



Humanist Community in Silicon Valley: Forum on March 19, 2017

Humanity's Space Frontier: Implications, Practicalities and Ethical Issues

by Chris Cassell, Ph.D.

Show Deep Space Industries promotional video (4 min)

(Chris is a co-founder of DSI) **

- First shown at Deep Space Industries' public announcement event in January 2013 **
- Vision of space resource utilization as an enabler of the space frontier, and the benefits thereof
- Many specifics in the video are outdated after 4 years, but the vision remains strong

**** The opinions expressed in this discussion are those of the presenter and not necessarily those of DSI.**

Implications (1 of 2): Are we “smarter than the dinosaurs?”

- That remains to be seen. We are currently **no** more capable of defending ourselves against a large asteroid or comet impactor than were the dinosaurs. (note: asteroids are **both** threat & promise)
- But are asteroids the **biggest** near-term threat to civilization? (hint: consider recent **politics**)
- Read Chris’ article from Nov 1995: Comments on “Arguments for Space: Space Travel or Extinction” (**attached**). The case is made that human expansion into space is necessary for technological civilization, and the “window” to do so is both short and near-term. (Not a commonly expressed opinion.)
- The “Malthusian Catastrophe” refers to collapse of human civilization due to inability to accommodate continued growth. So far, that’s been postponed by advances in agriculture, etc.
 - Is it nevertheless likely or inevitable?
 - If/when it does happen, the fall will be harder and deeper. Agree?
 - This is predicated on a “world” view that Earth is everything. Is that too limiting?
 - You don't need to expand your resource base if you completely recycle what you use. True?
- What are the threats to Earth and Humanity?: Top Five List
 - During next 1 to 500 years? (Chris thinks asteroid impacts not on this list)
 - 1000 years and beyond? (Chris thinks asteroid impacts makes this list)

Implications (2 of 2)

- What are characteristics of a sustainable economy and civilization?
 - Does it need to be continuously **expanding**?
 - Does it need to be **technological**?
 - Does it need to be global in **scope** (vs. multi-planet, regional, or local)?
 - What is the appropriate role of **government** in regulating such an economy/civilization?

[Note: these questions address only **sustainability**, not **desirability** of a particular economic system.]

- What is a **frontier** (space or earthly) and what's its relation to the civilization that "feeds" it?
- How does human expansion into space "save the Earth"? Can it?

Practicalities (1 of 2)

- A brief primer on Solar System history, emphasizing the relation between Main-belt asteroids and Near-Earth Objects (NEOs)
- What are the resources of space; should they be brought to Earth?
 - Low “Value” Stuff: Water, CO₂, Regolith (dirt)
 - Makes “Carrying Coals to Newcastle” seem like a good idea (so, **No**)
 - Industrial Metals: Iron and Nickel ***Maybe**
 - High “Value” Stuff: Platinum Metal Group (PMGs), Rare-Earth Elements (REEs)
 - **Yes**, but not likely until the space economy is well-established
- What are Advantages/Disadvantages of **Asteroids** vs. **Moon** as Source
- Space Resource Utilization **analogy**: Imagine settling North America if you had to bring everything you needed to live from Europe
- How do you make a business from space resources when there are (as yet) no **customers**?

Practicalities (2 of 2)

- “Space is a **Place**, Not a **Program!!**” (A Space Activist “Mantra”)
 - The "Space Age" began as a competition between the superpower **governments**
 - But an increasing proportion of space activity is now in the **private** realm
 - Yet, people continue invariably to link the words "Space" and "Program" (annoying, at least)
- Positive roles for **government** in space activities include:
 - Establishing legal frameworks: Clearing questions of ownership of space resources so that investors can invest
 - Exploration and Science beyond what is currently economic (as with Lewis & Clark)
 - Being “anchor tenant” & customer for early space industry (as with early aviation industry)
- Human expansion into inner solar system has more in common with undersea and arctic/antarctic operations than it does with interstellar travel and other subjects of **Science Fiction** (in my opinion).
 - I am satisfied to help humanity make the first permanent steps into near-Earth space, while we still can, and leave more ambitious steps to future generations.
 - So today, let's not diverge into speculations about settling exoplanets, faster-than-light travel, wormholes, etc. (except maybe aspirationally). **Please!!**

Ethical Issues (1 of 2)

- Given our poor stewardship of the Earth, what gives us the right to expand our **carnage** into the wider cosmos?
 - I (Chris) think that, regardless of our current societal maturity, we need to expand **now**
 - Yet many believe that we should solve our problems on Earth **before** going into space
- The sources of materials for industry in space, asteroids, the Moon, etc., are likely **devoid of life**
 - Does that **absolve** us of ethical responsibility for good stewardship, as we have with Earth?
 - Settlement of the American frontier by the U.S. had hugely negative impact on Indigenous Americans (to put it mildly). Is that fundamentally different from the space frontier?
 - I (Chris) nevertheless have ethical issues with “terra-forming” of Mars, even if Mars lacks life.
- An unregulated economy tends to increase **income inequality**. Is this true and will it be better or worse on the space frontier?
 - What does “Free” Economy mean? (Chris is currently reading R. Reich’s “Saving Capitalism”)
 - Is it O.K. for the space frontier to be like the “Wild, Wild West” on steroids? Can we stop it?

Ethical Issues (2 of 2)

- Would it be O.K. (and most desirable) for humanity to proceed into the future as an agrarian, non-technological, Earth-only society? There are appeals to a simpler, pastoral existence.
 - Technology allows us to expand and **enrich** our understanding of reality and the Universe, but does that benefit outweigh the risks our global civilization now faces?
 - A non-technological Earth-only society could support only a small fraction of Earth's current **population**. Does it seem likely that the needed population reduction would be violent?
 - A non-technological future also leaves our far-future **vulnerable** to asteroid impacts, our Sun's going supernova, etc. Should we be worried and take responsibility for that **now**?
- Human space settlements can be in "free" space as well as on planet or moon surfaces
 - Many advocate that free-space settlements be **preferred** to those on planetary surfaces
 - Colonies in space can have artificial gravity via rotation & a shopping mall-like environment
 - Mars (unless "terra-formed") makes Antarctica look like springtime in the park. Do Mars colonists have the **right** to inflict such harsh environments on their descendants?
- Does existence within a totally artificial free-space environment fundamentally change what it means to be **human**? Have we gained the **right** to change at will what is **natural** for us?