similarly, Lawrence D. Roberts calls for “[r]estrictions on development which gradually open the high frontier over time” on inhospitable bodies and a “precautionary principle” restricting development where life might have once existed, presently exists, or could potentially exist.³³ Others with no otherwise-apparent hatred for the human race make passing reference to the necessity of some degree of space environmentalism.³⁴

in WHO OWNS THE ENVIRONMENT? 153, 177–79 (Peter J. Hill & Roger E. Meiners eds., 1998).

29. Paul F. Uhlir & William P. Bishop, *Wilderness and Space*, in BEYOND SPACESHIP EARTH: ENVIRONMENTAL ETHICS AND THE SOLAR SYSTEM 183, 203–04 (Eugene C. Hargrove ed., 1986) (citing Harry H. Almond, Jr., *A Draft Convention for Protecting the Environment of Outer Space*, in PROCEEDINGS OF THE TWENTY-THIRD COLLOQUIUM ON THE LAW OF OUTER SPACE 101–02 (1980)) (emphasis added).

30. *Id.* at 205.

31. GLENN H. REYNOLDS & ROBERT P. MERGES, OUTER SPACE: PROBLEMS OF LAW AND POLICY 176 (1997).

32. *Id.*

33. Lawrence D. Roberts, *Ensuring the Best of All Possible Worlds: Environmental Regulation of the Solar System*, 6 N.Y.U. ENVTL. L.J. 126, 153, 158–59 (1997).

34. See, e.g., Steven Freeland, *Up, Up and . . . Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space*, 6 CHI. J. INT’L L. 1, 20 (2005) (declaring laws against “littering” by space tourists “imperative” to avoid “additional disruption to the space environment”); Kelly M. Zullo, Note, *The Need to Clarify the Status of Property Rights in International Space Law*, 90 GEO. L.J. 2413, 2442 (2002) (“Renewable licenses [for space ventures] should be granted liberally unless . . . the proposed activity would

We do not intend to attack the radical ecocentric environmentalists directly in this paper. The absurdity of “intrinsic” value or value independent of the existence of human beings has been well refuted elsewhere,³⁵ so we need not rehash those arguments here. Besides, we assume rather reasonably that the majority of our readers are anthropocentrists or at least moderate ecocentrists who do not favor the human race’s demise over and above any disturbance of the rocks of the solar system. And, of course, there is little use in trying to rationally persuade adherents of a religion, including nature worshipers, with rational arguments—they will believe what they will believe regardless of what we may write here. Further, their position amounts to a logical or internal contradiction. They wax eloquently about overpopulation.³⁶ Yet they all, each and every one of them, have the power to reduce the number of the earth’s inhabitants by precisely one. The fact that they are still here, complaining bitterly of too many people utilizing too few resources, shows that they do not take their own views seriously. If they do not, why should we? These people might likely argue (not totally unreasonably, given their premises) that they reduce the population more by sticking around and persuading others not to have children, etc. If this were true, however, then when they were no longer able to convince people of the merits of their position (say, due to old age or infirmity), they would commit suicide. They might well do so publicly, in order to better promote the overpopulationist movement. To the knowledge of the authors of the present paper, this has *never* been done. Actions speak louder than words.

Instead, we intend to argue to our fellow anthropocentrists and even moderate ecocentrists that one would have to be a *radical* ecocentrist to seriously embrace any sort of space environmentalism that goes beyond a regime of full private property rights and

cause an unacceptable degree of harm to the Earth or outer space environment. An unacceptable degree of harm may include ventures that would leave excessive debris, produce harmful radioactive waste, or some other demonstrable damage.”). For an alternative view on littering, see WALTER BLOCK, DEFENDING THE UNDEFENDABLE 210–16 (Fox & Wilkes 1991) (1976).

35. See *supra* note 9.

36. See EHRlich, *supra* note 7; EHRlich & EHRlich, *supra* note 7.

strict liability for harms to private property. There is simply no legitimate philosophical or pragmatic argument to the contrary. Nor, we will show, does international law demand anything more than this.

B. What is the Space Environment?

To speak of a “pristine” environment outside of the planet Earth is a rather strange thing to do, given how utterly unpleasant the rest of the solar system (and, as far as anyone knows, the universe) is. The planet Mercury, for example, has no atmosphere, and portions of its surface become hot enough to melt tin. Other parts, however, remain cold enough to keep ice from crashed comets perpetually frozen—and there is nothing remotely pleasant in between. Mercury is, in one writer’s words, “geologically dead. It has not changed significantly in several *billion* years.”³⁷

Venus is even worse—“a good substitute for Hell.”³⁸ Its atmosphere is a “choking shroud of almost pure carbon dioxide” (a gas much hated by environmentalists on Earth) complemented by “thick clouds of battery acid.”³⁹ Its atmospheric pressure is ninety-two times that which exists on the earth’s surface, so any visiting astronaut in a spacesuit would be “crushed instantly.”⁴⁰ And the mean surface temperature is 480 degrees Celsius—even hotter than Mercury, and hot enough “to melt tin, zinc, and lead.”⁴¹

Earth’s moon is relatively less hateful, but it has no atmosphere, of course, and “has never supported liquid water,” let alone life.⁴²

“Mars is not alive. It is dead, and looks as if it has been that way for a long time. No conclusive evidence for life there, either

37. MARK A. GARLICK, *THE STORY OF THE SOLAR SYSTEM* 52 (2002) (emphasis added).

38. *Id.* at 58.

39. *Id.*

40. *Id.* at 58, 60.

41. *Id.* at 60. It may seem strange that Venus is further from the sun than Mercury, and, yet, hotter. This is due to its thick atmosphere of carbon dioxide that creates a “greenhouse effect.”

42. *See id.* at 66.

now or in the past, has ever been found.”⁴³ Its atmosphere consists mostly of deadly carbon dioxide,⁴⁴ and its mean surface temperature is negative twenty-three degrees Celsius.⁴⁵

The planets farther out are even worse, so bad that it is difficult to imagine that they could be of any use at all to humans, except perhaps as something for tourists to fly past and admire. Jupiter, Saturn, Uranus, and Neptune are covered in extremely cold, giant, stormy mixes of toxic liquids and gasses.⁴⁶ Tiny Pluto apparently no longer counts as a planet,⁴⁷ and has a surface temperature of negative 230 degrees Celsius and an atmosphere of nitrogen (good) and methane (poison).⁴⁸ There is talk of a tenth planet, but we are not competent to pronounce on its status.⁴⁹ Some of these distant planets’ moons might be of some use to humans, but are nonetheless wholly inhospitable. For example, one of Jupiter’s moons, Europa, is covered in water ice, and may have liquid water and possibly some sort of microscopic life beneath its frozen surface. And Saturn’s moon Titan has, like Earth, a mostly nitrogen atmosphere—at negative 180 degrees.⁵⁰

Where there is no atmosphere, as on the moon, the environment is far from healthy. Spaceships and spacesuits must be well shielded to protect against the sun’s radiation. “A hypothetically unprotected astronaut would receive (in the absence of solar flares) about 10 rems of radiation per year. In comparison, the average person on the face of the earth receives only about .1 rems of radiation per year from background sources (e.g., from the earth and from space).”⁵¹ The presence of solar flares makes matters much

43. *Id.* at 72.

44. *Id.* at 74.

45. *Id.* at 72.

46. *See id.* at 86–106.

47. Dennis Overbye, *Vote Makes It Official: Pluto Isn’t What It Used to Be*, N.Y. TIMES, Aug. 25, 2006, at A13.

48. GARLICK, *supra* note 37, at 112.

49. *See* Kenneth Chang & Dennis Overbye, *Planet or Not, Pluto Now Has Far-Out Rival*, N.Y. TIMES, Jul. 30, 2005, at A1.

50. GARLICK, *supra* note 37, at 97.

51. Schafer, *supra* note 24, at 427 n.19 (citing MICHAEL FREEMAN, SPACE TRAVELLER’S HANDBOOK: EVERY MAN’S COMPREHENSIVE MANUAL TO SPACE FLIGHT 154 (1979)).

worse—their high-energy protons “can cause the release of lethal doses of secondary radiation, such as gamma rays, when they collide with spacecraft.”⁵²

All of that may sound bad, but in fact the space environment is only going to become worse, much worse, even if we humans never reach other celestial bodies. That is because, as the eons pass, our sun will eventually change to a “subgiant” star, then a Red Giant, then a nebula, then a White Dwarf, then a Black Dwarf. In the end, all of the planets, including Earth, will lose their atmospheres and exist at a temperature just a few degrees above absolute zero, the coldest temperature possible.⁵³

Thus, in sum, the space environment is so bad right now that, from anything other than a rock-and-dirt-worshiping perspective, it could not get much worse—except that billions of years from now, it will get worse, and there is nothing anyone can do about that.⁵⁴

II. PROPERTY RIGHTS AND PROBLEMS OF SPACE POLLUTION

A. *Is Space Pollution even Possible?*

Considering the solar system’s present and future environmental state, the idea of space pollution becomes absurd to anyone apart from those who believe that whatever is “natural” is best, including even the eventual frozen desolation of our solar system. The reality is that virtually nothing human beings could do to the solar system could likely make it less livable or less useful than it is now.

Air pollution? As we have seen, there is no air on the moon—and to the extent that our neighboring planets have an atmosphere

52. REYNOLDS & MERGES, *supra* note 31, at 13.

53. GARLICK, *supra* note 37, at 127–42. Lest we depress our readers too severely, we note that author Robert Ringer suggests using this “ice ball” scenario as an opportunity to recognize that one’s day-to-day problems are relatively insignificant. See ROBERT J. RINGER, WINNING THROUGH INTIMIDATION 40–43 (1974).

54. Another antidote to depression: if we do not blow each other up before that, it is at least possible that long before this time man will have learned the techniques necessary to bring us to not only other planets, but other solar systems, more welcoming ones.

at all, it is almost entirely carbon dioxide, which is toxic and the bane of environmentalists here on Earth when it is produced by our automobiles.⁵⁵ Thus, nothing we could do to other celestial bodies could make the “air” more toxic than it already is. Water pollution? There is no surface liquid water, anywhere but Earth. Radiological pollution? As we have seen, there already is dangerous radiation in space against which humans must shield themselves. The Mars atmosphere may limit the amount of radiation on its surface—but if one cannot live there anyway without special protection (given the poison-gas environment), just how much worse would some radiation here and there make the planet? Also, Martian soil is believed to be highly toxic, to the extent that it could even threaten completion of any manned mission there.⁵⁶ Any human vehicles or structures there would have to be specially protected by something like “mega-Rust-Oleum” to avoid destruction from this planet’s violent sandstorms.⁵⁷

Thus, to speak of pollution or contamination of space in the abstract—apart from human beings’ property rights—makes no sense.

B. Air and Water Pollution in Space

Lawrence D. Roberts suggests that “[u]biquitous commons resources on Earth such as air and water will likely pose the same kinds of environmental challenges for space developers as they do for Earth developers,” adding, “The need to recycle such valuable commodities will require stringent regulation of the discharge of hazardous byproducts into the waste stream.”⁵⁸ We find this implausible. To the extent that there would be any air or water on the moon or elsewhere in space, how would it get there? It could only

55. On the enmity between environmentalists and carbon dioxide on Earth, see, for example, GORE, *supra* note 7, at 22.

56. NAT’L RESEARCH COUNCIL, SAFE ON MARS: PRECURSOR MEASUREMENTS NECESSARY TO SUPPORT HUMAN OPERATIONS ON THE MARTIAN SURFACE 28 (2002), available at <http://newton.nap.edu/books/0309084261/html/28.html>.

57. Benjamin Wallace-Wells, *Mars or Bust*, ROLLING STONE, Feb. 23, 2006, at 45, 50.

58. Roberts, *supra* note 33, at 154.

be from humans who brought or created it there. Where would it be found? Inside the space vehicles or other structures individuals brought to or built on the lunar (or Martian) surface. And here we get to the key of space environmental policy: to protect humans' environment in space, we need only protect their private property rights in whatever settlement they establish there.⁵⁹

On Earth, such a policy, though philosophically sound, has historically presented some technical difficulties. For example, on our planet it may be difficult to determine which factories contributed to victims' air or water pollution and in what amounts, as contaminants may travel imperceptibly over long distances.⁶⁰ Pollution victims may also suffer very small harms individually such that a lawsuit would cost them more than it was worth.⁶¹ Those problems are far from insurmountable in the earthbound context⁶²—indeed, technological advances and the availability of class-action lawsuits should make them decreasingly problematic—but they do exist.

In space, however, apart perhaps from radiological poisoning, some sort of unmistakable physical invasion would be necessary for anyone to pollute anyone else's air or water. Thus, enforcement of a strict-liability regime for pollution should be simple and effective.

59. In fairness to Roberts, he recognizes this point at least to a limited extent. *See id.* at 149 (“With regard to the inhospitable resources of the solar system, any environmental regime should begin with the management of property rights.”); *id.* at 151 (“Enforcement, in most cases, is a matter of individual property owners upholding their personal interests.”).

60. *See* Rothbard, *supra* note 2, at 88.

61. RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* § 13.5 (5th ed. 1998).

62. For example, if courts had continued to allow individuals to bring lawsuits for air pollution from the nineteenth century through the present, an environmental forensics industry would almost certainly be capable of determining sources of harm from air pollution. *See* MORTON HORWITZ, *THE TRANSFORMATION OF AMERICAN LAW: 1780–1860* (1977); Walter Block, *Private Property Rights, Economic Freedom, and Professor Coase: A Critique of Friedman, McCloskey, Medema, and Zorn*, 26 *HARV. J.L. & PUB. POL’Y* 923, 929–30 (2003).

C. *Other Pollution on the Moon and Celestial Bodies*

Roberts also sees a need for environmental regulation on the moon to prevent pollution from lunar dust.⁶³ The extent to which this would be a problem requiring regulation is, however, unclear, given the moon's lack of an atmosphere. Further, given the moon's size and its likely sparse population even once humans begin exploiting it, it seems those using the moon for mining and those using it for recreational purposes or for a good view of the Earth would rationally spread themselves apart. With relatively few parties and a strong incentive to spread out, we can imagine that parties might bargain in advance to avoid conflicts, or later to eliminate them.⁶⁴

Of course, to the extent that polluters (whether by dust, chemicals, radiation, or anything else) arrive at the moon first, they may establish property rights there *including the right to "pollute."* Where no one has already homesteaded lunar or planetary land, a mine or factory owner may homestead an easement to emit dust and other potential pollutants over the surrounding area that his operation affects.⁶⁵ Then, new arrivals will know that they should not locate in the area the established industrial operation affects unless they are willing to subject themselves to the industry's by-products. Not only is this philosophically sound from a property-rights perspective,⁶⁶ it also should present little burden in practice because of the moon's likely sparseness for a very long time.

On the other hand, where the owners of hotels, golf courses, "wilderness" preserves, and the like arrive first, they will homestead their land, including the right not to be disturbed by pollution. Should someone trespass upon their property with any form of pollution, they will be entitled to both damages and injunctive

63. Roberts, *supra* note 33, at 154.

64. A relatively low number of parties make bargaining more likely (though perhaps not certain if transaction costs are high). See POSNER, *supra* note 61, at § 3.8; Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

65. See Rothbard, *supra* note 2, at 77.

66. Such an act would be characterized as "coming to the nuisance."

relief, just as pollution victims were in Great Britain and the United States through the 1830s.⁶⁷

D. Space: The Ultimate Waste Dump

One of the most promising uses for space is, of course, as a waste dump. This should be cause for environmentalist celebration, not alarm.

For example, rational observers recognize that nuclear electric power is far better for the environment than fossil fuels, which pollute the air and cause countless health problems for those of us who breathe in the pollution.⁶⁸ An important problem, of course, comes in the form of the radioactive waste produced, which, though small in quantity, remains hazardous for a very long time.⁶⁹ Once space flight becomes sufficiently affordable, the answer of what to do with this waste becomes simple: send it on a long, long trip.⁷⁰ Who but the most fanatical “cosmo-centrist” could be disturbed by sending all of our toxic waste to, for example, Venus, an already hellish place where no human being or other living creature will likely ever go? Even if we were to take the nuclear waste to someplace humans might want to go, such as the moon or Mars, the physical quantities of such waste are small enough that it would require only minimal space.⁷¹ The only colorable objection

67. See Block, *Environmentalism and Economic Freedom: The Case for Private Property Rights*, *supra* note 2, at 1890; see also HORWITZ, *supra* note 62.

68. See, e.g., PETR BECKMANN, *THE HEALTH HAZARDS OF NOT GOING NUCLEAR* 122 (1977) (“Every 1,000 MW of nuclear power that replaces coal-fired power saves between 20 and 100 lives a year.”).

69. See *id.* at 102 (noting also that while it is correct to say that nuclear waste remains hazardous for thousands of years, the problem is not as threatening as it might seem, nor as threatening to human health in the short or long term as the burning of fossil fuels).

70. See Ty S. Twibell, Note, *Space Law: Legal Restraints on Commercialization and Development of Outer Space*, 65 *UMKC L. REV.* 589, 631 (1997).

71. See BECKMANN, *supra* note 68, at 99–111 (“If all of the US power capacity were nuclear, the total amount of wastes per person per year would amount to one aspirin tablet If the entire US electrical capacity were nuclear and ran at the present [1977] rate for 350 years, the volume of wastes

to this is that the waste might pose a risk to people on Earth as it leaves the atmosphere (e.g., if the ship carrying it explodes or crashes, as NASA vehicles are wont to do⁷²). But presumably that risk would ever decrease as the private sector moves further into the space transportation field and space technology advances. For example, a space elevator would not entail the high risks or costs of ordinary space flight.⁷³ And, of course, carriers of hazardous waste would be strictly liable for any harm—which, along with their financial investment, would encourage them to take extreme care.

Another potential benefit would be to move polluting industrial operations off-planet.⁷⁴ Again, environmentalists who really care about well-being of humans or life generally (as opposed to rocks and dirt per se) should delight in this prospect.

E. “Wilderness” Preserves

As noted above, Reynolds and Merges call for ten to fifteen percent of the moon (and presumably any other celestial body at which humans may someday arrive) as a “preserve.”⁷⁵ They make no argument to support this view, however, and even explicitly state that they believe no such argument is necessary.⁷⁶ The radical environmentalists go further, of course, and want earthly govern-

would amount to a cube 200 feet on a side.”).

72. For example, NASA lost two space shuttles and 14 astronauts in just 114 flights. Tariq Malik, *NASA’s New Moon Plans: “Apollo on Steroids,”* SPACE.COM, Sept. 19, 2005, http://www.space.com/news/050919_nasa_moon.html. In 1999 alone, it also lost two Mars spacecrafts and a \$246 million infrared telescope that failed shortly after launching. *Nasa’s Disastrous Year*, BBC NEWS, Mar. 22, 2000, <http://news.bbc.co.uk/1/hi/sci/tech/686674.stm>.

73. See Kenneth Chang, *Not Science Fiction: An Elevator to Space*, N.Y. TIMES, Sept. 23, 2003, at F1.

74. See Roberts, *supra* note 33, at 148.

75. REYNOLDS & MERGES, *supra* note 31, at 176. See also Robert P. Merges & Glenn H. Reynolds, *Space Resources, Common Property, and the Collective Action Problem*, 6 N.Y.U. ENVTL. L.J. 107, 124–25 (1997). Incidentally, Reynolds and Merges also call for “development preserves”—territory set aside to give to poor non-spacefaring nations later. REYNOLDS & MERGES, *supra* note 31, at 176.

76. REYNOLDS & MERGES, *supra* note 31, at 176.

ments to declare all of outer space an untouchable “wilderness.”⁷⁷ We find the alleged need for official wilderness preserves less obvious.

Indeed, this seems rather a strange preoccupation. As we have noted already, there seems to be plenty of room up there for everyone and every purpose imaginable. Right now space is *de facto* 100% wilderness preserve, and it is difficult to imagine humanity making a significant dent in that number anytime soon. After all, even vast amounts of the relatively hospitable continents of North America and Australia have minimal population density, even excluding national parks and other areas governments have so far placed off-limits. Environmentalists have also purchased land for the purpose of keeping it vacant and preserved on Earth;⁷⁸ there is no reason they could not do so in space—or rather than purchase simply homestead because it is there for the taking.

Governments have little incentive or ability to determine which parts of any celestial body are best used as wilderness preserves or which are best put to other purposes.⁷⁹ One can imagine that such determinations may be corrupted by the inevitable influence of special interests, just as special interests have influenced terrestrial environmental laws to the benefit of polluters.⁸⁰ Indeed, the United States government’s management of its national parks has been dismal, as have the environmental records of governments, especially socialist governments, generally.⁸¹ Thus, if optimal preservation of that which is valuable to scientists and other

77. See, e.g., Miller, *supra* note 22; Schafer, *supra* note 24.

78. These groups include, for example, the Nature Conservancy and the Audubon Society. See John Brätland, *Externalities, Conflict, and Offshore Lands*, 8 INDEP. R. 527, 540 (2004).

79. See *id.*

80. On the ability of polluters to “capture” centralized agencies ostensibly intended to regulate them, see, for example, Andrew P. Morriss, Bruce Yandle & Roger E. Meiners, *The Failure of EPA’s Water Quality Reforms: From Environment-Enhancing Competition to Uniformity and Polluter Profits*, 20 UCLA J. ENVTL. L. & POL’Y 25, 26 (2001–2002).

81. See, e.g., Block, *Environmentalism and Economic Freedom: The Case for Private Property Rights*, *supra* note 2, at 1889; Fred L. Smith, Jr., *Sustainable Development—A Free-Market Perspective*, 21 B.C. ENVTL. AFF. L. REV. 297, 305–06 (1994).

admirers of pristine lunar wilderness is the goal, the answer again is strictly enforced private property rights.

It is entirely unjust for “wilderness” advocates to use government to prevent others from developing their property in space. As Glenn Reynolds has noted, theirs is essentially an “aesthetic view masquerading as a religious one.”⁸² They may speak in terms of intrinsic value, but they really seek to use the law to forcibly place their personal aesthetic preferences—their own human desires—above those of others, and above the welfare of the human race. By and large they have been allowed to do this on earth, albeit only partially. Unfortunately, there is no reason why space should be any different. As we have seen, however, in space there is even less cause to cater to their desires. Perhaps, then, they will not succeed as well in the heavens as they have on earth.

F. Terraforming

“Terraforming” would involve transforming an alien environment (Mars being the obvious candidate) to a climate more like Earth’s.⁸³ Fantastic though it sounds, this is likely to be technologically feasible on the fourth planet.⁸⁴ Essentially, it would involve initiating “global warming” through the release of CF₄ into the now very sparse Martian atmosphere, raising the temperature by ten degrees Celsius within several decades, which would cause an increase of water vapor in the atmosphere, further warming the planet.⁸⁵ With that accomplished, humans could release “methanogenic and ammonia-creating bacteria into the now-livable environment,”⁸⁶ creating even more greenhouse gases. “The net result of such a program could be the creation of a Mars with acceptable atmospheric pressure and temperature, and liquid water

82. Glenn Harlan Reynolds, *Space Law in the 21st Century: Some Thoughts in Response to the Bush Administration’s Space Initiative*, 69 J. AIR L. & COM. 413, 422 (2004).

83. *Id.* at 419.

84. *Id.* at 420 (citing MARTYN J. FOGG, *TERRAFORMING: ENGINEERING PLANETARY ENVIRONMENTS* (1995)).

85. *Id.*

86. *Id.* (quoting ROBERT ZUBRIN, *ENTERING SPACE: CREATING A SPACEFARING CIVILIZATION* 37 (1999)).

on its surface within fifty years of the start of the program.”⁸⁷ Mars would not then have a breathable atmosphere, “but would support crops and allow people to move around without space-suits.”⁸⁸

Of course, those who want to preserve the outer space environment in its “pristine” form can be expected to oppose this.⁸⁹ Some already have.⁹⁰ From an anthropocentric environmentalist perspective, however, we find no problem with terraforming.

If no one owned property on Mars before terraforming apart from the terraformers, property rights certainly would not be an issue—the terraformers would have a right to do as they please with presumably large parts of the planet.

That is, terraformers could make whatever use they see fit or as much of Mars as they could homestead before other homesteaders arrived, apart from the land already taken over to use as a base for their operations. Strictly speaking, they could not claim even one square inch of the rest of the surface, as, by assumption, they would not have directly “mixed their labor with”⁹¹ any of it. In the scenario we are positing, their actions were limited to setting off

87. *Id.* (quoting ROBERT ZUBRIN, *ENTERING SPACE: CREATING A SPACEFARING CIVILIZATION* 37 (1999)).

88. *Id.*

89. A battle between “reds” who want to preserve a pristine Mars and “blues” who want to terraform occurs in an acclaimed series of science-fiction novels. See KIM STANLEY ROBINSON, *RED MARS* (1992); KIM STANLEY ROBINSON, *BLUE MARS* (1993); KIM STANLEY ROBINSON, *GREEN MARS* (1996).

90. See Reynolds, *supra* note 82, at 421 (“The character of these objections is likely to reveal much about the environmental movement, or at least about those making them.”); see also, e.g., Ryder W. Miller, *The Case Against Terraforming Mars*, *SPACE POL’Y DIG.*, May 22, 2003, available at <http://www.gyre.org/news/article/3273>.

91. See John Locke, *An Essay Concerning the True Origin, Extent and End of Civil Government*, in *SOCIAL CONTRACT* 17–18 (E. Barker ed., 1948); see also HANS-HERMANN HOPPE, *THE ECONOMICS AND ETHICS OF PRIVATE PROPERTY: STUDIES IN POLITICAL ECONOMY AND PHILOSOPHY* (1993); MURRAY N. ROTHBARD, *THE ETHICS OF LIBERTY* 32 (New York University Press 1998) (1982); MURRAY N. ROTHBARD, *FOR A NEW LIBERTY* 34–35 (Ludwig von Mises Institute 2002) (1973); Walter Block, *Earning Happiness Through Homesteading Unowned Land: A Comment on “Buying Misery with Federal Land”* by Richard Stroup, 15 *J. SOC. POL. & ECON. STUD.* 237 (1990).

gases. Of course, they would have a tremendous advantage in terms of homesteading over any other later arrivals.⁹²

If other property owners did exist, they would, of course, likely welcome the change because it would make their own property more useful to them. (In economic terms, they would enjoy *positive* externalities of the terraformers' activity. Instead of "coming to the nuisance," they would be coming to its very opposite.) But some Mars property owners—especially scientists trying to research the planet's history—might not welcome the radical changes to the planet. Still, the right to be protected against weather one finds undesirable has never been recognized, to our knowledge.⁹³

On the other hand, the very notion of externalities, whether positive or negative, is highly problematic. This concept is very subjective:⁹⁴ "one man's meat is another man's poison." A home painted with psychedelic colors will be off putting to most people, but attractive to some. To take a case from our present concern, the search for extraterrestrial intelligence ("SETI") is seen by many as a progressive step;⁹⁵ an attempt to uncover other species in the galaxy with whom we humans can interact. An entirely different interpretation of this initiative, however, could be that it is very dangerous, in that it might only call attention to ourselves with regard to a superior but evil species, who will either enslave or eat us.

Of course, non-property-owning environmental activists on Earth—those most likely to challenge terraforming—would have no standing to challenge this process of development. Again, their aesthetic tastes should not be given priority over those with an actual stake in the matter (i.e., property owners) and over the good of the human race generally.

92. For an analogous case regarding intellectual property, see N. Stephan Kinsella, *Against Intellectual Property*, 15 J. LIBERTARIAN STUD. 1 (2001) (explaining that the first creator of an idea has an advantage in reaping the economic benefits from the idea even if he cannot own it).

93. For a rejection of the notion of a right to weather of a particular type in the context of global warming on Earth, see Reisman, *supra* note 14, at 14.

94. See *supra* note 9.

95. See Dennis Overbye, *When It's Not Enough to Say 'Take Me to Your Leader,'* N.Y. TIMES, Mar. 5, 2002, at F1.

G. What if There's Life?

Some observers, such as Roberts, believe that bodies “with the potential for harboring biotic or prebiotic activity” present a special case for which different rules must apply. Roberts states that where life exists or even potentially exists, we must apply the “precautionary principle,” which would place the burden of proof on those engaged in a “challenged activity” and prohibit development that threatens evidence of past life or the existence of present or “potential” life.⁹⁶ We disagree.

First, we note that there is no evidence that life exists or has ever existed anywhere in the solar system except Earth.⁹⁷ Further, there is a strong consensus that to the extent that life might exist or have ever existed elsewhere, such as on Mars or Europa, it is limited to extremely simple microscopic organisms.⁹⁸ The likelihood of sentient or even plant life existing elsewhere in the solar system appears to be zero, and the question of life on planets outside the solar system is very hypothetical, even for an article on space law.⁹⁹ Therefore, a presumption against the existence of *actual* life where no evidence to the contrary exists seems proper.

Further, space environmentalists have failed to make the case that environmental regulations are necessary to protect whatever extraterrestrial life (or evidence thereof) may exist. Humans are fascinated by the prospect of the existence of any kind of extraterrestrial life. Anyone who bothers to go to space for any purpose is likely to be interested in checking for signs of past or present life on his property (or prospective property) before acting in a way that might destroy it. For the intellectually uncurious, there would still be financial incentives. For example, scientific or environmental organizations could offer prize money for discovery of evi-

96. Roberts, *supra* note 33, at 157–60. For more on the precautionary principle, see Steven A. Mirmina & David J. Den Herder, *Nuclear Power Sources and Future Space Exploration*, 6 CHI. J. INT'L L. 149, 164 (2005).

97. See BRUCE JAKOSKY, *THE SEARCH FOR LIFE ON OTHER PLANETS* 2 (1998).

98. *Id.* at 4.

99. The most earthlike planet known is 21,000 light-years away and has a surface temperature of negative 370 degrees Fahrenheit. Dennis Overbye, *Search Finds Far-Off Planet Akin to Earth*, N.Y. TIMES, Jan. 26, 2006, at A21.

dence of extraterrestrial life; a property owner who discovers evidence of life could sell scientists, journalists, and others rights to access, study, and publicize information about the discovery. Only governmental intervention (e.g., stripping individuals of property rights when something of scientific interest is found on their property) is likely to cause incentives to run in any other direction.¹⁰⁰

Suppose there were the proverbial “little green creatures” discovered on Mars or on any other planet humans colonized. What rights would they have? What obligations would we have to respect these rights? If they were smarter/stronger than we, the shoe of course would be on the other foot. There are several options. If they had the intelligence/ability of dogs or cats, then we would treat them as we now do those animals. But suppose they were an intermediate between us and the smartest of earth animals (chimps, porpoises), or had human qualities but looked like a cross between an octopus and a giraffe. According to Rothbard,¹⁰¹ if they could communicate with us, promise to respect our personal and property rights, and adhere to such undertakings, then and only then would we be obligated to treat them as we do each other (well, better, hopefully).

III. INTERNATIONAL LAW AND THE SPACE ENVIRONMENT

Despite a relatively large amount of academic writing *about* space law, relatively little space law actually exists for the obvious reason that there has so far been minimal need for it. Still, several international agreements comprise that space law which does exist—and space environmentalists may attempt to use it as a weapon against development. We argue, however, that the international agreements to which the United States is a party do not demand a

100. This has happened on Earth. For example, the Endangered Species Act encourages people to kill and hide any endangered species on their property (in the vernacular, “shoot, shovel, and shut up”) so they do not lose their property rights. See Andrew P. Morriss & Richard Stroup, *Quartering Species: The ‘Living Constitution,’ the Third Amendment, and the Endangered Species Act*, 30 ENVTL. L. 769, 795 (2000).

101. ROTHBARD, FOR A NEW LIBERTY, *supra* note 91, at 156; see also TIBOR MACHAN, *PUTTING HUMANS FIRST: WHY WE ARE NATURE’S FAVORITE* (2004).

restrictive environmental regime for outer space and celestial bodies.

A. The Test Ban Treaty

The Limited Test Ban Treaty of 1963 (“Test Ban Treaty”), signed by the United States, the Soviet Union, and Great Britain, forbids any “nuclear explosion . . . in the atmosphere; beyond its limits, including outer space; or underwater, including territorial waters or high seas,” as well as in “any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted.”¹⁰² Reynolds and Merges describe the treaty as primarily environmental in intent, seeking to prevent “global nuclear contamination,” though it had military effects.¹⁰³

We see nothing objectionable in this treaty’s ban on the use of nuclear weapons.¹⁰⁴ If states or anyone else want to bind themselves not to conduct certain activities, that seems appropriate. Certainly an inability to detonate nuclear weapons in space will not hamper development there and should even encourage it to the extent that it reduces the threat of nuclear annihilation those of us on earth face and eliminates the threat of an electromagnetic pulse that could affect electronic equipment¹⁰⁵ and thereby violate property rights.¹⁰⁶

102. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, U.S.-U.K.-U.S.S.R., art. I, Aug. 5, 1963, 14 U.S.T. 1313 [hereinafter Test Ban Treaty].

103. REYNOLDS & MERGES, *supra* note 31, at 54.

104. For a libertarian analysis of weapons in space and on the heavenly bodies in a different than earthly context, see Walter Block & Matthew Block, *Toward a Universal Libertarian Theory of Gun (Weapon) Control*, 3 ETHICS, PLACE & ENV’T 289 (2000).

105. See REYNOLDS & MERGES, *supra* note 31, at 59.

106. Former U.S. Secretary of State Dean Rusk noted, “I can think of no other way to more massively increase the pollution of outer space than to allow the arms race to move out there.” Dean Rusk, *Star Wars: The Nuclear/Military Uses of Space*, in BEYOND SPACESHIP EARTH: ENVIRONMENTAL ETHICS AND THE SOLAR SYSTEM 315, 318 (Eugene C. Hargrove ed., 1986).

The Test Ban Treaty also implicitly prohibits nuclear fission as a means of space propulsion.¹⁰⁷ Again, to the extent that states wish to bind themselves not to do certain things in space, that seems appropriate, just as any private party can agree to refrain from particular actions. The terms of the Test Ban Treaty require the signatories to “prohibit” nuclear explosions “at any place under [their] jurisdiction or control”;¹⁰⁸ this would not seem to bind private parties beyond the confines of the Earth. Reynolds and Merges also suggest that if non-signatory nations allow nuclear propulsion, the signatories are likely to follow suit in the interest of competition.¹⁰⁹ To the extent that repudiation of this aspect of the Test Ban Treaty would encourage private parties to use nuclear propulsion, and thereby facilitate space activities, we see it as a laudable step.

B. The Outer Space Treaty

The Multilateral Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (“Outer Space Treaty”)¹¹⁰ is the foremost document in international space law.¹¹¹ The United States and other spacefaring countries have signed it. Primarily, the Outer Space Treaty limits the activities of governments in space. Most significantly, it prohibits them from claiming sovereignty over outer space “including the moon and other celestial bodies,”¹¹² prohibits “nuclear weapons or any other kinds of weapons of mass destruction” in space,¹¹³ and allows the moon and

107. REYNOLDS & MERGES, *supra* note 31, at 61.

108. Test Ban Treaty, *supra* note 102, art. I.

109. REYNOLDS & MERGES, *supra* note 31, at 61.

110. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, U.S.-U.K.-U.S.S.R., Jan. 27, 1967, 18 U.S.T. 2410 [hereinafter Outer Space Treaty].

111. See Steven A. Mirmina & David J. Den Herder, *Nuclear Power Sources and Future Space Exploration*, 6 CHI. J. INT’L L. 149, 158 (2005) (calling the Outer Space Treaty “the cornerstone of international space law”); REYNOLDS & MERGES, *supra* note 31, at 62.

112. Outer Space Treaty, *supra* note 110, art. II.

113. *Id.* art. IV.

other celestial bodies to be used “exclusively for peaceful purposes.”¹¹⁴ As with the Test Ban Treaty, we find nothing objectionable here. Governments have been responsible for massive pollution, millions of human deaths,¹¹⁵ and countless invasions of property rights on Earth; to the extent that they agree to keep their hands off and weapons out of space, that appears favorable from both environmental and property-rights perspectives.¹¹⁶

Some argue that Article IX of the Outer Space Treaty calls for environmental restrictions.¹¹⁷ It provides, *inter alia*, that exploration of celestial bodies must be conducted “so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter.”¹¹⁸

114. *Id.*

115. See R.J. RUMMEL, *DEATH BY GOVERNMENT* (1994).

116. Some have argued that the Outer Space Treaty effectively abolishes both government and private property in space. Reynolds, however, argues that a consensus exists to the contrary—that is, that property rights are allowed. Glenn H. Reynolds, *International Space Law: Into the Twenty-first Century*, 25 *VAND. J. TRANSNAT'L L.* 225, 230 (1992). But the idea that the Outer Space Treaty proscribes private property persists among some commentators, and the status of private property rights in space therefore remains uncertain. See, e.g., Heidi Keefe, Essay, *Making the Final Frontier Feasible: A Critical Look at the Current Body of Outer Space Law*, 11 *SANTA CLARA COMPUTER & HIGH TECH. L.J.* 345, 350–60 (1995); Leo B. Malagar & Marlo Apalisok Magdoza-Malagar, *International Law of Outer Space and the Protection of Intellectual Property Rights*, 17 *B.U. INT'L L.J.* 311, 345 (1999); Uhlir & Bishop, *supra* note 29, at 196 (noting that this prohibition will preserve space “wilderness”). This debate is beyond the scope of this article, but we note that a considerable consensus does exist that even if the Outer Space Treaty does not allow for private property rights, it *should* allow for them so entrepreneurs will have an incentive to go there. See, e.g., Kurt Anderson Baca, *Property Rights in Outer Space*, 58 *J. AIR L. & COM.* 1041, 1083–85 (1993); Julie A. Jiru, Comment, *Star Wars and Space Malls: When the Paint Chips Off a Treaty's Golden Handcuffs*, 42 *S. TEX. L. REV.* 155, 169–73 (2000); Twibell, *supra* note 70, at 613–19; Keefe, *supra*, at 350–60; Wayne N. White, Jr., *Real Property Rights in Outer Space*, in *PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE* 370 (1998); Zullo, *supra* note 34, at 2438–44.

117. See, e.g., Molly K. Macauley, *Flying in the Face of Uncertainty: Human Risk in Space Activities*, 6 *CHI. J. INT'L L.* 131, 144 (2005); Uhlir & Bishop, *supra* note 29, at 196–97.

118. Outer Space Treaty, *supra* note 110, art. IX.

Baker concedes that this rule is essentially anthropocentric—that is, “harmful contamination” simply means contamination that hurts other humans.¹¹⁹ Nothing in Baker’s idea necessarily conflicts with the private-property, strict-liability regime we propose; to the contrary, it is fully consonant with it. And to us it appears to be the most logical reading of the treaty—that is, if contamination of the space environment is, as we have argued, inconceivable except from the perspective of property-rights violations, then the Outer Space Treaty creates no protection for the space environment *per se*.

Schafer argues that Article VIII of the Outer Space Treaty prohibits contamination of the space environment.¹²⁰ Article VIII provides: “Ownership of objects launched into outer space, . . . and of their component parts, is not affected by their presence in outer space”¹²¹ Schafer reads this provision as establishing “a responsibility to deal with all of the incidence of ownership of such an item, including the contamination it may cause the space environment.”¹²² Although Schafer is concerned with preserving the environment *per se*, his argument only supports the notion of a respect for property rights in space. Therefore, Article VIII of the Outer Space Treaty is congruent with, not contrary to, our proposed property-rights regime and does not establish any environmental protection beyond it.

C. The Liability Convention

Another major agreement is the 1972 Convention on International Liability for Damage Caused by Space Objects (“Liability Convention”).¹²³ It holds nations strictly liable for damage caused by their (or their citizens’) space objects to aircraft in flight or ob-

119. See Baker, *supra* note 23, at 163 (“[I]t was never intended that the protection offered by the avoidance of harmful contamination principle would extend to the environments of the Moon and other celestial bodies *per se*.”).

120. Schafer, *supra* note 24, at 404.

121. Outer Space Treaty, *supra* note 110, art. VIII.

122. Schafer, *supra* note 24, at 404.

123. Convention on International Liability for Damage Caused by Space Objects, U.S.-U.K.-U.S.S.R., Mar. 29, 1972, 24 U.S.T. 2389 [hereinafter Liability Convention].

jects on Earth, and applies a “fault” standard for damage to other space objects. The Liability Convention, however, does not address protection of the space environment apart from human-made “space objects” and, therefore, does not call for any sort of space environmentalism.¹²⁴

D. The Moon Treaty

A treaty that *does* seem to call for space environmentalism is the 1979 Agreement Governing the Activities of States on the Moon and other Celestial Bodies (“Moon Treaty”).¹²⁵ It requires signatories to “take measures to prevent the disruption of the existing balance of [the moon’s] environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise.”¹²⁶ It also proclaims the moon and its resources “the common heritage of mankind.”¹²⁷ Its terms also apply to other celestial bodies.¹²⁸

124. This is in sharp contrast to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (“CITES”), Mar. 3, 1973, 27 U.S.T. 1087, the aqueous analog to the Liability Convention. CITES specifically rules out and condemns private property rights as a means of protecting endangered species. See Jonathan Adler, *Do Conservation Conventions Conserve?*, in SUSTAINABLE DEVELOPMENT: PROMOTING PROGRESS OR PERPETUATING POVERTY? (Julian Morris ed., 2002).

125. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 34/68, U.N. Doc. A/RES/34/68 (Dec. 5, 1979) [hereinafter Moon Treaty].

126. *Id.* art. 7.

127. *Id.* art. 11. For an analysis of this concept, see KEMAL BASLAR, THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW (1998); for applications of this concept to the earth’s oceans, see Jan van Etinger et al., *Ocean Governance and the Global Picture*, in OCEAN GOVERNANCE: SUSTAINABLE DEVELOPMENT OF THE SEAS (Peter Bautista Payoyo ed., 1994); for a critique on the ground that it interferes with private property rights and opens the door to the tragedy of the commons, see Roy Whitehead, Jr., Catherine Gould & Walter Block, *The Value of Private Water Rights: From a Legal and Economic Perspective*, 9 ALB. L. ENVTL. OUTLOOK J. 313 (2004).

128. Moon Treaty, *supra* note 125, art. 1.

What precisely the Treaty means by “the existing balance” of the a celestial body’s environment is unclear. As for “harmful contamination,” the Moon Treaty does not define the term, but again, in light of our discussion above, this phrase could possibly be interpreted to mean that property rights must be respected.

In any event, the Moon Treaty is of virtually no practical consequence, because “no major space power has signed it.”¹²⁹ Further, observers agree that it is unlikely that the United States will ever join, because it not only would impose environmental restrictions, but also would prohibit property rights¹³⁰ and essentially impose a space welfare or global wealth redistribution program, under which profits from wealthy nations’ space ventures would have to be shared with the governments of poor non-spacefaring countries.¹³¹ Not even the Soviet Union, despite its communist ideology, was willing to agree to that.¹³² Therefore, though it receives attention in academic literature, the Moon Treaty will not directly affect space environmental law in the United States.

IV. CONCLUSION

As we have shown, space environmentalism lacks a legal or economic justification. Its only philosophical foundation is a most extreme form of environmentalism to which very few people seriously subscribe. For the good of the human race, and because it is just, the law should continue to allow private parties to use space for whatever human purposes they see fit within the limits of private property rights.

129. Rosanna Sattler, *Transporting a Legal System for Property Rights: From the Earth to the Stars*, 6 CHI. J. INT’L L. 23, 30 (2005); see also REYNOLDS & MERGES, *supra* note 31, at 116 (“Absent adoption by the major space powers, the Moon Treaty is unlikely to play a major role in the future.”).

130. See Sattler, *supra* note 129, at 30; Twibell, *supra* note 70, at 598.

131. See Kevin V. Cook, Note, *The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty*, 11 GEO. INT’L ENVTL. L. REV. 647, 664–70 (1999).

132. REYNOLDS & MERGES, *supra* note 31, at 116.