

ARTICLE IX OF THE OUTER SPACE TREATY: Extraterrestrial Back Contamination,  
the U.S. Constitution, and the “Politics” of U.S. Regulatory Authority

-by-  
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Abstract

The ensuing discussion addresses the genesis primarily of space-related exploration activities referenced in Article IX of the 1967 Outer Space Treaty and certain relevant legal issues deriving from adverse back contamination concerns. The need for precise definitions in *specific contexts*, such as those referenced in Article IX, is emphasized, particularly when focusing on such words and phrases as “adverse” and “where necessary.” Addressed, also, are certain issues of law relating to the early roles of the U.S. Interagency Committee on Back Contamination (ICBC), and the subsequent roles of the United Nations Committee on Peaceful Uses of Outer Space (COPUOS), the International Council of Scientific Unions (ICSU) and its *ad hoc* Committee on Contamination by Extraterrestrial Exploration (CETEX), the Committee on Space Research (COSPAR), the U.S. Administrative Procedures Act (APA), and the U.S. National Environmental Policy Act (NEPA). The early disfranchising by NASA of laws and procedures relating to public notice and certain provisions of the United States Constitution regarding the seizure and quarantine of persons and property is discussed, particularly in the context of domestic and international political posturing between and by the United States and the former Soviet Union. Finally, in addition to the current status of domestic and international regulatory authority relating to Mars exploration and that of other celestial bodies, certain legal issues and concerns are discussed that relate to quarantine protocols potentially posed in the context of implementing the Agreement on the Rescue and Return of Astronauts and Objects Launched into Outer Space, the Convention on International Liability for Damage Caused by Space Objects, and the Moon Treaty.

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Article IX of the 1967 Outer Space Treaty provides in part that “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.” (Emphasis added.)

While it is possible for astronauts and exploration equipment containing Earth-indigent biota to affect adversely other celestial bodies and therefore require being subjected to quarantine protocols, the comments and observations set forth below focus primarily on back contamination adversely affecting Earth’s immediate biosphere.

Much like the phrase “where necessary,” the word “adverse” can be interpreted as having many diverse characteristics, both technical and legal, depending on the focus of the exploration program. The word “contamination” has just as many variations and uncertainties, depending again upon the context of its use, e.g., technical or legal.

Essentially, the initial primary concern about the potential for adverse and/or harmful planetary contamination, particularly as it relates to back contamination of Earth’s

biosphere, involves issues of 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, or otherwise adjusted to for survival purposes, by human and other Earth biota immune systems...including fisheries, domestic livestock, plant crops, wildlife, etc.

“Contamination” has many definitions, both in statutes and case law depending upon the context and circumstances being addressed. The same is true of the phrase “harmful changes”. *Context* is the key component of the accuracy of any definition. However, any issue of law dealing with extraterrestrial back contamination causing *adverse* or *harmful changes* likely would rely on the formulae and protocols designed by NASA and the United Nations Committee on Space Research (COSPAR) to determine whether and to what extent a piece of space equipment or an astronaut is considered contaminated...and for what purpose and under what circumstances it is considered contaminated. 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 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. Back contamination issues remain integral to contamination concerns and their resolutions, including the role of astronauts, mission specialists, “tourists,” and returned extraterrestrial samples. This also includes Earth indigent material containing Earth biota that may have mutated after being taken into space on equipment or personnel with the intention of both carriers returning to Earth and its biosphere.

Much of the work of the Interagency Committee on Back Contamination and also NASA personnel involved with the issue at the time of Apollo 11, was rendered questionable in large part, principally because (1) only a handful of scientists believed there might even be a possibility of life forms on the Moon; (2) no one believed water and other life support requirements for carbon-based life existed on or in the Moon and, perhaps most important, (3) President John F. Kennedy had made it clear to the international public that the United States was committed to making a manned landing on the Moon and a safe return before the former Soviet Union. This was a race! And 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, paid lip service to adverse or harmful contamination control procedures, very little effort was made in the Soviet space program to ensure spacecraft sterilization and containment procedures. But 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.

Subsequently, early attempts to reduce the risks of lunar and planetary contamination to an acceptable level (i.e., 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 which 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 COSPAR. ICSU then adopted resolution 10 of the Code (i.e., “Space Experiments with Undesirable Effects”) 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.

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 Article IX of the Outer Space Treaty of 1967. 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/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 relevant scientific data and related technological information deriving from each space mission *in situ*. The legal definition of “adverse” and “harmful” also will change as Earth 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...or universes. And contamination control and biotic and engineering containment protocols have taken quantum leaps in evolution and sophistication. 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. There were questions 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. Who or what would be the proper parties defendant 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? What is the requirement for federal rule making to be subject to the Administrative Procedures Act and, in the case of Apollo 11 launching, the applicability or not of the 30 days notice of effective date requirement? What is the law and relevance regarding agency discretion and judicial review? What are the issues of injunctive relief as they relate to questions of Constitutionality? What was the analogy of nuclear testing at the time of Apollo 11 and the legal arguments surrounding nuclear testing on the High Seas? What was the international customary and treaty law relating to a "reasonable use" embracing the legal and practical distinction between unacceptable interference and acceptable use? Was there any effective 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? Was there any practical consideration by the United States of extraterritorial application of criminal laws and sanctions?

As tentative and politically influenced as the lunar surface sample return missions were in preparations for the remote possibility of harmful contamination, both of the Moon and Earth, planning for the Mars Sample Return mission, particularly in terms of design engineering, public involvement, shared military interests and/or funding in the technology used, and domestic and international political concerns prevailing from the time of conceptualization to return of samples and, ultimately, astronauts, the ultimate manned mission to Mars and return 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 focus on finding carbon-based life forms or precursors. It is fairly certain that the experts 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. 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.”

Unlike preparations for the Lunar sample return missions of the Apollo program, infinitely more legal complexities face the Mars Sample Return (MSR) mission planners, and particularly for the follow-on manned 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 of the provisions found in the U.S. National Environmental Policy Act, since that legislation “requires all federal agencies to conduct comprehensive reviews and interdisciplinary analyses of environmental impacts prior to decision-making.” In addition to the detailed public disclosure required in a NEPA Environmental Impact Statement, a public process involvement in the form of a launch approval for the MSR and Mars manned mission is required that, under a Presidential Directive, 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’s biosphere or its individual biotic components. This requirement may, however, be satisfied through the work engendered by the Environmental Impact Statement. 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.” Some of these issues relate to decisions regarding legislative control and authority, presently conflicting regulations, overlapping jurisdictions, uncertainties regarding treaty obligations and effectiveness with respect to planetary protection measures, and questions about US Constitutional law regarding quarantine protocols and extraterritorial applications of implementing quarantine regulations.

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

On the very day Apollo 11 began its historic journey to the moon, NASA published its “Extraterrestrial Contamination” regulations in the Federal Register. There was no publication of an NPRM, i.e., a Notice of *Proposed* Rule Making. These regulations established 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 also referenced security requirements, restrictions, and safeguards that are necessary in the interest of the national security. 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 Administrative Procedures Act, which states in part 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.” The “good cause” stated by NASA was

“[I]n the light of the Apollo 11 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 public interest; therefore, the provisions of Part 1211 are effective upon publication in the Federal Register.”

This was merely a statement of the decision that was made, not an explanation of why it was “impracticable” and “contrary to the public interest” for NASA to comply with the provisions of 5 U.S.C. Sec. 553(d)(3). It appears that NASA intentionally delayed publication of the rule in the Federal Register until the day of the launch of Apollo 11 because it would have been contrary to NASA’s interests to publish these regulations earlier, and to open the regulations as a proposed document for public comment and discussion. 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.”

Nevertheless, another internal memorandum to the NASA 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 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.”

The issue, then, is whether the Administrator of NASA, acting alone or in conjunction with other Government officials, has the authority, then and now, 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 accident, be exposed to extraterrestrial matter obtained by, or involved

in, a NASA space mission. The issue of whether the extraterrestrial exposure involves *harmful* contamination is not addressed and settled.

The National Aeronautics and Space Act of 1958, as amended, 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.” 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.” 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 quarantining by NASA would involve the detention and/or incarceration, not only of Government employees and property, but of private individuals and private property 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 protected by the Constitution.

Whenever the U.S. Congress has legislated authority to quarantine, such authority has been the subject of well-defined procedural constraints. Without the necessary delegation of specific authority by the Congress, NASA, an independent Executive Branch administration, 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, i.e., those concerning NASA’s response to court orders:

“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...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.”

NASA’s refusal to submit to legal process regarding implementation of its quarantine regulations seems to put the Executive Branch on a collision course both with the Congress *and* the Judiciary, creating a separation of powers controversy of the first magnitude. Combined with NASA’s encroachment into the Legislative Branch, these two separations of powers issues would probably be sufficient to invalidate the regulations upon judicial review.

The U.S. Supreme Court has heretofore held Constitutional various state quarantine provisions that deal with an actual communicable disease, while any proposed quarantine legislation 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 4<sup>th</sup> Amendment of the U.S. Constitution; (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 5<sup>th</sup> Amendment; (3) procedures invoked in the quarantine are not suitable and proper and thus do not meet the procedural due process requirement of the 5<sup>th</sup> Amendment; and (4) whether the quarantine of contaminated persons results in an involuntary servitude prohibited by the 13<sup>th</sup> Amendment. It is necessary to keep in mind that the NASA quarantine regulations included 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.*” (Emphasis added.)

The Fifth Amendment of the U.S. Constitution provides that “private property [shall not] be taken for public use, without [payment of] just compensation.” 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.

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.” In other words, 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/or 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.

Again in the context of the United States Constitution and authority of NASA or any other agency or department of the Executive Office, it is necessary to assess applicable international law. First, The Rescue and Return Agreement: Article 5 of the Rescue and Return Agreement, relating only to the return of objects launched into space, 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 direction and control of said Contracting Party.



Of significant importance of the Rescue and Return Agreement to the promulgation and implementation of U.S. and international quarantine regulations, as applied outside the territorial *in rem* or *in personam* jurisdiction of any nation, is the determination of (1) whether non-citizens of a launching state(s) who assist in the rescue of astronauts and equipment are subject to, say, United States quarantine; (2) whether the Agreement does, in fact, recognize the legitimacy of applying quarantine procedures (including temporary incarceration, at least as between contracting parties) to non-citizens assisting astronauts in distress and, therefore, exposed to extraterrestrial matter; (3) whether international recognition of rights and obligations in the rescue and prompt return of astronauts, etc., does in fact recognize 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 of enforcing the regulations, assuming domestic jurisdiction can be had over alleged offenders.

Next, the Convention on International Liability for Damage Caused by Space Objects 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. Article I of 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."

Article VI of the Outer Space Treaty makes signatory nations internationally responsible for their activities in space, regardless of whether the activities are governmental or non-governmental. 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) a sufficiently "deep pocket" is available for the payment of any damages resulting from space missions, including hazardous and deleterious back contamination primarily by extraterrestrial biota, carbon based or not. Unfortunately, although compliance by various nations is improving, the effectiveness and utility of the Registration Convention for purposes of quarantine authority and protocols is and always has been, to date, questionable in terms of identifying the State responsible, say, for extraterrestrially-contaminated persons and objects returned to Earth.

The Moon Treaty is oriented towards commercial exploitation of space, and is in effect for a comparatively small number of States. As in the Outer Space Treaty of 1967, 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.*" (Emphasis added.)

It would appear that at least one source recognized very early the need for, if not efficacy of, international applicability of the quarantine protocol and implementing regulations promulgated by the US National Aeronautics and Space Administration. 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 UN Committee on Space Research (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 Agreement on the Rescue and Return of Astronauts and Space Objects. The same holds true, at least in the United States, for the deficiencies in applicable domestic law.

After careful deliberation regarding the legal sanctity of NASA's quarantine regulations, two points should be emphasized: (1) NASA's Office of Planetary Protection is working on the best means of implementing the outbound and back contamination prophylactic caveats implied, if not stated, in Article IX; and (2) NASA has dropped its quarantine regulations as "no longer necessary."

Evaluation of quarantine protocols is limited essentially to robotics and does not cover humans beyond breach of quarantine protocols applicable to study of returned extraterrestrial samples. In-orbit quarantine and testing facilities for returned extraterrestrial samples has been put on hold for the time being since the primary effort is focused on criteria to determine the *likelihood* of harmful contamination, etc., of returned materials. If criteria are met for what constitutes harmful contamination and adverse changes in Earth's environment, the sample will be deflected from an Earth-return trajectory. At this time, there is no legislation for any quarantine protocols...only criteria for breach of containment procedures for returned or returning samples being examined and prior to release.

The possibility or probability of mutated earth indigent biota being a contaminant or capable of causing an adverse change to Earth's environment has been suggested a number of years ago, but has not been considered sufficiently serious to consider at present. While much of the international collaborative work has taken place within COSPAR, significant collaborative outbound and back contamination efforts have been pursued between NASA and ESA because of their joint mars exploration efforts. Again, almost exclusive efforts have been focusing on robotic expeditions in the context of quarantine protocol studies.

Activities that amount to *unlawful* incarceration, i.e., quarantine of persons and property, and the *unlawful* seizure of private property, are two of the most egregious abuses of critical provisions of the United States Constitution. There is a history of this type of abuse in the United States...albeit extraordinarily limited in number and types...related to the purpose of securing national defense objectives, such as the previously noted quarantine of political opponents by incumbent office holders during colonial times, internment of Japanese citizens of the United States during World War II, and, in more recent times, the highly questionable quarantine of persons and property by NASA without proper or even any legislative authority...strictly for domestic and international political objectives. The development of technical criteria and options for outbound and back contamination protective protocols must not only be in furtherance of clearly stated international criteria implementing in part Article IX of the 1967 Outer Space Treaty, they must be in strict compliance with the dictates of the United States Constitution and the attendant underlying spirit and intent of the relevant provisions of that document. This is necessary in order for the United States to participate in various cooperative activities related to space exploration and development uses, and as presently set forth in President Barack Obama's most current space policy of 2010.

Finally, it should be noted that there are over 1300 laboratories in the United States alone that work with highly toxic and/or fatal pathogens. The work in these facilities relates to creating pathogenic components for biological warfare and/or creating prophylactic vaccines. Many of these laboratories are now run by the U.S. Department of Homeland Security. Inadvertent release of various of these pathogens, such as those related to hemorrhagic fever, occur...e.g., Plumb Island close to the center of New York City, northern Virginia (e-bola), the Fort Dietrich, Maryland facility, and so forth. These are ideal targets for terrorist activities and overall security of these facilities is *de minimus* at best.

It seems that this potential of bioterrorist activity would be of interest to NASA's Office of Planetary Protection, and the work and responsibilities of spacefaring nations represented on the UN Committee on Space Research. Perhaps this already is being attended to. Question: What are the prospects of pathogens deriving from various aspects of the potential of bio-terrorism and bio-warfare finding their ways off-Earth in various manned and unmanned space activities? What if pathogens deriving from Earth-indigent biota, or those specifically engineered in the international space station, are inadvertently or intentionally released...what quarantine laws, if any, would apply *in situ* in outer space? Much like the intentional anthrax release in Washington, D.C., and elsewhere after 911, will quarantine laws be formulated that are essential to that time period in which the pathogen is unknown and whether it is infectious in a "communicable" sense? What about communicable pathogens that become such in space through, for example, intensely high radiation, and the like? Are responsible agencies officially researching/advising regarding these potential scenarios applicable to forward and back contamination, and in the context of domestic and international requirements for imposing various quarantine laws and protocols?

What have we learned about viral mutations, interspecies infections and the evolving lessons of the great Aztec civilization die-off of 17 million people in the mid- to late 1500s? What are the lessons to be learned from the hanta virus infections and die-offs in southwest United States in the early 1990s? What are we learning about our own planetary weather pattern fluctuations and the roles they play in the spread of viral and bacterial diseases? What, based upon these lessons, are we really learning about the potential for lethal effects caused by outbound contamination, back contamination, and cross-contamination between and among celestial and fabricated off-Earth bodies that derive from human space activities? Are the existing laws, and those being explored in an international context, addressing the relevant issues of biotic contamination in a genuinely responsible and realistic fashion by the various domestic and international legal communities?