



## Viewpoint

## Defending spaceflight – The echoes of Apollo

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## ABSTRACT

This paper defends, and emphasizes the importance of, spaceflight, broadly construed to include human and unmanned spaceflight, space science, exploration and development. Within this discourse, I provide counter-replies to remarks by physicist Dr. Steven Weinberg against my previous support of human spaceflight. In this defense of peaceful spaceflight I draw upon a variety of sources. Although a focus is human spaceflight, human and unmanned modes must not be treated as an either-or opposition. Rather, each has a critical role to play in moving humanity forward as a spacefaring species. In the course of this communication, I also stress the perennial role of space agencies as science and technology-drivers, and their function to provide a stable and unified platform for space programs.

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## 1. Introduction

This paper defends, and emphasizes the importance of, *spaceflight*, broadly construed to include human and unmanned spaceflight, space science, exploration and development. Within this discourse I provide counter-replies to remarks against human (manned) spaceflight in particular.

In Ref. [1], I presented some common reasons for human spaceflight. In Ref. [2], Dr. Steven Weinberg, Nobel Laureate in Physics, expresses why he finds those reasons unconvincing. In this paper, I argue that his responses are insufficient and do not provide justifications for rejecting the pursuit of human spaceflight. Some of my points are intended to anticipate other anti-human spaceflight positions, and may not be suggestive of Dr. Weinberg's view. In this defense of the pursuit of peaceful and responsible spaceflight, I draw upon a variety of sources that demonstrate the benefits of human and unmanned spaceflight.

It is important to explicitly state that the unmanned-manned spaceflight distinction is not an either-or opposition. They are not mutually exclusive modes of spaceflight and should not be treated as such. Each has a critical role to play in moving humanity forward

as a spacefaring species. To argue against one or the other—at least in a sweeping, unqualified, or context-independent sense—is misguided. I believe spaceflight in general, and human spaceflight in particular, has been and can continue to be a means to uplift humanity on an individual and collective basis. It must not be taken lightly, but should be pursued responsibly with (inter)national resolve and cooperation. It should not be pursued with profiteering in mind, but should have scientific knowledge, technological advancement and infrastructure development as goals.

In the course of this communication, I also stress the perennial role of space agencies such as the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) as science and technology-drivers, and their function to provide a stable and unified platform for space programs. More generally, I stress the essential role of public or national space programs, and call for greater support for these engines of innovation. For NASA to successfully do what it does best, not only does proper leadership need to be in place, but one or more long-term visions for scientifically, technologically and socially fruitful spaceflight must be formed.

The paper is divided thusly: section 2 summarizes the positive spaceflight position, section 3 presents my counter-responses to Dr. Weinberg [2], section 4 offers a discussion, and section 5 ends with some concluding remarks. Section 3 is divided according to the rationales for human spaceflight discussed in Refs. [1,2]. Key phrases or passages are either in bold or italicized text.

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## 2. Spaceflight position summary

The pro-spaceflight position I take is a *positive* one in at least two senses. First, in a normative sense: (human) spaceflight should be pursued. It has value—scientific, technological, moral and otherwise. Second, it is positive in the sense of production, development and responsibly proactive engagement. I summarize the general idea below. In what follows ‘HSF’ is short for ‘human spaceflight’.

- A fundamental, overarching goal, drive, and obligation is to positively develop and uplift humanity.<sup>3</sup>
- When wisely conducted, spaceflight—unmanned and manned—can be a means toward that overarching and ever-present goal. It is one manifestation of that ever present goal. It is also arguably sufficient for it, with some reasons being that both forms of spaceflight (but perhaps HSF in particular) requires/ involves/affords/realizes/engenders:
  - (a) Achieving higher levels of...
    - (i) Pedagogical and educational progress (improving the quality of teaching, education and access to education)
    - (ii) Scientific knowledge, and technological development
    - (iii) Infrastructure ...that ideally benefit all persons, increasing the quality and care of life
  - (b) Engaging novel environments and conditions
  - (c) Increased potential to solve problems in other domains of society
  - (d) International cooperation, as well as interdisciplinary collaboration and research
  - (e) Stimulating, appealing to, and strengthening the selfless and positive aspects of the human spirit, the human mind, and the human heart, e.g., the drive to do good; the desire to be part of something greater than oneself; awe, wonder, and the sublime; the joy that comes from discovery, collective accomplishments, teamwork, etc.
- These reasons for (human) spaceflight are partially summarized as:
  - Scientific knowledge and discovery; Exploration itself
  - Practical benefits: spinoffs, problem-solving
  - Aspirational, philosophical, aesthetic, intangible and uplifting effects on the intellect, mind, spirit. This includes inspiring effects on current and future generations
  - Improving life for posterity, and
  - Survival, e.g., the fate of our sun and solar system; unknown astronomical threats, etc.
- In short, “Space exploration stimulates the creation of both tangible and intangible benefits for humanity.”[3, p.5]
- Spaceflight should be responsibly and peacefully pursued for the above reasons, but also because it may very well be a natural step in the direction of positive human progression.

HSF is *essential* at least in the sense that it is necessary for humanity to survive in the long-term. This is under the assumption that we do not develop the technology capable of preventing (or changing) astronomical phenomena from leaving Earth uninhabitable. Given that assumption, it is a *moral imperative* or *obligation*.

<sup>3</sup> ‘Positive development’ and ‘uplift’ are not explicated here except to say that they are used in at least in the sense of doing good; increasing the human beings ability to do good, improve, realize their potential, contribute, cooperate, and so on. They have to do with touching that part of the human spirit that seeks to grow, have a positive effect, and do good. It may be helpful to remind ourselves of Article I of the United Nations outer space treaty of 1967, which states that space exploration is for the benefit (and province) of all. URL: <http://history.nasa.gov/1967treaty.html>, <http://www.oosa.unvienna.org/oosa/SpaceLaw/outerspt.html>.

In Ref. [4], Schwartz gives specific arguments in favor of a moral obligation for space exploration, including the survival rationale (from asteroids and solar evolution). Although he no longer flat-out endorses those arguments, they remain supportive of spaceflight. In his more recent paper [51], he is correct in that space science (as contrasted with space development in the sense he uses) is of paramount importance. This point, which he explicitly states, is one that I have implicitly assumed. That is, in my writing I have made two assumptions. First, that HSF will and must involve (indeed focus on) scientific investigation, at least in our early developmental stages of space exploration. Two, I have implicitly assumed that space development is primarily about technological innovation and producing the physical infrastructure that will allow humanity to safely and sustainably live beyond Earth. I have not had commercial, recreational, or profit-oriented space activities in mind, partly because these are dependent on a secure scientific and engineering foundation. Thus HSF must be scientifically and technologically-focused.

Responsibly engaging in HSF, and the research and development to see it accomplished, is simultaneously *one path toward* the manifestation of the *creative* and *productive* powers of the human mind, and *is* the manifestation itself. In manifesting those powers for the good of all, we are attending to our natural moral imperative (e.g. as expressed by the first bullet point). In this process, we stand to better ourselves and increase the quality and care of life.

The potential to do so exists as an extension of the imaginative possibilities, and discoveries, the mind conceives and apprehends. History—before and after project Apollo—has shown that this potential is actualizable. “Possibilities for benefit creation multiply rapidly when the products of space exploration interact with the imagination and creativity present in other fields of endeavour.”[3, p.6].

I say *responsibly/wisely* because it should be obvious that we must (continue to) take the proper precautions, and ensure **capability-development** for *safe* spaceflight. Astronaut Chris Hadfield says it well: “We’re going to do it [forming a permanent human presence in space] because it’s a natural human progression”<sup>4</sup> and “[...] we are trying to do it right and it takes time, it takes patience and it takes tenacity” [39]. As he says, we are not going to engage because it “titillates the nerve endings.”

So if, in expressing anti-HSF views, Dr. Weinberg [2] is claiming that we do not have the capability to safely engage in HSF missions, then that claim is different from an anti-human spaceflight position. The former does not imply the latter. If the former is true, then quite obviously to be successful (as well as safe) in HSF *we must develop the requisite capabilities* for, among other things, long-term missions. In other words, the absence of capability at a given time is not a reason against HSF research and development, and should not be used as such. Even in circumstances where there are good reasons to postpone HSF activities, there are no good reasons for never pursuing it.

<sup>4</sup> From a philosophical perspective, the concept of natural human progress raises questions, but I interpret these quotes as being consistent with the sort of positive direction and uplifting of humanity I have in mind. Natural human progression, is (or should be) an inclination, drive or natural directedness toward greater levels of good, positive development, and quality of life. It is toward generating conditions that better afford persons the ability and resources to realize their creative potential, and their potential to do good, e.g., solve problems, help others, etc. Aside from the common rationales, I believe spaceflight is an activity that moves in that direction if coupled with scientific and technological investigation and a sense of discovery and exploration. Persons may not act in altruistic or beneficial ways, but I believe it is an inherent human drive, one that can become obscured by the many harmful socio-psychological influences that surround us from birth. These are by no means simple topics, but this will suffice for the present communication.

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