

“A ruined world, a globe burnt out, a corpse upon the road of night”

Editor's Notes

The heading of **Luna!** № 6 came from the second part of Samuel Butler's mock epic **Hudibras**, published in 1664. The verse recalls the title of a 1638 book by Bishop John Wilkins, **The Discovery of a World in the Moone**, a production of that first blush of telescopic astronomy which began with the appearance of Galileo's **Sidereus Nuncius** in 1610. If (so the argument went) the Moon was not, as had so long been supposed, a perfect sphere, but had mountains and valleys, why might it, and the other planets as well, not be like the Earth in other ways, even to the extent of supporting inhabitants? Scientific advances led inevitably to the the abandonment of such ideas, but have now made it possible for us to live there ourselves.

Correction Arthur Dula was not, as stated in № 6, one of the principals of *MirCorp*, the American-Russian joint venture which took over the **Mir** space station from the Russian government. One of his enterprises, *Space Commerce Corporation*, did serve as intermediary for the first deal to send an American to **Mir**, even before the collapse of the Soviet Union. Conceived by Houston enthusiasts as a means of raising public space-consciousness, the project met with strong official opposition in the aftermath of the intense embarrassment caused to NASA by the flight of a

Moon Phases

First Quarter	26 September 04:49 GMT
Full	4 October 06:11 GMT
Last Quarter	11 October 08:56 GMT
New	18 October 05:32 GMT
First Quarter	26 October 00:41 GMT
Full	2 November 19:15 GMT

Step by Step

Discussion of lunar settlement frequently elicits the suggestion that some degree of preparatory work should be done by robots, sometimes even that all the facilities should be finished out and put into operation, before any humans arrive. While this sounds attractive, closer consideration reveals a crucial flaw. Automata and teleoperated machines can be highly efficient for narrowly-defined tasks, but in the present state of the art they lack flexibility, and may fail in unpredictable ways when the assumptions incorporated in their designs are violated. If such a system must work before occupation can begin, its failure would set the whole effort back indefinitely ; if not, developing and transporting it is a questionable use of limited resources. Since settlement inherently requires humans, it is more reasonable to assign vital tasks to human-tended systems.

The idea has, however, a strange tenacity. A recent letter cast the matter in another form, asking where the settlers would live while building the settlement, and what they would live on before self-sufficiency was achieved. The underlying assumption seemed to be that the whole colony would arrive at once, as though on the *Mayflower*, requiring everything to be operating at full capacity, ready to receive them. The limitations of present transportation systems make this impossible, but even if feasible, it would not be desirable.

Science and Man

One often hears that ‘scientists’ prefer unmanned space exploration to the manned type. But don't tell that to Alan Stern, principal investigator of NASA's **New Horizons** Pluto mission. In an interview with the daily science radio show *Earth And Sky* (www.earthsky.org), aired 12 October, he advocated sending human explorers to investigate the planets, wherever it is possible to do so. Why? A man on the spot, he says, can perform the complex tasks of selecting and gathering information so much more effectively than even the most capable combination of robot probe and terrestrial controllers, that the much greater expense of a manned mission is more than justified. Dr. Stern also looks forward to the improvement of the human condition arising from planetary exploration and the development of a space economy.

Colonization will not be accomplished at a single blow, any more than a tall building is erected using a yet-taller crane. Like hoists secured to a steadily-rising frame, lifting material from the ground to ever-greater heights, the incremental growth of lunar capabilities will multiply the effect of cargoes from Terra by an ever-greater factor. The pioneers will live in temporary shelters, on imported supplies, while they establish the basis for supporting themselves and those who will follow. In step with the expansion of living space and industrial capacity, and the gradual closure of the life cycle, new settlers will arrive to add their skills and labour, driving yet further growth. Thus, the large initial support requirements will continually diminish, until finally immigrants will arrive with little more than baggage, their needs being satisfied by local production and the ordinary course of trade.

This gradual approach is made possible by the unique accessibility of Luna. The short transit time and minimal launch window issues allow dispatching materiel and personnel in small lots according to circumstances, and mounting relief efforts in case of emergency. These conditions do not obtain for Mars or the asteroids, making operations there more difficult, and ‘one-shot’ colonization that much more desirable. It cannot be doubted that the experience gained in the lunar settlement effort will be the foundation of the knowledge base necessary to develop such techniques.

Blind Spots

It is something of a received opinion among planetary scientists that Luna is devoid of water and other volatile compounds, and of the elements — such as carbon, hydrogen, and nitrogen — which form those compounds. Since the lunar gravity is too weak to hold an atmosphere, so the argument goes, and the mineralogy of the crust implies a period of global melting, anything which could boil off into space must have done so very early on. This idea is strengthened by the hypothesis that Luna is the product of a collision between the primitive Terra and another large protoplanet, a cataclysm generally supposed to have driven off all but the most refractory substances.

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Merchandise Update

The eBay sales mentioned in **Luna!** No 4 are proving useful. As a source of revenue, they have so far yielded a monthly maximum of \$52, in August. In terms of spreading our message, orders have gone out not only to locations across the United States and Canada with which we have had no other contact, but also to Brazil, England, Holland, metropolitan France, and Martinique, and samples of our publications have gone with them. Encouragingly, some of the sales have included duplicate items, suggesting that they are being further disseminated.

174 Project medalets have been sold since their introduction in August of last year, counting individual specimens and premium sets, but not those given away or sold loose for jewelry purposes. This is about half the number required to sink the initial investment, although the higher margins on the premium sets help in that regard. About a third of that total came in the first month, a phenomenon perhaps attributable to novelty value and a good convention schedule on the one hand, and the bank panic which developed in September on the other. As *Moffatt and Company*, which struck the initial batch of medalets, has gone out of business, we have taken steps to secure our custom die, and are assessing future developments in the program.

Mission Accomplished?

Just after 1130 GMT on 9 October, the impact of a spent Centaur rocket stage into a crater in the lunar Antarctic, followed minutes later by its accompanying probe, marked the completion of NASA's **LCROSS** mission. The scientific results of this pick-a-back on the **Lunar Reconnaissance Orbiter** launch are as yet unclear, though the initial impression was one of anticlimax, as the spectacular ten-kilometer plumes of debris described in Ames Research Center publicity (the source of some controversy and even hysteria about 'bombing the Moon') failed to appear. Like previous attempts to prove the existence of cometary ice residues in permanently-shadowed 'cold traps' by blasting them into the light, although a positive result would be conclusive, a negative one cannot be. It may be that certainty will come only with ground-truth sampling.

Orders of Magnitude

The reader daunted by the idea of processing 8000 tonnes of lunar soil monthly, in order to produce water and other necessities of life, might find it useful to reflect that the Cumberland Fossil electric generating station of the Tennessee Valley Authority consumes some 20 000 t of coal *every day*.

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As a result, there has been a tendency to ignore contrary evidence. When an American instrument carried by the recent Indian lunar orbiter, **Chandrayaan-1**, detected the signature of water molecules and hydroxyl radicals on the surface, the scientists monitoring it spent weeks trying to eliminate what they assumed to be a spurious reading. Investigating whether the observation might be real, they found that the same detection had been made by other probes, as much as a decade before, but not reported because it *had* to be wrong. Even traces of water found in the *Apollo* soil samples had been dismissed as 'contamination'. In retrospect, it is reasonable that interaction between the oxide minerals of the soil and the protons of the solar wind would produce a thin film of OH⁻ and H₂O, held tightly by electrostatic forces — but the presumption was against it.

Of course, the lunar surface is an unpromising place to find water, exposed as it is to a vacuum as hard as any produced in terrestrial laboratories, and (except in permanently-shadowed hollows near the poles) to the heat and actinic rays of unfiltered sunlight, but this is not true of the interior. Although the major constituents of the crust are very dry, with few traces of the hydrated and weathered silicates ubiquitous in terrestrial geology, some substantially-younger volcanic rocks tell a different story. The blowholes of vesicular basalt attest the presence of gas, while beads of glassy ash are coated with substances absent from the country rock, and have been found to contain endogenous water.

Furthermore, certain short-lived changes in the appearance of small areas of the Moon, known to astronomers as 'transient lunar phenomena' (and mostly ignored by planetologists), suggest that the internal sources are not yet exhausted. A spectrogram taken of a 1957 event appears to show a cloud of carbonaceous vapour. Detections from orbit of the longer-lived isotope of radon imply the release, from pockets beneath the surface, of gaseous products of radioactive decay (by inference, mostly helium and argon), which would tend to carry with them volatiles cooked out by decay heat.

Although chosen for other reasons, our proposed colony site at Plato happens to be the second most common location for reports of TLP, and petroleum engineers have judged the stratigraphy, as deduced by the United States Geological Survey, to be a good candidate for a gas reservoir. Therefore, it appears likely that Luna, while admittedly poor in certain important substances, does not completely lack them, and that what there is may be available for our use.

Tokyo Broadcasting System reporter, well ahead of the schedule arranged with the Japanese space agency for government astronauts, and ended not merely in failure, but in criminal charges (subsequently dropped) and one arrest.

—**Christopher Carson**
(publius)

Events

A-Kon², Dallas, 29–31 May
SoonerCon¹, Oklahoma City, 5–7 June
FiestaCon (Westercon)², Tempe, 2–5 July
Anticipation (Worldcon)¹, Montreal, 6–10 August
AnimeFest¹, Dallas, 4–7 September
FenCon², Dallas, 18–20 September
SiliCon², San Jose, 2–4 October
SteamCon², Seattle, 23–25 October
Astronomicon², Rochester, 6–8 November
LosCon, Los Angeles, 27–29 November

Completed

Definite

Under Consideration

¹Table

²Small Display or Flyers

Thanks to Lisa Hayes for distributing materials at SiliCon, and to Albert Bishop for doing the same at SteamCon. Anyone wishing to follow their example is encouraged to inquire for advice and assistance.

—**publius**

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