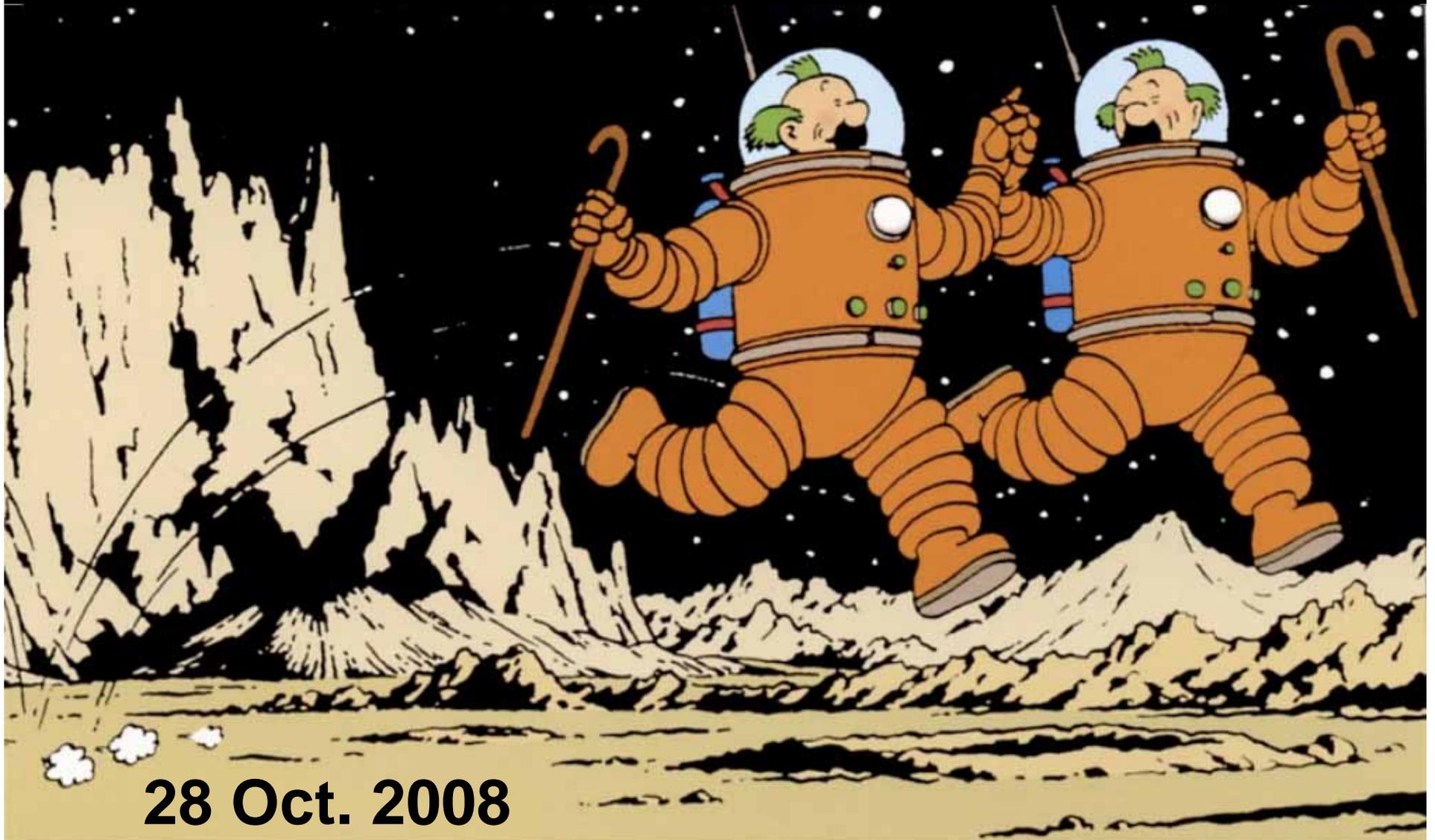


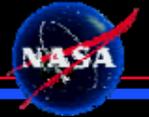
Planetary Protection for the Moon



Catharine Conley, NASA HQ



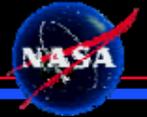
28 Oct. 2008



Essential Planetary Protection Policy

- Preserve planetary conditions for future biological and organic constituent exploration
 - *avoid forward contamination; preserve our investment in scientific exploration*
- Protect the Earth and its biosphere from potential extraterrestrial sources of contamination
 - *avoid backward contamination; provide for safe solar-system exploration*

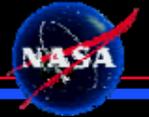
Complies with Article IX of the 1967 Outer Space Treaty



Committee on Space Research (COSPAR) Planetary Protection Activities

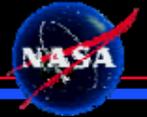
- COSPAR maintains a Planetary Protection Policy representing the international consensus standard for the 1967 UN Space Treaty
- COSPAR's Planetary Protection Panel was formed to:
 - Develop, maintain, and promulgate planetary protection knowledge, policy, and plans to prevent the harmful effects of such contamination
 - Provide an international forum for exchange of information in this area through symposia, workshops, and topical meetings at COSPAR Assemblies
 - Inform the international community, e.g., the Committee on the Peaceful Uses of Outer Space (COPUOS) of the United Nations, as well as various other bilateral and multilateral organizations, of COSPAR decisions in this area.
- Current policy approved by COSPAR Bureau and Council at the COSPAR Scientific Assembly in Montreal, July 2008.
 - Policy is revisited regularly through Panel activities
<<http://cosparhq.cnes.fr/Scistr/Scistr.htm#PPP>>





Planetary Protection Mission Constraints

- Depend on the nature of the mission and on the target planet
- Assignment of categories for each specific mission/body is to “take into account current scientific knowledge” via recommendations from advisory groups (SSB, PPS).
- Examples of specific measures include:
 - Constraints on spacecraft operating procedures
 - Spacecraft organic inventory and restrictions
 - Documentation of spacecraft trajectories and spacecraft material archiving
 - Reduction of spacecraft biological contamination
 - Restrictions on the handling of returned samples
- Probabilistic requirements dictate limits on microbial contamination pre-launch



Planetary Protection Mission Categories

PLANET PRIORITIES		MISSION TYPE	MISSION CATEGORY
A	Not of direct interest for understanding the process of chemical evolution. No protection of such planets is warranted.	Any	I
B	Of significant interest relative to the process of chemical evolution, but only a remote chance that contamination by spacecraft could jeopardize future exploration. Documentation is required.	Any	II
C	Of significant interest relative to the process of chemical evolution and/or the origin of life or for which scientific opinion provides a significant chance of contamination which could jeopardize a future biological experiment. Substantial documentation and mitigation is required.	Flyby, Orbiter	III
		Lander, Probe	IV
All	Any Solar System Body	Earth-Return	V
		<i>“restricted” or “unrestricted”</i>	

The Basic Rationale for Planetary Protection Precautions

(as written by Bart Simpson, Dec. 17, 2000, "Skinner's Sense of Snow")

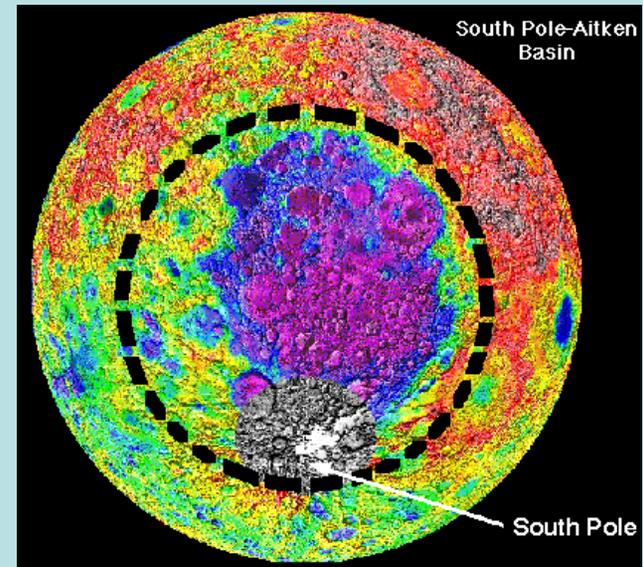


**Science class should not end in
tragedy....**

Science class should not

Committee on Space Research (COSPAR) Guidelines for the Moon

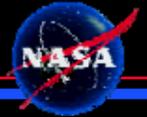
- Previously the Moon was considered Category I, “Not of direct interest for understanding the process of chemical evolution...” requiring no documentation of activities beyond launch.
- To protect possible polar volatile deposits, the COSPAR Planetary Protection Panel has recommended that the Moon should become Category II “Of significant interest relative to the process of chemical evolution ... but only a remote chance that contamination by spacecraft could jeopardize future exploration” .
 - Category II requirements for the Moon will include documentation of activities, final disposition, and an inventory of organic materials (>1 kg) carried on the spacecraft.



Practical Implications for Exploration

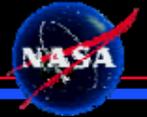
- **Activities on the Moon will not be restricted for planetary protection.**
- **Technologies intended to feed-forward to Mars or other protected planetary bodies should be engineered to meet the more stringent requirements.**
 - **The Moon is an excellent place to develop capabilities for minimally-contaminating equipment, facilities, and human support, as well as microbial monitoring and inventory capabilities that will be required for future exploration.**
 - **Exposure to other planetary materials is inevitable, so it is essential to develop operational procedures for routine monitoring of human health and human activities, to understand the impact on astronauts :**
 - **If somebody gets sick from breathing lunar dust, is it from infection by a 'lunar organism' or just something that came with us?**
 - **Remediation technologies should be developed and tested on the Moon, in preparation for inevitable accidents elsewhere (e.g., Mars).**





NASA Planetary Protection Policy

- The policy and its implementation requirements are embodied in NPD 8020.7F (*NASA Administrator*)
 - Planetary Protection Officer acts on behalf of the AA for Science to maintain and enforce the policy
 - NASA obtains recommendations on planetary protection issues from the National Research Council's Space Studies Board, and advice from the NAC Planetary Protection Subcommittee
- Specific requirements for robotic missions are embodied in NPR 8020.12C (*AA, SMD*): specific requirements for human missions are under development
 - NASA policy requires that COSPAR planetary protection policy and implementation guidelines must be followed by any international mission in which NASA participates



NASA Policy Directive

NPD 8020.7F

Effective Date: February 19, 1999

Expiration Date: February 19, 2009

COMPLIANCE IS MANDATORY

[Printable Format \(PDF\)](#)

**Subject: Biological Contamination Control for Outbound and Inbound Planetary
Spacecraft (Revalidated 10/23/03)**

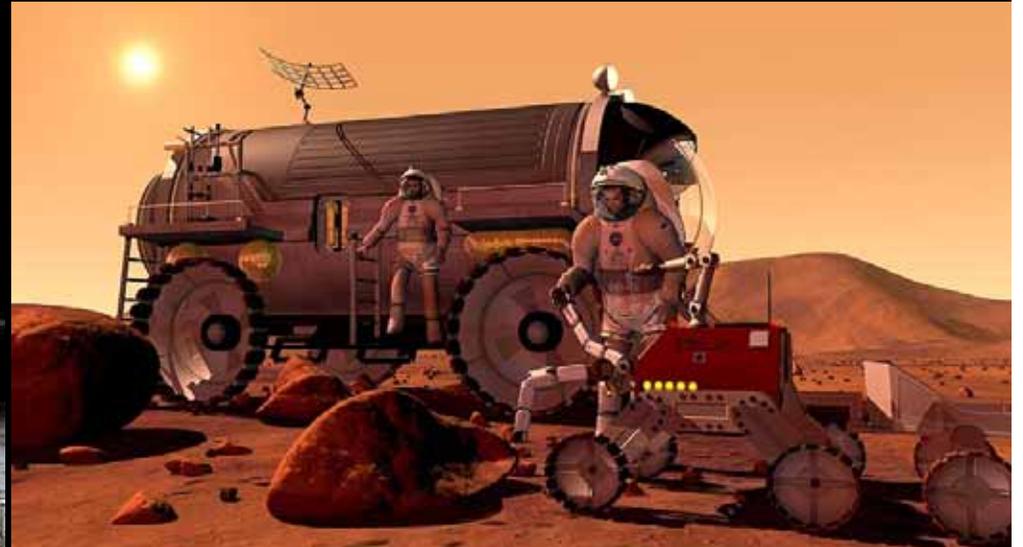
revalidated again, fall 2008

Responsible Office: Science Mission Directorate

- “The conduct of scientific investigations of possible extraterrestrial life forms, precursors, and remnants must not be jeopardized. In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from another planet or other extraterrestrial sources.”
- “This directive applies to NASA Headquarters and NASA Centers, including Component Facilities...”
- “The provisions of this directive cover all space flight missions which may intentionally or unintentionally carry Earth organisms and organic constituents to the planets or other solar system bodies, and any mission employing spacecraft which are intended to return to Earth and/or its biosphere...”

Don't forget the goal!

Experience here...



http://www.polarfoundation.org/pics/projects/Be_poles/drilling_site_domec_or.jpg

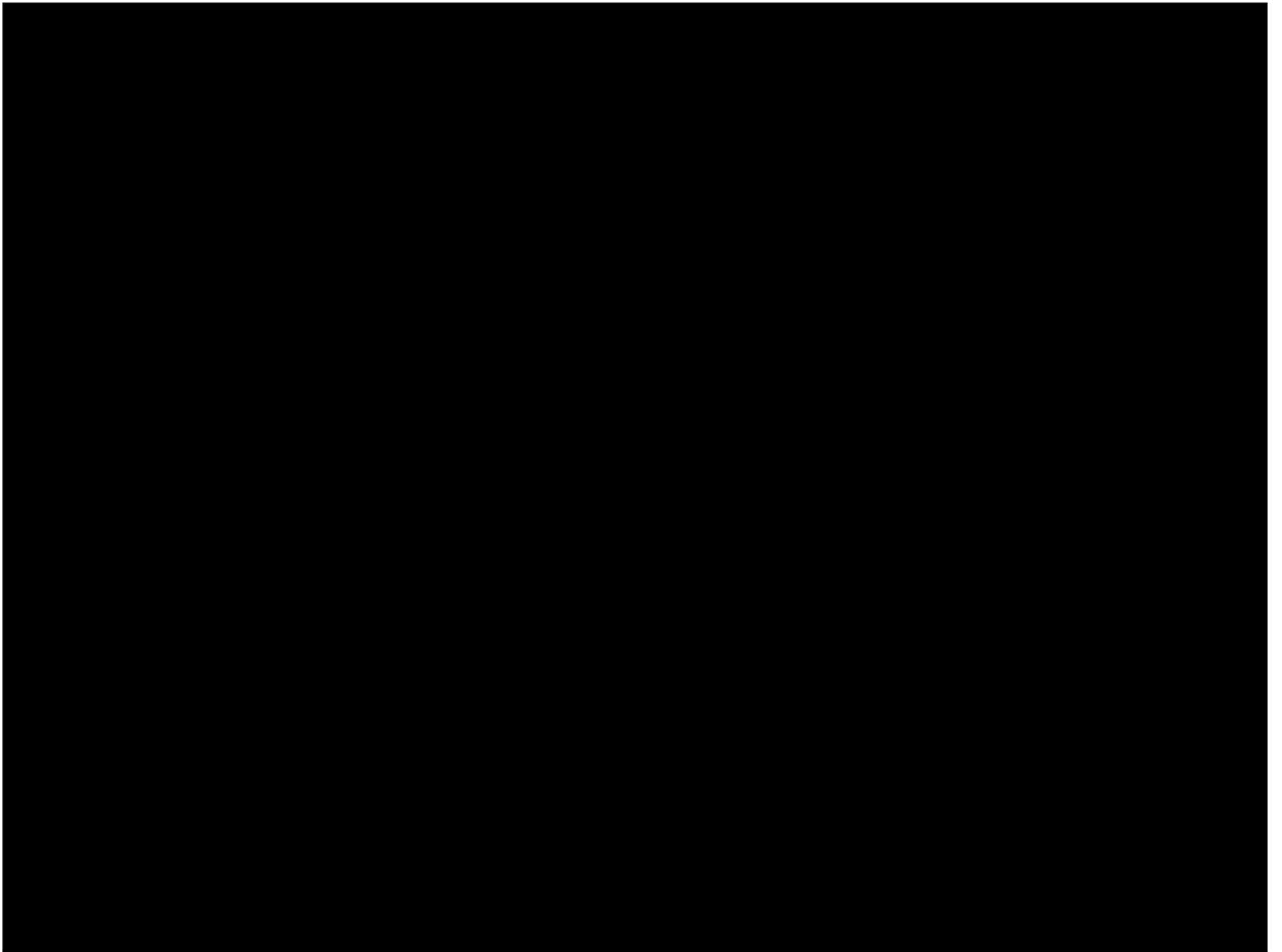
helps get to here...

Protecting the Earth from the Scum of the Universe (well, mostly *vice versa*)



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Beware! *The War of the Worlds*



H.G. Wells
1898



Orson Welles
1938

And scattered about...
were the Martians—dead!
—slain by the putrefactive
and disease bacteria against
which their systems were unpre-
pared; slain as the red weed was
being slain; slain, after all man's devices
had failed, by the humblest things that God,
in his wisdom, has put upon this earth.

...By virtue of this natural selection of our kind
we have developed resisting power; to no
germs do we succumb without a struggle...

An international issue...

