INTERPLANETARY CONTAMINATION: THE ULTIMATE CHALLENGE FOR ENVIRONMENTAL AND CONSTITUTIONAL LAWYERS?

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"All of the planets, All of the time."[1]

I. LEGAL GENESIS OF THE ISSUES

> "In the exploration and use of outer space, including the moon and other celestial bodies, States...shall...conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary shall adopt appropriate measures for this purpose."[2]

Once again, the National Aeronautics and Space Administration (NASA) has been directed to resume studies and plan-

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[1] *See* Linda Billings and John Rummel, "All of the Planets, All of the Time: Planetary Protection at NASA" SPACE TIMES, 12 (January/February 2004). The authors state that "while a primary focus of NASA's solar system exploration program is the search for evidence of life on Mars, the agency's current approach to planetary protection is 'all the planets, all the time.'" *Id.* Dr. John Rummel is the Planetary Protection Officer in NASA's Office of Planetary Protection, and Linda Billings is a research associate with the SETI Institute.

[2] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies, Jan. 25, 1967, art. IX, 18 U.S.T. 2410, 610 U.N.T.S. 2005 (entered into force on Oct. 10, 1967) [hereinafter Outer Space Treaty]. While the genesis of interplanetary contamination control rests in the Outer Space Treaty, much of the international law from which contamination control is derived relates to the law of the seas. *See generally*, Myres S. McDougal & Norbert A. Schlei, *Hydrogen Bomb Tests in Perspective: Lawful Measures for Security*, 64 YALE L.J. 648 (1955) (addressing law relating to "permissibility of use"). *See also*, MYERS S. MCDOUGAL & WILLIAM T. BURKE, THE PUBLIC ORDER OF THE OCEANS (1962).

ning designed to incorporate human missions into the exploration of the Moon and Mars.[3] The first and foremost concern continues to be containment of adverse interplanetary cross-contamination. "Adverse" is a word that can be interpreted as having many diverse characteristics, both technical and legal, depending on the focus of the exploration program.[4] The word "contamination" has just as many variations and uncertainties, depending again upon the context of its use, that is, technical or legal.[5]

Whether human or robotic, the planning stages for all Mars missions have, and will continue to address, well-considered planetary protection procedures consistent both with international and domestic scientific goals, policies, and laws, particularly as they relate to the protection of Earth's biosphere and, equally as important, the need to conduct planetary research for carbon-based life unencumbered by sites inadvertently contaminated with Earth indigent biota and carbon-based life precursors carried to those sites robotically or by humans in human missions. One of the primary objectives of planetary research is

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[3] Policy statement of President George W. Bush, 40 WEEKLY COMP. PRES. DOC. 175 (Feb. 9, 2004).

[4] Essentially, the initial primary concern about the potential for adverse and/or harmful planetary contamination related to back contamination issues and whether extraterrestrial life forms, or Earth indigent life forms taken into space and returned in mutated status from, say, excessive radiation, will be or will become infectious and/or toxic in a fashion that cannot be accommodated by human and other Earth biota immune systems...including fisheries, domestic livestock, crops, and plants and animals in the wild.

[5] "Contamination" has many definitions, both in statutory and case law, depending upon the context and circumstances being addressed. Black's Law Dictionary does not offer a legal definition of contamination or contaminate, but it is clear from Webster's Ninth New Collegiate Dictionary that a rather benign definition is not intended, i.e., "contamination", which is a state of being contaminated, is akin to contagion, befouling, foul, filthy, and the like. *See* WEBSTER'S NINTH NEW COLLEGIATE DICTIONARY 283 (1991). Use in Article IX of the 1967 Outer Space Treaty of the phrases "adverse changes" and "harmful contamination" implies that it could be passive contamination or infectious, etc., contamination. "Adverse" can denote a hostile change in circumstances or simply as being opposed to prevailing interests. (Outer Space Treaty, *supra* note 2, at art. IX.) In either event, any issue of law dealing with extraterrestrial contamination causing adverse or harmful changes likely would rely on the formulae and protocols designed by NASA and the Committee on Space Research (COSPAR), created by the International Council of Scientific Unions (ICSU) to determine whether and to what extent a piece of space equipment or an astronaut is considered contaminated or adversely changed and for what purposes.

to understand the genesis of our solar system, galaxy, and, indeed, our universe; and particularly and often most compelling, the origin of life and whether carbon-based Earth life is unique, that is, "are we alone?" Obviously, the theological and philosophical issues assume extraordinary importance in the pursuit of this research, and too little attention has been given to these issues as integral components of space sciences and exploration.[6] Does or has life, as we currently recognize it, principally carbon-based, exist or has it existed on other planets or celestial bodies (moons, asteroids, and the like), and is life truly the business of the universe? Hopefully, in a more pragmatic sense, what is learned will have useful application to understanding the ultimate survivability characteristics of *Homo sapiens sapiens* and its own Earth indigent web of life.

It is absolutely essential, critical, that not only the United States, but the entire world, develop and apply adequate protective barriers and containment procedures to ensure against, or at least reduce the risk to an acceptable level, adverse or harmful forward contamination of Mars and other planets being explored, as well as harmful back contamination of Earth. Originally, NASA's efforts relating to containment concerns focused primarily, if not exclusively, on issues of *back* contamination and were overseen principally by an Interagency Committee on Back Contamination (ICBC).[7] The concern focused on health

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[6] For broad and frequently fascinating discussions of issues relating to morality and ethics in exploration of the solar system, and particularly Mars, *see* J. Baird Callicott, *Moral Considerability and Extraterrestrial Life*, *in* MORAL EXPERTISE (D. MacNiven, London: Routledge ed., 1990). *See also* Robert H. Haynes, *Ecce Ecopoiesis: Playing God on Mars*, *in* MORAL EXPERTISE : STUDIES IN PRACTICAL AND PROFESSIONAL ETHICS 161-183 (Don MacNiven ed., 1990) and C.P. McKay, *Does Mars Have Rights?*, *in* MORAL EXPERTISE : STUDIES IN PRACTICAL AND PROFESSIONAL ETHICS 184-197 (Don MacNiven ed., 1990). In this respect, particularly as it relates to the requisite to include the general international public reasonably in decision-making processes regarding the potential harmful contamination of Earth and other planets/celestial bodies, *see* Margaret S. Race, *Societal Issues as Mars Missions Impediments: Planetary Protection and Contamination Concerns*, 15 ADV. SPACE RES. 285 (1994). *See also*, Margaret S. Race, *Anticipating the Reaction: Public Concern about Sample Return Missions*, 14 PLANETARY REP. 20-22 (July/Aug. 1994), and Margaret S. Race, *Planetary Protection, Legal Ambiguity and the Decision Making Process for Mars Sample Return*, 18 ADV. SPACE RES. 345 (1996).

[7] For the purpose of providing assistance to NASA in formulating a program to prevent adverse contamination of Earth's biosphere by lunar matter returned from

issues related to the return of lunar samples, astronauts, and returned equipment to Earth from the various *Apollo* missions. Much of the work of that committee was rendered questionable, in large part, because only a handful of scientists believed there might even be a possibility of life forms or life precursors on the Moon; there was believed to be no water and other life support requirements for carbon-based life on or in the Moon. Perhaps most important, President John F. Kennedy had made it clear to the international public that the United States was committed to making a human landing on the Moon and a safe return before it was accomplished by the former Soviet Union.[8] This was a race! Moreover, it was perhaps more politically driven than the product of scientific curiosity and the advancing state of engineering technology. While the Soviet Union, the only other spacefaring nation at the time, purported to heed adverse or harmful contamination control procedures, very little effort was made in the Soviet space program to ensure spacecraft ster-

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human explorations, the Interagency Committee on Back Contamination (ICBC) was established and came into effect through an August 24, 1967 interagency agreement. The principal agencies represented on that Committee were NASA, the Department of Agriculture, the then Department of Health, Education and Welfare (HEW), the Department of the Interior, and the National Academy of Sciences. Interestingly, heavy emphasis was placed on three members (Interior, Agriculture, and HEW) since they possessed at least limited quarantine authority and NASA had none. *See* Interagency Agreement between the National Aeronautics and Space Administration, the Department of Agriculture, the Department of Health, Education, and Welfare, the Department of Interior, and the National Academy of Sciences on the Protection of the Earth's Biosphere from Lunar Sources of Contamination, Aug. 24, 1967.

[8] For a discussion of the domestic and international law and politics impacting the development and application of evolving contamination control and quarantine regulations established for the human lunar mission program beginning with *Apollo11* through the end of the *Apollo* Program, *see* George S. Robinson, *Contamination of Earth's Ecosystem by Extraterrestrial Matter: United States Authority to Promulgate and Enforce Quarantine Regulations* (1970) (unpublished doctoral dissertation, McGill University Institute of Air and Space Law, Montreal Canada) (on file at McGill University Institute of Air and Space Law). *See also*, George S. Robinson, *Earth Exposure to Extraterrestrial Matter: NASA's Quarantine Regulations*, 5 INT'L LAWYER 219 (1971). *See particularly*, L.B. Hall and R.G. Lyle, *Foundations of Planetary Quarantine*, *in* PLANETARY QUARANTINE 5 (L.B. Hall, ed., Gordon and Breach, New York, NY 1971) (L. B. Hall was the director of NASA's Office of Planetary Quarantine right before, during, and after the Apollo 11 mission). *See also* J.R. Bagby, Jr., *Back Contamination: Lessons Learned During the Apollo Lunar Quarantine Program*, Jet Propulsion Laboratory CR-560226 (1975).

ilization and containment procedures.[9] However, on the theory that such a program is only as good as its weakest link, progressive efforts were made to reach some level of assuredness that contamination control procedures were truly international.[10]

Early attempts to reduce the risks of lunar and planetary contamination to an acceptable level (outbound or forward contamination, back contamination, and cross contamination between and among celestial bodies, human fabricated as well as natural) started in 1956 at the International Astronautical Federation's Seventh Annual Congress convened in Rome. Initial attempts to coordinate international efforts to reduce human initiated interplanetary contamination to an acceptable level of risk led in part to the establishment of the International Institute of Space Law under the aegis of the Federation. Standards were to be established and implemented by international law. Early steps also were made in 1956 by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) to address contamination and sterilization issues.

The International Council of Scientific Unions (ICSU) established an *ad hoc* Committee on Contamination by Extraterrestrial Exploration (CETEX), which provided preliminary findings regarding the potential for contamination of the Moon, Mars, and Venus. CETEX then recommended the establishment of a code of conduct for space missions and research. In the same year, ICSU accepted those recommendations from CETEX and established the Committee on Space Research (COSPAR) to coordinate worldwide space research. In 1958, the United States National Academy of Sciences also established the Space Science Board (SSB), which was given the mandate, among other instructions, of addressing and providing advice on issues of planetary contamination. Between 1959 and 1964, the SSB recommended sterilization of space probes and, significantly, endorsed the CETEX Code of Conduct and the establishment of

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[9] For an early characterization of the incipient phases of the Soviet and American planetary contamination containment policies, *see* Bruce Murray et al., *Planetary contamination II: Soviet and U.S. Practices and Policies*, 155 SCIENCE 1505-1511 (1967).

[10] *See*, generally, George S. Robinson, *NASA'S Accountability for Life and Informed Public Consent: Planetary Protection and Evolving Law*, 17 (3) THE AIR & SPACE LAW. 9-11, 26 (Winter 2003).

COSPAR. ICSU then adopted resolution 10 of the Code ("Space Experiments with Undesirable Effects")[11] recommending that all countries launching space experiments with possible adverse effects on other scientific research should provide ICSU and COSPAR with information about those intended experiments sufficient to evaluate the potential for contamination, adverse or not. COSPAR also organized a "Consultative Group on Potentially Harmful Effects of Space Experiments" to help conduct these evaluations about potential adverse or harmful effects. In the United States, NASA adopted a policy regarding the Moon, Mars, and Venus that spacecraft sent to these particular bodies will have an absolute minimum microbial count, based on engineering, spacecraft assembly procedures, and established sterilization criteria.[12]

COSPAR adopted a quantitative framework for the development of planetary protection standards lasting until 1982. In 1967, after about ten years of intense work under the auspices of the United Nations, all of these concerns about planetary outbound or forward, cross- and back-contamination resulting from space activities were addressed in the Outer Space Treaty of 1967.[13] With this Treaty provision fully recognized in the directives of all spacefaring nations, COSPAR has been developing with NASA and other domestic and international space agencies various formulae through the years regarding just when a planetary body or space vehicle or platform has become contaminated, and under what technical circumstances of risk management the contamination is acceptable or unacceptable. Nevertheless, the issues of what constitutes harmful contamination and adverse change in Earth's environment have yet to be interpreted and defined legally. That likely will have to await

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[11] COMMITTEE ON SPACE RESEARCH, 20 COSPAR INFORMATION BULLETIN 25-26 (Nov. 1964).

[12] For an excellent summary of the early history of spacecraft quarantine contamination control policies and procedures adopted by NASA, as well as the applicable criteria and standards determined acceptable by U.S. scientists, *see*, by L.B. Hall, *Recent Developments in Planetary Quarantine*, 9 DEV. INDUS. MICROBIO. 19 (1968). L.B. Hall was NASA's former Planetary Protection Officer,

[13] Outer Space Treaty, *supra* note 2, at Art. IX.

relevant scientific data and related technological information deriving from each space mission *in situ*. The legal definition of "adverse" and "harmful" will also change as Earth indigenous sciences progress, separately or in concert, with the planetary exploration space sciences.

Between the successful completion of the *Apollo 11* mission and now, significant increases in scientific data deriving from a multitude of different types of space studies programs and projects have enhanced the belief that life, even carbon-based life, is truly the business of the Universe. Contamination control and biotic and engineering containment protocols have taken quantum leaps in development and sophistication.[14] But of principal concern and focus here, although not exclusively, is the human component of planetary exploration and the need for particularized contamination containment and component quarantine protocols that satisfy numerous safety conditions and applicable laws to which unreturned robotic activities in space research are not held accountable.

In point of fact, in preparing for the *Apollo* missions, particularly *Apollo 11*, many laws in the United States were addressed and disposed of, some properly, some questionably, some rather cavalierly, and some simply ignored. For example, restraining orders and injunctions were assessed and evaluated in the context of temporary relief and irreparable damages that would be created for the *Apollo 11* mission.[15] There were ques-

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[14] The latest successful U.S. and European robotic landers on Mars are providing extraordinary data regarding the presence of water and other carbon-based life support matter. General and specific discussions about evolving planetary protection policies and protective protocols can be seen in J.D. Rummel, *Planetary Protection Policy* 12(4) ADV. SPACE RES. 129 (1992); Patricia M. Sterns and Leslie I. Tennen, *Recent Developments in the Planetary Protection Policy: Is the Outer Space Environment at Risk?, in* 32 COLLOQUIUM ON THE LAW OF OUTER SPACE 163 (1989). *See also* Patricia M. Sterns and Leslie I. Tennen, *Current United States Attitude Concerning Protection of the Outer Space Environment,* 27 COLLOQUIUM ON THE LAW OF OUTER SPACE 398 (1984). The NASA Mars rovers *Spirit* and *Opportunity* have returned data indicating the presence of methane gas in some of the caves on Mars. These caves containing methane are located rather near the strong indications of pre-existing (and perhaps even existing) water sources, and if the methane in fact derives from these water sources, scientists have a strong indication also of biometabolic processes which do, in fact, emit methane.

[15] Two major sources of authority exist for seeking temporary relief from governmental agency action: (1) The Administrative Procedure Act, 5 U.S.C. § 550 - 596, and

tions of who has standing to petition for a restraining order or temporary injunction against the launch of *Apollo 11* until the issues surrounding particularly back contamination procedures and relevant quarantine regulations could be fully vetted before and by the general public.[16] Who or what would be the proper defendants in these circumstances, and what would be the availability of a judicial review of NASA's quarantine protocol and rules as a prerequisite to issuing an injunction?[17] What is the requirement for federal rule making to be subject to the Administrative Procedure Act (APA) and, in the case of the *Apollo 11* launch, the applicability or not of the thirty days notice of effective date requirement?[18] What is the law and rele-

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(2) 28 U.S.C. § 2282, wherein provision is made for enjoining the enforcement of a Federal statute.

[16] *See* 5 U.S.C § 702 wherein it is provided that standing is had by "[a] person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute...."

[17] Essentially, the judiciary has recognized three exceptions to immunity of agency personnel from personal liability and specific relief, where an action against an officer of the United States for the specific relief does not also constitute a "suit against the United States":

> If the officer purports to act as an individual and not as an official, a suit directed against that action is not a suit against the sovereign ... On a similar theory, where the officer's powers are limited by statute, his actions beyond those limitations are considered individual and not sovereign actions. The officer is not doing the business which the sovereign has empowered him to do or he is doing it in a way which the sovereign has forbidden ... [and where] the statute or order conferring power upon the officer to take action in the sovereign's name is claimed to be unconstitutional.

Larson v. Domestic & Foreign Commerce Corporation, 337 U.S. 682 (1949). As stated by Mr. Justice Hughes, "...in case of an injury threatened by his illegal action, the officer cannot claim immunity from injunctive process." *Id.* at 690, *citing* Philadelphia Co. v. Stimson, 223 U.S. 605, 620 (1912). The principle has frequently been applied with respect to state officers seeking to enforce unconstitutional enactments. It is equally applicable to a Federal officer acting in excess of his authority or under an authority not validly conferred. *Id* at 690-91. *Cf.*, North Carolina v. Temple, 134 U.S. 22, 30 (1890) (recognizing that a suit may fail "...if the relief requested cannot be granted by merely ordering the cessation of the conduct complained of but will require affirmative action by the sovereign or the disposition of unquestionable sovereign property.")

[18] "Informal written or oral consultation with affected parties or with advisory committees is the mainstay of rule-making procedure," particularly in view of the fact that public scrutiny can be avoided by the often-used facility of invoking the proviso of "impractical, unnecessary, or contrary to the public interest." KENNETH CULP DAVIS, 1 ADMINISTRATIVE LAW TREATISE § 6.02, 36 (1958), This concern is one of the primary reasons that every reasonable effort is being pursued to involve the public in the development of contamination control and quarantine procedures for the Mars Sample Re-

vance regarding agency discretion and judicial review?[19] What are the issues of injunctive relief as they relate to questions of Constitutionality?[20] What was the analogy of nuclear testing at the time of *Apollo 11* and the legal arguments surrounding nuclear testing on the High Seas?[21] What was the international

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turn mission and later human mission to Mars and return. *See* Margaret S. Race, *Planetary Protection, supra* note 6, 345-50 (Dr. Race observes that "[a]s scientists and mission planners develop planetary protection requirements for future Mars sample return missions, they must recognize the socio-political context in which decisions about the mission will be made and pay careful attention to public concerns about potential back contamination of Earth. To the extent that planetary protection questions are unresolved or unaddressed at the time of an actual mission, they offer convenient footholds for public challenges in both legal and decision making realms, over which NASA will have little direct control."). Dr. Race, with direct experience in similar situations involving the unknowns of scientific research and public reactions to potential consequences, continues by asserting that "[l]egal issues with the potential to complicate future missions include: procedural review under National Environmental Policy Act (NEPA); uncertainty about institutional control and authority; conflicting regulations and overlapping jurisdictions; questions about international treaty obligations and large scale impacts; uncertainties about the nature of the organism; and constitutional and regulatory concerns about quarantine, public health and safety. In light of these important legal issues, it is critical that NASA consider the role and timing of public involvement in the decision making process as a way of anticipating problem areas and preparing for legitimate public questions and challenges to sample return missions."

[19] Despite much argumentation to the contrary, it was determined that action or responsibility committed by statute to agency discretion is not subject to judicial review. 5 U.S.C. § 701(a)(2). However, with respect to *Apollo 11* and subsequent *Apollo* missions, the issue was one not of agency discretion, but rather whether there was adequate legislative authority for NASA to incorporate the quarantine regulations as a component of the mission.

[20] Injunctions obviating the enforcement of Federal legislation are authorized specifically by 28 U.S.C. § 2282, *repealed by* Act of August 12, 1976, Pub. L. No. 94-381, § 2, 90 Stat. 1119, which provides that the only grounds for "...restraining the enforcement, operation or execution of any Act of Congress..." is when the legislation is repugnant "...to the Constitution of the United States." *See also* Darlington, Inc. v. F.H.A., 134 F. Supp. 337 (D.S.C., 1955), *rev'd on other grounds*, 352 U.S. 977 (1956). *See also*, Flast v. Cohen, 392 U.S. 83 (1968) (defining what constitutes "repugnance to the Constitution").

[21] Nations have employed the High Seas and superjacent airspace for a rapidly increasing variety of reasons, particularly with respect to testing weapons of mass destruction and the development of advanced aviation concepts, as well as human and robotic exploration of the ocean floors and minerals. Many of the uses have been conflicting and attempts to resolve them are manifest in various conventions and treaties. For a discussion of conflicting uses of the High Seas and international airspace, *see* George S. Robinson, *Military Requirements for International Airspace: Evolving Claims to Executive Use and De Facto Control*, J. NAT. RESOURCES (July 1970). *See also* George S. Robinson, *The Regulatory Prohibition of International Supersonic Flights*, 18 BRIT. INT'L & COMP. LAW Q., Part 4, 833-846 (Oct. 1969) (discussing the economic and legal problems attendant to conflicting uses of international airspace as they relate to innovative aviation technology).

customary and treaty law relating to a reasonable use embracing the legal and practical distinction between unacceptable interference and acceptable use?[22] Was there any progress at the time of *Apollo 11* and subsequent *Apollo* missions in involving the World Health Organization in outbound sterilization practices and the problematic threat of back contamination?[23] Was there any practical consideration by the United States of extraterritorial application of criminal laws and sanctions?[24]

Of principal concern and focus here, although not exclusively, is the human component of planetary exploration and the need for particularized contamination containment and component quarantine protocols that satisfy numerous safety conditions and applicable laws to which unreturned robotic activities in space research are not held accountable.

II. QUARANTINE PROTOCOL

As tentative and politically influenced as the lunar surface sample return missions were in preparations for the remote possibility of harmful contamination of the Moon and Earth, planning for the Mars Sample Return (MSR) mission[25] will be infinitely more complex. This is true not just in the technology and mission designs ultimately adopted to accomplish the goals but because of the heightened public awareness of the missions and the positive focus on the likelihood of finding carbon-based life forms or precursors on Mars. It is certain that the experts

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[22] For an excellent historical summary of international law and its functional applicability to areas not subject to sovereign jurisdiction, *see* Myres S. McDougal & Norbert A. Schlei, *Hydrogen Bomb Tests in Perspective: Lawful Measures for Security*, 64 YALE L.J. 648 (1955).

[23] In July 1964, Lawrence B. Hall (USA), V.V. Parin (USSR), and F. Violette (France) met in Paris to discuss "WHO Consultation on Health Aspects" of the exploration and peaceful uses of outer space. *See* the report by Mr. Hall in the files of the Office of Planetary Quarantine [now the Office of Planetary Protection], NASA Headquarters, Washington, DC.

[24] For a discussion of extraterritorial application of criminal provisions of various NASA and other U.S. and treaty laws, *see* George S. Robinson, *Contamination of Earth's Ecosystem*, *supra* note 8, at 116-121.

[25] Particularly in terms of design engineering; public involvement; shared military interests and funding in the technology used; domestic and international political concerns prevailing from the time of conceptualization to return of samples; and, ultimately, astronauts in the ultimate human mission to Mars and return.

planning these missions will be joined by an informed public in the routine, daily decision-making regarding procedures, standards, and criteria adopted to ensure planetary protection.[26] Many government agencies and international organizations will be providing oversight and routine review of any plans being offered by NASA regarding planetary protection, particularly from potential harmful biotic back contamination. Further, government experts also recognize that,

> [i]t is almost certain that many legal, regulatory and institutional decision-making issues will surface regardless of whether public opposition arises against the mission. In the event of disagreement over MSR plans, there are numerous federal, state and local laws that could be used for challenging mission decisions in court.[27]

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[26] Toward this end, on February 13, 2001, the NASA Administrator signed into effect, pursuant to the Federal Advisory Committee Act (5 U.S.C. § 1-16) and The National Aeronautics and Space Act of 1958, as amended [Pub. L. 85-568, *as amended*, Sec. 203(c)(7)], the NASA "Charter of the Planetary Protection Advisory Committee of the National Advisory Council" (PPAC). The purpose and duties of the PPAC is to "...advise the NASA Administrator through the NASA Advisory Council on Agency programs, policies, plans, and other matters pertinent to the Agency's responsibilities for biological planetary protection, as defined in NPD 8020.7, including NASA planetary protection policy documents and components, implementation plans, and organization...." National Aeronautics and Space Administration Charter of the Planetary Protection Advisory Committee of the NASA Advisory Council, Feb. 13, 2001, *available at* http://www.hq.nasa.gov/office/oss/adv/PPACCharter.htm (last viewed June 10, 2005) [hereinafter 2001 NASA Charter]. A more recent version of the 2001 NASA Charter was signed on April 29, 2005, *see* National Aeronautics and Space Administration Charter of the Planetary Protection Advisory Committee of the NASA Advisory Council, April 29, 2005, *available at* http://www.science.hq.nasa.gov/strategy/ppac/PPACCharter2005.pdf (last viewed June 10, 2005). The membership of the Committee consists of up to 20 members selected to ensure "a balanced representation among industry, academia, and Government...At least four of the Committee members shall be persons knowledgeable in one or more of the fields of bioethics, law, public attitudes and the communication of science, the Earth's environment, or related fields." 2001 NASA Charter. Further, non-voting "representatives" shall be solicited for attendance and advice from the Department of Agriculture, Department of Energy, Department of Health and Human Services (National Institutes of Health and the Centers for Disease Control and Prevention), Department of the Interior, Department of Transportation, Environmental Protection Agency, National Science Foundation, and the Executive Office of the President of the United States. *Id.* Also important to note is that the meetings, held at least twice a year, are *open to the general public. Id.*

[27] *See* Donald.L. DeVincenzi et al., *Planetary Protection, Sample Return Missions and Mars Exploration: History, Status, and Future Needs*, 103 (E12) J. GEOPHYS. RES.,

Unlike preparations for the Lunar sample return missions of the *Apollo* program, infinitely more legal complexities face the MSR mission planners particularly for the follow-on human mission to Mars. Although there certainly is room for discussion of priority considerations, several experts believe that the most probable and important legal issues to resolve pertain to certain provisions found in the U.S. National Environmental Policy Act (NEPA), since that legislation "requires all federal agencies to conduct comprehensive reviews and interdisciplinary analyses of environmental impacts prior to decision-making."[28] In addition to the detailed public disclosure required in a NEPA Environmental Impact Statement (EIS), a public process involvement in the form of a launch approval for the MSR and Mars human mission is required that, under a Presidential Directive,[29] would initiate a multi-agency review of experiments and/or launches if there is any possibility, regardless of how remote, that those activities may have large scale adverse environmental consequences to Earth. This requirement may, however, be satisfied through the work engendered by the EIS. Nevertheless, given the scientific and engineering complexities involved in returning Mars surface samples to Earth, "it could take several years to complete the documentation, public hearings, agency consultations, and stepwise review and publication process required under NEPA."[30]

As already noted in part by Dr. Race,[31] numerous other legislative and regulatory issues need to be satisfied before the MSR mission is undertaken, all of which could complicate and delay both the MSR mission and the eventual human presence on Mars. Some of these issues relate to decisions regarding leg-

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28,577, 28,581 (Nov. 25, 1998). *See also*, Margaret S. Race, *Planetary Protection, supra* note 6.

[28] DeVincenzi, *supra* note 27, at 25,581.

[29] Presidential Directive/National Security Council Memorandum, Scientific or Technological Experiments with Possible Large-Scale Adverse Environmental Effects and Launch of Nuclear Systems into Space, Presidential Directive PD/NSC-25, May 8, 1996.

[30] DeVincenzi, *supra* note 27, at 25,581. This is an observation reported to have been made in 1996 by S. Dawson, Jet Propulsion Laboratory, in a personal communication to Dr. Margaret S. Race.

[31] *See* Margaret S. Race, *Planetary Protection*, *supra* note 6.

islative control and authority, presently conflicting regulations, overlapping jurisdictions, uncertainties regarding treaty obligations and effectiveness with respect to planetary protection measures, and questions about United States Constitutional law regarding quarantine protocols and extraterritorial applications of implementing quarantine regulations. These and related issues will require constant integration of continually changing scientific data, technological challenges, *un*informed public concerns, political considerations unrelated to planetary protection requirements, health and safety of astronauts, legal interpretations in the form of case law, and very likely new legislation to clarify these complexities and authorize clear governmental control and accountability to resolve the ambiguities and conflicts.

III. QUARANTINE PROCEDURES AND APPLICABLE LAW

Prior to 1991, the Code of Federal Regulations had the following section on environmental contamination,

> Scope: This part establishes: (a) *NASA* policy, *responsibility and authority* to guard the Earth against any harmful contamination or adverse changes in its environment resulting from personnel, spacecraft and other property returning to the Earth after landing on or coming within the *atmospheric envelope* of a celestial body; and (b) security requirements, restrictions and safeguards that are necessary *in the interest of national security*.[32]

The 1997 Code of Federal Regulations states that 14 C.F.R. Part 1211 is "Reserved".[33] In another, it is characterized as "Removed,"[34] and the change announcement is referenced.[35] The reference page has the statement that "NASA is removing 14

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[32] 14 C.F.R. § 1211.100 (emphasis added).

[33] *Id.* edition dated Jan. 1, 1997, p. 75 to end.

[34] In the back of the Volume 14, on page 481, is a section titled "List of CFR Regulations affected" and identifies by year all the changes to the Code of Federal Regulations made since 1986. 14 C.F.R. Part 1211 is characterized as "Removed" in 1991. *Id.* at p. 484.

[35] CFR56 P 19259.

CFR 1211 since it has served its purpose and is no longer in keeping with current policy."[36]

Reference to "Reserved" and "Removed" creates some confusion and ambiguity, but it is clear that NASA is unsure at this time what regulations will evolve to cover future planetary protection procedures relating to the possibility of harmful contamination and the need for regulations implementing a quarantine protocol that covers material and humans exposed to extraterrestrial matter and returned to Earth. It also is clear that NASA is unsure what authority it has to invoke quarantine of material and humans, and intends to have at least some regulations in place that can be re-enacted quickly to cover unexpected contamination events that directly affect Earth. Nevertheless, in order to evaluate Part 1200 to identify the legal and practical deficiencies incorporated in the regulations relied on in the past, an assessment of the regulations in effect until January 1, 1997 follows. This can ensure that the regulations are properly modified or eliminated when new regulations are promulgated for future MSR missions and the ultimate human mission to Mars.

The most important regulatory deficiency is that there is no legislation authorizing NASA to promulgate its own quarantine regulations. Review of the previously relied upon regulations, presently withdrawn, reveal unauthorized regulatory "bootstrapping" by NASA without seeking legislative authorization from the Congress to promulgate quarantine regulations. Unauthorized quarantine is a subject of very sensitive and historical significance.[37] Uncertainty regarding legislative authority to quarantine is exhibited by NASA's reliance in the first instance

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[36] *Supra* note 33.

[37] Quarantine involves restraint of people and property without definite time limits, based solely on the certainty or likelihood of contamination that may or may not be harmful. In the history of the American colonies and the early United States, a common practice by incumbent politicians seeking re-election was to declare the opponent as being subject to quarantine for health reasons, at the very least until the elections were over. Subsequently, legislatively authorized quarantine required there to be contact/contamination with a "*known* infectious disease." Of course, when dealing with extraterrestrial contamination, at least until determined otherwise from experience, there is no way to know whether contamination with inanimate material as well as extraterrestrial biota could result in contamination by an "infectious" disease, let alone a "known" infectious disease. *See* George S. Robinson, *Contamination of Earth's Ecosystem*, *supra* note 8.

on the legislative authority of the Department of Health and Human Services and the Department of the Interior to implement regulations to detain, examine, quarantine, and decontaminate.

Set forth, below, are some of the principal areas of weakness that must be addressed in the now withdrawn regulations.

1. Unclear categories of contamination: The regulation states, "[t]he provisions of this part apply to all NASA manned and unmanned space missions which land on or come within the atmospheric envelope of a celestial body and return to the Earth."[38]

The quarantine regulations discussed below must apply to all types of NASA space missions. The constraints of principal importance are that the quarantined objects must (a) land on or come within the atmospheric envelope of a celestial body,[39] and (b) return to Earth. Obviously, matter existing in interstitial space, other than celestial bodies and which is included in atmospheric envelopes, is not part of the extraterrestrial matter covered by the exposure and quarantine protocol and regulations. The presumption is that the "other" matter in space is not considered to be contaminating, or that the probability of pathogenic organic and toxic inorganic complexes surviving or existing in outer space is still too remote to consider, or that the probability of an encounter between space missions and such "free floating" matter is too remote to be covered by regulations at present.[40] No mention is made either of cross contamination

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[38] 14 C.F.R. § 1211.101.

[39] Under certain circumstances, it is reasonable to assume "celestial" body would include artificial bodies, such as the *International Space Station*, as well as naturally occurring celestial bodies.

[40] For early space missions, it was determined by the Interagency Committee on Back Contamination that, should any microorganism in space strike a spacecraft the force of impact (16,000 meters/second) would destroy that microorganism. Much has been learned about unanticipated survivability characteristics of extremophiles on Earth and survival of microorganisms in space that make such an assumption perilous at best. At present, scientists are discovering the devastating effects of viruses, bacteria, and other forms of Earth indigent biota that only recently are becoming known because of the extensive travel to and from remote areas of heretofore relatively unvisited sections and isolated ecosystems of Africa, Latin America, the Southeast Asian continent, etc. The HIV virus and its increasing number of mutations is an excellent example. Extremophiles are only lately being discovered to exist and thrive in areas of Earth

where an object or person comes in contact with other equipment and humans exposed as defined in this section.

2. Lack of direct authority:[41] The regulation relies on Sections 203 and 304 of the National Aeronautics and Space Act of 1958, (NAS Act), as amended. Neither of these sections addresses any issue of quarantine authority directly. In addition to the Outer Space Treaty,[42] the regulation cites internal management policies[43]as authority. However, these management instructions do not provide authority to quarantine; only authority to assist in implementing valid quarantine authority.

3. Details unsupported by adequate authority:[44] The details of how seizure and quarantine procedures and NASA policies will be implemented are addressed, but with extraordinarily broad and self-assumed discretion given to the NASA Administrator to develop them. Again, however, there is only the assumption that adequate legislative authority exists.

IV. THE *APOLLO* PROGRAM: HOW NOT TO PROCEED WITH A QUARANTINE PROTOCOL

The ICBC was established to coordinate activity in the United States relating to protection from back contamination. The enabling agreement distinguishes between regulatory agencies such as the Departments of Agriculture, Health, Education and Welfare, and the Interior, and other interested agen-

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where none were thought to be able to sustain carbon based organic life. Even in the deepest parts of the oceans, scientists are finding single cell and colonies of biota thriving in and around superheated thermal vents where the metabolic characteristics and requirements of living Earth organisms are in many ways significantly, if not completely, different from those of other Earth indigent life forms. Even in NASA's "clean rooms", such as the decontamination facility at the Jet Propulsion Laboratory in California, previously unknown Earth indigent microorganisms are being discovered and named, and unique metabolic activities of these microorganisms are being identified. For an excellent resource on the locations and characteristics of extremophiles, such as anaerobes, thermophiles, psychrophiles, acidophiles, and the like, particularly in the context of recognizing potential astrobiological life forms and their support systems, *see* The Astrobiology Web *available at* http://www.astrobiology.com/extreme.html (last accessed on May 31, 2005).

[41] 14 C.F.R. § 1211.103.

[42] Outer Space Treaty, *supra* note 2, at art. IX.

[43] 14 C.F.R. § 1211.103, *citing to* Management Instructions 1052.90 and 8020.13.

[44] 14 C.F.R §§ 1211.104 – 1211.108.

cies such as the regulatory agencies plus NASA and the National Academy of Sciences.[45] Only those federal agencies with direct statutory authority to promulgate quarantine regulations were designated as regulatory.[46] In contrast to these regulatory agencies, NASA has not been granted specific legislative authority to promulgate quarantine regulations. From this perspective, it is important to understand the political and procedural history of the quarantine regulations that NASA published for the *Apollo* program. On the very day *Apollo 11* began its historic journey to the Moon, NASA published its "Extraterrestrial Contamination" regulations in the Federal Register. These regulations established:

> a) NASA policy, responsibility, and authority to guard Earth against harmful contamination or adverse changes in its environment resulting from personnel, spacecraft, and other property returning to Earth after landing on or coming within the atmospheric envelope of a celestial body; and
>
> b) Security requirements, restrictions, and safeguards that are necessary in the interest of the national security.[47]

As noted previously, NASA did not publish its quarantine regulations until 16 July 1969, the day *Apollo 11* was launched. This is a procedure contrary to the APA, which states that "the required publication...of a substantive rule shall be made not less than 30 days before its effective date, except...as otherwise provided by the agency for good cause found and published with the rule."[48] The "good cause" stated by NASA was,

> In the light of the Apollo 11 space mission and the need to guard the Earth against extraterrestrial contamination, it is hereby determined that compliance with section 553 of Title 5 of the United States Code is impracticable and contrary to the

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[45] *See supra* note 7.

[46] The Department of Agriculture regulates pathogens that affect plant and certain animal life; the Department of Health, Education and Welfare (now the Department of Health and Human Services), with pathogens that affect humans; and the Department of the Interior that regulates the introduction of injurious species.

[47] 14 C.F.R. § 1211 (1969).

[48] 5 U.S.C. § 553(d)(3).

> public interest; therefore, the provisions of this Part 1211 are effective upon publication in the Federal Register.[49]

This was merely a restatement of the decision, not an explanation of why it was "impracticable" and "contrary to the public interest" for NASA to comply with the APA provisions.[50] Publication of the rule appears to have been delayed until the day of the launch of *Apollo 11* because it would have been contrary to NASA's interests to publish the regulations earlier and open them for public comment and discussion. If this was done, there was the possibility—albeit remote—of a restraining order and temporary injunction being imposed on the launch.[51] It is very likely that NASA acted in this fashion

> to minimize exposure to the back contamination issue to the public, [and] to ensure there was no program derogation [or launch delay], in the time-frame set for the Apollo 11 mission, caused by lengthy administrative procedures if the public were to be permitted consultative participation and/or scrutiny in the development of the back contamination standards and quarantine regulations.[52]

NASA relied on four other sources of "authority"[53] to reinforce the validity of its quarantine protocol and regulations: the

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[49] *See* 69 Fed. Reg. 8473, 34 Fed. Reg. 11975, 11976 (July 16, 1969), in which the NASA Administrator avoided the 30 days' notice of proposed rule making attendant to the start of the Apollo 11 mission (during which, according to the Administrative Procedures Act, the public and other interested parties/entities would be permitted to comment on the proposed rule). This was a "non-substantive statement" offered as an attempt to ensure the Apollo 11 launching would occur on time without delays that might be caused by what NASA officials considered might be "frivolous" and "uninformed" attempts to obtain restraining orders and the like.

[50] 5 U.S.C. § 553(d)(3).

[51] *See* George S. Robinson, *Contamination of Earth's Ecosystem*, *supra* note 8, at 149, n.202. *See also* George S. Robinson, *Earth Exposure to Martian Matter: Back Contamination Procedures and International Quarantine Regulations* 15 COLUM. J TRANSNAT'L L. 17, *see also*, George S. Robinson, *Return of Extraterrestrial Biota: Legal, Ethical and Moral Participation by the Public*, *in* 20 COLLOQUIUM ON THE LAW OF OUTER SPACE 430 (1977).

[52] *See* George S. Robinson, *Contamination of Earth's Ecosystem*, *supra* note 8, at 149, n.202. *See also* George S. Robinson, *Earth Exposure to Martian Matter*, *supra* note 51, and *see also* George S. Robinson, *Return of Extraterrestrial Biota*, *supra* note 51.

[53] 14 C.F.R. § 1211.103, which provides that the authority relied on for the quarantine regulations was "(a) Sections 203 and 304 of the National Aeronautics and Space

obligation to avoid harmful contamination of Earth and other celestial bodies;[54] criminal penalties for noncompliance with NASA regulations;[55] physical and national security interests;[56] and internal NASA policy dealing with back contamination issues,[57] and the quarantine authority of the Departments of Agriculture, the Interior, and Health, Education and Welfare (now Health and Human Services).

"In the exploration and use of outer space, including the Moon" signatories to the Outer Space Treaty are required "to avoid [its] harmful contamination".[58] Regarding "the environment of the Earth" they are required to "avoid...adverse changes...resulting from the introduction of extraterrestrial matter and, *where necessary* shall, adopt appropriate measures for this purpose".[59] At the time of *Apollo 11*, as is true now, the state-of-the-art did not permit absolute knowledge of the existence of extraterrestrial life forms on the Moon (and whether they would be harmful to Earth's biosystem or any of its component life forms). This could not be determined until after astronaut contamination with lunar material had occurred and they had been biomedically tested for harmful biotic and nonbiotic contamination under secure conditions in the Lunar Receiving Laboratory. The second factor, and perhaps the most limiting, is that the Outer Space Treaty cannot be considered self-executing.[60] Therefore, adequate authority does not exist in that source *generally* for the NASA Administrator to "adopt appropriate measures" for the purpose of safeguarding Earth from

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Act of 1958, as amended (42 U.S.C. 2473, 2455 and 2456, (b) 18 U.S.C.799, (c) Article IX, Outer Space Treaty, TIAS 6347 (18 UST 2416), (d) NASA Management Instructions 1052.90 and 8020.13."

[54] Outer Space Treaty, *supra* note 2, at art. IX.

[55] 18 U.S.C. § 799.

[56] 42 C.F.R. § 304, 18 U.S.C. § 799.

[57] NASA Management Instructions 1052.90 and 8020.13 (Aug. 24, 1967).

[58] Outer Space Treaty, *supra* note 2, at art. IX.

[59] *Id.* (emphasis added).

[60] "(4) An international agreement of the United States is 'non-self-executing' (a) if the agreement manifests an intention that it shall not become effective as domestic law without the enactment of implementing legislation." *See* RESTATEMENT (THIRD) OF FOREIGN RELATIONS LAW OF THE UNITED STATES § 111 (1987). Note the distinction between what is considered enabling *legislation* and implementing *regulation* in U.S. procedural law.

extraterrestrial contamination. Reliance on criminal sanctions[61] was also insufficient as a matter of law to support NASA's assertion of quarantine authority necessary to publish its quarantine regulations. The criminal regulation stated,

> [w]hoever willfully shall violate, attempt to violate, or conspire to violate any regulation or order promulgated by the Administrator of the National Aeronautics and Space Administration for the protection or security of any...facility...spacecraft, or similar vehicle, or part thereof...shall be fined under this title, or imprisoned not more than one year, or both.[62]

This provision was used as a mechanism for enforcing those regulations issued by NASA to protect or secure NASA facilities, and spacecraft. The initial lunar quarantine regulations were intended for the astronauts, other NASA employees, and various scientists and engineers assigned to conduct initial research regarding the returned lunar samples, as well as spacecraft and other government property. The authority NASA claimed may have been sufficient for the purpose of removing its own employees and equipment to the Lunar Receiving Laboratory for indefinite periods of "incarceration", but this authority was insufficient to grant general quarantine power over *all* potential "extraterrestrially exposed" persons and property.[63] Further, it is clear from a reading of these regulations that "security" was very likely intended to mean only "physical" security.

Similarly, 42 USC Sections 2455 and 2456 relate to preserving and enhancing the physical integrity and security of NASA *installations*. Section 2455 involves security investigations of NASA employees and contract personnel regarding access to sensitive data and installations.[64] Section 2456 permitted cer-

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[61] *See supra* note 55.

[62] *Id.*

[63] In 14 C.F.R. § 1211.102 (b) (1969), NASA defined "extraterrestrially exposed" as "the state or condition of any person, property, animal or other form of life or matter whatever, who or which has: 1. Touched directly or come within the atmospheric envelope of any other celestial body; or 2. Touched directly or been in close proximity to (or has been exposed directly to) any person, property, animal or other form of life or matter who or which has been extraterrestrially exposed."

[64] 42 U.S.C. § 2455.

tain NASA employees to carry firearms.[65] Clearly, these provisions were insufficient to serve as authority for NASA's quarantine protocol regulations.

The NASA Management Instruction 1052.90 incorporated the ICBC Interagency Agreement into NASA management policy.[66] NASA's reliance on its own internal directives as a source of authority to promulgate quarantine protocol regulations was nothing short of unauthorized promulgation of authority to quarantine that, in fact, did not exist.

NASA officials were fully aware of the relative potential for biological contamination associated with the *Apollo* program, and also its broad impact on public interest if these potential problems were made known. Although presently somewhat more attuned to and sophisticated about its responsibilities to involve the general public in developing outbound and back contamination control procedures, facilities, and contamination control protocols that involve robotics and humans coming in contact with the Moon, Mars, and other celestial bodies being explored *in situ*, NASA officials made decisions early in the development of the back contamination program that appeared to take note of the advice and concerns about the adequacy of that program expressed by interested non-NASA scientists. In fact, legal counsel at NASA felt that the Administrator, acting alone or in conjunction with other government officials (that is, certain agency members of the ICBC with limited and specific quarantine authority), did not have authority to enforce the quarantine of any contaminated persons or property. "Legislation," asserted counsel, "would be necessary to obtain this authority."[67] Nevertheless, another internal memorandum to the General Counsel opined in September of 1969 that,

> this [quarantine] power derives from a general Congressional delegation of authority to promote the general welfare to certain executive agencies, and from the inherent power of the

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[65] 42 U.S.C. § 2456.

[66] Management Instruction 1052.90 (Aug. 24, 1967).

[67] Internal NASA memorandum from Robert J. Wojtal, to the General Counsel, (Feb. 25 1969), shortly before the launch of *Apollo 11*, and entitled "Quarantine – Protection of the Earth from Lunar Contamination" (on file with author).

> executive to control access to the United States as part of the foreign affairs power of the executive, NASA partakes of both of these powers where they pertain to the space activities of the United States, and therefore of the authority to quarantine extraterrestrially exposed persons or materials.[68]

Based upon these two opinions, at a minimum the foundation may have been laid for an interested third party to seek a judicial declaratory judgment.

The ICBC member agencies with legislated quarantine authority had decided, *ad hoc*, to merge their respective quarantine authorities and delegated this "collective" quarantine authority to NASA for the purpose of issuing its own quarantine regulations. Accordingly, NASA took the position that if one of the ICBC members with quarantine authority exercises that authority and quarantines an extraterrestrially exposed person, property, animal, or other form of life or matter whatever, NASA will not exercise its own rather pallid authority to quarantine that same extraterrestrially exposed person, property, animal, or other form of life or matter whatever.[69]

A. Constitutional Concerns with NASA's Quarantine Regulations...Then and Now

The fact that the Outer Space Treaty is not self-executing required that legislation be enacted to implement the Treaty.[70] Congress has the power "to make all laws which shall be necessary and proper for carrying into Execution...all other powers vested by this Constitution in the Government of the United

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[68] Memorandum from Joseph W. Dellapenna, to the NASA General Counsel (Sept. 2, 1969, entitled "[T]he basis of NASA's Authority to Quarantine Extraterrestrially Exposed Persons and Materials" (on file with author).

[69] 14 U.S.C. § 1211.105 – Extraterrestrial Exposure – Relationship with Departments of Health, Education, and Welfare and Agriculture.

[70] Very early in the history of American jurisprudence, Chief Justice John Marshall stated his view that a treaty is not self-executing if "the terms of the [treaty]...import a contract, [and] when either of the parties engages to perform a particular act, the treaty addresses itself to the political, not the judicial department; and the legislature must execute the contract before it can become a rule for the Court." Foster v. Nelson, 27 U.S. 253, 314 (1829).

States, or in any Department or Officer thereof."[71] The Congress, therefore, has the authority to enact legislation necessary and proper for the execution and implementation of a treaty properly made by the President with the advice and consent of the Senate.

The issue, then, is whether the Administrator of NASA, acting alone or in conjunction with other Government officials, had then and has now the authority to (1) apprehend, detain, examine, decontaminate, and quarantine individuals; and (2) seize, examine, decontaminate, condemn, and destroy animals, or other forms of life or property, if such individuals, animals, or property should, through design or by accident, be exposed to extraterrestrial matter obtained by, or involved in, a NASA space mission. The issue of whether the extraterrstrial exposure involves *harmful* contamination is not addressed and settled.

The NAS Act provides that NASA may "[i]n the performance of its functions...make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of the power vested in it by law".[72] The Congressional Record indicates that the intent was to give NASA broad authority, enabling it to "carry on a wide spectrum of activities which relate to the successful use of outer space."[73] It seems very unlikely that this general, vague, and at times ambiguous, language was meant to include the highly contentious and troublesome authority to quarantine property and particularly people, given its history of abuse throughout the world and in the early history of American politics. Since the act of quarantine carried out by NASA would involve the detention and incarceration not only of Government employees and property but of private individuals as well, it is an extreme stretch to interpret Congressional intent as giving the NASA Administrator *carte blanche* authority in this area without more specifically delineated constraints, especially since it involves the issue of deprivation of liberty and property that is protected by the Constitution.

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[71] U.S. CONST. art I, § 8, cl. 18.
[72] 42 U.S.C. § 2473(c)(1).
[73] H.R. REP. NO. 2166, 85th Cong. (2d Sess. 17 1958).

Whenever the U.S. Congress has legislated authority to quarantine, such authority has been the subject of well-defined procedural constraints.[74] Without the necessary delegation of specific authority by the Congress, NASA, an independent Executive Branch agency, was in effect legislating for the Congress when it promulgated and published its quarantine regulations. Additionally, NASA confronted the Judicial Branch with perhaps the most controversial provisions of its quarantine regulations, such as those concerning NASA's response to court orders:

> a. NASA officers and employees are prohibited from discharging from the limits of a quarantine station any quarantined person, property, animal or other form of life during an announced quarantine period in compliance with a subpoena, show cause of any court or other authority without the prior approval of the General Counsel and the Administrator.
>
> b. Where approval to discharge a quarantined person, property, animal in compliance with such a request, order or demand of any court or other authority is not given, the person to whom it is directed shall, if possible, appear in court or before the other authority and respectfully state his inability to comply, relying for his action upon this Sec. 1211.107.[75]

NASA's failure to submit to legal process regarding implementation of its quarantine regulations seems to put the Executive Branch on a collision course with the Judiciary, creating a separation of powers controversy of the first magnitude. Combined with NASA's encroachment into the Legislative Branch, these

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[74] *See, e.g.*, 21 C.F.R. § 1240 (Control of Communicable Diseases; Food and Drug Administration, Department of Health and Human Services); 42 C.F.R. Parts 71 and 72 (Foreign Quarantine and Interstate Shipment of Etiologic Agents; Public Health Service, Department of Health and Human Services); 9 C.F.R. Parts 49 – 124 (Cooperative Control and Eradication of Livestock or Poultry Diseases; Interstate Transportation, Exportation and Importation of Animals and Animal Products; Viruses, Serums, Toxins, and Analogous Products; Organisms and Vectors); 7 C.F.R. Part 301 (Domestic Quarantine Notices; Animal and Plant Health Inspection Service, Department of Agriculture); 7 C.F.R. Part 340 (Introduction of Organisms and Products Altered or Produced Through Genetic Engineering which are Plant Pests or Which There is a Reason to Believe are Plant Pests; Animal and Plant Health Inspection Service, Department of Agriculture).

[75] 14 C.F.R. § 1211.107.

two separation of powers issues would probably be sufficient to invalidate the regulations upon judicial review.

B. *The Constitution, the U.S. Supreme Court and Police Power*

Since the U.S. Supreme Court has consistently upheld the authority of a state to make reasonable quarantine regulations under the state's exercise of its police power, and since the Court also has recognized that it would be proper for the Congress to enact quarantine legislation,[76] there is no bar to enactment of such legislation. Apparently, the authority that the Congress has exercised in enacting provisions such as 42 U.S.C. 264,[77] is the authority "[t]o regulate commerce with foreign nations, and among the several states..."[78] and "[t]o make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers and all other Powers vested by this Constitution in the Government."[79]

There has been no direct confrontation before the U.S. Supreme Court regarding Congressional exercise of the quarantine authority and that of the "right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures;"[80] the right not to "be deprived of life, liberty, or property, without due process of law,"[81] and the proscription that "[n]ether slavery nor involuntary servitude...shall exist within the United States, or any place subject to their jurisdiction."[82]

The U.S. Supreme Court has heretofore held Constitutional various state quarantine provisions that deal with an actual communicable disease, while any proposed quarantine legisla-

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[76] *See* Compagnie Francaise de Navigation a Vapeur v. Louisiana State Board of Health, 186 U.S. 380 (1902). *See also* Morgan's Steamship Co. v. Louisiana Board of Health, 118 U.S. 455 (1886); Francis A. Benton v. Curtis Reid, 231 F. 2d 780 (D.C. Cir. 1956).

[77] 42 U.S.C. 264 (The Public Health Service General Powers And Duties Quarantine And Inspection).

[78] U.S. CONST. art. I, §. 8, cl. 3.

[79] *Id.* at art. I, §. 8, cl. 18.

[80] *Id.* at amend. IV.

[81] *Id.* at amend. V.

[82] *Id.* at amend 13, § 1.

tion applicable to planetary contamination, outbound and back contamination, would not; there would be only speculation at this point in time, a possibility, that contaminated materials carry communicable diseases or may otherwise endanger Earth's biosphere or potential biospheres of other celestial bodies. Bearing this distinction in mind, the issues arise whether (1) seizure pursuant to future legislation would be unreasonable and therefore in conflict with the 4th Amendment; (2) the permitted seizure, examination, decontamination, and detention of contaminated persons or property would be an arbitrary, capricious, and unreasonable act with no reasonable relation to a legitimate legislative purpose and, therefore, prohibited by the 5th Amendment; (3) procedures invoked in the quarantine are not suitable and proper and thus do not meet the procedural due process requirement of the 5th Amendment; and (4) whether the quarantine of contaminated persons results in an involuntary servitude prohibited by the 13th Amendment.

C. The Quarantine Regulations and "Due Process"

The NASA quarantine regulations include the following definition:

> (c) Quarantine means the *detention, examination* and decontamination of any person, property, animal or other form of life or matter whatever that is extraterrestrially exposed, and *includes the apprehension or seizure of such person*, property, animal or other form of life whatever.[83]

Although the term "incarceration" is rarely used in United States law, it does appear occasionally in statutes. When so used, it always appears to mean confinement by competent public authority under due legal process. "Imprisonment," however is the act of "...confining a man in prison; the restraint of man's personal liberty; coercion exercised upon a person to prevent the free exercise of his powers of locomotion."[84] Further, the act or

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[83] 14 C.F.R. § 1211.102 (c) (emphasis added).

[84] For a definition of "imprisonment," *see* BLACK'S LAW DICTIONARY 370 (4th ed. 1951). For a definition of "confinement," *see* BLACK'S LAW DICTIONARY WITH

status of *confinement* "may take place without the actual application of any physical agencies of restraint [such as locks or bars], but by verbal compulsion and display of available force."[85]

Additionally,

> "[I]mprisonment" may be accomplished by a private person as well as competent public authority. If the imprisonment is unjustified, it comes from [t]he unlawful arrest or detention of a person without a warrant, or by an illegal warrant, or a warrant illegally executed, and either in a prison or a place used temporarily for that purpose, or by force and constraint without confinement...[F]alse imprisonment consists in the unlawful detention of the person of another, for any length of time, whereby he is deprived of his personal liberty.[86]

If quarantine confinement is by competent authority, or pursuant to due process, then the act may be referred to as incarceration and is, therefore, legitimate. However, "competent" has been defined in the present context as "having sufficient ability or authority; possessing the requisite physical, mental, natural or legal qualifications."[87] In addition, "competent authority" has been defined, in application to courts and public officers, as having "jurisdiction and due legal authority to deal with the particular matter in question."[88] If specific quarantine legislation or other sources of authority do not permit detention for the purposes detailed in NASA's regulations on extraterrestrial exposure, it can be argued that "competent authority" does not exist for the quarantine of extraterrestrially exposed people, objects and any other matter whatever. Additionally, the provision that "[t]he quarantine may be used only on a determination, *with or without a hearing*, that there is probable cause to believe that such person, property, animal or other form of life or matter whatever is extraterrestrially exposed"[89] may violate

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PRONUNCIATIONS, 757 (6th ed. 1990). *See also*, Dupler v. Seubert, 230 N.W. 2d 626, 631 (Wis. 1975).

[85] BLACK'S LAW DICTIONARY, *supra* note 84.

[86] BLACK'S LAW DICTIONARY, *supra* note 84.

[87] *Id.* at 284.

[88] *Id.*

[89] 14 C.F.R. § 1211.104 (emphasis added).

the due process guarantees of the 5th Amendment of the U.S. Constitution.

Without specific quarantine authority to examine and decontaminate a potentially exposed person (for example, but not exclusively, an individual or material accidentally or incidentally coming into contact with an individual, equipment or material who or that has been exposed intentionally as part of a particular mission and who or that may have become *potentially* contaminated through unintended sequential exposure), the issue arises whether anything more than isolation and detention is an abuse of police power, especially if the individual or material detained is forced to submit to examination and decontamination. To make the circumstances even more questionable, without certainty as to what pathogen, toxin, etc., is being sought, such examination and decontamination could be a lengthy process. These and other due process issues arise when considering the past NASA quarantine regulations. They must be avoided in formulating new regulations.

The essential guarantee of the due process clause of the 5th Amendment is that the Government may not imprison or otherwise physically restrain a person, except in accordance with specific and fair procedures. Although the due process clause of the 5th Amendment is concerned primarily with procedures used in the context of restraining, imprisoning, indicting, and convicting someone of a crime, it in fact covers all governmental deprivations of liberty.

While the required statutory authority may differ depending upon the type of action, government can never impose substantial physical restraints on an individual without establishing a procedure to determine the factual basis and legality of such actions. In *Addington* v. *Texas*,[90] the U.S. Supreme Court determined that an adult could not be involuntarily committed to a psychiatric institution on burden of proof that requires the State merely to show by a "preponderance of the evidence" that the person is dangerous to himself or another. Although the Court did not require a "beyond reasonable doubt" standard, it

[90] Addington v. Texas, 441 US 418 (1979).

held that trial courts must at least use a "clear and convincing" evidence standard. Quarantine proceedings are arguably comparable to those of civil commitment, since neither is criminal and both are related to public health and safety. As such, they both should require the same burden of proof, that is, "clear and convincing evidence," as the applicable standard.

The NASA quarantine regulations relied on in the past allow the Administrator of NASA to quarantine an individual "based only on a determination, with or without the benefit of a hearing, that there is *probable cause* to believe that such a person...is extraterrestrially exposed"[91]. Although the definitions may vary from case to case and court to court, "probable cause" has been defined in Black's Law Dictionary as "[r]easonable cause; having more evidence for than against."[92] Therefore, it would appear that procedural due process would not have been afforded to individuals who are quarantined under these regulations since the burden of proof for the government is not more than a "preponderance of the evidence."

The NASA quarantine regulations were often vague and non-specific. For example, they required simply that the Administrator "shall in his discretion...[d]etermine that a particular person...is extraterrestrially exposed and quarantine such person...."[93] Nowhere is the basis for this deprivation of liberty defined in terms of the types of pathogens being sought, or reasons for believing that the individual is contaminated or infected at all. Under the regulations, the Administrator,

> in his discretion shall [h]old such hearings at such times, in such manner and for such purposes as may be desirable or necessary under this part, including hearings for the purpose of creating a record for use in making any determination under this part or for the purpose of reviewing any such determination.[94]

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[91] 14 C.F.R.§ 1211.104(3) (emphasis added).
[92] BLACK'S LAW DICTIONARY 1201 (6th ed. 1999).
[93] 14 C.F.R. § 1211.104(7).
[94] *Id.*

Again, the regulations provided no guidance as to the content of hearings or what right of appeal there might be from a decision of the Administrator. In short, since the Administrator is not authorized by legislation to quarantine, it is highly questionable whether the ultimate confinement of person or property by a duly authorized NASA quarantine officer can be accomplished within the constraints imposed by the 4th and 5th Amendments of the U.S. Constitution.

Finally, responding to the original question whether it is unreasonable or arbitrary to seize and otherwise deprive contaminated persons of liberty or to deprive persons of contaminated property by quarantine, it may be assumed, based on current scientific data, that no reasonable person could contend at this time that Earth's immediate ecosystem is immune from the danger of extraterrestrial contamination. Precisely because the danger of adverse or harmful contamination of Earth's biosphere is unknown, and because the possibility exists that extraterrestrial biota may possess pathogenic disease characteristics unknown to humans, it is persuasively reasonable to permit seizure and quarantine in this *sui generis* situation but only under tightly controlled conditions. Relatively unconstrained regulatory quarantine and enforcement authority residing in one government official, here the NASA Administrator, is not altogether persuasively reasonable. Therefore, since the 4th and 5th Amendments proscribe unreasonable seizures[95] and arbitrary, capricious and unreasonable acts with no reasonable relation to a *legitimate legislative* purpose,[96] *proper* quarantine legislation so giving rise to NASA's quarantine policies and regulations would not violate the U.S. Constitution.

If what is required by the procedural due process aspect of the 5th Amendment is "that kind of procedure...which is suitable and proper to the nature of the case, and sanctioned by the established customs and usages of the courts",[97] then this re-

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[95] Carroll et al. v. United States, 267 U.S. 132, 147, 149 (1925).

[96] Darrell V. Boylan v. United States, 310 F.2d 493, 498-499 (9th Cir. 1962) *cert. denied*, 372 U.S. 935 (1963). *See also Compagnie Francaise*, 186 U.S at 393.

[97] *Ex Parte* Wall, 107 U.S. 265, 289 (1883). *See also* Cafeteria & Restaurant Workers Union v. McElroy et al., 367 U.S. 886, 895 (1961).

quirement may be met by specific and carefully crafted legislation. In brief, the procedure envisaged would be an administrative determination based on probable cause that the person or material had been contaminated. This determination undoubtedly would be reviewable on application for a writ of *habeas corpus*, though the quarantined person would not be permitted to appear before the court.[98]

If, then, a person is deprived of liberty or property with due process of law, it appears that legislation could not be successfully contested on the ground that the quarantined person is thus required to perform an involuntary servitude proscribed by the 13th Amendment. The argument would be specious. Insofar as a person's liberty is denied, it would be accomplished with due process of law in accordance with the 5th Amendment; and insofar as the 13th Amendment proscribes involuntary servitude, no enforced compulsory service or labor would be required under such new legislation. In short, although proper and sufficient legislative authority underlying NASA's old quarantine regulations did not exist, and does not exist at present for new quarantine regulations, there appears to be no Constitutional obstacle to passage of necessary authorizing legislation by the Congress to accommodate this *sui generis* situation.

D. The Law and "Takings" under the Constitution

The Fifth Amendment of the U.S. Constitution provides that "private property [shall not] be taken for public use, without just compensation."[99] Ownership, use, and transfer of private property of all types are rights, not benefits or privileges bestowed by the government. Of course, governments have the obligation to govern *lawfully*; thus, the rights of property owners are not absolute and the government may, within prescribed limits, regulate the use of property. Where those regulations amount to a taking of private property, governments must pay

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[98] *See* 28 U.S.C. §§ 2241-2255 (for applicable provisions dealing with the writ of *habeas corpus*). *See also* United States v. L. Thomas Shinnick, 219 F. Supp. 789 (E.D.N.Y. 1963).

[99] U.S. CONST. amend. V.

the owner for the property rights abridged. The fact that a government's actions are otherwise constitutionally authorized does not mean that those actions cannot effect a taking. However, such a taking must be for a public purpose within the government's Constitutional authority, and only then on the payment of just compensation.

Government actions taken specifically for purposes of protecting public health and safety ordinarily are given greater latitude by courts before their actions are considered to be takings. Where public health and safety are the asserted regulatory purposes, the health and safety risk posed by the property use to be regulated must be identified with as much specificity as possible and should be "real and substantial". That is, it must be more than speculative and must present a genuine risk of harm to public health and safety.

Any action to regulate property use, through seizure and quarantine, for public health and safety purposes must, to avoid a taking, specifically be designed to counter the identified risk and must substantially advance those public health and safety purposes. The action also must, within the limits of available technology and information, be no more restrictive than necessary to alleviate the health and safety risk created by the use to be regulated.

In assessing whether quarantine or confiscation is for the protection of the public health and safety, some of the following factors should be examined:

> (1) The certainty that the property use to be regulated poses a health and safety risk in the absence of government action; and
>
> (2) The severity of the injuries to public health and safety should the identified risk materialize, based on the best available information at the time the risk is undertaken.

From the perspective, then, of a "takings" implication analysis, the greater the certainties of the severity, the more stringent measures are justified. Although the ideal is that the response taken to counter the risks is no greater than the risk posed, this presupposes that appropriate technology and information are

available. That information for the MSR mission and the later human mission to Mars is not available! Until it is, development and application of quarantine protocols, necessary legislation, implementing regulations, and applicable treaties must be developed hand-in-glove with the scientists, engineers, program and project managers, and particularly with program and project budget officers involved. It is not enough for the legislators and the lawyers to await the final MSR mission program approval before taking tangible steps to ensure any quarantine laws and takings are fully consistent with applicable law. To do otherwise would invite, as it did with the *Apollo* and Lunar Surface Sample Return missions, political answers and regulatory bootstrapping more harmful, perhaps, than the actual risk of harmful and adverse outbound and back contamination consequences.

E. Contamination and Quarantine: Space Treaties and Other International Law

Regarding international collaboration and regulation of space activities, there is an affirmative duty set forth in the Outer Space Treaty requiring States-Parties to "immediately inform the other States Parties...or the Secretary-General of the United Nations of any phenomena they discover in outer space...which could constitute a danger to the life or health of astronauts."[100] This duty is required only when a *potential* danger becomes apparent. In the circumstances of outbound and back contamination, the *potential* for danger or harm is becoming, albeit slowly, increasingly apparent primarily through ongoing robotic exploratory missions.[101]

The Outer Space Treaty, Article IX,[102] addresses the need of States-Parties to be

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[100] Outer Space Treaty, *supra* note 2, at art. V.

[101] The potential for harmful cross and back contamination from mutated Earth indigent biota in the *International Space Station* is being assessed in varying degrees of urgency, principally as part of ongoing biomedical evaluations of astronauts and biological scientific experiments on board the station.

[102] Outer Space Treaty, *supra* note 2, at art. IX.

> ...guided by the principal of co-operation and mutual assistance and shall conduct all their activities in outer space...with due regard to the corresponding interests of all other States Parties....[103]

Article IX then goes on to provide, as indicated previously, that Parties to the Treaty shall explore space and celestial bodies so as to

> avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, *shall adopt appropriate measures for this purposes*.[104]

Clearly, then, the Outer Space Treaty is not self-executing, at least with respect to Article IX. No additional specific legislation was adopted in the United States for implementing this provision of the Treaty.

One of the most important requisites of Article IX is that cooperation and mutual assistance *shall* be the guiding principle. Concisely, States-Parties to the Treaty are bound to prevent harmful effects to Earth's biosphere through back contamination. Cooperation and mutual assistance presuppose, at a minimum, multilateral consultations regarding standards and procedures to be followed. The wording requiring States to "adopt appropriate measures for this purpose" is sufficiently inclusive to be directed at several or all States Party to the Treaty or in the absence of conclusions based on multilateral consultations, each launching or otherwise responsible State must take appropriate measures *unilaterally*. But it may well be that in the absence of any specific agreement, U.S. quarantine regulations, assuming they are properly authorized by the Congress, may be recognized under international law as applied to non-U.S. citizens on the high seas, in foreign territory, in international airspace, and in outer space on celestial bodies, or the *International Space Station*.

The obligation under Article IX also requires that,

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[103] *Id.*

[104] *Id.* (emphasis added).

> [i]f a State Party...has reason to believe that an activity or experiment planned by it or its nationals in outer space...would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.[105]

Outbound contamination control is integral to understanding the requirements for back contamination control procedures, i.e., it is essential to know that Earth biota taken to Mars, for example, is properly inventoried and not mistaken for Mars biota, or has not mutated into a new and unknown type or paraspecies. So, the requirement for consultation was included in part to cover the biotic threat from wherever it might come. Although the threat to Earth of contamination by non-Earth indigent organisms was originally thought to be remote, contamination from irradiation-induced mutants of Earth biota was and continues to be a seriously considered possibility. The consultations required in by the Outer Space Treaty[106] have been increased and enhanced through the more focused and intense coordination with the COSPAR by nations conducting and planning space activities.

Of principal concern, regarding the international obligations of States-Parties to coordinate their treaty activities in a way that diminishes the potential for harmful back contamination, is Article V of the Outer Space Treaty which requires astronauts be "safely and promptly returned to the State of registry of their space vehicle."[107] Among other possible reasons, it may be presumed that the prompt return requirement means that recovered astronauts and equipment are not held captive for political purposes and technical and military analyses by other nations prior to return to the country of origin. This, of course, can raise the issue of whether the prompt return of astronauts clause would supersede quarantine measures designed to prevent the potential international threat to Earth's environment and the public health.

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[105] *Id.*
[106] *Id.*
[107] *Id.* at art. V.

F. The Rescue and Return Agreement

Leaving aside for the moment the role of COSPAR in developing and coordinating outbound and back contamination control standards, criteria, and procedures to protect against creating adverse conditions (health of animals and plants) caused by harmful back contamination with non-Earth as well as Earth indigenous mutated pathogenic life forms, the real focal point for establishing effective contamination barriers and quarantine protocols is in the international arena. The role of international waters creates jurisdictional issues that require assessment of certain sovereign activities on the high seas in the past that could provide much precedence for how to conduct and even whether to conduct a search for extraterrestrial life, and for assessing and resolving planetary protection issues in the future. At present, however, it is necessary to review the influence and impact of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space[108] on any domestic and international back contamination regulations.

The Rescue and Return Agreement does not define the astronaut return criteria found in the Outer Space Treaty, although the language is the same, that is, astronauts shall be "safely and promptly returned." No guidance is given when safety or promptness is to take precedence. However, relating only to the return of objects launched into space, the Rescue and Return Agreement indicates an overriding concern for safety. Article 5(4) provides that,

> a Contracting Party which has reason to believe that a space object or its component parts discovered in territory under its jurisdiction, or recovered by it elsewhere, is of a hazardous or deleterious nature may so notify the launching authority, which shall immediately take effective steps, under the direc-

[108] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119 (effective Dec. 3, 1968) [hereinafter Rescue and Return Agreement].

> tion and control of the said Contracting Party, to eliminate possible danger of harm.[109]

This provision requires launching parties[110] to minimize the risks posed by nuclear powered satellites and radioactive component parts, but may be inferred as encompassing contamination hazards inherent in explore-and-return space missions. This provision was drafted to cover situations such as the Canadian claim against the former Soviet Union for damage to the environment caused by the *Cosmos 954* accident, which occurred when the orbit of the *Cosmos 954* decayed causing it to re-enter the atmosphere and strew hazardous radioactive debris across a large portion of Canada.[111]

Particularly significant to the promulgation and implementation of U.S. and international quarantine regulations applied outside the territorial, *in rem*, or *in personam* jurisdiction of any nation, is the determination of four issues. They are (1) whether non-citizens of a launching state(s) who assist in the rescue of astronauts and equipment are subject to United States quarantine; (2) whether the Return and Rescue Agreement does, in fact, recognize the legitimacy of applying quarantine procedures (including temporary incarceration, at least as between contracting parties) to non-citizens who are exposed to extraterrestrial matter by assisting astronauts in distress; (3) whether international recognition of rights and obligations in the rescue and prompt return of astronauts also includes the necessity of applying extraterritorially, unilaterally promulgated quarantine regulations in the absence of internationally promulgated regulations; and (4) whether recognition of the need for regulations presupposes the necessity of sanctioning provisions as a means

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[109] *Id.* at art. 5(4).

[110] The definition of "launching party" is more fully developed in the subsequent space treaties. *See* Convention on Registration of Objects Launched in Outer Space, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[111] *See* Amanda L. Moore and Jerry V. Leaphart, *Manipulation and Modification of the Outer Space Environment: International Legal Considerations* 25 COLLOQUIUM ON THE LAW OF OUTER SPACE 15, 16 (1982). *See also* Michael Bein, *Star Wars & Reactors in Space: A Canadian View* (1986) *available at* http://www.animatedsoftware.com/spacedeb/canadapl.htm (last visited June 15, 2005).

of enforcing the regulations, assuming domestic jurisdiction can be had over alleged offenders.

Several of the salient, and in the present context pertinent, provisions of the Return and Rescue Agreement appear ambiguous and inconclusive.[112] For example, it is not clear *who* must be rescued, assisted and returned; who must be returned *promptly*; what *conditions justify* delay in the return of astronauts; and in what *manner* the astronauts must be returned. Ambiguities can be seen in the fact that both the Outer Space Treaty and the formal title of the Return and Rescue Agreement refer specifically to *astronauts*, while the substantive provisions of the Return and Rescue Agreement speak of spacecraft *personnel*. Obviously, in the latter instance, the coverage regarding who must be returned promptly is much broader than implied simply by the word "astronaut." For internal political reasons, NASA initially defined "astronaut" as that member of a spacecraft crew authorized to navigate the craft. It was a question of whether "payload specialists" and other specialists on board for specific limited tasks would be qualified as that special breed known as the "pilot astronaut" comprising NASA's *Astronaut Corps*, with separate and distinct recognition. Definitions varied from country to country, and the terminology in domestic enabling legislation as well as in the various space treaties was not always consistent. "Personnel" can include anyone else officially assigned to the spacecraft, such as payload specialists, scientists, physicians, technicians, mechanics, surface crews during errant recovery operations, and the like. From another perspective, "personnel" would not cover unauthorized passengers and, in the not so distant future, commercial passengers in the form of scientists traveling by space shuttle to the *International Space Station* or other orbiting habitat...and, indeed, a tourist.

Although not all the ambiguities in, and inconclusiveness of, some of the Return and Rescue Agreement provisions are of

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[112] *Compare* R.C. Hall, *Comments on Rescue and Return of Astronauts on Earth and in Outer Space*, NASA A69 – 37115, wherein it is observed at p. 115 that "[t]he rights and duties of States with respect to rescue and return of astronauts who have crash-landed on Earth are carefully drawn, and it does not appear that there are any foreseeable circumstances of astronaut-emergency on earth not covered in these articles."

practical importance, several are. For example, is a contracting state compelled to return a non-astronaut crew member promptly? Must an astronaut always be considered an official crew member? Is a passive passenger considered a crew member? Is there an official difference between astronaut and astronaut pilot? Does NASA have different definitions and, if so, for what specific purposes? Do other nations have differing definitions of "astronaut"? Will these definitional discrepancies have an effect on quarantine protocols and procedures adopted by COSPAR or nations establishing their own quarantine protocols and implementing regulations? If the contracting State to the Return and Rescue Agreement also is a party to the Outer Space Treaty, is it not required by Article IX either to apply its own adequate quarantine procedures and regulations, or in the absence of such, to return the "personnel" promptly to ensure adequate application of quarantine procedures by the launching or other responsible state? What if the launching state or other responsible participant in a given mission has imposed standards for detention and quarantine that are more stringent than those adopted by COSPAR? Must the lesser standards be applied?

A Contracting State is obligated to pursue all "possible steps" and render "all necessary assistance" only if a spacecraft landing occurs in territory under the sovereign jurisdiction of such State.[113] Should there be any dispute as to what constitutes assistance that is necessary and steps that are possible to take, including measures to protect Earth's biosphere from harmful back contamination, it would appear that the State rendering assistance is the final arbiter as to what quarantine measures are satisfactory.[114] Such a decision would be consistent with the

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[113] Return and Rescue Agreement, *supra* note 108, at art. 2. Pursuant to Article 3 of the Agreement, the sole obligation of a Contracting State to spacecraft personnel located on the high seas or any other place not under the jurisdiction of another State is to *extend assistance if in a position to do so* and if such assistance is necessary to ensure *speedy recovery*. *Id.* at art. 3.

[114] Even though a State rendering assistance might be bound legally by the COSPAR contamination criteria and relevant quarantine protocol, it is not difficult to envisage such a State assessing and determining that the risk of harmful back contamination is sufficiently slight, when compared with the advanced technology available by seizing

requirements of Article IX of the Outer Space Treaty. In the absence of quarantine procedures and other measures for protecting against the possibility or probability of harmful back contamination promulgated or agreed to (such as those established by COSPAR) by the State rendering assistance, the minimum requirements would appear to be those of the launching State, or at least a prompt return of astronauts, personnel, and space equipment and objects to the launching State for the earliest implementation possible of quarantine procedures. By then, of course, the risk of contamination to others will have spread.

Even if the obligations of a State-Party under the Rescue and Return Agreement is reasonably clear, situations may occur in which the prompt return may either be physically impossible or legitimately argumentative as to the procedures for return. For example, this may occur in situations where the government rendering assistance is not recognized by the launching State, or the launching State does not recognize the State in a position to render assistance. In short, political relationships, as well as more practicable obstacles, can easily frustrate effective implementation of back contamination protection programs, especially those in which immediate notification and very prompt return of astronauts and space objects are deciding factors in the success of such programs.[115]

Dr. Gennady P. Zhukov early on emphasized the fact that the Return and Rescue Agreement is "in full conformity with the principles of the Space Treaty of...1967." [116] For this reason, stated Zhukov, "the regulations of the Agreement on the rescue are closely tied up with the principles of the Space Treaty of...1967, and should be regarded in the light of those principles."[117]

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and examining the astronauts and their equipment, that the consequences of ignoring the Rescue and Return Treaty would be a small price to pay.

[115] Other issues that could easily frustrate back contamination control measures used to implement quarantine procedures, and the like, include (1) astronaut requests for political asylum, and (2) the diplomatic inflexibility to resolve problems when military personnel and equipment are involved in a highly classified mission and are the subject of a rescue and return situation.

[116] Gennady Petrovich Zhukov, *International Cooperation on the Rescue of Astronauts,* 11 COLLOQUIUM ON THE LAW OF OUTER SPACE 124 (1968).

[117] *Id.*

If States are required to interpret, as Zhukov implies, the provisions of the Rescue and Return Agreement within the dictates of the Outer Space Treaty, it appears that Article IX of the Outer Space Treaty would be one of the controlling provisions and that "all possible" steps and "all necessary" assistance would be rendered in a fashion to protect Earth's biosphere from harmful back contamination. For example, the most effective back contamination program and quarantine procedures available would be accommodated by the State effecting assistance to spacecraft personnel and space objects in distress.

Zhukov enhanced this possible interpretation of the Return and Rescue Agreement by observing that,

> one could not but take into account the fact that the technical facilities of different states are far from being the same and so not every state is capable of carrying out the necessary operations, ensuring a quick and effective rescue of the personnel of a spacecraft. It is possible that a spacecraft crew makes an emergency or unintended landing in territory of a state which will have the necessary technical facilities (for example helicopters) for the search and for the rescue, while the state, which launched the spacecraft, *has skilled personnel and corresponding transportation, technical, and other conveniences for the rescue operations*. The help of the state, which launched the spacecraft...may become necessary. The Agreement has provisions committing the state, which launched the spacecraft, to cooperate with the country, on whose territory the spacecraft landed, for the effective accomplishment of the search and rescue operations.[118]

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[118] *Id.* at 128 (emphasis added). *See also* Hall, *Comments on Rescue and Return, supra* note 112, at 119 (wherein the author states that politics and the cost of assisting in rescue may be justifiable grounds for not honoring the Agreement on Rescue and Return). In anticipation of effective work and jurisdiction over back contamination programs in the future by COSPAR, Dr. G.P. Zhukov noted in 1967 that an international organization for the rescue of astronauts in outer space is justified on the basis of overwhelming costs and the time element of "emergency" in rescuing astronauts in distress. Gennady Petrovich Zhukov, *International Rescue Service for Space Travelers*, MOSCOW NEWS, No. 6, Feb. 18-25, at 6. It should be noted also that while the Return and Rescue Agreement does provide for the rescue and rendering of assistance to astronauts in distress in space and on celestial bodies, such provisions are clearly subordinate to those for the rescue and safe return of astronauts on the surface of Earth. They are inade-

Although back contamination criteria and quarantine protocols were not foremost in Zhukov's mind at the time, his observation remains valid and important for current outbound and back contamination programs of spacefaring nations. Its importance is threefold in nature. First, it recognizes that not all States have the technological capability and equipment to effect a rapid and efficient rescue, and that some States, at least the launching State, do have the capability. Second, it recognizes that more than simple recovery of astronauts is contemplated, that is, sophisticated equipment that could easily imply mobile-type quarantine facilities to implement a future back contamination program in situations involving errant and emergency landing procedures. Third, Zhukov's statement was closest to public recognition of the need of a State offering rescue assistance to accommodate quarantine procedures, if not attendant sanctions for criminal violations. The same would hold true for the launching State. One would suspect that COSPAR criteria and rules for quarantine and other aspects of a back contamination program would be sufficient to rectify these concerns, at least for United Nations signatories and those nations which adopt those criteria and rules. However in confirmation of the groping directions being pursued not only at the time of the *Apollo* missions, but also for the present circumstances in many respects, Zhukov described his prescient concern for the physical well-being of astronauts and cosmonauts when he stated that,

> [t]he personnel of a spacecraft should be under the Agreement on the rescue, safely and promptly returned to representatives of the state, which launched the spacecraft. But what is to be done if the health of one of the...crew does not permit him to be moved? It seems to us that in that case the state, on whose territory is the injured member of the crew, should provide the necessary care and give the government of his country the chance to send medical personnel and to render any other necessary help. *The question of the procedure and the time of the*

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quate and ambiguous, and not at all responsive to accommodating any quarantine requirements established in furtherance of Art. IX of the 1967 Outer Space Treaty.

return of such member of the crew home should be settled by the government of the country whose citizen he is.[119]

From this, it would appear that at least one source recognized very early on the need for, if not efficacy of, international applicability of the quarantine protocol and implementing regulations promulgated by NASA. At this point in time, outbound back-contamination procedures to protect Earth and Mars from harmful contamination rests primarily on what NASA's Office of Planetary Protection and its foreign counterparts formulate and approve under the auspices primarily of the COSPAR. The great majority of that work is being conducted without a strong sense or awareness of the constraints imposed by existing international treaties and agreements, such as the Return and Rescue Agreement. The same holds true, at least in the United States, for the deficiencies in applicable domestic law.

G. The Space Liability Convention: Damages after the Damages

The *Convention on International Liability for Damage Caused by Space Objects*[120] places liability on launching parties for damages caused by their space activities. The Treaty attempts to ensure that injured parties collect some form of damages from the launching party(ies). It also emphasizes to launching parties the need to conduct their space activities as safely as possible, particularly as it relates to absolute liability regarding people and property on Earth's surface. The Convention defines damage as "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons".[121]

The Liability Convention also imposes absolute liability on a launching State for damage caused "on the surface of the Earth."[122] The concept of absolute liability arises in tort law

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[119] Zhukov, *International Cooperation on the Rescue of Astronauts, supra* note 116, at 130 (emphasis added).

[120] Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[121] *Id.* at art. I.

[122] *Id.* at art. II.

when activities are deemed to be unreasonably dangerous and the party initiating the activity is held responsible for whatever damages occurs. The drafters of the Liability Convention prescribed absolute liability because of the inherent high risk involved in space activities. Absolute liability is the price for the unknown hazards such as disease resulting from contamination with extraterrestrial or other non-indigent pathogenic biota caused simply by going into space. Of course the phrase "unreasonably dangerous" is subject to a multitude of interpretations depending on a broad array of influential factors, such as budget, national defense, international politics, extent of international participation, and the like.

The Liability Convention further provides that,

> [i]f the damage caused by a space object presents *a large-scale danger to human life or seriously interferes with the living conditions of the population or the functioning of vital centres*, the States Parties, and in particular the launching State, shall examine the possibility of rendering appropriate and rapid assistance to the State which has suffered the damage, when it so requests.[123]

Here, the treaty presupposes that States-Parties already have adequate legal authority, both domestic and international, to quarantine and implement other contamination prevention or protection measures.

The Outer Space Treaty makes signatory nations internationally responsible for their activities in space, regardless of whether the activities are governmental or non-governmental.[124] This seems the only practical way of ensuring that (1) contamination control measures are developed and adopted at least by one nation, (2) they are truly enforceable as a matter of law and not just policy, and (3) an with adequate ability to provide compensation is available for the payment of any damages resulting from space missions, including hazardous and deleterious back contamination primarily of extraterrestrial biota, carbon based or not.

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[123] *Id.* at art. XXI (emphasis added).

[124] Outer Space Treaty, *supra* note 2, at art. VI.

H. The Utility and Importance of the Registration Convention

Under the aegis of the Registration Convention,[125] a launch registry is required to be established both within the United Nations, and also as an independent registry within the launching State or States. The Registration Convention requires registering certain launching and satellite parameters and characteristics, and also provides that,

> [w]here the application of the provisions of this Convention has not enabled a State Party to identify a space object which has caused damage to it or to any of its natural or juridical persons, or which may be of a hazardous or deleterious nature, other States Parties, including in particular States possessing space monitoring and tracking facilities, shall respond to the greatest extent feasible to a request...for assistance...in the identification of the object.[126]

Unfortunately, the effectiveness of this Convention is and always has been questionable in terms of identifying the State responsible for extraterrestrially contaminated persons and objects returned to Earth. While early on, both the United States and the former Soviet Union, and now certain other spacefaring nations, say they observe the Convention, however, they frequently provide a launch date with a generally unhelpful characterization of its purpose, and without other significant information provided by the launching state(s). The United States, Russia, China, and other nations have been known to cite the military purposes of some of their respective launches as justification for non-compliance with all the registry requirements. In Russia, China, the United States, the European Space Agency, and other intergovernmental organizations conducting space activities, military space requirements frequently find shared space on civilian platforms. This practice could be perilous to any effective internationally-oriented back contamination and quarantine program. It could even be the weakest link in any

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[125] Registration Convention, *supra* note 110.

[126] *Id.* at art. VI.

international planning and a back contamination control program, of course, is only as good as its weakest link.

I. The Moon Treaty

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[127] is oriented towards commercial exploitation of space and is in force for a small number of States. As in the Outer Space Treaty, the Moon Treaty provides that "States Parties shall promptly inform the Secretary-General, *as well as the public* and the international scientific community, of any phenomena they discover in outer space, including the moon, which could endanger human life or health, as well as *any indication of organic life*."[128] For the first time in the space treaties, the issue of fully informed consent of the public is addressed, as well as the reality of potential problems of extraterrestrial organic life forms and Earth indigenous mutated biota. Unfortunately, the Moon Treaty has the same basic limitation as the Outer Space Treaty in that the duty to inform is invoked only when a potential danger becomes apparent. Nowhere is *candor*, in discussing potential dangers, required. States merely agree to pay "[d]ue regard...to interests of present and future generations".[129] Once again, no legal mechanism is provided for the international community, governmental or private, to *enforce* standards that protect Earth's biosphere.

V. CONCLUSION

NASA's past quarantine regulations are viewed as lacking adequate legislative authority, even for domestic application, either from a single source such as NASA, or cumulative sources such as ICBC regulatory agency members with quarantine authority. The same is true at this point in time regarding potential quarantine regulations of NASA addressing MSR missions

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[127] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, U.N. GAOR, 34th Sess., Supp. No. 46, at 77, U.N. Doc. A/34/46 (1980), 18 I.L.M. 1434 [hereinafter Moon Treaty].

[128] *Id.* at art. 5(3) (emphasis added).

[129] *Id.* at art. 4(1).

and a human mission to Mars and return. This does not mean, however, that formulation of adequate legislation would be either improper or difficult. Common sense and the Outer Space Treaty dictate that responsible measures with appropriate safeguards should be adopted to protect Earth and, therefore, the United States from potential adverse and harmful effects of back contamination.

Toward this end, legislation should be drafted that would provide the Administrator of NASA with full authority to promulgate and enforce necessary quarantine regulations to implement, in part, the domestic and international back contamination standards, including outbound contamination standards as a necessary component of establishing back contamination criteria. Such legislation also should establish specifically a Planetary Protection and Quarantine Committee (PPQC) that would assume many of the responsibilities of the previous ICBC, and provide advice and consent to NASA regarding the technical and legal validity of the quarantine regulations adopted, in addition to requiring approval of the President. The legislation should authorize the President to direct any federal department, including the Department of Defense, agency, or instrumentality of the executive branch to provide appropriate and available assistance, upon request, to NASA in executing and enforcing contamination standards and regulations promulgated pursuant to the legislation. Further, it should provide the President with authority to implement more effectively Article IX of the Outer Space Treaty, for example, to negotiate bilateral and multilateral agreements for requesting and accepting the assistance of, or the rendering of assistance to, any state, possession, commonwealth, territory, the District of Columbia, foreign government, or international organization in the implementation of domestic or foreign quarantine standards and procedures. Finally, non-voting members of the proposed PPQC should include representatives from COSPAR and any other public or private international organization deemed appropriate and useful by the President.