

“Have we not lately in the moon / Found a new world, to th’ old unknown?”

Editor’s Notes

Last month’s heading was taken from Jules Verne’s classic *De La Terre A La Lune*, specifically from President Barbicane’s speech to the Gun Club. In English it runs, “There is none among you who has not seen the Moon, or at least heard tell of it.” While the average person might not be able to point out, for example, Mars, nearly everyone can find the Moon in the sky. It may be no small advantage that Luna is such a concrete reality in the popular mind.

In our last number we printed a poem by Ron Drummond, recalling a bit of history not too widely known. Shortly after the **Eagle** landed, Astronaut Aldrin called for a global moment of silence in thanksgiving for their safe arrival. A devout Presbyterian, he took the opportunity to receive Holy Communion from a kit packed by his minister. This was not publicized at the time, both for personal reasons and because of the furore raised by atheist leader Madalyn Murray O’Hair following the **Apollo 8** reading from *Genesis*.

—Christopher Carson
(*publius*)

Norstrilia

Heinlein described Earth orbit as *halfway to anywhere*. Certainly the velocity change required to reach low Earth orbit is about half of that needed to reach the lunar surface.

Moon Phases

First Quarter	27 August 11:42 GMT
Full	4 September 16:03 GMT
Last Quarter	12 September 02:16 GMT
New	18 September 18:44 GMT
First Quarter	26 September 04:49 GMT
Full	4 October 06:11 GMT

Quantitative Analysis

A recent letter questioned the concept of lunar settlement on the very grounds of self-sufficiency upon which we have advocated it. *An acre of wheat yielding forty bushels*, says our correspondent by way of example, *requires twenty-four inches of rain, amounting to 3.32 million pounds of water*. He supposes that, even with solar-wind volatiles, cold-trap ices, and the long lever furnished by abundant lunar oxygen, this requirement cannot be met, and the colony cannot feed itself.

The facts are correct, as far as they go, but the conclusion is erroneous. The plants cannot possibly consume 1750 liters of water per liter of grain produced : part runs off, part soaks into the soil, and of what they do absorb, almost all is soon given up in transpiration. In hothouse, as opposed to field, culture, most of it can be recovered in short order. The growing season for wheat (including periods of darkness, but recalling that much is grown in high latitudes where summer nights are short) is about 2500 hours, so an average recirculation ‘dwell time’ of about ninety minutes would mean a reduction in the water requirement by three orders of magnitude.

A serious issue does remain to be addressed. Terra’s ecology is enormous and infinitely complex, and (as **Biosphere II** demonstrated) we cannot hope to duplicate its operation on a small scale. Rather, we must design the life cycle as a synthesis of biological and technological systems, guided always by the principle of self-sufficiency. Since Luna is poor in certain vital elements, and whatever cannot be supplied from local sources must be made up in imports, this design principle implies that requirements for water and non-human biomass must be held to a minimum. We should always look forward to the goal of a robust, diverse ecology, attainable perhaps with the resources of the asteroids ; but we must not give up what we can achieve now because it is not that ultimate.

The 1975 Stanford summer study of space settlement arrived at a figure of 4.2 tonnes of water, 2.1 t of atmospheric nitrogen, and 590 kilograms of plant and animal biomass, requiring (less oxygen) 2.7 t of lifestuffs, per person for a colony of ten thousand. Diseconomies of scale notwithstanding, we can improve on this substantially. Nitrogen gas plays no role

in animal, and little in plant, metabolism, so by restricting this element principally to fixed forms, the requirement can probably be held to 50 or 100 kg. The study group, despite recognizing, for example, the need to substitute apparatus such as chemical digesters for the web of scavenger organisms which purify terrestrial air and water and recycle organic wastes, assumed a relatively conventional agriculture with high yields from intensive cultivation. More than half of the water budget was allocated to soil moisture ; by the use, where appropriate, of soilless culture (with minerals processed from lunar sources) and allied techniques, the hydrogen requirement can probably be reduced from 470 to 250 or 300 kg. As we have seen, time delay is an important factor in determining system mass, and by selecting food plants (and animals) not only for low water use and large proportion of edible to total mass, but also for shortness of growing cycle, it should be possible to realize further overall efficiencies of ten to thirty per centum.

Even with all these savings, about 400 kg must be supplied per person, not counting industrial reagents. According to reliable estimates, extracting this much hydrogen, carbon, and nitrogen for 120 settlers would mean processing about 8000 t of lunar soil per month, on average, over a nominal five-year startup. This is burdensome, especially if a substantial fraction is required early on, but relief may be available from imports not manifested as such. Food and drink, of course, remain in the life cycle as human metabolic wastes, and their usefulness can be increased by emphasizing oxygen-poor fats and proteins over carbohydrates. Less obvious sources which can be maximized by clever engineering and management include residual propellants, packaging materials (such as plastic and dry nitrogen), and even spacecraft components such as ablative heat shields. Even without adventitious sources such as gas wells, therefore, we are confident of subsistence.

Special Report

WORLD SCIENCE FICTION CONVENTION

I was, despite some problems, able to attend this year’s Worldcon, *Anticipation* in Montreal, and represent the Project there. Although I did not

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Industry News

An enterprise known as Excalibur Almaz Ltd, based in the Isle of Man but headed by Houston lawyer Art Dula, has announced its intention to provide commercial human orbital transportation services, beginning as early as 2013. This is made possible by the acquisition of components of an also-ran Soviet space station project of the 1970s, including reusable man-rated capsules. The firm proposes to integrate these spacecraft with a variety of launch vehicles, enabling both access to low-inclination orbits not served by Russian launch sites, and a higher flight rate than would be possible for a system dependent upon a single booster.

Especially since the hardware acquired also apparently includes flyable space station modules, this could be a significant step toward near-term space development. We wish Mr. Dula much better success with this project than he had with his acquisition of the *Mir* space station, which NASA required the Russians to de-orbit as a condition of participation in *ISS*.

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Sally Ride's "Doom and Gloom Subcommittee", charged with shoehorning announced NASA programs and objectives into the projected ten-year budget, succeeded mostly in showing that, within the current organizational model, it can't be done. They obtained some interesting results, such as that *Ares-Orion* is likely to slip another two to four years (putting it far behind commercial suppliers), and that only about half of the *Shuttle* budget will be freed for other uses by ending the program. *Shuttle* will probably continue operating into 2011 because its current manifest cannot be flown by the end of 2010 at recent launch rates ; one additional mission is possible, but no more, because there is only one spare External Tank and the production line has already been shut down.

Overall, there was much discussion of programs and vehicles, little of goals or purposes ; international partners were talked up, and commercial providers down. A disturbing thread through the whole hearing was the idea that the US will be stuck for the coming thirty years with whatever space access infrastructure NASA selects today — the *Shuttle* experience has shown the necessity of continuous improvement. During the public comment period I upbraided the commissioners for their willingness to accept two manned missions per year as the limit of American space aspirations.

—publius

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have any help pre-arranged, after I arrived I received some assistance, principally from Ed Wilson and Lisa Hayes, who have my thanks.

Even without a lunar globe, the display in the Fan Table area was well received, particularly with the Copernicus backdrop : people even stopped to have their pictures taken "on the Moon". The Astronaut Snoopy doll (which I registered as a "Mascot" for \$5) proved a good attention-getter as well, and was probably partly responsible for my being interviewed for a segment on the *CTV Montreal* (an English-language station) evening news*. As expected, I had a large volume of productive conversations with interesting people, although progress continues slow.

Attendance was less than usual for a North American Worldcon, reflected in a low volume of mailing-list subscriptions and merchandise sales. Apparently the Westercon this year had the same problem, probably attributable to the current economic uncertainty. Donations, however, came close to equalling sales revenue. I brought twenty-five copies of each of the first four numbers of **Luna!**, and gave away all, but did not end up having more printed as had been my intention. Book giveaways seemed biased toward non-fiction ; thinking myself ill-prepared with only two books in French (**L'Homme qui Vendit la Lune** and **Les Vertes Collines de la Terre**), I was correspondingly dismayed to bring one home with me. I also lent out two children's books to an inquisitive young person.

I participated in several panel discussions, and was thanked by some in the audiences (if not the other participants) for enlivening them. In one, entitled "After Shuttle", I was seated next to Geoff Landis of NASA, and had the distinct impression (shared, I later discovered, by others present) that he might do me violence for contradicting some of his statements about NASA space programs with information from the Augustine Committee hearing. At one point, to my suggestion that the pro-space community must take responsibility for and ownership of space activities, and focus on those which will be productive, he retorted that it would be impossible to get political support for such a program. How he expected to get it for *anything* was beyond me.

—publius

*This can be viewed over the Internet, at least for now, by following a link on the Events page of lunarcc.org, under the heading for *Anticipation*.

It has been calculated that, taking air drag into account, the velocity increment needed to go from the United States to Australia is about the same as that needed to get into orbit. Accordingly, then, a round trip to Australia is in some sense equivalent to a one-way trip to Luna. Might it not be a reasonable test of our resolve to discover how large a delegation we can send to the 2010 Worldcon, *Aussiecon 4* in Melbourne?

Events

Space Access Conference, Phoenix, 2-4 April
Conestoga¹, Tulsa, 24-26 April
A-Kon³, Dallas, 29-31 May
SoonerCon¹, Oklahoma City, 5-7 June
FiestaCon (Westercon)³, Tempe, 2-5 July
Anticipation (Worldcon)¹, Montreal, 6-10 August
AnimeFest¹, Dallas, 4-7 September
FenCon³, Dallas, 18-20 September

Completed

Definite

Under Consideration

¹Table

²Advertisement

³Small Display or Flyers

This list would be much improved by the addition of events at which someone other than myself will represent the Project, and of Project-sponsored events.

—publius

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