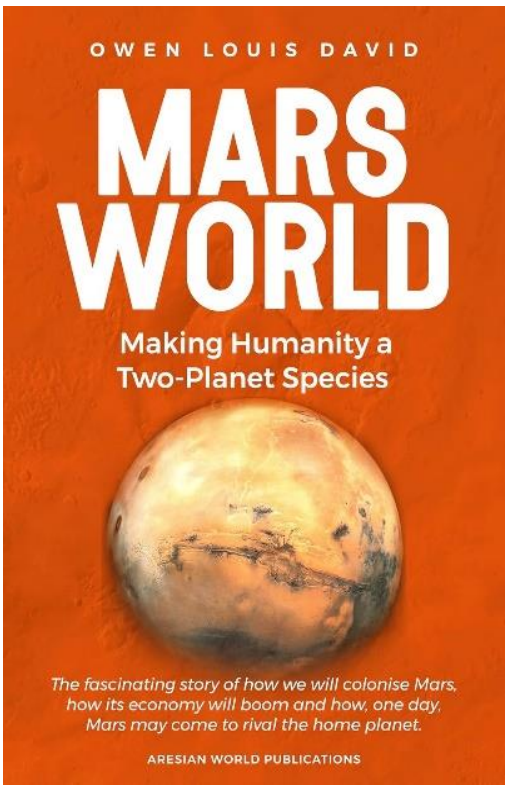
THE ARESIAN

August 2024

Volume 2 No. 7

Editor: Owen Louis David **Assistant Editor:** Mary Khan **Contributors:** Victor Samuels, and Mario Pinto. *Published by Mars Futures Forum*

MARSWORLD HAS BEEN PUBLISHED!



Most of this issue is devoted to the publication of *Marsworld* by Owen Louis David.

Marsworld is a truly comprehensive account of Mars colonisation. The book covers all aspects: transit to Mars, rocket systems, the first mission, and all that follows.

The book examines the various challenges that humans will face. The book predicts that the Mars economy will be red-hot from the get-go. Growth will be "off-the-scale". Capital investment will be at a level never seen before in a human society. Owen Louis David dispels many myths about Mars. Against the nay-sayers, the planet provides a perfect platform for a second human civilisation. It has just about everything humans need to survive.

Let us know what you think about the book. Search on Marsworld at Amazon to get an ebook version or paperback. ***See page 3.***

IFT 5 next up.

Here's your latest update on where we are with the fifth Starship flight, commonly known as IFT 5.

Preparations are intensifying. It looks like September this year will be the month we see the fifth full Starship launch. Our understanding is that once again it will be sub-orbital but that doesn't mean it will be any less amazing.

It still appears that Space X are intent on testing "Mechazilla", the fondly named return-capture mechanism as part of the flight plan. The "chopstick arms" were in fact strengthened with some additional structural welding after testing revealed weaknesses. Some design changes have also been made to the two launch towers (one tower being a recent addition).

It is fascinating watching the step-by-step progression in the flight test programme, with each flight delivering strong incremental progress.

The Starship rocket system incorporates a payload rocket (the Starship or simply "Ship" as it is often referred to) and a huge Booster rocket. This will be a chance for Ship 30 and Super-Heavy Booster 12 to really shine. It's hoped that with its improved protective tiling and underlay system beneath the tiles, Ship 30 will be much more resistant to the incredibly high temperatures generated by atmospheric friction as it returns to Earth. If it can also return home into the loving embrace of the chopstick arms, that will be a truly phenomenal triumph.

Credit: Space X

All that seems to be standing in the way of a launch now is agency approval. Specifically, the FAA (Federal Aviation Agency) is reported as being optimistic that it can give its approval by the end of October. This may be bureaucratic caution on the agency's part as Space X seem to think everything can get wrapped up some time during next month, September. One thing to watch out for is the issue of environmental approvals – something Space X has come unstuck with previously.

MARSWORLD

A taster session: here we reprint some extracts from Owen Louis David's new book, a survey of all aspects of Mars colonisation titled ***Marsworld****.*

FOREWORD (extract)

Can humans live on Mars? Can they create a dynamic society, which will show humanity at its best? Those are the key questions which have motivated this book.

INTRODUCTION (extracts)

Mars colonisation no doubt seems to many, probably most, a marginal issue of little or no relevance to everyday life. A prime objective of this book, then, is to correct that faulty impression and invite the reader to travel into what is going to be an exciting new realm: a two-planet future for humanity. What [will] take place on Mars over the next 100 years will be of incredible significance but, currently, we still have to use our imaginations to help us envision what will take place.

******

One of the main aims of this book is to break the myth of the "dead planet". Even NASA are guilty of propagating the myth, referring to Mars as a *"hostile world, blanketed in toxic soil and zapped with radiation"* on their website. We could refer to the Brazilian rainforest as a *"hostile world"* but, of course, it is not if you have been born and brought up there and know how to survive within that ecosystem, or – alternatively – if you go well equipped with the medicine and technology that will allow you to survive. Really, this is all about *perception*.

CHAPTER 1 – A VISION OF MARS (extracts)

Mars can fairly be described as our *cousin planet*. It is certainly a close family member with many resemblances to its grander relative, Earth.

****

So, Musk's visionary idea of creating a million-person city on Mars might lie within the realm of the possible, at least within a few decades. We shall examine its prospects in forthcoming Chapters but for the moment it is worth noting a number of milestones have to be reached:

1. It needs to be shown that humans can live on Mars without dying of radiation poisoning or low-gravitational effects. That may take 8 or so years from landing.

2. An all-planet Government needs to be established so people can see that Mars is not going to become a conflict zone but, rather, one big oasis of peace and prosperity. If the will is there, a Mars Government could be established within 15-20 years from landing.

3. It needs to be shown that humans can enjoy a good existence on Mars, with plenty of entertainment, leisure and recreational opportunities, together with a vibrant high-growth economy. Again, I think the timeline for reaching this milestone is around 15-20 years from landing.

4. It needs to be shown that humans can successfully reproduce on Mars (not quite as easy as it sounds!) and that children can grow up there safely. This might take a few decades. But the issue could be settled within 30 years if all goes well.

If all those milestones can be reached then I believe people will come in sufficient numbers. They will be attracted by this *Vision of Mars.*

****

Mars colonisation will far outstrip the Apollo missions in significance and ambition. Anyone looking at Mars through the lens of the Apollo missions (that sadly led nowhere) needs to reconsider that narrow viewpoint….So much has changed in the last 60 years…

CHAPTER 2 – THE CHALLENGES (extracts)

We can think of getting to Mars as like a 110 metre hurdle race – one that is repeated, repeated and repeated so it ends up being more like a marathon event with thousands of hurdles. You don't need to worry too much about kicking over the hurdles…that might slow you down a little, but it doesn't disqualify you from the race. We *do* need to be sure we don't fall flat on our face at any point, though!

****

The challenges to a successful series of *early missions* to Mars, the missions that will inaugurate the first phase of colonisation, fall into a number of categories which I am going to label *physiological, psychological, technical, political,* and *financial.* In this Chapter we'll look at each of these categories in turn and then examine the issues of crew specification and selection.

****

The great thing about journeying through space is that, as voyages of exploration go, it is incredibly safe. Once you are clear of all that space junk orbiting Earth there is effectively nothing in your way and you don't even need to expend fuel to keep going as the laws of Newtonian physics lend a hand.

****

We evolved as complex beings capable of living on a 1G planet. We weren't designed for "Zero G" (more correctly, weightlessness) or even the 0.38G of Mars. Also, on Earth the radiation levels we are subjected to are not very injurious to our health thanks to our magnetosphere and our thick atmosphere, as previously mentioned. Sadly, Mars is far more open to cosmic and solar radiation because of its thin atmosphere and absence of a magnetosphere. Radiation consists in subatomic particles from the Sun and from within our galaxy (or the wider cosmos). These particles, travelling at incredibly high speed, rip through DNA molecules, creating havoc within cells, splitting the molecules or disrupting encoded information needed for healthy cell reproduction. The badly damaged DNA can then cause cancers or other diseases. As more has become known about the health risks, steps have been taken to improve radiation protection within the orbiting International Space Station, with shielding being augmented and improved in those parts most frequently used by the occupants, for example the sleeping area and the kitchen area. This has proved effective in reducing the amount of radiation that crews are exposed to. It has been found that materials with a high proportion of hydrogen content, such as polyethylene, prove very effective. Water of

course contains hydrogen and that too can also be used as a protective barrier.

****

Cleaning will be an important requisite both during transit and on Mars. Experience with orbiting space stations has shown that, without a rigorous cleaning regime, microbes can build up in all sorts of unexpected places, most worryingly even rubberised seals around windows, on structural metal surfaces and even around electric cables (the integrity of which can be compromised by microbial acid-excretion). On the Soviet Union's space station Mir, pools of water were discovered which were alive with fungi, microbes and mites. Essentially, these organisms are brought into space vehicles by humans – since we are ourselves teeming with "life" other than our own – bacteria in our gut, mites feasting on our dead skin and even fungi within our bodies. These are not entirely dependent on humans as their habitat and they can adapt to various environments within the spacecraft.

****

Well, the key factor here is the *amount* of cargo that *Starship* can carry to Mars. Never before have we seen a rocket system capable of transferring such huge cargo loads. In terms of *Mission One* to Mars, it would appear from Space X presentations that six *Starships* will be assigned to transfer maybe 500 metric tons of non-human specific cargo to Mars. That is a truly huge amount of mass compared with the Apollo landings (which actually delivered less than 5 metric tons to the lunar surface on each mission - and most of that actually constituted the structure of the craft, not useable cargo) or indeed compared with the Mars Rover landings (the largest Rover delivered so far to the surface of Mars, *Perseverance*, has a mass of just over 1 metric ton). The lunar landers were little more than tiny little lifecrafts really, suitable for stays on the Moon's surface of no more than a few days. While NASA's Rovers have proved wonderfully productive in increasing and enhancing our knowledge of conditions on Mars, they really are only a very tiny part of what needs to be done if we are to colonise Mars.

****

Of course, some of the coldest places on Earth often outdo Mars in terms of low temperatures. There is a place in Siberia – Yakutsk - which experiences temperatures that, in winter, often dip below temperatures on Mars. It creates all sorts of problems for the long-suffering residents, not least when the engine oil in their cars freezes. In fact, most cars are fitted with mechanisms that start up the vehicle's engine at regular intervals when it is parked, to keep it warm, and as an added measure cars are covered in cosy "duvets" that help reduce heat loss. Cars also require double glazing on the windscreen in order not to prevent misting.

You might be getting the impression that Yakutsk is a tiny little place where hardly anyone lives, given these conditions. Not so - it's actually a city with a population of over 350,000 and it is the regional commercial centre for highly lucrative mining operations (coal, gold, diamonds and various precious stones). Even at its coldest in the city, life goes on…people drive cars, go shopping, meet up in restaurants. The city is built on permafrost and, as a consequence, buildings cannot go higher than six storeys and the pipes pumping hot water around the city have to be above ground.

CHAPTER 3 – TERRAFORMATION (extracts)

….we will be dealing with a lot of big questions…among them, the following:

> *How do you terraform a planet like Mars?*
>
> *Is it even possible?*
>
> *Can we afford it?*
>
> *Or is it a pipe dream, a sci-fi fantasy?*

Terraformation…involves turning the physical climate and atmosphere of planet of Mars into something much more closely resembling Earth. It's a big deal – and one that, if pursued, will undoubtedly affect the way Mars's culture, economy and governance develop. We have already touched on this fascinating topic. However, we are now going to take a much closer look at what is involved. This will lead us into us into some extremely interesting areas of speculation about Mars's future and what it will all mean for humans colonising the Red Planet.

******

In an ideal world – and we want Mars to be an ideal world – we need Mars to meet the following criteria:

> *It should have a much denser atmosphere. More than 100 times denser in fact would make the air on Mars potentially breathable without artificial aids.*
>
> *The constituents of Mars's atmosphere need to approximate to Earth-like atmospheric constituents (or substitute for them in a way which will not interfere with our natural breathing mechanisms).*
>
> *Average temperatures on Mars need to be more Earth-like. We may not be looking to create tropical zones on Mars but if we could replicate something like Canada that would be good enough.*
>
> *Although there is plenty of water on Mars to sustain life on Mars, if it is to become more Earth-like it needs to be warm enough to allow for flowing water. Flowing water will greatly enhance Mars's ability to sustain agriculture and also a wide range of natural habitats.*
>
> *Mars needs an equivalent of Earth's electromagnetic shield (the magnetosphere) in order to protect its people from radiation which could have negative effects on their health. A solution to this problem may be a long way off but it does seem something that could be resolved with near-term developments in technology.*

Boiling all these desiderata down to the two most important changes required, we end up with (a) a denser atmosphere and (b) more Earth-like constituents to the atmosphere. With those two issues resolved, humans could walk more or less freely on the surface, even if they had to guard against very low temperatures sometimes and radiation. We might be aiming for a Canada or Siberian-style climate.

****

There was a guy, an artist, called Christo, who in the last few decades of the 20th century was famous for wrapping up large public buildings (including the Reichstag in Berlin) and even whole islands, in plastic. I think he would have liked the next idea…

A serious proposal has been made that we could cover large areas of the surface of Mars (millions of square kilometres) in a transparent material that will trap heat. Researchers from Harvard University, the Jet Propulsion Lab and Edinburgh University have suggested this could even constitute an interim method of terraformation.

Their proposal would see whole regions of Mars's surface transformed through the use of a silica-based aerogel that would in a way replicate the greenhouse gas effect on Earth. The researchers suggest that a thin shield of silica aerogel (between about 2 and 3 centimetres thick) could block harmful radiation, transmit sufficient light for photosynthesis, and raise temperatures enough to melt water ice. This could all be achieved without any internal heat source.

****

If you delve into Mars colonisation online you will likely come across what I call the "solar wind fallacy". What is this, exactly? It is the assertion that after you've created a nicely dense atmosphere on Mars it will disappear overnight/in a few years/in a few hundred years due to the action of solar wind depleting the gases surrounding Mars, so there was no point in going to all that terraforming effort in the first place! Be assured, while this depletion is a process that has occurred on Mars in the past due to the lack of a protective magnetosphere and so would be a factor we should consider, it would take tens of thousands of years for any effects to be really noticeable, and millions of years for the work of atmospheric concentration to be undone – by which point technology will no doubt have found 101 solutions to the problems presented by the lack of a magnetosphere.

****

Aresians are going to have to learn how to create viable, sustainable and desirable ecosystems which will involve minimal human intervention. They will also have learn how to balance the needs of agriculture (which will tend towards monocultures or at least quite simple ecosystems) and their neighbouring wild ecosystems.

****

God-like choices will have to made about what organisms to include in the ecosystem and which effectively to consign to oblivion. Does Mars really want to encourage malarial mosquitoes or indeed the malaria parasite itself? I doubt it. Likewise with the more poisonous and dangerous types of flora and fauna. Will Aresians really want to import the most venomous snakes on to Mars? Hmmm. On the other hand, I can't see Aresians wanting to create a kind of disinfected Disneyland version of nature. Insects can be bothersome to humans but they perform vital task in ecosystems such as breaking down waste material, so a wide range of insects are going to gain admission to Mars ecosystems. We can assume then there are going to be billions, no trillions, of insects on Mars. I would also anticipate that apex predators such as bears and wolves or lions and tigers will find their way into the mix, despite the potential danger to humans that they pose. Aresians may decide to create safe raised walkways with observation points through these ecoregions.

One interesting idea is that Mars may be a good place to introduce old extinct species into

ecosystems. On Earth it would be problematic to introduce woolly mammoths into existing ecosystems: one or more existing species are going to suffer. However, a wooly mammoth might be the perfect addition to a sub-polar Mars ecosystem

****

CHAPTER 4 – THE MARS ECONOMY (extracts)

The Mars economy will be the key determinant of how successful we are going to be in our new role as a "multi-planetary species" which is why in a way this Chapter is the most important part of this book. A Mars civilisation that is entirely dependent on the Earth economy would essentially mean that we had not achieved that status of being a "multi-planetary species". We would simply be an "Earth-Plus" species. Were we just an Earth-Plus species, then, should civilisation on Earth collapse for some reason, the likelihood is that it would also collapse on Mars, certainly as long as Mars was in the pre-terraformation stage and dependent on a wide variety of imported artificial systems to keep life going on the Red Planet.

****

The goal of a high degree of self-sufficiency - though a logical follow-on from the Muskian impulse behind colonisation - will also be a necessity determined by the pragmatic considerations of the Mars-Earth connection. Space X may be able to reduce Earth-Mars cargo transit costs to, let's say, $800 per kg (on the basis of the claimed $100 per kg launch to Earth orbit, but bearing in mind, as one must, the multiple refuelling launches required and the added costs of a long Mars transit). However, $800 per kg of anything would certainly still provide a strong incentive for Mars to produce its own foods and its own goods. If the colonists relied on importation from Earth, the food bill would be something like $1200 per person per sol on Mars (before you add on costs of storage and distribution on Mars).

****

One important perception we need to adjust is this idea that Earth would be unlikely or unwilling to pump billions of dollars into Mars colonisation. This is to misunderstand what Mars will be asking of Earth. Mars is not seeking a "gift" but rather a "shift" – a shift in resource allocation. To understand Mars's economic potential we really need to appreciate this important point and I will be returning to it at intervals as the analysis of Mars's economic potential unfolds. Earth-based budgets don't need to be expanded in order for a Mars colony to thrive, they need to be restructured.

Here's one example of what I mean. After colonisation, everything changes. Would NASA really want to continue with its hyper-expensive Mars rover exploration project (with each rover costing billions of dollars) or would it hitch a ride on a Starship, sending a human passenger rover with crew and paying the good people of Mars to look after the crew and the vehicle? I am sure you can immediately see it would be crazy for them to continue splurging billions on robot rovers when they could have their own people driving around Mars in a much bigger vehicle at one tenth or less of the cost. NASA can use its existing Mars-related budget (or a large part of it) to pay Space X and the Aresian community to provide the necessary accommodation, maintenance services,

communications services and life support while they are on the planet.

****

Before we look in more detail at Mars's potential economy, I want to begin by laying out the advantages that Mars enjoys compared with economies back on Earth. Did you do a double take? I am sure some readers might find that an odd perspective, the idea that Mars could have any advantages over Earth!

The Outlook is Fine

Most importantly, Mars does not experience truly destructive weather events as we see occurring with alarming frequency on Earth. … The truth is that adverse weather events can certainly disrupt settlement and economic growth. Many early European colonies in the Americas were abandoned precisely because they were subjected to repeated hurricanes, year after year during decades when there was high prevalence of such mega-storms. The storms ruined crops, destroyed houses, boats and ships and laid waste to infrastructure like roads, bridges and harbours. You don't have to worry about any of that on Mars.

****

It seems clear then that water ice will be the mining industry's first port of call. Another early contender for mining will be the very ubiquitous iron ore on Mars that can be used in steel making. Once purified, the iron can be used to create high-grade steel which in turn can be used by 3D printers to produce all sorts of items such as cutlery, furniture, construction supports or indeed art works.

****

Given the lack of hydrocarbons on Mars, I would expect that in contrast to our experience on Earth, plastic will not dominate packaging of food on Mars. Glass, which could easily be manufactured on Mars, might be the surprise food packaging material of choice, especially as it will be some 62% lighter than on Earth. For food on offer in supermarkets (sandwiches, prepared salads and so on) organic packaging such as bamboo, vine leaves, banana leaves and so on might have a significant role to play. We should in any case remember that on Mars, in Sagan City, freshly harvested crops could go from farm to restaurant in under an hour in many cases. The bogus claims of "freshness" we are used to on Earth will be a thing of the past.

****

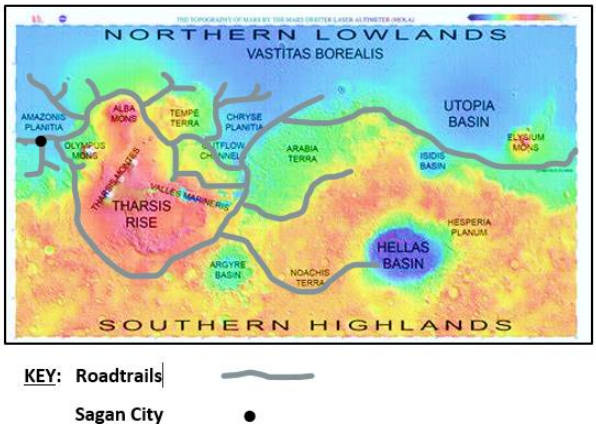
Rather than go to the trouble of providing resource-gobbling tarmac or concrete roads (neither of which would cope well with the cold of the Mars climate), it is far more likely, as already touched upon, that semi-natural roadtrails will be created. In the first place, transport planners would identify desired routes which would of course have to avoid areas of steep incline, major sand accumulation or very heavy boulders. After that the road making would involve specialist rovers (similar to bulldozers, either fully robotic or automated, but acting under remote human instruction) that would pass along the surveyed routes removing stones, rocks and any smaller boulders. Another class of rover – similar to a steam roller in effect – would then move along the route ensuring that it is fully compacted and as smooth as possible. This might require in some parts laying down of some additional clay-like material or gravel for instance.

Once the route has been cleared and made ready for vehicular traffic, it would then be provided with automated "service stations" at intervals. These service stations, powered by photovoltaic arrays, would include batteries that the electric vehicles could draw on as a power source for their journey. They would also include pressurised Earth-like air or oxygen to replenish stocks in human passenger vehicles. Long-life food rations and drinking water would no doubt also be on offer.

****

We shouldn't be too surprised at this idea of unmetalled roads. Long distance trucks use both ice roads in North America and dirt roads in Australia. In Australia there are 910,000 kms of roads but over half – some 560,000 Kms - of that total are actually dirt roads.

****



Map showing likely roadtrails on Mars.

******

I hope by now we are in agreement that the economic prospects for a Mars colony will be truly stellar. Any fair-minded person, I believe, would reach that conclusion once they examine this issue in detail. We can forget the myth of the cold, dead planet where no one can turn a penny. Mars has huge potential.

CHAPTER 5 – THE CULTURE OF MARS (extracts)

Since homo sapiens became an identifiable presence in the archaeological record, the arts have been a central part of our story. We have the wonderful incontrovertible evidence of the marvellous cave paintings at Lascaux and elsewhere, to show just how important art was to our forebears. From the very beginning it wasn't just a leisure activity, childish fun and games, it was something that brought sense and coherence to the world for them.

This is probably the highest function of art and of primal importance in the world of homo sapiens. After all, humans, one might say, are (from an objective viewpoint) a hormonal and cognitive mess. As social primates we have inherited an array of crazed trigger responses (summarisable as fight or flight) that can disrupt, or even destroy, our lives in an instant. Add to that our incredibly effective but problematic brain power. Our ability to see the world not just directly through the senses but as a symbolic representation (primarily through vocalised words, but also other symbols) means we inhabit a kind of dream-world placed somewhere between sensed reality and our internal consciousness. Nietzche's dictum that "We have art in order not to die of the truth" makes sense in this context: we need to avoid being overwhelmed. In fact, the evolution of our big brains might only have been made possible by art, art acting as a filter for the explosive symbolism which resulted from us developing the powerful facility of language. Art then enables us to cope with what would

otherwise threaten to overwhelm us with symbolic chaos.

Without art could we have progressed as we have? Or would the symbolic chaos have led us on a path to extinction? It's an open question of course. Paleontology is a science but a science that operates on the basis of very limited evidence - so little that a bone flute, a fragment of DNA or some dead plant material in a grave is enough on which to build a very complex but speculative narrative. However, of some things we can speak with relative certainty. We can say it seems pretty clear that not so very long ago – perhaps between 30,000 and 60, 000 years ago – humans developed the ability (through genetic or cultural change is impossible to say) to deploy a range of artistic skills.

****

From the beginning of the human presence on Mars, the Arts will have a vital role to play in making the pioneers and later colonists feel at home on the Red Planet, especially during the first century or so when living will likely have to be done principally "indoors" (albeit that the so called "indoor" spaces will be getting bigger, more interesting and more Earth-like over time).

Art can do so much: it can enliven the mind, bring us deep satisfying pleasure, offer us experiences of shared emotion, express an individual's innermost feelings, highlight social issues and make a dull life less so. George Bernard Shaw put it rather well when he stated that: "Without art, the crudeness of reality would make the world unbearable." Again, this isn't to be taken as referring to high art only. Adverts, pop, TV soaps are also examples of art. The 20th century dramatist and songwriter, Noel Coward, famously, and rightly, advised us to never underestimate the potency of "cheap music", meaning popular music with all its catchy hooks and deceptively simple lyrics. The world is chock-full of art: advertising symbols, billboards, product labels, interior décor, statues, TV dramas and documentaries (yes, documentaries are as much about the art of filming and narrative voice as about "nature" or the "problems" being examined).

****

We can all have our own mental image of what public spaces on Mars might look like. My favourite starting point is The Great Court at the British Museum, the largest covered public space in Europe, which is pictured below. If you have been there or get the chance to visit it I think you'll agree it is a wonderful design, one that makes you feel you are in a very open and natural environment.

Credit: The British Museum

****

What language will people speak on Mars? The answer I think is pretty obvious: English. Or

"English, duh" if we are going to use the vernacular.

****

At this point we need to be a little unsentimental about things. If we want our Mars community to be united, peaceful and productive it really does need to have a single principal language of communication (people can of course still have other languages they make use of).

****

Well, firstly, on planet Earth, English is the language of science, medicine and engineering. It is the language of technology, the language of global academia, the language of international business and finance and the language of the arts. That's a lot of international languages! Its influence in popular culture is huge, through Hollywood's continuing dominance of the world movie market and through American, British and (a surprising amount of) Canadian popular music.

Even more importantly – much more importantly - it is the principal second language of humans on Earth (for the billions who don't speak it as a first language). This means it operates like a lingua franca for planet Earth, enabling billions to communicate with each other if only in rudimentary fashion sometimes.

CHAPTER 6 – THE GOVERNANCE OF MARS (extracts)

Let us first accept the profundity of the slogan of the French Revolution: liberty, equality and fraternity - what one might call the eternal triangle of politics. These three words define the ambitions and the conflicts of the modern era, albeit we might prefer these days to amend the last one to "community", so as to remove its male bias

These three desiderata are the tripod of fundamental values which any modern state with any pretensions to good governance has to address. In that sense the slogan of the French Revolution is still very much with us. That's how history works – the present incorporates the past to make a new future. You can try and run away from this Holy Trinity of politics by saying only one of them is "really" important but always reality will catch up with you and find you out, at which point you discover, no, the other two are just as important. It is no coincidence that this three-part slogan emerged during the French Revolution: once you have removed the bonds of feudalism, you have to replace them with something else. How free should people be? How equal and in what ways? And what social bonds should replace those old feudal ties?

****

But I am sure people will still say how in the hell do you expect such a tiny colony to become an independent state?

There is an interesting precedent in American history: just prior to the Revolution of 1835, the area that was to become the territory of the sovereign Republic of Texas (prior to that Republic later joining the United States of America) was home to approximately just 35,000 people.

******

THE LATEST WEATHER ON MARS

Here's your update for the weather on Mars provided by the Curiosity Rover in Gale Crater.

For the nearest Sol to **27 August 2024** we have a *high* of **minus 5 degrees Celsius** (23 degrees Fahrenheit) which is the same as last month but still something we can relate to in the UK. The low at **minus 72 Celsius** (or minus 98 degrees Fahrenheit) is the same as last month. Very, very cold but – as we said last time - not as cold as the record low on Earth (minus 89.2 Celsius), registered at Vostok on Antarctica in 1983. However, it is currently midsummer at the Gale Crater location and winter temperatures could go as low as minus 90 celsius.

Just a reminder: daytime temperatures on Mars can get as high as 30 degrees Celsius. Of course craters will be naturally more shaded than flat plains or south-facing slopes (in the Northern Hemisphere, as on Earth).

PICK OF THE PICS

Credit: NASA

Sunset at Gale Crater – how good does that look!

LET US KNOW WHAT YOUR FAVOURITE PIC IS AND WHY! WE ARE ALWAYS INTERESTED IN YOUR COMMENTS.