

Everyone's going to the Moon

It will be almost fifty years between the next human landing on the Moon and the last one on December 11, 1972. As of mid 2007, no less than six nations announced their intention to put their citizens on the Moon. The countries are the United States, Russia, Japan, the EU (ESA), China, and India. A Moon race is clearly underway, at a staggering cumulative cost exceeding one trillion (current) dollars. The first of these human lunar landings is expected to be the United States in approximately 2020, followed in short order by the other announced contenders, especially China.

So, why are countries representing the greatest share of our Earth's wealth and population racing to such an inhospitable environment, with no atmosphere, unproven benefits, and radiation levels not exactly conducive to good public health?

In addition to the daunting technical and cost issues, there is the not so minor issue of who owns the place anyway? There is no Law of the Moon, comparable to the Law of the Sea or Antarctica. The United States and certain other nations backed away from a proposed UN Moon treaty in 1982. There is a more limited, though not inconsequential, Outer Space Treaty agreed to in 1967 and eventually signed by approximately 189 countries. Based on the Bureau of Verification, Compliance, and Implementation, the essence of this treaty is as follows:

First, it contains an undertaking not to place in orbit around the Earth, install on the moon or any other celestial body, or otherwise station in outer space, nuclear or any other weapons of mass destruction.

Second, it limits the use of the moon and other celestial bodies exclusively to peaceful purposes and expressly prohibits their use for establishing military bases, installation, or fortifications; testing weapons of any kind; or conducting military maneuvers.

These seem eminently sensible rules regarding the non-proliferation of weapons of mass (or minor) destruction in outer Space, but they don't resolve more mundane issues of property rights, resource exploitation, environmental impact, earth remote sensing (*aka* spying), and so forth.

It is fair to say that few in the general public either understand, or necessarily agree with, the priority of returning to the Moon with humans. Nowhere is this truer than the US. This country will spend some \$200 billion returning to the moon with manned landings. So far, possible benefits have been inadequately explained by NASA, the Executive branch, or Congress. And, of course, there are well documented trade-offs involving cutbacks in the exploration of Space Science, and other NASA space programs. Ironically, we will soon know more about the Moon and Mars, than Earth's deep ocean floors.

Most would agree that it was the Space Race between the US and the Soviet Union that led to the US placing the first humans on the Moon, July 20, 1969. Most would also agree

that the overall benefits exceeded the considerable costs of this endeavor, in terms of national pride, new technologies, science, and the remarkable visual perception of the fragility of our Earth.

Moving fast forward to the 2020 time frame, a few things need to happen that were not addressed in Jonathan King and Nina Simone's delightful title song "Everyone's gone to the Moon":

- It seems an incredible waste of human resources for six nations (or more) to separately fund high risk missions to the Moon, and set up independent lunar bases.
Haven't we learnt anything from Antarctica and the necessity for, and benefits of, international cooperation? Something has to give between now and 2020, whereby the announced Moon-faring nation states work to combine their resources and objectives for the benefit of *all* humankind, as well as their national objectives. In this respect, the U.N. Antarctica treaty and shared international base, is a good proxy.
- **It is not unreasonable to speculate that the U.S lunar exploration budget could be cut by at least half, saving ~\$100 billion in taxpayer money, if the U.S. were to help form a consortium of nations to return to the Moon - in a manner analogous to establishing the International scientific base on Antarctica.**
- The 1967 Outer Space Treaty is all well and good, but there is legitimate (and growing cynical) concern that the non-militarization of the Moon is not a "*slam dunk*." Firstly, it was a while ago, and much has changed in terms of the technology, verification, and politics of current warfare. Secondly, it is not clear that certain powerful nations, including the US, can be trusted to adhere to the 1967 treaty. What is needed is a reaffirmation that the Moon will not be used for military purposes; as well as a structure for peaceful and environmentally benign exploitation – in other words, we need a (new) Law of the Moon.
- Thirdly, the public deserves a more cogent set of reasons and benefits for returning to the Moon - beyond the fact it is there, and we need to exploit it! I have attempted to highlight some important benefits that would get me excited as a member of the general public.
 - **Exploration.** *The human species is compelled to determine if survival and reproduction on a planet other than Earth is possible. A sustained presence on the Moon would help establish the conditions necessary for such a capability. Just imagine the first extraterrestrial human birth!*
 - **Science.** *Our understanding of the universe and our place in it would be advanced by scientific experimentation, such as building a (radio) telescope on the far side of the Moon that would be more powerful than any existing telescope (including the planned James Webb Space telescope in approximately 2013).*
 - **Energy.** *There are intriguing possibilities of energy sources that could benefit our earth-bound needs. The more obvious is solar energy that*

could be collected and beamed to suitable collectors on Earth. A more distant but higher impact source of energy is the abundant trapped helium 3 that is present on the lunar surface or regolith. Helium 3 is a very rare isotope of helium on Earth, and is a potential ideal low neutron emitting fuel for nuclear fusion, according to many nuclear scientists. It is hoped the fusion 500 MW reactor ITER being built in France by a seven-nation consortia (US investment is ~\$1 billion) will demonstrate the commercial viability of nuclear fusion by the 2020 time frame. Nuclear fusion is a strategic research initiative that currently is receiving low level annual funding in the US (DOE R&D investment ~\$350 million/year).

- **Media.** *The TV, Internet, social networks, and to some extent the print media businesses, stand to gain significant viewers and billions of advertising dollars (Google, Yahoo, News Corporation, Time Warner, Disney, BBC, Canal Plus, etc.) from a sustained human presence on the Moon. This could run the gamut from serious science based programs, to reality and competition- based shows (Lunar Rover Race?).*
- **Serendipity.** *Based on the old adage that “We don’t know what we don’t know” it is highly probable that important unanticipated discoveries will occur on the Moon. In the course of human development this has always been the case. For example, products such as Teflon, Velcro, Post-it-notes, microwave ovens, etc., were serendipitous inventions, while Christopher Columbus, Vincente Pinzon and Leif Ericsson ‘discovered’ new continents while not going where they thought they were going! Even the discovery of infrared radiation proved serendipitous (<http://en.wikipedia.org/wiki/Serendipity>). In the case of NASA, inventions have included kidney dialysis, CAT scanners, surface enhancement coatings, cordless power tools & appliances, and temperature regulated clothing.*

In conclusion, the new Moon race needs to be tempered with a little less competition and a lot more international cooperation, by using the U.N. Antarctica treaty and base as a model for lunar exploration. It is also imperative, for the sake of humanity, that the Moon is declared a ‘**military and arms free zone**’ - before that genie is out of the bottle. Our current world situation continues to be fragile, but this is a vital issue for men and women of vision and courage to stand up and make happen.

We need international collaboration, under an appropriate U.N. treaty, to share resources with other nations to return to the Moon and establish an experimental station; a Law of the Moon that addresses these issues; a better public articulation of the benefits of returning to the Moon and, as President Thomas Jefferson declared, “an informed public.”

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