IISL-99-IISL.4.16

SHOULD THE LUNAR CRATER SAHA BE ACCORDED SPECIAL LEGAL PROTECTION?

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ABSTRACT

The Saha crater has been identified as a unique location from which the search for extraterrestrial intelligence and other scientific investigations may be conducted. Situated on the far side of the Moon, Saha is naturally shielded from radio frequency interference emanating from Earth and geostationary satellites, thereby providing a virtually silent venue to search the heavens and listen for extraterrestrial intelligence. Nevertheless, the pristine state of Saha could be jeopardized in the next several years, as a wide variety of scientific and commercial ventures may be conducted on the Moon and in cislunar space. Therefore, it must be considered whether Saha should be accorded special legal protection. This article examines the current status of Saha *vis-a-vis* the *corpus juris spatialis,* with particular emphasis on whether the crater should be declared as an international scientific preserve.

INTRODUCTION

The study of the radio frequency spectrum is an essential activity in the search for extraterrestrial intelligence. It generally is considered that a signal from an ETI, if any, likely will be faint and of low power and intensity. Fortunately, the sensitivity of detection and monitoring equipment is improving at a remarkable rate. Unfortunately for SETI purposes, we have created an electromagnetic zone expanding in all directions from the Earth, the by-product of telecommunications, irrevocably announcing our presence in the cosmos to any entity which may detect the signals. This zone of radio frequency emissions must be filtered out and factored from the data collected by radioastronomers.[1]

Dr. Jean Heidmann, of the Observatoire de Paris, Meudon, France, has emphatically argued that the problem of

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radio frequency interference (RFI) is particularly acute for SETI.[2] This problem, it is noted, will only intensify as the population of telecommunications satellites and transmitters increases, and more elaborate transmission systems, such as solar power satellites, are developed.[3] Ultimately, the continued existence of Earth based SETI activities, and radioastronomy in general, may be threatened by RFI.[4]

A solution to this problem has been proposed by Dr. Heidmann: the dedication of a zone on the lunar far side for radioastronomy, including, prominently, the search for extraterrestrial intelligence.[5] This proposal is limited in scope so as not to conflict with future exploration and use of the Moon. The intent of the proposal is to "reduce [the] requirements to a strict minimum compatible with good science which should then be considered as a last ditch entrenchment."[6] After reviewing the scientific requirements, and researching potentially acceptable locations, Dr. Heidmann has concluded that a "practically unique candidate" emerges: the crater Saha.[7]

The far side crater Saha, according to Dr. Heidmann, has several unique attributes. First, it is "permanently shielded from Earth radio pollutions."[8] Second, it is accessible from the Earth. Third, it is in the lunar equatorial region, and is in proximity to the eastern longitudes. The crater itself has a high protective rim, and a wide array of topography is present on the crater floor.[9] Dr. Heidmann makes a convincing argument that Saha should be protected. Now it must be determined whether Saha can be protected.

THE SAHA PROPOSAL AND THE *CORPUS JURIS SPATIALIS*

The dedication of a lunar zone for radioastronomical purposes is merely an initial step in a process, as an observatory facility must be constructed and operated from the site to give meaning to the reservation. Dr. Heidmann has identified the "programmatic issues" in establishing such an observatory as follows: transportation; telecommunications; mutual environmental protection; infrastructure requirements; long term maintenance; and international and interdisciplinary concerted technical planning.[10] The preliminary legal matters raised by the Saha proposal were discussed at the Jerusalem Colloquium of the IISL in 1994, particularly by Drs. Doyle and Cocca. It was recommended at that time that contact be made with various groups, such as COSPAR, UNESCO, ICSU and the International Astronomical Union, and that a priority be sought with the International Telecommunications Union.[11]

Substantial progress has been made in furthering the Saha proposal within the international scientific community since the Jerusalem Colloquium. It should be noted, however, that recognition of the need for protection of the radio frequency spectrum for SETI is not a novel concept. The 1979 World Administrative Radio Conference expressed, in the "timid and small print footnote No. 722: 'In the bands 1400-1727 MHz and 101-120 and 197-220 GHz, passive search is being conducted in some countries for SETI'"[12] More recently, the ITU has established a lunar "quiet zone," wherein selected bands are protected on virtually the entire far side of the Moon.[13] Within the international scientific community, additional proposals have been made to, or contact initiated with, the IAF, IAA, the IAU 1996 Bioastronomy Colloquium, the European Geophysical Society, and the EAS/Deutsche Forschungsanstalt für Luft und Raumfahrt 'International Moon Workshop'.[14] In 1998, a symposium dedicated to the Saha proposal was held during the 32nd Scientific Assembly of COSPAR.[15]

The progress within the international scientific community has emphasized protection of the intangible aspects of the Saha proposal, that is, reservation of the radio frequency spectrum for scientific investigations. However, the physical components of the Saha proposal, that of protection of the crater site and the legal implications of its use, largely are matters within the province of the *corpus juris spatialis*. Dr. Heidmann acknowledges that the specific components of the

infrastructure for a Saha based observatory, as well as the means of construction and operation, are yet to be determined.[16] Laser relays, bulldozing the regolith for roads, and other possible mechanisms are under consideration. Each of these measures, however, may present serious issues regarding the disruption of the natural lunar environment, a thorough discussion of which is beyond the scope of this study.[17] However, the threshold inquiry must focus on what protections the *corpus juris spatialis* can accord to reserving the Saha crater for scientific purposes, and ensuring that it remains shielded from RFI.

A. The Outer Space Treaty

The analysis of the issues involved in the establishment of a dedicated lunar zone for scientific research must begin with an examination of the Outer Space Treaty.[18] Article I, paragraph 2 of the Outer Space Treaty provides, as a fundamental principle, that:

> Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States *without discrimination* of any kind, on a basis of equality and in accordance with international law, and there shall be *free access to all areas* of celestial bodies [emphasis added].

This provision would seem to militate against the reservation of a lunar zone, if the purpose of the reserved zone was to restrict or limit the activities of any state in the use or exploration thereof. The setting aside of a particular zone could be considered as discriminating against other uses, and a restriction on free access to areas of a celestial body. Such restrictions, if unilaterally declared, could be considered as a form of national appropriation, prohibited by article II of the Outer Space Treaty.

Article IX of the Outer Space Treaty may have particular relevance to the Saha proposal. This article provides:

> If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the moon and other celestial bodies, may request consultation concerning the activity or experiment.

The operative phrase of the foregoing provision is "potentially harmful interference," which could arise from a variety of sources in a mission or activity. The requirement to initiate or request consultations is consistent with the principles of international cooperation and pacific settlement of disputes inherent in the *corpus juris spatialis* and the U.N. Charter.[19] Although the provisions of the Outer Space Treaty necessarily are phrased in terms of "States Parties," the right to request consultations could not reasonably be denied to a non-party to the Treaty. Similarly, the declination of a request for consultations could not be supported on the narrow ground that it was made by a state not a party to the Outer Space Treaty.

In the event a lunar zone is dedicated, other states do not appear to be prohibited by the Outer Space Treaty from conducting activities in the reserved area. Nevertheless, such states must request consultations. These consultations may be analogous to, or in conjunction with, consultations required for visitation to stations, installations, equipment and space vehicles on the Moon.[20] Should such a state fail to initiate appropriate consultations, any other state conducting activities in the proximity of the dedicated zone could request the discussions.

To be certain, the Outer Space Treaty does protect the rights of states and their nationals[21] to use and explore the surface, subsurface, orbits and trajectories of the Moon and other celestial bodies. However, these rights seem to be based on actual rather than projected or possible activities, such that once a mission or program is established, the right to the use and exploration of the intended areas of the celestial body may be considered to be recognized. But a project such as the dedication of the Saha crater for radioastronomical research, by unknown entities, at some undetermined future date, would not appear to give rise to the same rights as current activities. Thus, the Outer Space Treaty does not seem to provide direct support for the establishment of a dedicated lunar zone. Indeed, the specific provisions discussed above promote the rights of states to use and explore all areas of celestial bodies without discrimination. However, the Outer Space Treaty does provide that such use and exploration must be conducted in accordance with international law.[22] Other sources of international law, specifically the Moon Treaty, may provide direct support for the Saha proposal.

B. The Moon Treaty

The Moon Treaty restates many of the principles set forth in the Outer Space Treaty, although not necessarily verbatim. Included among these reconfirmed provisions are the principles of non-appropriation,[23] free access to all areas of the Moon,[24] non-discrimination,[25] the rights of visitation[26] and consultations,[27] and the encouragement of international cooperation.[28] As discussed above, many of these provisions are not conducive to the dedication of a restricted lunar zone. Nevertheless, direct support for the Saha proposal can be found in the second introductory paragraph of the Moon Treaty, where it is "Recogniz[ed] that the moon, as a natural satellite of the earth, has an important role to play in the exploration of outer space." The Moon Treaty further provides that:

> The exploration and use of the moon shall be the province of all mankind. . . Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the United Nations.[29]

Dr. Cocca has noted that the use of the Moon for SETI communications would be a specific benefit from a celestial body, and the reservation of a lunar zone would be an application of the common heritage of mankind.[30] Dr. Heidmann has been more emphatic, declaring that "it is a political and philosophical duty for humankind to provide for such a safe, unique and limited location from which SETI can be pursued for the benefit of our global culture."[31]

The most significant provision of the *corpus juris spatialis* regarding the Saha crater proposal is article 7.3 of the Moon Treaty, which provides:

> States Parties shall report to other States Parties and to the Secretary-General concerning areas of the moon having *special scientific interest* in order that, without prejudice to the rights of other States Parties, consideration may be

> given to the designation of such areas as *international scientific preserves* for which special protective arrangements are to be agreed upon in consultation with the competent bodies of the United Nations [emphasis added].

This provision allows for the protection of an area which has unique scientific interest, in advance of specific missions or programs to use or explore the area.[32] The Saha crater clearly appears to have "special scientific interest," and therefore should qualify as a candidate for consideration and consultations as provided for in this article of the Moon Treaty.[33] These consultations could result in the enactment of special protections for the Saha crater and environs, including, importantly, the continued shielding from RFI. Since these consultations are to include the competent bodies of United Nations, it may be considered that a broad range of issues will be studied,[34] and appropriate protections developed and implemented for both the physical as well as the intangible characteristics of Saha.[35] The rights of other states parties to conduct activities, however, are not prejudiced, at least pending the establishment of special protections for an international scientific preserve.

The reporting requirements of article 7.3 present an interesting contrast to the notification provisions of other articles of the Moon Treaty. Pursuant to article 7.3, a state party is obligated to report areas of special scientific interest to other states parties and the Secretary General. However, pursuant to article 5.1, "States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of their activities concerned with the exploration and use of the moon." Article 11.6 further obligates disclosures to the Secretary-General, the public and the international scientific community, of natural resources discovered on the Moon.

The terminology of articles 5.1 and 11.6 may be inconsistent with disclosures only to the Secretary General and other states parties as required by article 7.3. Is not an area "having special scientific interest" properly considered as a natural resource of the Moon, and thereby subject to disclosure to the public and the international scientific community? Clearly, both the public and the international scientific community have an interest in any report identifying an area of the Moon as having special scientific interest. Therefore, it may be considered that the omission of the public and the international scientific community from the reporting requirements of article 7.3 was not intended to restrict the disclosure of pertinent information therefrom. That is not to say, however, that as a natural resource, the Saha crater, as a candidate for consideration as an international scientific preserve, also is subject to an international regime as referred to in article 11.5. The establishment of an international regime is not a prerequisite to the designation of an area of the Moon as an international scientific preserve, nor is there any express or implied linkage between articles 7.3 and 11.5. Furthermore, the international regime is not required to be established by article 11.5. Finally, the establishment of special protective measures for Saha could constitute a form of "international regime," and set a positive precedent for the rational management of the use of other resources of the Moon.

CONCLUSIONS AND RECOMMENDATIONS

The Outer Space Treaty, as the fundamental source of legal regulation of mankind's activities in space, provides for the right of all states to use and explore outer space, including the Moon and other celestial bodies. This right of use and exploration is to be without discrimination, and states have the express right to free access to all areas of celestial bodies. Although these provisions of the Outer Space Treaty are not conducive to the establishment of a restricted lunar zone, the Outer Space Treaty also provides that the

use and exploration of space is to be conducted in accordance with international law. The Moon Treaty, as an independent source of international law, provides direct support for the Saha proposal, especially in article 7.3 which establishes a procedure for the designation of specific areas of the Moon as international scientific preserves.

Dr. Heidmann's institution, the Observatoire de Paris, is located in France, and that state is a signatory to the Moon Treaty. Thus, France would be an appropriate state[36] to initiate a report to the States Party to the Moon Treaty and the Secretary General, identifying the Saha crater as an area having special scientific interest. Efforts should be made in the near term to encourage the appropriate institutions within the French government to bring the Saha proposal to the attention of the Secretary General, and to seek placement of consideration of the proposal on the agendas of competent bodies of the United Nations.

Efforts to promote the Saha proposal should continue within the international scientific community. Dr. Heidmann has been instrumental in initiating a Cosmic Study of the Saha crater within the IAA. Extensive communications should also continue with other scientific institutions, such as COSPAR and the IAU, particularly with Commissions 40 (Radioastronomy), 44 (Space and High Energy Astrophysics), 50 (Protection of Existing and Potential Observatory Sites), and 51 (Bioastronomy: Search for Extraterrestrial Life). Finally, the endorsement of public advocacy groups could be sought, as a means of generating support for the protection of the Saha crater within the general population.[37]

NOTES

1. *See* McNally, *The Impact of Space Activities on Astronomy*, in SPACE BENEFITS FOR HUMANITY IN THE TWENTY-FIRST CENTURY 162, 163, U.N. Doc. No. A/CONF.184/BP/13 (1999)("why should the astronomical community be forced, by the actions of others, to accept . . . reduc[ed] efficiency of the sums invested in their buildings, operations, telescopes and detector systems?").

2. Heidmann, *SAHA Crater: A Candidate for a SETI Lunar Base*, 32 ACTA ASTRONAUTICA 471 (1994)[hereinafter referred to as "Heidmann, Candidate"].

3. *See* McNally, *supra* note 1, at 165.

4. Heidmann, *A Proposal for a Radio Frequency Interference-Free Dedicated Lunar Far Side Crater for High Sensitivity Radioastronomy: Long-Term International Programmatic Issues*, IAF Paper No. IAF-94-Q.1.330 (1994)[hereinafter referred to as "Heidmann, Proposal"].

5. Heidmann, Candidate, *supra* note 2; Heidmann, *SETI From the Moon: An Invitation to COSPAR*, 22 ADV. S. RES., No. 3, 347 (1998) [hereinafter referred to as "Heidmann, Invitation"].

6. Heidmann, *Recent Progress on the Lunar Farside Crater SAHA Proposal*, IAF Paper No. IAA-97-IAA.9.1.05, at 3 (1997) [hereinafter referred to as "Heidmann, Recent Progress"]. As an example of these self imposed limitations, Dr. Heidmann has taken the position that the protection from RFI must include geostationary satellites, but not satellites and probes beyond that orbit, which could be "taken care of" by the COSPAR Panel on Potentially Environmentally Detrimental Activities in

Space (PEDAS). *Id.* However, the protection of the Saha crater, or any other reserved zone, must be complete and comprehensive if it is to be effective, and the self imposed limitations may be too restrictive.

7. *Id.*

8. Heidmann, Invitation, *supra* note 5, at 348.

9. *See* Heidmann, Candidate, *supra* note 2, at 471.

10. Heidmann, Proposal, *supra* note 4, at 2.

11. *See* Masson-Zwaan, *Summary of Discussions*, PROCEEDINGS OF THE 37TH COLLOQUIUM ON THE LAW OF OUTER SPACE 301 (1995).

12. Heidmann, Invitation, *supra* note 5, at 348, *citing* Kahlmann, *SETI and the Radiospectrum*, in SETI-3: The Search for Extraterrestrial Intelligence 26 ACTA ASTRONAUTICA 213 (J. Heidmann ed. 1992); *see also* Kopal, *International Law Implications of Extraterrestrial Intelligent Signals*, 21 ACTA ASTRONAUTICA 123 (1990); Cocca, *Reservation of a Lunar Zone for SETI Purposes*, in PROCEEDINGS OF THE 38TH COLLOQUIUM ON THE LAW OF OUTER SPACE 270, 271 (1996); *cf.* Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *entered into force* July 11, 1984, art. 9, ¶ 1, 1363 U.N.T.S. 3, *text reproduced in* UNITED NATIONS TREATIES AND PRINCIPLES ON OUTER SPACE 22 (1999), *and* 18 I.L.M. 1434 (1979)(States shall use only that area which is required for the needs of the station) [hereinafter referred to as the "Moon Treaty"].

13. *See* ITU, *Protection of Frequencies for Radioastronomical Measurements in the Shielded Zone of the Moon*, Study Group 7, Radiocommunications Assembly, Geneva, Rec. ITU-R RA.479-4 (1997).

14. *See generally* Heidmann, Recent Progress, *supra* note 6.

15. *See generally* Protection of Part of a Celestial Body for the Scientific Benefit of Humankind: The Lunar Farside Crater Saha Proposal, ___ ADV. S. RES. No. ___, ____ (J. Heidmann, ed. ____).

16. Heidmann, Proposal, *supra* note 4.

17. For a discussion of these issues, *see generally* Lyall, *The Lunar Far-side Saha Proposal And Law* (1998), copy on file in the Law Offices of Sterns and Tennen; *see also* Sterns & Tennen, *Principles Of Protection Of The Outer Space Environment In The Corpus Juris Spatialis*, PROCEEDINGS OF THE 30TH COLLOQUIUM ON THE LAW OF OUTER SPACE 172 (1988).

18. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* January 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205, *text reproduced in* UNITED NATIONS TREATIES AND PRINCIPLES ON OUTER SPACE 3 (1999)[hereinafter referred to as the "Outer Space Treaty"].

19. *See generally* U.N. CHARTER, Chap. VI, arts. 33-38.

20. Outer Space Treaty, *supra* note 18, at art. XII.

21. *See id.* at art. VI (non-governmental activities require appropriate state authorization and supervision).

22. *Id.* at art. I.

23. Moon Treaty, *supra* note 12, at art. 11.2.

24. *Id.* at art. 9.2.

25. *Id.* at art. 11.4.

26. *Id.* at art. 15.1.

27. *Id.* at art. 8.3; *see also* arts. 5.2, 15.2.

28. *Id.* at art. 4.2.

29. *Id.* at art. 4.1.

30. Cocca, *supra* note 12, at 271.

31. Heidmann, Proposal, *supra* note 4, at 155-56.

32. Lyall, *supra* note 17.

33. Of course, if Saha is found to be inappropriate for any reason, alternative candidates should be sought.

34. For a description of the various bodies of the United Nations with an interest in space activities, *see generally* SPACE ACTIVITIES OF THE UNITED NATIONS AND INTERNATIONAL ORGANIZATIONS, U.N. Doc. A/CONF.184/BP/16 (1999).

35. It may be questioned whether the approach of article 7.3 is inverted. *See* Sterns & Tennen, *Protection of Celestial Environments Through Planetary Quarantine Requirements*, PROCEEDINGS OF THE 23RD COLLOQUIUM ON THE LAW OF OUTER SPACE 107, 115 (1981)("That is, a celestial body should be considered as an international scientific preserve *ab initio*, with particular areas being designated as scientifically safe for use and exploration.")

36. It should not be material that France has signed but not yet ratified the Moon Treaty, as states have an obligation to comply with treaties they have signed pending ratification. *See* Vienna Convention on the Law of Treaties, art. 18, *text reproduced in* 8 I.L.M. 679 (1969). However, as noted by Prof. Ribbelink in his clarification inquiry during the presentation of this paper to the IISL Colloquium, France has not ratified the Vienna Convention, either. Nevertheless, whether by virtue of express treaty obligation, customary international law, or *jus cogens*, it clearly would be bad faith for a state to act to defeat a treaty it has signed pending ratification thereof.

37. *See* Race, *Mars Sample Return and Planetary Protection in a Public Context*, 22 ADV. S. RES. No. 3, 391 (1998).

This paper is dedicated in memory of my father, Edward Tennen. LIT and PMS