Planetary Protection - Some Legal Questions

E. Fasan

Honorary Director, International Institute of Space Law,
Raimundweg 2, A 2620 Neunkirchen, Austria

ABSTRACT

When we legally investigate the topic of planetary protection, we have to realize that there are primarily two very distinct parts of our juridical work: We have to study *lex lata*, the existing applicable law, especially space law, and also *lex ferenda*, what should be the law. With this in mind, we have to deliberate the legal meaning of the notions "planetary", and "protection".

About "planetary": Our own Earth is our most important planet. At present only here do exist human beings, who are *sensu strictu* the only legal subjects. We make the law, we have to apply it, and we are to be protected as well as bound by it. But what is further meant by "planetary"? Is it planets in an astronomical sense only, the nine planets which revolve around our fixed star, namely the sun, or is it also satellites, moving around most of these planets, as our own Moon circles Earth. "The Moon and other Celestial Bodies (C.B)" are subject to space law, especially to international treaties, agreements, resolutions of the UN etc. I propose that they and not only the planets in an strictly astronomical sense are to be protected. But I do not think that the said notion also comprises asteroids, comets, meteorites etc. although they too belong to our solar system. Our investigation comes to the result that such bodies have a different (lesser) legal quality.

Also we have to ask protection from what? I suggest the following:
Natural bodies: Meteorites, NEO asteroids, comets that could hit Earth or C.B.
Artificial objects: Space debris threatening especially Earth and near Earth orbits.
Terrestrial life: No infection of other celestial bodies.
Alien life forms which could bring about harmful contamination of Earth and the life, above all human life, etc. Here, astrobiological questions have to be discussed.
Special realms on C.B. which should be protected from electronic "noise" such as craters SAHA or Deadalus on the Moon, also taking into account the Common Heritage principle.

Then we have to examine: protection where, of whom and of what:
On Earth: Humans, and nature, namely other life forms, air, water and soil, but also all man made things.
On Other celestial bodies: Crew of manned space missions, stations on C.B., possible alien life forms, or remnants of such, water, other environment on C.B.- even if completely barren ? Protection of C.B. from becoming " an area of international conflict."

Finally we have to discuss overriding interests, such as deflection of asteroids which threaten to hit Earth, then the legally permitted "use" of C.B., also mining versus protection, then, too high costs of absolutely sterile spacecraft etc.

With this we have *de lege ferenda* to create an order of values of protection, whereby the protection of the higher category has priority over the lesser ones.

THE NEED FOR LEGAL REGULATIONS.

We speak about planetary protection, we want planetary protection, and we - not the lawyers but the scientists and technicians - even invent and/or adapt devices for such protection. Several papers today deal with this, on a very learned level. So why does planetary protection create legal problems?

Legal entities, legal subjects, be it individuals, juridical persons, and thus even States, are bound by a framework of laws. In the still valid definition of Kant (1) "Law is the total of conditions, by means of which the discretion of the one with the discretion of the other can be reconciled under a general rule of freedom".

Law is the rule of social conduct. It establishes the obligation to act or not to act in a certain way, and enables every legal subject to expect from all others that they do the same. Thus, it gives legal security, and prevents the otherwise unavoidable collision of interests. Without law, such collisions would be solved by brute force only. Law that is in force, presently existing law, is called *lex lata* (2).

Such rules of conduct may be -on a national basis - created, but also altered or abolished, by a relevant body (king, government or parliament etc.) or they can be concluded between legal subjects themselves; that is what we call treaties or agreements. On an international basis such treaties and agreements can be concluded by sovereign states. Then, they constitute (among others) the international law. When a sovereign nation concludes and ratifies a treaty, then it has the obligation to adhere to it (*pacta sunt servanda*), and to adapt its national laws in a way compatible with those treaty regulations (obligations and rights) (3).

For our investigation, the main legal framework of international law is the Law of Outer Space(4). Therefore, we at first will have to examine which codified space legal rules do exist, applicable to planetary protection. But after that, we will have to deliberate which changes or additions of or to space law seem necessary in order to better serve the desired protection. This will be deliberations of *lex ferenda* (5).

Legal rules show a tendency to demonstrate sometimes a kind of "hierarchy" This is not a modern idea. However, it was the Vienna school of Law with Kelsen (6) and Merkl (7) who systemized this notion in the framework of the so called "Pure Theory of Law" (8). In short, they taught that all national legal systems are based upon a constitution. Even in countries where such a constitution formally does not exist there are basic legal rules, which the so called "simple" or general laws may not violate. A Congress, a Parliament "shall make no law" contradicting the basic constitutional norms. And decisions, court sentences, administrative decrees may - following this system - not contradict those general laws. Usually a Constitutional or Supreme Court can be appealed to if this order of norms is violated. In a rude scheme, the hierarchy of norms shows the following picture:

Constitution
»
General (simple) Law
»
Decisions

In international law, too, there is a kind of hierarchy: Treaty Law usually derogates Customary Law, and General Principles of International Law recognized by civilized nations are applicable on a subsidiary basis only(9). Our above scheme would look as follows:

Treaty Law
»
Customary Law
»
General Principles

As we have seen, International Legal Treaties and Agreements have therefore the highest order in our hierarchy of norms. And there are such norms - *leges latae* -which already regulate several topics of planetary protection. But if we study these existing rules and examine the work of many distinguished authors we must come to the conclusion that the most important task is yet to be undertaken, and a clear system of law and procedure is still lacking.

Existing International Space Law (10) is codified mainly in the so called Space Treaties and Agreements. In addition, there are "Legal Principles" of space law which have been adopted by the United Nations General Assembly, not having the force of treaties.

The main document of space law, often called *"Magna Charta of Space"*, is the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies" of Jan 27., 1967 (OST). It has been signed and ratified by 98 Nations, and (merely) signed by 26 more. (11)

In chronological order there follows the Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement), of April 22nd, 1968, the Convention on International Liability for Damage, Caused by Space Objects (Liability Convention) of March 29th, 1972, the Convention on Registration of Objects Launched into Outer Space (Registration Convention) of January 14th, 1975, and finally the Agreement Governing the Activities of States on the Moon and other Celestial Bodies (Moon Agreement) of December 18th, 1979 (12).

There was, and still is, a decreasing number of States having signed and ratified these Treaties and Agreements. So the last one, the "Moon Agreement merely received 10 ratifications and 6 more signatures. We shall not explore the reasons for this today, but examine now the space legal norms, applicable to our problem.

EXISTING SPACE LAW ON PLANETARY PROTECTION:

The OST states in Art. I the freedom for Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and (Art. IV) the exclusive use for peaceful purposes, and prohibits in Art. II national appropriation. In Art V. it requests immediate information . . ."of any phenomena . . . which could constitute a danger to the life or health of astronauts."

Still more important to our topic is Art. IX., which requests to conduct national space activities in a way ". . . as to avoid their (*of space and C.B.*) harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter. . . ."

Whereas the Rescue Agreement shows no norms specifically applicable to our problem, the Liability Convention states in its Art. II the absolute liability of the launching State for damage, caused by its space objects on Earth. Art. III requests that State (States) be liable for damages caused elsewhere only in case of fault.

We will not examine the Registration Convention in detail for our work (13) but the Moon Agreement goes far more into details: In Art. 3 it prohibits the placement of nuclear weapons or other weapons of mass destruction, and the conduction of military manoeuvres on C.B.

Of other multinational treaties the most important is the "Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Underwater, of Aug.5., 1962 (the Moscow Test Ban Treaty) between (originally) USA, GB and the USSR with the intention, as expressed in the preambula, to end the contamination of humankinds environment by radioactive matter.

Each Party "undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control . . . including Outer Space." This treaty received in the meantime all in all 104 ratifications, and 7 more signatures (14).

The "Principles" on outer space matters, adopted by the General Assembly of the UN can be used as demonstration of that organizations and its members intention to protect environment, even if those Principles deal mainly with other space topics.

In short: P. 15 of the "Principles Governing the Use of States of Artificial Satellites for International Direct Television Broadcasting" (15) refers to the "unavoidable overspill of radiation of satellite signal", about which reference is made to the International Telecommunication Union (ITU).

Principle X of the "Principles Relating to Remote Sensing of the Earth from Outer Space" (16) reads as follows:

" Remote Sensing shall promote the protection of the Earth's natural environment. To this end, States participating in remote sensing activities that have identified information in their possession that is capable of averting any phenomenon harmful to the Earth's natural environment shall disclose such information to the States concerned."

The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (17) request in 3., I, (a) ".States launching space objects with nuclear power sources on board shall endeavour to protect individuals, populations and the biosphere against radiological hazards . . . and not cause a significant contamination of outer space".

Principle 7. 2. requests launching States to ". . . provide promptly the necessary assistance to eliminate actual and possible harmful effects . . ."

This, then is our starting platform (*lex lata*) of International Law and Regulations about Planetary Protection. They are, as indicated, not sufficient. But before requesting new regulations of our problem (*leges ferendae*), we have to quote some works and opinions of the last years, even decades.

AN OVERVIEW OF THE LEGAL HISTORY OF PLANETARY PROTECTION ISSUES

The following short and not complete overview of conferences and papers about our topic demonstrates that the main concern of authors was the important problem of space debris. This is correct and understandable because space debris endangers not only future space flights but the terrestrial environment as well (debris, especially larger exemplars crashing unto the Earth's surface). Also, the possible influence of military operations on the environment as a whole - terrestrial and extraterrestrial - was investigated. But also other important questions of planetary protection, such as militarisation and terrorism from and into outer space, cross contamination, radio activity, were dealt with as well as procedural problems, and possible solutions. This is shown by the following examples.

Olmstead (18) quoted the legal principle "*sic utere tuo ut alienum non laedes*" - One must use ones own rights so as not to do injury to another. He referred to the Corfu Channel Case (1949) I.C.J. Rep.4, that States are obliged "not to allow knowingly their territory to be used for acts contrary to the rights of other States". And he refers to the well known Trail Smelter Arbitration (between USA and Canada) - Decision of Mar.11., 1941, U.N.Rep., Int'l arbitration Awards 1905, (1945), citing the passage that "under the principles of international law as well as the Law of the United States, no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the property of persons therein..." *Olmstead* states quite correctly, that..."effective action to maintain the global environment requires co-operative international community action" (19).

G.S.Robinson in his 1976 paper "Earth exposure to Martian Matter: Back contamination procedures and international Quarantine Regulations" (20) points out that the US Public Health Service Act gave "...authority to the Surgeon General to promulgate and enforce regulations for prevention of the introduction and spread of communicable diseases into and throughout the United States." And he requested and proposed a "Convention on the International Prevention of harmful contamination of Earth by extraterrestrial matter".

In his "Free Enterprise and the proposed Moon Treaty" (21) *A. Dula* discussed among others the principle of "Common Heritage of Mankind", as used p.e. in the Moon Treaty. He pointed out that for the developing countries this means "common ownership of the resources and majority control over their disposition". This might be " a dangerous and unnecessary abandonment of the basic legal rights free enterprise will need...." The question, whether the common heritage principle would also include the obligation of planetary (lunar) protection, was not discussed, and was not the theme of that paper.

In 1984, at the 27th Colloquium of Outer Space, questions of "Military uses of Outer Space" were discussed (22) by P. M. Sterns and L. I. Tennen. N. Jasentuliyana spoke on "Debate Concerning Arms Control in Outer Space in the Context of the Conference on Disarmament," (23), and legal problems arising from the adaptation of Asteroids into Space Stations were investigated by E. Fasan,(24). At the

same Colloquium there took place a Scientific - Legal Round Table under the chairmanship of V. Kopal "Present and expected Uses of Outer Space and Problems of protecting the Space Environment" with papers of L. Perek, E. A. Roth, C.Q.Christol, G. Gßl, N. Jasentuliyana, and P. M. Sterns & L. I. Tennen.

In 1988 ESA published a report of its Space Debris Working Group (25) which under Chapter 9 discussed legal aspects, and especially the applicable provisions of the Space Treaties and Agreements. And it came to the conclusion that "the necessary legal instruments should be negotiated at an early date, following Art. IX. of the OST".

In 1989 the International Institute of Space Law (IISL) dealt in its second session with: "Legal Aspects of Protection of Outer Space Environment". Chairman was M.Menter.

H.A.Baker (26) spoke on the "Current Space Debris Policy and its Implications." He quoted the revised US National Space Policy of 1988, that "all space sectors will strive to minimize the creation of space debris...", and he dealt extensively with the "Declaration of the United Nations Conference on the Human Environment of 1970", and the Vienna Convention for the protection of the ozone layer, of 1985.

K.H.Bockstiegel examined "Procedures to clarify the Law regarding the Environmental Aspects of Activities in Outer Space" (27). He reported on the 1988 Cologne Colloquium, and requested above all the clarification of several terms in space law texts. He requested an interdisciplinary approach, and especially mandatory exchange of information, mandatory consultations and cooperation.

A.A.Cocca saw "Environment as a Common Heritage of Mankind" (28). He reported of the first environmental law, namely the 1306 a.D.(!) Royal Proclamation of King Edward I. of England, prohibiting "open Furnace". He called "space armamentism the worst pollution" and reported on the Ottawa Meeting 1989 which had found that the atmosphere is a "resource of vital interest to mankind".

I.H. Ph.Diederiks Verschoor spoke on the "...increasing Problems of Space Debris and their Legal Solutions" (29). She requested a clarification of the term space object as used in the Space Law Texts and quoted several proposals to prevent damage caused by debris.

E.Fasan, your present author, started with the "*neminem laedere* " principle of Art 51 of the UN Charter, and gave tables of "Types and Causes of Emissions", "Space Legal Sources about Damage" etc. He expressed his doubts regarding the Convention on the prohibition of military and other hostile use of environmental modification techniques (30). This Convention, he pointed out, in its Art. III(1) states that its provisions "shall not hinder the use of environmental modification for peaceful purposes".

J.F.Galloway (31) spoke on "Mission to the Atmosphere" and taught about the various Conventions to protect the Atmosphere, as Montreal (1987), Sofia (1988), Bangalore (1987), adopting the 1985 Vienna Convention, and stated that the "winding down of the cold war necessitates a new definition of national security".

S.Gorove (32) gave an overview on "Space Debris in International Legal Perspective". He demonstrated the importance of clarifying whether "space debris" could be subsumed under the term "Space Object". He criticized the "non committal attitude of the major space powers" towards our problem.

E.Konstantinov (33) requested in his paper "The Outer Space Environment and its Legal Protection" to "find out the correct ratio between the interests of the States deriving direct benefit from ecologically adverse space activity, and in the interests of all States of the preservation of the ecological equilibrium"

V.Kopal (34) gave his paper the clear title " The Need for International Law Protection of Outer Space Environment against Pollution of any kind, particularly against Space Debris." He said:" It seems that preventive measures are technically feasible while future remedies such as cleaning of Outer Space are beyond the possibilities of present science and technology". He reported that COSPAR and IAF had in 1982 explained "that no concrete evidence had been found that rocket effluences may be deleterious to our environment". And he found that the present international law principles to protect the human environment and also space law are far from being satisfactory for that requested protection.

N.S.Natov spoke on "Some Ecological Problems in the Area of the Exploration and Use of Outer Space" (35) and posed five questions still to be answered to solve our related problems.

C.C.Okolie discussed "International Law Principles for the Protection of Outer Space Environment" (36). He taught about the US National Environmental Protection Agency, and the necessity to "maintain the natural balance between Humans and the Environment".

B.Reijnen reported on " Pollution of Outer Space and International Law" (37). She clearly pointed out the responsibility of States for space activities and with this also for pollution, caused by that. Regarding the Terrestrial atmosphere, she quoted the 1979 Convention on Long-Range Transboundary Air Pollution; regarding the ozone layer and radio-active pollution, she quoted the 1987 Conventions following the Chernobyl accident, and she then examined the relevant contents of the Space Treaties and Agreements. Her conclusion was the responsibility of States, according to the (imperfect) *legas latae*.

H.Safavi read about "Legal Aspect of Outer Space Environment (38), and was of the opinion that the terms "benefit" and interests of all countries" would comprise environmental protection.

G.Catalano Sgrosso (39) in her paper "Protection of Outer Space Environment; The present International Law Rules and Suggestion for New Legal Measures and Instruments" defined the terms "pollution", "debris", and spoke about the often debated term of "space object". She concluded: "A Convention dealing with pollution of Outer Space environment should specify duties and to keep their observances under control . . ."

R.Stamps had the Title: " Space Debris, an International Agreement is needed" (40). He spoke on tort liability, the destruction and removal of space debris, and especially stressed the importance of Art. IX of the OST for our problem.

P.M.Sterns and L.I.Tennen (41) put before the audience the question: "Recent Developments in the Planetary Protection Policy: Is the Outer Space Environment at Risk?" They reported about the COSPAR Planetary quarantine Requirements of 1964 and called them correctly a "significant deviation in the approach to preservation of pristine celestial environments", "because PQR allowed a limited microbial burden to be present at launch." They then reported, quoting a paper by J. Rummel on the US-American SBB, about the acceptance of those American standards by COSPAR in 1984. They found the situation still suffering "from a fundamental inconsistency and concluded that "the planetary protection policy must apply to every target body in which there is any possibility for the existence of life, its remnants and precursors...."

K.Tatsuzawa (42) spoke on "The Protection of Space Environment: The Problem of Space Wreckage". That term seemed to the author preferable to Space Debris, discussing papers of *Diederiks Verschoor, Kolosov, Reijnen, Gorove*, and others. In conclusion, an international agreement was requested.

S.M.Williams (43) discussed "Environmental risks arising from space activities, some legal issues". She discussed Art. IX of the OST, the 1985 Vienna Convention and requested also a convention, which would have to define the terms "pollution" and "debris".

W.B.Wirin spoke under the short and clear title "Space Debris 1989" (44). He taught on the U.S. Space Debris Report of Feb., 1989, and President Reagan's Space Policy Directive, released in 1988. *Wirin* quoted shocking numbers of debris in LEOs, mid earth orbit and GEO, and the dangers obviously connected with this. He called for an international agreement after serious studies but warned: "One of the (U.S.) goals will be to ensure that the commercial space industry is not significantly disadvantaged by regulatory steps that are not followed by the competitors of the United States".

E.G.Zhukova-Vasilevskaja in the last - but not least paper of this session - "Progressive Development of Space Law and Protection of Environment" (45) discussed the provisions of the OST, and of the Liability Convention. She warned from damage "from military activities in space". This should be referred to as "international crime". She concluded that international legal rules should be elaborated, which should be a task of UNCOPUOS.

In 1992, ten years ago, at the World Space Congress in Washington D.C. the Colloquium on the Law of Outer Space dealt in its session X.3. with "Managing environmental Issues including space debris" (46). Here, C.Q.Christol started his paper on "The Stratosphere Ozone Problem and Space Activity" with the following remarkable statement: " Humans have demonstrated a remarkable capacity to threaten Mother Earths natural environment". J.Galloway spoke on "The implementation of

environmental treaties", and discussed the Montreal Protocol and its London Amendment. Further papers were by S.Courteix, E.Fasan, I.Kuskuvelis, M.Na Idu, L.Perek, and M.Rothblatt.

In 1993, there took place "The First European Space Debris Conference" in Darmstadt, Germany. A detailed overview in given by W.Flury, the Conference Organiser (47). The purpose was "to present the results from research on space debris . . . and to discuss international implications and policy issues". J.P.Loftus Jr. gave an overview on current mitigation practises, and asked for international agreements. W.Flury and D. McKnight discussed the Space Debris position Paper of the International Academy of Astronautics (IAA). The authors recommended furthermore several debris control measures, mainly to facilitate prevention measures. G.C.M.Reijnen, first legal author of the conference, explained in detail the importance of Art.IV., par.2. of the Registration Convention. She also thought that a new custom of consultation between the space powers seems to be emerging. M.Benko, K.U.Schrogl, and G.Gruber requested that space debris legal problems ought to be solved within the United Nations, and called especially for immediate work at UNCOPUOS.

H.A.Baker offered "recommendations for consideration when developing space debris policy" He found that international space law, and international environmental law were to be applied.

In 1996 on occasion of the 35th Session of the Legal Subcommittee (LSC) of UNCOPUOS in Vienna, Austria, there took place the annual Symposium, organised by IISL under its president, N. Jasentuliyana, and ECSL under its president G.Lafferranderie. The topic was Protection of the Space Environment (48.) Here, in his paper "Space Debris: Discussion in the Scientific and Technical Subcommittee in Feb., 1996." L.Perek quoted the proposed definition of space debris as "...inactive man-made objects, such as spent upper stages, spent satellites, fragments or parts generated during launch or mission operations, or fragments from explosions and other break-ups."

Lafferranderie discussed the Status and Organisation of the Inter-Agency Space Debris Co-ordination Committee, and requested examination of future legal regulations by UNCOPUOS.

F.B.Cheuvront reported on the industry viewpoint on space debris with special regards to the mitigation efforts of the "IRIDIUM Project".

V.Kopal spoke about the "Current Regulatory System about Space Debris", especially pointing out the provisions of the Space Treaties and Agreements, which he correctly deemed as being "too general . . . and far from being satisfactory."

For an overview of this symposium see "Protection of the Space Environment" by your present author who had served as coordinator (49).

In their paper "Preliminary Jurisprudential Observations Concerning Property Rights on the Moon and other Celestial Bodies in the Commercial Space Age" (50) P.Sterns, H. Stine and L. Tennen stressed Art V, and X of the OST, and stated: "Activities in space shall be conducted to prevent harmful contamination of outer space and celestial bodies, and also prevent adverse changes to the environment of the Earth through the introduction of extraterrestrial matter . . ."(51).

At the 40st Colloquium on the Law of Outer Space (52) P.Sterns and L.Tennen discussed "Exobiology and the Outer Space Treaty: From Planetary Protection to the Search for Extraterrestrial Life." They warned for the possible unforeseen and catastrophic consequences, "Cross-contamination" might bring about, discussed the 1964 COSPAR PQR requirements, the NASA Pub. No. SP-530, Exobiological Strategy for Mars Exploration, and in conclusion requested the legal protection of natural celestial environments to be supported by effective policies and procedures of the international scientific community. "Thus, the law of outer space should contain clear and express requirements to disclose and provide detailed information concerning the nature scope, extent and location of the contamination and the risk of harm . . . and the obligation to disclose the discovery of organic life, found on the Moon or elsewhere."

During the same Colloquium (53) A.Debus, J.Runavot, G.Rogovsky, V.Bogomolov, N.Khamidullina, and V.Trofimov discussed the "Mars 96 Planetary Protection Program and Implementations for Mars Environment Preservation". They spoke extensively about the COSPAR recommendations, both old and new, and implementations, decontamination methods, documentation, and studies.

There followed the paper "Dangers from Asteroids and Comets" by E. Brooks (54). The author gave an astronomical - scientific background and said that "there are an estimated .5 million to 1,5 million asteroids larger than 50 meters, whose orbits cross the orbit of Earth. He discussed the 1981 University of Arizona "Spacewatch", and especially the new (1995) "Near Earth Asteroid Tracking System (NEAT) of Air Force, NASA, and JPL. And as important conclusion, Brooks stated: "Present technology exists or can be adapted to deflect or destroy an offending body. This includes rockets, launch vehicles, tracking and homing,, and finally the energy delivery to the offending body." With sharp observational clarity he pointed out that several legal instruments, namely the Moscow Test Ban Treaty, the OST, the Environmental Modification Treaty of 1978, and the Moon Treaty seemed to restrict the proposed measures to deflect an asteroid or comet. And he asked for "human ingenuity" to solve the (seemingly contradictous) topics of avoiding danger and using and exploiting asteroids.

Furthermore, I would like to quote M.Williamson's "Protection of the Space Environment under the Outer Space Treaty" (55). He pointed out the danger to the lunar environment by space debris, discusses the Space Treaties, and found them insufficient for the said protection. A suitable choice - plunder or protection - is requested.

The late J. Heidmann had always been a stout defender of keeping some sites of the Earth-averted side of the Moon clean, and reserved for scientific purposes, especially for SETI. This should be SAHA, "a little crater near *Mare Smithii*". In "What Legal Questions are raised by the Establishment of a dedicated Lunar Far Side Specific Crater for High Sensitivity Radioastronomy?"(56) he gave astronomical details, and requested to discuss and solve the relevant legal problems.

In January, 1997, there took place in Alpbach, Austria, a Seminar "Space Futures and Human Security"(57). The Second Session (chair S. Doyle) dealt with "Space and Environmental Security". Papers were presented among others by R. Winter, "Environmental Monitoring from Space", and V. M. Canuto, "Space Activities and Environmental Security".

Also in 1997 G.Lafferranderie with Co-Author D.Crowther published the "Outlook on Space Law over the Next 30 Years (58). Chapter 9 deals with the "Environment of Earth and Space". In this book J.M.deFaraminan Gilbert discussed space debris, and requested legal solutions with "recommended minimum standards." C.Catalano Sgrosso followed suit with "Prevention and Management of Natural Disasters". She gave an extensive bibliography on the policy of preventing natural disasters, and the methods available. She showed, that the "Rio Declaration of 1992, UN Doc. A/Conf.151/5" goes farther as the former "Soft Law Contents". And she concluded: "The United Nations must absolutely guarantee the leadership of the international system for the prevention and management of calamities . . ."

In 1998, S.Doyle published a paper "Using extraterrestrial resources under the Moon Agreement of 1979" (59). Approaching our problem (correctly) from the other side, he pointed out the legality of not only exploitation but also use of Outer Space and the C.B. Not without reason he called the Moon Agreement imperfect etc. But the necessity of planetary protection versus exploitation of C.B. was not his topic.

F.Lyall in his paper "On The Moon" (60) was not quite as critical about the Moon Agreement. But he also made clear that the "Common Heritage" concept is one of the reasons why the said agreement is not widely accepted". In detail, Lyall requested that "certain areas of the moon should be set aside for scientific study..", and proposes especially the area of the (far side) crater SAHA.

N.Jasentuliyana wrote in the same issue of J.Space L. (61) on "Space Debris and International Law". The author discussed not only the Space Treaties and Agreements, but in detail and extensively the work within UNCOPUOS, especially its scientific and technical Subcommittee, including problems of nuclear power sources. He reported that some studies "suggest that, in the crowded orbital regimes of LEO, the number of collision partners will reach the critical level required to sustain collisional cascading within the next 10 to 15 years." He taught then about national and multinational space debris mitigation measures. He did not think that one treaty or convention would be the solution but - as he had advocated earlier (62) - that expert technical groups should develop recommended standards.

The UNISPACE III Conference in Vienna, 1999 (63) in its Workshop on Space Law had a special session "Maintaining the Space Environment" under the chairmanship of ambassador Qizhi *He*. One heard the discussion paper by *L.Perek*, one of the best authors on the topic of Space Debris. Perek made special reference to the Technical Report on Space Debris of the UNCOPUOS Scientific and Technical Subcommittee, A/AC.105/720. He pointed out that "Every year about 500 pieces of trackable debris and a very large number of debris too small to be detected, decay in the atmosphere". The total mass of all artificial objects in earth orbit is between 2000 and 3000 tons ." And he requested to maintain the space environment in a state suitable for future Space Activities.

In 2001, A.A.Cocca, M.M.E.de Cocca, P.M.Sterns and L.I.Tennen published a paper "Autonomous Settlements and Environmental Protection in the Law of Outer Space" (64). Although this paper mainly deals with "habitats in outer space and on C.B.", it very extensively investigates the questions of environmental protection, resulting from establishing such habitats. They find clearly, quoting Williamson, that "...it is inevitable that the exploration of celestial bodies will cause some impact on the natural environment". They continue that ". . . environment is a concept inseparable from life. . . ." And they request, quoting a 1993 paper of Sterns and Tennen the establishment of an "International Agreement of Recognition and Capacity" which would include relevant protective measures.

The International Academy of Astronautics (IAA) has dealt with problems of space debris since more than ten years. Its first Position Paper on Orbital Debris was issued in 1993, and an updated and extended "Edition 2001" was published in Sept., 2001 (65). This excellent report gives an overview on the present status and the future development, and deals then with debris control options, i.e. prevention and removal. One of these options is "reorbiting of geostationary satellites into a disposal orbit, at least 300 km above GEO". The booklet contains an extensive bibliography, deals with the early report of AIAA of 1981, and gives in Appendix E a very good political/legal historical overview. Here, the work of UNCOPUOS and its Scientific and technical Subcommittee and of COSPAR is quoted. The most important chapter for our legal problems and procedure is "Approaches to Implementation". After "technical discussions within - among others - COSPAR, IAA, IAF, IISL" there should be discussions at the UNCOPUOS, leading ultimately to a "Code of Conduct", international standards, or space law ." This, of course, is a very sensible proposal, which is recommended by your author also for all the problems of planetary protection of which space debris issues are only one (but most important) chapter.

The United Nations Office for Outer Space Affairs annually prepares a "Highlights in Space" volume in cooperation with IAF, COSPAR, and IISL. The 2001 edition carries a Chapter XV, "PLANETARY PROTECTION". The presentation defines planetary protection as "the activity that seeks to prevent the biological cross contamination of solar system bodies, especially those that may (or do) harbour living entities." And it comes to the solution, "...that the contamination of other solar system bodies by Earth organisms is possible, and that the potential for life elsewhere in this solar system exists". It requests prudence, "both to protect Earth and to shield those other bodies from Earth contamination." Legally, the paper referred especially to Art IX of the OST, as quoted above. Under Chapter XI. it dealt under the title "Potentially Environmentally Detrimental Activities in Space", especially with the problems of space debris as one of the most important topics.

Furthermore, I want to quote the UNGA Resolution of 21 Jan., 2002, which in its part E. deals with "Ensuring the safety of space activities to human health, property and the environment"(66). It points out the importance of the Liability Convention, but especially the relevant national laws of space faring nations. Australia, the Russian Federation, South Africa, Ukraine, UK., USA., Guiana, and Art.10 of the International Space Station Agreement are quoted.

Finally, we have seriously to consider the Report "COSPAR/IAU Workshop on Planetary Protection", Williamsburg, Virginia, 2-4 April 2002 (67). It proposes "five categories for target body/mission type combinations and their respective suggested ranges of requirements . . . ." It goes deep into the matter and details, especially regarding Missions to Mars and Europa. It contains the draft to be presented to the Council and Bureau.

THE MEANING OF THE TERMS "PLANETARY" AND "PROTECTION".

Before trying to come to a conclusion, we will now have to examine the exact meaning of the two main terms of our topic, namely "planetary", and "protection".

The notion of "planetary" seems to be an astronomical one. The definition seems (but only seems) to be clear: A planet is a celestial body which revolves around a fixed star; in our case, that star would be the sun. Our own Earth is one of those (nine) planets. But all studies demonstrated very quickly, that "planetary protection" would not only apply to such planets but to natural satellites, to moons, of such planets as well, especially to our own Moon.

Our Earth itself is our most important planet. At present only here do exist human beings, who are *sensu strictu* the only legal subjects. We make the law, we have to apply it, and we are to be protected as well as bound by it. Thus Earth is the planet to be protected above everything else. But then, we have to discuss what is further meant by "Planetary". "The Moon and other Celestial Bodies" are, as indicated above, subject to Space Law, especially to International Treaties, Agreements, Resolutions of the UN etc. They, and not only the planets in an strictly astronomical sense are to be protected. We can not - contrary to existing Space Law norms as quoted above - protect Pluto but neglect to protect Luna. In this sense, S. Gorove (68) equalled the Moon with "other planets of the solar system". On the other hand, I do not think that our notion 1"Planetary" also comprises small asteroids, comets, meteorites etc. although they too belong to our solar system. Some such objects might cross Earths orbit at quite close distances. A typical example is Asteroid 253 Mathilde. It was one of the first C.B. which approached Earth 1997 in a way which caused the NASA program of near Earth asteroid rendezvous (NEAR) to study and photograph it (69). And in the same time issue AIAA invited for April, 1998 to the "Leonid Meteorids Storm and Satellite Threat Conference". Such bodies, most of them without detectable orbits, may constitute high danger to Earth and its inhabitants, including Astronauts. Protection from them is requested, not protection of them. They must have a different legal quality. Maybe, they, or some of them, are also to be protected themselves. An example might be an asteroid which might be mined for valuable materials.

But such protection need not be on the same level as that of the C.B themselves. And the question of living entities - be it on Earth or on other C.B.- is of foremost importance (70).

Lachs had raised the question of minimum size of a natural object in space in order to be deemed a C.B. The definition of the latter should be "land areas in space" (71).

A solution might be, and this I propose , the definition of "Planetary Body" as it was defined by the then Working Group Three of the IISL: "Celestial Bodies in (legal) sense are natural objects in Outer Space, including their eventual gaseous coronas, which can not artificially be moved from their natural orbits" (72).

"Protection" (the latin root of this notion is *tectum* - the roof, and *tegere*, to cover) means averting, fending off, shielding from injury or destruction, and other harmful influences - be it by voluntary acts or from natural occurrences (73).

A protecting measure is one which prohibits or at least decreases such harmful influences. The prohibition would be factual (physical - technical). It will have to be based on legal rules, in order to avoid misunderstandings, duplications or even disputes(74).

With this we have to ask Protection from what? From:

Natural bodies: Meteorites, NEO asteroids, comets which could hit Earth or C.B.

Artificial Objects: Space debris threatening especially Earth and near Earth orbits.

Militarisation of outer space and its effects, terrorism from Outer Space.

Radiation, especially from nuclear sources.

Terrestrial Life - no infection of other celestial bodies.

Alien life forms which could bring about "harmful contamination" of Earth and life, above all human life. Here, astrobiological questions have to be discussed.

Special realms on C.B. should be protected from electronic "noise" such as craters SAHA or Deadalus on the Moon, also taking into account the "Common Heritage" Principle.

Then we have to examine: Protection where, of whom and of what:

On Earth: Human life above all, but of course our whole nature, including other life forms (animals and plants), and soil, air, water etc. etc. And all man made things, all artificial objects, immovable or movable as well.

On Other celestial bodies: Crews of manned Space Missions, Stations on C.B., possible alien life forms, or remnants of such, water, other environment on C.B.- whereby it seems questionable whether areas should be included, even if they are completely barren. And protection of C.B. is necessary from becoming "an area of international conflict".

Finally we have to discuss overriding interests, such as deflection of asteroids which threaten to hit Earth, then the legally permitted "use" of C.B., especially mining versus protection, and the possibly too high costs of absolutely sterile Spacecraft etc.

May I add that it would be illogical to protect natural resources on the Moon more strictly than those on Earth. The Moon should remain free, free of appropriation. But its natural resources should serve all mankind. And he who can bring them here, should be rewarded in the sense of a clear space legal regulation.

CONCLUSION: LEX FERENDA.

To find solutions, we at first have to ask: How shall we proceed, and what is our aim?

As we have seen, there are several categories of dangers to planetary environments. To evaluate these categories, and to find practical solutions, we need the expertise of scientists and technicians on the highest level, and we need a forum for these knowledgeable people. But we need an international legal forum as well, on the same supreme level. These fora should be on the broadest international basis and acceptance, and experienced in matters of Outer Space. I strongly propose - in accordance with many authors, as quoted above - that to be the Committee on the Peaceful Uses of Outer Space of the United Nations (UNCOPUOS).

UNCOPUOS was established by UNGA Resolution 1472 (XIV) of Dec. 12., 1959. It has two Sub-Committees, namely the Scientific - Technical, and the Legal ones. It was the most important body, in whose realms the formulations of the Space Treaties, and the "Principles" were worked out (75). It would be insensible, not to rely on the expertise of these bodies, of their excellent procedural knowledge, and the outstanding cooperation of Nations there.

At the Scientific and Technical Subcommittee, possible protective measures could be elaborated against the various dangers to our planetary environment, as elaborated above in Protection from what.

After that, we will have to forge a legal framework for those technical solutions. States might be interested to have the discussion on a basis as broad as possible in an reliable institution, knowledgeable in the formulation of Space Law principles. This once more would be UNCOUPOS, and its Legal Subcommittee.

Thus, States might want to decide on this, and to propose and pass an UNGA Resolution, requesting UNCOPUOS and its two Subcommittees, to work on suitable texts. Those texts could then be the basis of a new set of "Principles", to be voted upon by UNGA itself. Whether then a new Agreement should follow, or whether these new "Principles" themselves would be found to be sufficient, would be a question to be solved, once the said Resolution is passed.

About the content of these Principles, I believe, and I propose, to create an order of values of protection as follows, whereby the protection of the higher category has priority over the lesser ones:

Therefore we have to protect:

1) Human life, be it on Earth or beyond it,
2) Other terrestrial life, i.e., animate nature,
3) Inanimate terrestrial environment, i.e. inanimate nature,
4) Possible alien life forms or their remnants on the Moon or other C.B.,
5) The natural environment of the Moon and other C.B.,
6) In some cases even asteroids, comets etc.

And with this, I submit that the work could start immediately.

Notes and References.

(1) Metaphysics of Morals, Berlin 1912, VII, 31.
(2) Roman law concept: existing valid law.
(3) Treaties must be adhered to, contractual obligations must be kept.
(4) Although Space Law - especially in its beginnings - was International Law, there have been developed more and more national Laws and regulations, applicable to Outer Space.
(5) Roman law concept (see (2): Law to be created.
(6) Reine Rechtslehre, 1934, 1960, General Theory of State and Law, 1945.
(7) Prolegomena einer Theorie des rechtlichen Stufenbaus, Gesellschaft, Staat und Recht, 1931, 252ff.
(8) Legal System, based on human logic.
(9) See Art. 38 of the Statutes of the International Court of Justice, also *Tunkin* Remarks on the juridical nature of customary norms in international law, Calif. Law Rev. 49, 419ff (1961).
(10) See *Kopal* about the "layers of regulations of space activities" in "Existing United Nations Treaties and Agreements", UNISPACE III, Proceedings of the workshop on Space Law in the twenty first century, UN Doc. A/CONF.187/7.
(11) See "United Nations Treaties and Principles on Outer Space", annually published by the UN Office for Outer Space Affairs, Vienna, Austria. It annually contains a list of all relevant documents with indication which States have signed and/or ratified the relevant Treaties and Agreements, prepared by *A. Terekhov*.
(12) Texts in (11).
(13) But see *Reijnen* in (47).
(14) Text in (11).
(15) Dec.10., 1982, No. 37/92.
(16) Dec.3.,1986. No. 41/65.
(17) Dec.14., 1992, No. 47/68.
(18) Prospects for Regulation of Environmental conservation under International Law, Centenary Celebration of the International Law Association, Kluver 1973, 245ff.
(19) ibidem, 248.
(20) 18 Proc. Colloq. L. Outer Space, 1976, 134ff
(21) Houston Journal of International Law, Vol.2., 1979, No.1.
(22) 27.Proc. Colloq. L. Outer Space, 1984, 134ff.
(23) ibidem 326ff.
(24) ibidem 243ff.
(25) esa SP-1109, Technical Coordinator *W.Flury*.
(26) 32. Porc. Colloq. L. Outer Space, 1989, 59ff.
(27) ibidem65ff.
(28) ibidem 71ff.
(29) ibidem 77ff.
(30) of May. 18., 1977 UNGA Res. 31/72.
(31) ibidem 89ff.
(32) ibidem 97ff.
(33) ibidem 100ff.
(34) ibidem 107ff.
(35) ibidem 118 ff.
(36) ibidem 123ff.
(37) ibidem 130ff.

(38) ibidem 138ff.
(39) ibidem 146ff.
(40) ibidem 152ff.
(41) ibidem 163ff.
(42) ibidem 173ff.
(43) ibidem 177ff.
(44) ibidem 184ff.
(45) ibidem 197ff.
(46) I would like to refer to the Book of Abstracts - AIAA, NASA, and NAS - which contains also the scientific - technical papers.
(47) J.Space L. 1993, No 1., 46ff.
(48) 39. Proc. Colloq L. Outer Space, 298ff.
(49) J.Space L., 1996, No. 1., 48ff .
(50) 39 Proc. Colloq. L Outer Space, Beijing, 1996, p.50ff.
(51) ibidem p. 52.
(52) 40.Proc. Colloq. L. Outer Space,Turin, 1997.
(53) ibidem 220ff.
(54) ibidem 238ff.
(55) ibidem 296ff.
(56) ibidem 302ff.
(57) Proceedings edited by *N. Jasentuliyana* and *K. Karnik* United Nations Office for Outer Space Affairs, Vienna, 1997.
(58) Kluwer, The Hague.
(59) J.Space L. 1998, 111ff.
(60) J.Space L. 1998, 129.
(61) ibidem, p.139ff.
(62) 27 Proc. Colloq. L. Outer Space , 395, 1985.
(63) Proceedings of the Workshop on Space Law in the Twenty First Century, UN Doc. A/CONF.184/7.
(64) IAF Paper No. IISL-01-IISL.4.07.
(65) Published by IAA under its Director of Publication *J.M.Contant*.
(66) A/AC.105/768
(67) The Report was prepared by the COSPAR Planetary Protection Panel under the chairmanship of *John D. Rummel*.
(68) Space Law, its challenges and prospects, Sijthoff, Leiden, 1977, 174.
(69) Aerospace America, Dec. 1997, 63 and 70.
(70) The question of extraterrestrial intelligence is not discussed in this paper.
(71) The Law of Outer Space, Sijthoff, Leiden, 46.
(72) *Cocca*, in 7 Proc. Colloq. L. Outer Space 16, 1962. But we will have to be careful there, in order not to exclude the Mars moons Phobos and Deimos from such protection.
(73) Websters New Collegiate Dictionary, 926.
(74) *Fasan*, How to legally protect Outer Space Environment", 32 Proc. Colloq. 1989, 81ff.
(75) See UN Doc. A/AC.105/193 New York, 1973, "Space Activities and Resources", especially p. 2ff.