




Two Threats To Terraforming Mars And A Discussion Of How To Counter Them

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Some Observations about Terraforming

- An extremely long and involved process
 - 300-900 years of continuous, well funded effort
 - That time frame does, at least, reflect an assumption of only current technology.
 - N.B.: this is contrary to popular culture's expectations
 - e.g. WALL-E (space colony part).
 - But we won't go there, as it's off topic.
- There are two very obvious barriers to any such long term project.
 - Space Junk
 - Changes in priorities that come with governmental transitions.



Space Junk

- This is a well-recognized problem that is growing robustly, despite efforts to minimize introduction of new objects via spacecraft design improvements.
- Some approximations:
 - 2500 active satellites
 - 17000 debris objects > 10 cm (tracked)
 - >200000 debris objects 1-10 cms (most of which could bring down a manned vehicle)
 - 1 militarily destroyed satellite = >35000 fragments > 1 cm
 - Longevity of most of such debris >10 years
- Manned Space Travel implications:
 - Columbia reactions to first suspicions of the cause.
 - The “open window” myth.



Space Junk (cont.)

- Implications (cont.)
 - War as a means of slamming the window shut.
 - Satellites will be prime targets.
 - “Enshrouded” is the word.
 - Even if society on the ground does survive.
 - So much for the idea space travel is inevitable.
 - In the absence of a 300-900 year peace, this means the time is likely very short for getting a significant start on terraforming Mars.
 - Barring, of course, the invention of an adequate cleaning system.
 - It also highlights how very important to our aspirations keeping the peace is.



Space Junk (cont.)

- Question: Is there a prize for the first “space vacuum cleaner?”
 - If not, let's get on it!



Democratic Elections (Or Other Transitions)

- The task of continuing an effort for a minimum of 300 years is daunting.
 - Every four years the U.S. has an election for its leadership. That's 75 elections and 37 administrations, minimum.
 - Non-democratic industrial nations average about one leader per every 10 or 11 years. That's at least 30 leaders before a terraforming project would be completed.
 - The project runs many generations



The Effect of Time (cont.)

- **300 years is a long time (cont.)**
 - At every change of leadership, the support for an “off world” project gets re-evaluated.
 - Long-term projects subjected to constant, often hostile, review are extremely difficult at best.
 - An overriding principle is the only way to drive such a project.



“Learning More” as a Driving Force

- 300 years!! (cont.)
 - N.B. The principle of “scientific knowledge acquisition” has driven space exploration forever.
 - That does almost nothing for Terraforming.
 - It does little more for global warming.
 - And about the same for manned missions.



Exploration

- A backup principle has been “exploration” as a human drive.
 - “Our destiny” works a bit better with the public than pure science.
 - Who really cares much about the Big Bang?
- But neither of the above motivations will stand up when climate change forces us to look at global warming face to face.
 - Our money will dry up so fast current allocations will look like “the good ole days.”



Death Knell or Clarion Call?

- **Science acquisition as a motivator (cont.)**
 - If we expect to see a terraforming project actually happen, we have to find a better rationale.
- The current threats to the planet are either our death knell or our possible salvation.
 - If we (terraforming advocates) don't put ourselves soundly on the side of presenting an option to the dire predictions, their actually coming true will bury us.




Making it be a Call!


- Putting ourselves on the side of options-viable options
 - First Task:
 - Make the public see it as a viable option.
 - Second Task:
 - Make the public see us as both a strong part of the effort to preserve the planet and
 - As a safety valve in case things don't go well here on Earth.




Backing it up!

- Second Task (cont.)
 - N.B. NO ONE else is offering any backup!
 - Everyone else is stuck on “We must save it.”
 - -But none of them are offering a believable means of “saving it.”

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- - Third Task (Well, maybe a higher priority):
 - Establish a Think Tank
 - Drawing together leading experts from academia, political science, economics, philosophy, etc.
 - \$1,000,000 per year should do it.
 - Provides a means of coping with the long-term nature of the project.

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- - Codifies an institution to influence policy, public opinion, and orchestrate responses to current events.
 - Modeled on the highly influential think tanks of the conservative movement such as the Hoover Institute.
 - Hard to underestimate their effectiveness.

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- - Note: This was submitted to the Mars Project Challenge, but didn't make the cut.
 - Now I'm seeking a new sponsor for the idea.
 - Anybody know Diamontes? Or Musk?
Or ??
 - But finding an institution to drive such an effort is a formidable task.
 - -A driver is essential.




- This may actually see the terraforming option become viable.
 - Must be seen as a positive, not “giving up” position.
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Can Science Do It?

- The scientific community is uniquely positioned to push for terraforming.
 - Number one, it has the reigns.
 - But, it doesn't have the public behind it-or even some of its own.
- An essential advantage the scientific community has.
 - To get the public behind it, all that is need

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- - The question, perhaps, is whether the scientific community has reached the point of having actually become a culture or even a “religion” in its own right.
 - The latter is a charged term, but the equivalent of one or the other is what is needed, in any case.

Two Threats To Terraforming Mars And A Discussion Of How To Counter Them

Slide 1:

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Slide 2:

Terraforming Mars is an extremely long and difficult undertaking. Minimum estimates for the project are in the range of 300+ years, with the more common estimates being higher by one to two hundred years. This is a surprise to many, as the expectations promoted by such pop culture movies as *Star Trek* and *WALL-E* emphasize unlimited technological advances. In fairness, the estimates above assume only current technology with, at most, moderate assumptions about new inventions. But, on the other hand, they also assume continuous effort toward the end goal of terraforming that planet.

There are at least two obvious problems with such an assumption: space debris and politics as usual.

Slide 3:

The space debris problem is one that's well recognized, but growing nonetheless. There are approximately 2500 active satellites, 17,000 objects greater than 10 centimeters in diameter, and as many as 200,000 from 1 to 10 cm in orbit at present, any of which might bring down a spacecraft. In addition, the military destruction of a satellite in orbit introduces approximately 35,000 potentially lethal fragments into orbits that require, on average, more than ten years for decay to destruction in Earth's atmosphere.

Slide 4:

Some implications for manned space travel:

1) If missions start encountering debris, the public won't support more missions (e.g. reaction to the first suspicions re Challenger). There's strong opposition to throwing money at space, throwing human beings to their death in space will not be tolerated at all.

2) The assumption that we will naturally become a space faring planet is put very much in doubt by the potential of a military conflict, during which most of those 2500 satellites will likely be targets.

A war between two satellite owning countries will literally slam the open window into space shut, and we will likely never go there again, even if the technology/society survives on the ground.

Slide 5:

Question: Is there a prize like the x-prize for a "space vacuum?" Maybe with countries being eligible? If not, one or more of our benefactors and/or a space interested country and/or the United Nations and/or ??? should get on it immediately.

Slide6:

The problem of consistent support is dramatically complicated by the frequent elections that appear to be an integral, and critical, part of democracies. With even the smallest time estimates, the effort in America would have to be sustained through at least 37 administrations and 75 elections. For non-democracies we're talking about 30 leaders, minimum.

Slide 7:

This project needs to run for many generations through many changes in leadership and, potentially, focus. An overriding principle is the **only** way to sustain it.

Slide 8:

The current driving principle behind space exploration is "learning more". As a principle, this does virtually nothing for the goal of terraforming Mars, little more for the problems presented by global warming, and about the same for manned missions.

Terraforming Mars is about development and, although much will obviously be learned, that doesn't seem to be its focus. The case for space based knowledge being applied to global warming may be sound, but it certainly isn't being made well, and, to the general population, seems tangential at best. The whole idea of gathering information is clearly as readily addressed by robotics as by sending people, especially if the budgetary considerations are included in the evaluation. And that will be an increasingly important factor.

Slide 9:

An additional principle behind space exploration is that "exploration is a human drive." This probably appeals to the general public more than does the pure science arguments. But neither of these two principles will withstand the onslaught of competing demands if the problems of global warming prove to be even one fifth what they are projected to be by the great majority of the experts who study the problem. Money for space will approach zero precipitously.

Slide 10:

If we want to have our prodigy see a terraformed Mars, we **have** to have a better driving principle. If we don't line ourselves up on the side of those working to respond to global warming, then the onset of the predicted problems will bury us.

Slide 11:

The goal of lining ourselves up on the side of working against global warming entails at least two tasks. The first is to make the public aware of the realistic possibility of terraforming Mars. The second is to identify, in the public's eye, the projects directed toward terraforming Mars as **both** a strong part of the efforts to preserve this planet and a safety valve in case things don't go as we'd like here on Earth.

Slide 12:

Notice: **Nobody** is currently even talking about the possibility we might not succeed in "saving the planet!" This despite the fact that none of those who are unwilling to acknowledge that we might not save it, have presented any credible proposals for saving it, let alone shown any overall progress.

Slides 13-14:

Another task which seems advisable to this author: Establish a Think Tank of established scientists plus theorists from political science, economics, philosophy, etc. to address the goal of transferring the primary goal of the space program from one of gathering scientific data to one of developing another location in the solar system for Earth-based life forms to survive.

Estimated budget for such a think tank would be in the one million dollar per year range. A think tank could serve as a kernel to influence policy, public opinion, and orchestrate responses to current events. The ideal model would be the Hoover Institute and other examples of conservative public opinion persuaders.

Slides 15-16:

The Mars Society chose not to get involved in this as it's MPC proposal (at the preliminary selection process, even).

So now I'm calling for a donor. Diamontes? Musk? Bill?? Anyone???

Finding funding for this or a similar project is essential if we hope to find a new driver for the project of terraforming Mars. Finding such an institution, however, and inventing a new driver for the project could, indeed, make it happen. One additional important point, though: This must be seen as a positive, not a "giving up" position.

Slides 17-18:

The scientific community is uniquely positioned to push for terraforming, for it has the reigns in regard to these kinds of considerations. But it presently is neither united in support nor in possession of public support for such a different kind of goal (development vs gathering info).

The question, perhaps, is whether the scientific community has reached the point of having actually become a culture or even a "religion" in its own right. The latter's a charged term, but, whatever you call it, the equivalent of one or the other is what is needed to bring about the necessary kind of change in principle that we need.

Slide 19:

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