History of Rocketry and Astronautics

Proceedings of the Fifty-Third History Symposium of the International Academy of Astronautics

Washington DC, USA, 2019

Otfrid G. Liepack, Volume Editor

Rick W. Sturdevant, Series Editor

AAS History Series, Volume 52

A Supplement to Advances in the Astronautical Sciences

IAA History Symposia, Volume 39

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AAS Publications Office
P.O. Box 28130
San Diego, California 92198

Affiliated with the American Association for the Advancement of Science
Member of the International Astronautical Federation

First Printing 2022

ISSN 0730-3564

ISBN 978-0-87703-681-4 (Hard Cover Plus CD ROM)
ISBN 978-0-87703-682-1 (Digital Version)

Published for the American Astronautical Society
by Univelt, Incorporated, P.O. Box 28130, San Diego, California 92198
Web Site: http://www.univelt.com

Printed and Bound in the U.S.A.

Chapter 4

From Contamination to Sterilization to Quarantine to Protection: The Significance of Terminology on an Interplanetary Scale*

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Abstract

Concern about preventing the biological and organic contamination of other planetary bodies while also protecting the biosphere from the consequences of finding and returning extraterrestrial life to Earth began well before the 1940s and developed into a systematic area of inquiry coinciding with the beginning of the Space Age in the 1950s. Within their first decades, those concepts were initially labelled "contamination" or "sterilization." "Planetary quarantine," a name that suggested a unified approach, eventually gained a foothold, but unfortunately came with latent baggage of its own. Over time, however, that terminology was replaced—quietly, organically, and without fanfare—by the more prosaic "planetary protection," and this phrase has become the accepted common parlance to describe the science and practice of biological and organic contamination avoidance within the space flight community. This is a broad overview of the evolu-

* Presented at the Fifty-Third Symposium of the International Academy of Astronautics, October 21–25, 2019, Washington, DC, United States. Paper IAC-19-E4.1.04.

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tion of the terminology surrounding this concept that eventually came to be known as planetary protection, and does not duplicate material found in the "official" NASA history of planetary protection or planetary quarantine, which covered this specific subject only broadly.

Abbreviations

PPO—Planetary Protection Officer
PQO—Planetary Quarantine Officer
COSPAR—Council of Space Researchers

I. Introduction

Planetary protection, planetary quarantine, and their related descriptors are defined as "policies and practices that seek to avoid biological and organic chemical contamination during space exploration and use. These policies intend to avoid both the contamination of other celestial bodies (forward contamination) and the possible contamination of the Earth's biosphere by extraterrestrial material (backward, or back contamination)" [1].

The notion of protecting the Earth from foreign contamination as well as protecting other planets from Earth-based microbes has seen several terminology changes since its first mentions. This brief history will enumerate the evolution of these naming conventions (and their concomitant thought) and serves as a broad overview of the evolution of the terminology surrounding this concept that eventually came to be known as planetary protection.

II. Earliest Mentions

Concern about preventing the biological and organic contamination of other planetary bodies while also protecting our planet from the consequences of finding and returning extraterrestrial life to Earth began long before space travel was a reality [1], and were famously outlined in H. G. Wells' *War of the Worlds* from 1898 [2]. "The triumph of Earth microbes over the invading Martians saved the day for the earthlings, but provides a timely and instructive comment on one potential concern that might cause the human invasion of Mars to have a negative outcome" [3].

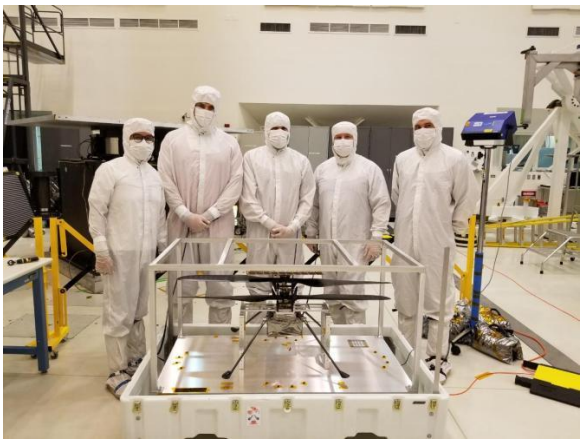

Figure 4–1: NASA Clean room "bunny suits." (image: PIA23317 NASA/JPL-Caltech).

III. Sterilization vs. Contamination

The term "Spacecraft Sterilization" was widely used for several decades from the early 1940s to the mid-1960s, referring both to specific techniques and to the broader concept of complete elimination of earth-based organic and chemical matter [4]. We have now learned that no spacecraft is likely to be truly "sterile," as there are microorganisms that feed on the solutions we use to perform the process.

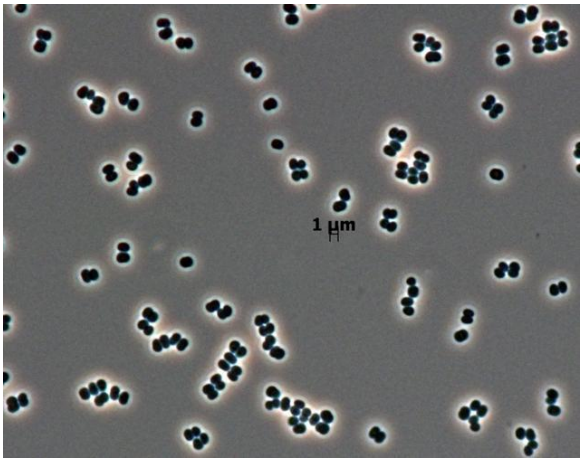

Figure 4–2: Tersicoccus phoenicis, found only in spacecraft assembly clean rooms. (image: PIA17369 NASA/JPL-Caltech).

Figure 4–3: Swabbing the floor for a microbe census. (image: PIA17368 NASA/JPL-Caltech).

Comfortably existing alongside "Sterilization" was the common—and quite opposite—term "Contamination," the latter in heavy rotation during the 1960s and 1970s [5] and still in use today. Both terms described absolutes in the prevention of transferring foreign matter to new worlds and referred to the two possible states of a spacecraft, either contaminated or sterile.

Figure 4–4: Michael Collins at the Lunar Receiving Laboratory. (image: NASA).

IV. From Sterilization to Quarantine

"Planetary Quarantine" entered the common parlance in the mid-1960s [4,6], and became the accepted term of art shortly thereafter [6,7]. Despite being

open to broad criticism [8], NASA established the position of Planetary Quarantine Officer (PQO) in August 1963 [9].

Figure 4–5: Mobile Quarantine Facility. (image: NASA).

V. From Quarantine to Protection

The replacement of "Planetary Quarantine" with "Planetary Protection" came in fits and starts, unlike most official consultative and bureaucratic procedures associated with NASA and other space agencies today.

In 1969, NASA codified the ability of its PQO to arrest and quarantine anyone who was "extraterrestrially exposed" within the confines of the Manned Spacecraft Center (now Johnson Space Center), a task that, in an objective analysis, was seen to lie outside of NASA's function and scope. This likely-unenforceable regulation was primarily responsible for abandoning the term "quarantine" to describe efforts to control interplanetary contamination [1,9]. Richard S. Young, the NASA Planetary Quarantine Officer appointed in 1976, supported the terminology change from "Planetary Quarantine" to "Planetary Protection," but both terms remained in active use until 1981 [1,10].

Uses of the term "Planetary Protection" began to appear in official NASA and other documentation as early as 1977 [11,12]. Then-PQO/PPO Donald L. DeVincenzi et al. [13] proposed international adoption of the term "Planetary Protection," which was accepted by COSPAR in 1984 [9]. However, NASA did not "officially" change the name until the 1988 NMI 8020.7A [14], although it was in use as a title for a NASA HQ official at least seven years earlier. Addi-

tionally, NASA authors had already been using the term for several years prior in their official reports [9].

Figure 4–6: Lunchtime in quarantine. (image: NASA).

VI. Suggested Further Reading

The "official" NASA histories of planetary protection [15] and planetary quarantine [9], cover in greater detail the policies, procedures, and science that went into the development of these programs.

Acknowledgements

The authors would like to acknowledge Dr. Jim Green, NASA Chief Scientist, for the impetus behind this research journey.

The research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Appendix

(Dates for the use of the terms "Planetary Quarantine" and "Planetary Protection.")

Program Designation/ Actor	*NASA HQ*	*SSB*	*COSPAR*
Planetary Quarantine (First)	≤1963	≤1958	1958
Planetary Quarantine (Last)	≥1987	≥1985	1984
Planetary Protection (First)	1978–1981[a]	1982	1983

[a]NASA did not "officially" change the name until NMI 8020.7A (1988), although it was in use as a title for a NASA HQ official at least 7 years earlier (1981). NASA authors had been using the term for several years prior to that (*e.g.,* Stabekis and DeVincenzi, 1978).

[1]

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