[A publication of the Milwaukee Lunar Reclamation Society,
a chapter of the National Space Society and of the Moon Society]

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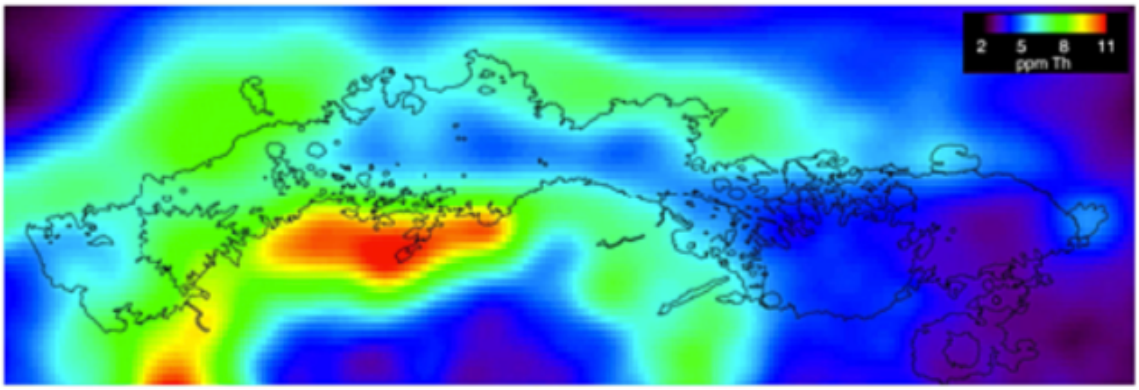
Windows for traveling to and from Mars

Unlike the Moon, which always stays in orbit around Earth, and can be reached at any time, Mars orbit around the Sun takes almost 2 Earth years. Also, Mars' orbit around the Sun is much more elliptical than Earth's. *As a result, trips to Mars* (with the same rocket) take *more months* in some opportunities and *less months* in other opportunities.

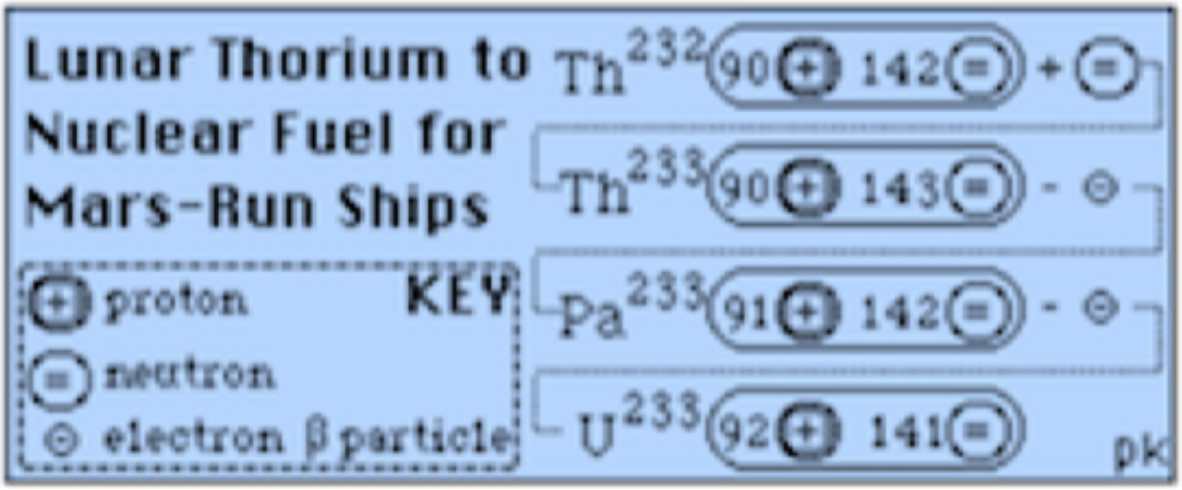
Nuclear fuel made on the Moon for faster trips to Mars

Once we begin to settle Mars, volunteers will go to Mars *at all opportunities*. ***More powerful "nuclear" powered ships will cut the travel time to and from Mars at all opportunities, and if necessary, in between. These ships will be powered by Uranium 233, processed from Thorium mined in the lunar "highlands" below Mare Frigoris and above Mare Imbrium.***



Above: Thorium (in green, yellow, orange for increasing concentrations) above, below, and in Mare Frigoris, will be the fuel that will allow ships from Earth to the Moon make the trip much faster.

BELOW: the process by which Lunar Thorium can be turned into Uranium 233.



Below: some of the **partially shaded craters above the 60°N line with the permanently shaded areas shown by Lunar Prospector to be filled with water ice**, the thing that makes heavily basaltic MARE FRIGORIS the place to start Lunar Settlement.

Basalt (out of which SO MANY things can be made that do not have to be "upported" from Earth) and Water will be the Foundations Pilars of lunar industry and settlement. And so will it be on Mars as well.

Education en Route to Mars: a trip nearly a year long

These long and longer journeys will be ***opportunities for volunteer settlers to learn much more about Mars*** and in greater detail through educational courses, as well as to learn ***more useful "hands on abilities,"*** adding to talents they may already have, that will render these settlers more skilled and useful (and thus their lives more meaningful) once they arrive on Mars.

√ Flight "coasting" duration will take 230-300 days: longer voyages will provide more time for courses in a wide range of hands-on topics to make the recruits more useful on arrival.

Conversations, Ship to Earth, Ship to Mars

Even with distances increasing back to Earth, and decreasing to Mars (or vice versa), ***you will not have to wait for a response "if" you talk for as long as it takes your message to Earth or to Mars at the speed of light, and then listen for as long as it takes the response message to get to your ship, while at the same time the party you are talking to, does the same.***

In this approach, no one is "waiting many minutes for a response!" Both talk, answering questions of the other, then both listen to the answers of the other. Then both talk again, and then both listen again.

The closer to each other are the correspondents, the shorter the message and response time in both directions. The further each parties are from each other, the longer will be the message and response time for each parties.

Thus both parties are talking at the same time, and both parties are listening to each other at the same time.

No one is waiting for the other's message. ##

Making good use of the long trip time to Mars from Earth and/or from the Moon to Mars (230-300 days!! ***One way!!***)
Classes about Mars and how we can live there

√ **Studying the variety of Living Walls, and Vertical Vegetable Gardens** ***how to design them: what plants to use, what plants go where, how to "plant" them, and how to keep them green and productive (in the case of fruit bearing plants.)***

√ Studying **Mars and its surface and its resources:** ***what we know and what we do not know;***

- **Mars Geography and Geology: basins, giant volcanoes, craters, polar caps etc.**
  - *What we don't know about today's Mars and/or the Mars of previous eons*
  - **Tourist hot points: Valles Marineris - Hot Spot #1 for settlers and tourists alike;**
  - **Mars enormous volcanos; what to expect, and to look for**
  - Settlements require **access to both √ water and to √ basalt**
  - **What we can make out of basalt** (cast, carved, and fiber)
  - **What we can make out of Bamboo and where we can grow it**
- **Container Factories already on Mars, √ those on this ship, and √ those yet to come**
- **Mars Calendar: dealing with four longer seasons**
- **Ways to travel around Mars: roads, rails, and dirigibles**

Zapping Moon dust produces water

Experiment suggests source for lunar liquid – & a possible resource for colonisers.

https://cosmosmagazine.com/space/zapping-moon-dust-produces-water

Laboratory researchers have found a way to liberate water from Moon dust, a result that may someday be used to supply water for future lunar bases.

Scientists have long known that the Moon is mostly dry, but recent space missions have found traces of **water vapour** in its hyper-tenuous exosphere – a layer of gas so thin that it can't really be called an atmosphere.

They have also found ice in permanently shaded **"cold traps"** at the bottom of deep craters near its south pole.

Theories for where this water comes from are numerous, ranging from vapour leaking from deep in the Moon's interior to ice **delivered to its surface** by meteorites or comets.

One of the leading theories is that the water might be produced by the solar wind, which is composed of high-energy particles streaming out from the Sun.

For more, read the article above. ##

Settler Space Ships that travel one-way from Earth to Mars

Vs. Tourist Ships that make very expensive Round Trips

Space ships carrying settlers to Mars will be on a one way trip, with ***every part of the ship "co-designed" for new use on Mars, as part of a "neighborhood" in a Mars settlement. (with ship "cockpits" designed for a second life on long distance bus coaches, trains, and dirigibles etc.)***

√ No ships will return from Mars "back to Earth" except for "visitors" or "tourists" at great cost, (a price large enough for settlements to make a profit to pay for incoming freight from Earth or from the Moon, on tourist ships, income from tourists paying for equipment needed on Mars, but made on Earth or on the Moon. But there may be an exception for reporters enthusiastic about Mars, and who will encourage others to support Mars settlement in one way or another.)

Working Tourists

√ Perhaps tourists who sign on for a period of duty on Mars before returning to Earth will get a substantial break in the price of an eventual trip back home to Earth, **the longer the stay, the greater the break in the price (but also a greater burden of getting used to Earth's gravity and who might have to spend time daily on a centrifuge to rebuild their muscles.)**

This should apply to settlers, who after some time, realize that for one reason or another, they want to return to Earth. Those who reached the retirement age, be it 65 or some other current figure, might get a substantial break on a ticket back to Earth.

But in all such cases, having become used to Mars substantially lower gravity, settlers and tourists should go through a period of rebuilding their muscles etc. less they return home only to be unable to handle Earth's much greater gravity.

Settlers on the Moon would face an even greater challenge, getting used to gravity six times as strong and powerful as the level they have become used to on the Moon.

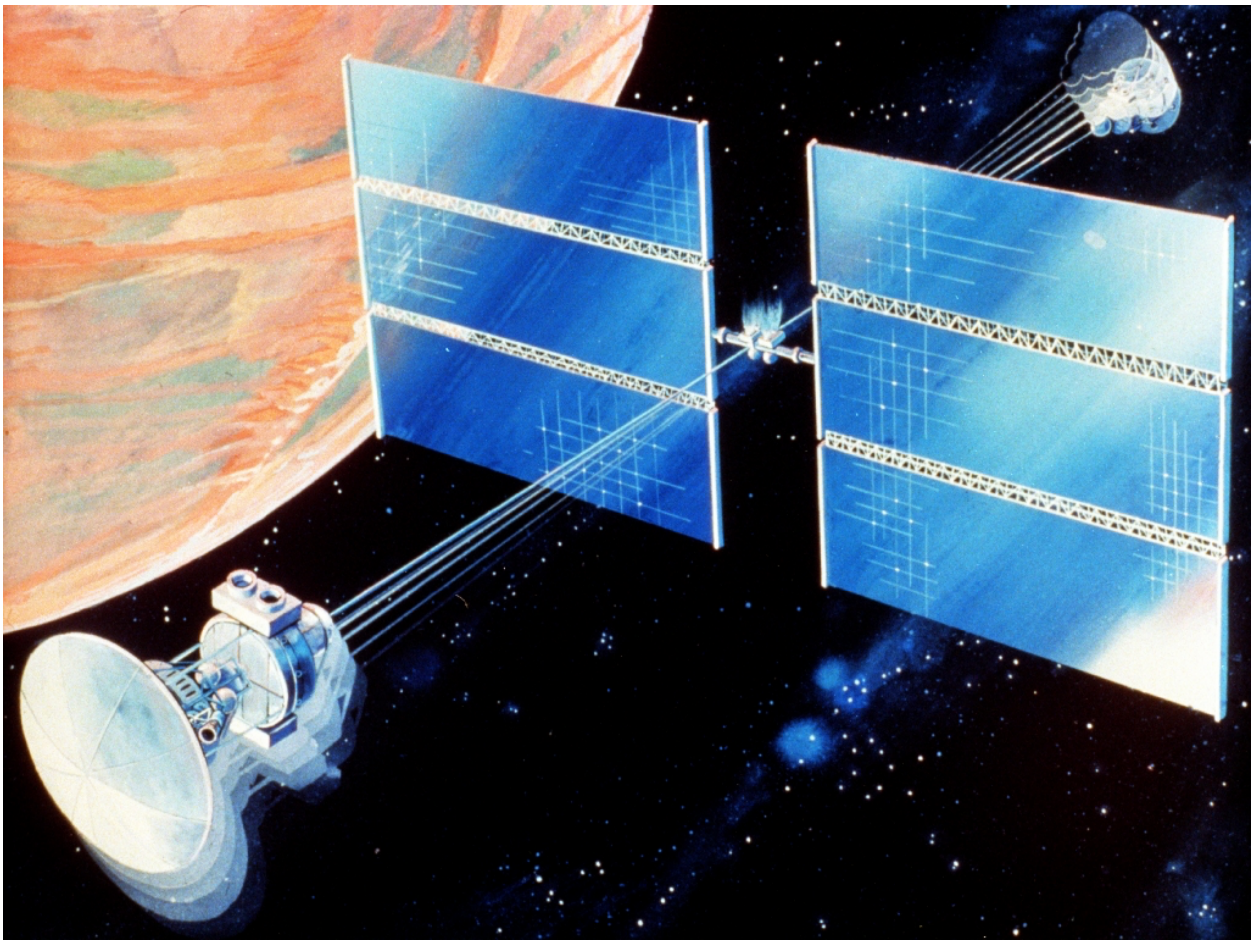
Those who signed on for duty on the Moon or Mars, who are not 100% sure that they want to live out the rest of their lives on a new world, would do well to regularly (once a week?) spend time on a "gravitrak" facility, on which Earth level gravity is reached. Even those determined to live out the rest of their lives on the Moon or Mars, might want to spend time on a gravitrak, so that they could return to Earth, even if only for a visit. ##

Artificial Gravity: 2 Basic types

1) The maypole: we see this at many amusement parks. You step into a pod at the end of a cable, and then the device starts to spin faster and faster. There has to be a way to keep the pod from shining at the end of the cable.
2) The gravitrak: you get into a car on a circular track, and as you speed up, the track goes from flat on the ground to perpendicular to the ground, the speed determining the strength of the artificial gravity. As you get used to the force, you can get up and move around, all perpendicular to plane of the surface below. The faster the loop, the higher the graivity.

Something similar is common at amusement parks, designed for short rides. On the Moon and Mars, if you want to retain your Earth Musculature, you should spend time on such a facility regularly.

In Space, en route from Earth (or the Moon) to Mars, this effect is simply a matter of dividing the ship into two parts and send them spinning around a center point.



Keeping both parts from spinning perpendicular to their common plane of rotation could be a trick.

In the design above, all the people on board are in one end, only machinery and freight in the other. While this is not a design that can be duplicated on Mars' surface, it would be useful on early non-atomic ships bound from Earth to Mars. The rate of spin could then be reduced slowly from Earth normal to Mars normal, say by the half way point, then at Mars normal the rest of the many months long trip.

There must be a way to keep either end from spinning sideways, a stiff beam, instead of a bunch of cables (as shown in the picture above.)

While this configuration has Mars settlers already used to Mars-level gravity upon arrival at Mars, it does not help settlers, or visitors to Mars, to retain the musculature that would allow them to pay a visit to friends and relatives back on Earth.