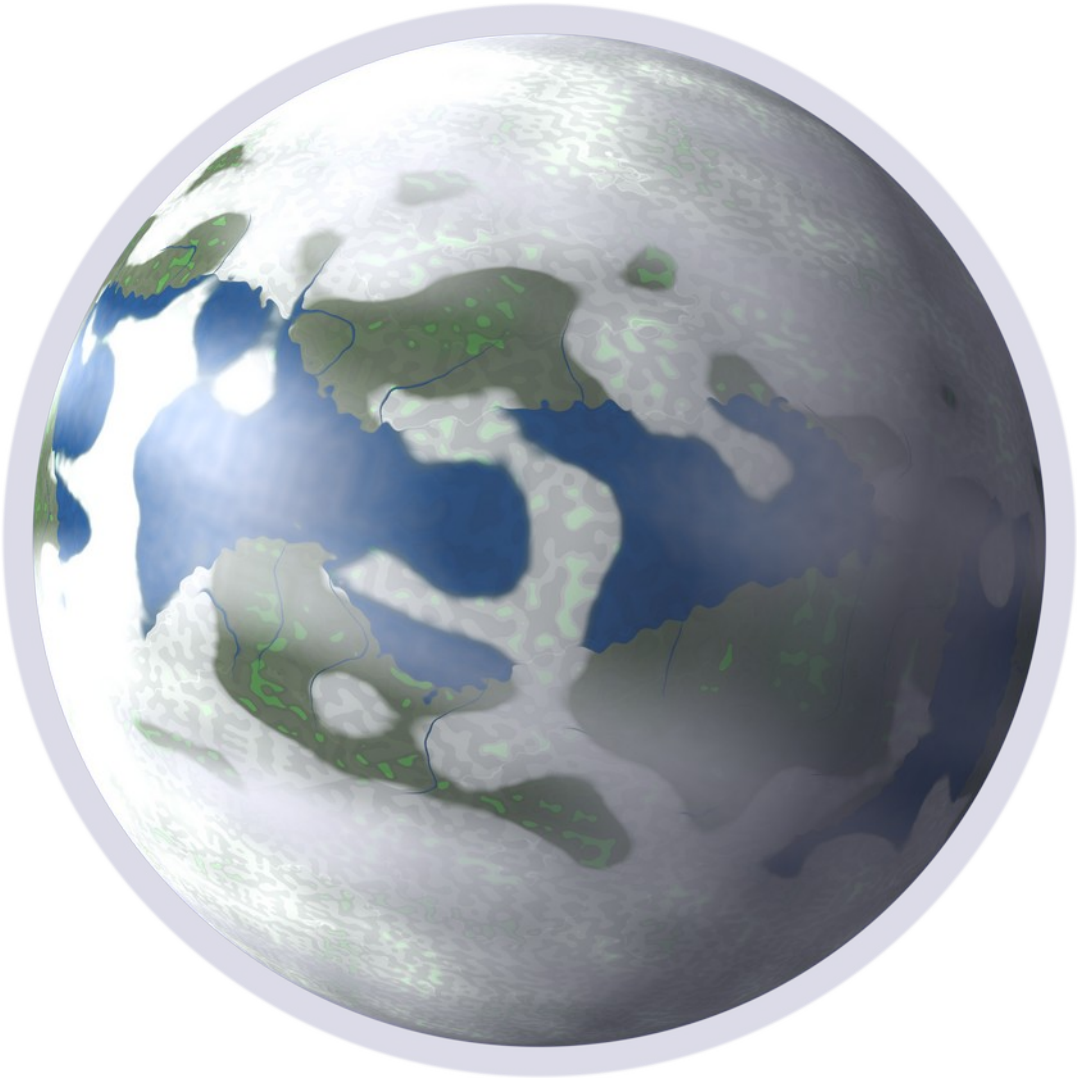
Minerva

A Guide for Terrans



Minerva, ~1,430 million years ago, when Earth life was seeded by meteoroid. Credit: Minervan Research Institute

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The Basics

Minerva is, arguably, the most famous of our solar system’s eight planets, other than our own Earth. While scorched Mercury and parched, lifeless Ares play morning and evening stars, while mighty Jupiter and Saturn impress with their size and myriad moons, it is the shining beacon of icy Minerva that has most captured the imagination of humankind over the millenia. So like Earth, yet so alien.

In the late twentieth century, the dream of exploring Minerva became reality, and the rush for colonies began.

Today, Minerva is a thriving colony of more than 700,000 people from various countries of Earth. The shores of Geneva Bay host more than a dozen significant towns, linked by a loop of dirt road, foremost among them New Geneva City, the de facto business and cultural hub, with a population of 61,070 people in the 2068 census.

A steady flow of settlers comes through the quarantine facility on the inner moon of Strix.

Minerva is cold, but with the same basic biochemistry as Earth, thanks to microbial life transfered by meteoroids to Minerva more than a billion years ago. Native plants are simple and primitive, but covered large areas near the Equatorial Ocean. In the nearly two centuries since humans first landed, Earth life has, with plenty of assistance, managed to flourish in carefully selected regions. An abundance of carbon dioxide augmented by artificially produced extreme greenhouse gases has boosted the average temperature by trapping more of the sunlight that reaches Minerva as heat, and the two orbital mirrors reflect a bit more onto key regions.

Forests are rare, young and not very thick, but several valleys near the equator, where appropriate soil and helpful humans exist, have trees that would not look out of place in the boreal forest of Sweden or Canada.

Greenhouses are essential for supporting settlers on Minerva. Crops can be grown outdoors in certain areas, thanks to extensive genetic enhancement and the long summers that are a consequence of Minerva's lengthy year. To get enough local produce to last through the equally long winters, most agriculture is intensive and makes great use of hydroponics and similar approaches.

The Oxygen Issue

Living with low oxygen is possible at low altitudes, for most people, with ease for people who are adapted to it. Pregnant women and babies typically opt for supplemental oxygen when indoors, and often when moving around outdoors. Most homes and workplaces are thoroughly enclosed, and able to contain air with higher oxygen levels. Many houses have what amounts to a basic airlock.

Minerva Physical and Orbital Data

Minerva circumference at equator: 38024 km

106 km per degree

Surface Gravity: 0.9 g

Tilt: 11.7 degrees

Sidereal Day: 18 h 4 m 22 s

Moons:

Strix: ~700 km in 78,000 km orbit (67.2 h)

Neith: ~270 km in 150,000 km orbit (179.5 h)

SMA: 1.44 AU

Minervan year: 630 Earth days or 840 sols (~18 hours)

12 months of 70 sols (named for constellations?)

24 months of 35 sols each

History

Exploration began in the early 1960s as part of the space race between the Soviet Union on one side and the USA and its allies on the other. Once the realms of orbital space had been pierced by humans, and robotic explorers had reached the moon, both powers strove to be the first to land a human on the lunar surface. Even then, the ultimate goal was the shining beacon of Minerva.

Mariner 4 roared past the northern hemisphere of Minerva on June 17th, 1964. The first grainy black and white images returned to NASA's Jet Propulsion Laboratory showed the imposing ice caps that were already known from decades of ground-based observation. More interesting to some were the hints of vegetation along the shores of the equatorial ocean, confirming the hints of life seen from Earth.

A Soviet flyby mission (Zond 3) followed, skimming 1200 kilometers above the Minervan surface, sending back more photographs and readings of the Minervan magnetosphere. A series of probes both failed and successful zoomed past the planet, until in a last ditch attempt to steal glory from the successful landing of Apollo 11 on the moom, the Soviet Minerva 7 probe swooped into orbit, becoming the first mechanical visitor from Earth to circle the world. Minerva 7 orbited for more than three years before being destroyed by a random meteor impact, returning hundreds of images and a vast quantity of useful data about Minerva and its moons until its unfortunate demise.

NASA was not to be outdone. In 1976, the first of the two Viking missions achieved what had hitherto eluded all attempts, a controlled landing on Minerva. On the shore of what later came to be known as Geneva Bay, the Viking 1 lander sat for 92 sols, taking readings, taking stunning photos of the landscape and digging into the soil for samples of alien microbes and plant material. What it found was life that, while not terrestrial, was so similar in its basic makeup that a common origin was likely. Photos showed primitive plants and algae lining the waters edge. The Viking 2 lander also reached its target area in the southern hemisphere. There, beside a meltwater stream, remnants of simple worm-like animal life was discovered.

Over the next two decades, as the various nations of Earth established a permanent, if contentious, presence on Luna, various orbiters and landers explored Minerva and its moons, preparing for the inevitable arrival of humankind.

The Minerva Accords were the first attempt to reign in the enthusiastic urge to explore in the interest of preserving the unspoiled local environment for study. Strict decontamination protocols were agreed upon and, for the most part, implemented, often with the encouragement of international inspectors. By agreement, the isolated Sulis Sea, separated by mountain ranges from both ends of the Equatorial Ocean, became a restricted zone where no settlement or terraforming was aloud. Over time, the Sulis Sea became known as the Forbidden Sea.

In 1996, Athena 4, a USA/ESA crewed mission was the first such to orbit Minerva, circling it for 3 weeks and rendezvousing with the outer moon Neith.

The big day came with the arrival of Athena 5 nearly two years later in early 1998. The Athena 4 lander with a crew of three astronauts – two from NASA, one from France – landed on an island in the middle of the Equatorial Ocean. More than 2 billion people watched the landing on television and over the newly popular world wide web.

The first landings were soon followed by Russian and Japanese landings. The first permanent station was established by NASA and ESA within three years. Exploration was the focus of the early expeditions, but soon enough settlement was booming. Many nations, even those without space programs of their own, staked claims in accordance with the settlement provisions of the Accords. In 2023, the first Minervan baby was born to a couple of biological researchers in Bremen.

The first cycler ship, Aldrin, began regular voyages between Earth and Minerva in 2038, making travel much safer and more comfortable for explorers and settlers. Additional cycler ships were built and launched over the next three decades, until six were carrying passengers between the worlds.

2077 First human clone on Minerva born at Yamato.

2124 The Kingdom group founds its colony.

The opening of Skyhook One in 2018 and the first orbital ring around Earth in 2114 boosted development of lunar industry, asteroid exploitation and the transfer of people off Earth to Minerva.

The Minerva Accords

Minerva to be governed by a planetary council and national colonial administrations.

No nuclear weapons on Minerva or its moons, or in orbit of Minerva.

Both moons are neutral territory governed by the Planetary Council.

Unity Island to be seat of planetary government.

Territorial claims in the UN zone are void after 40 standard years if not settled and sustained for at least 5 years. Five years after abandonment a UN zone claim can be reallocated if court approves.

Immigration quotas are negotiated every three years between Minervan Planetary Council and

Minerveography

Minerva is the only other large terrestrial body in our planetary system. With a slightly smaller diameter than Earth and a position at the outer edge of the habitable zone (1.44 AU). it is cold. Really really freeze-your-whatever-to-anything-metal cold. Yet Minerva is much more than it’s prominent ice caps suggest. With relatively low tilt, a rapid spin and enough sunlight to melt water during the summer months, the planet’s equatorial region is almost entirely ringed with major bodies of water, the largest, the Equatorial Ocean, stretching for almost 30,000 km. Rivers carry meltwater from the ice caps.

No settlements exist north or south of 30 degrees from the equator, and most are at significantly lower latitudes. Longitudes are measured east and west of the appropriately named Cape Meridiani, a point of land connected to the southern land mass that reaches to the equater near the western end of the Equatorial Ocean.

Maps
Important note: these maps show assigned exclusive settlement zones without regard to whether they are actually occupied or not. Zone indicators may be removed if the allocation is rescinded or claim is abandoned. The majority of the human population of Minerva resides in settlements around Geneva Bay, and ten other settlement zones created by the USA, Russia, China, Japan, France, the UK, Germany, India, Australia/New Zealand and the Baltic Cooperation Council.

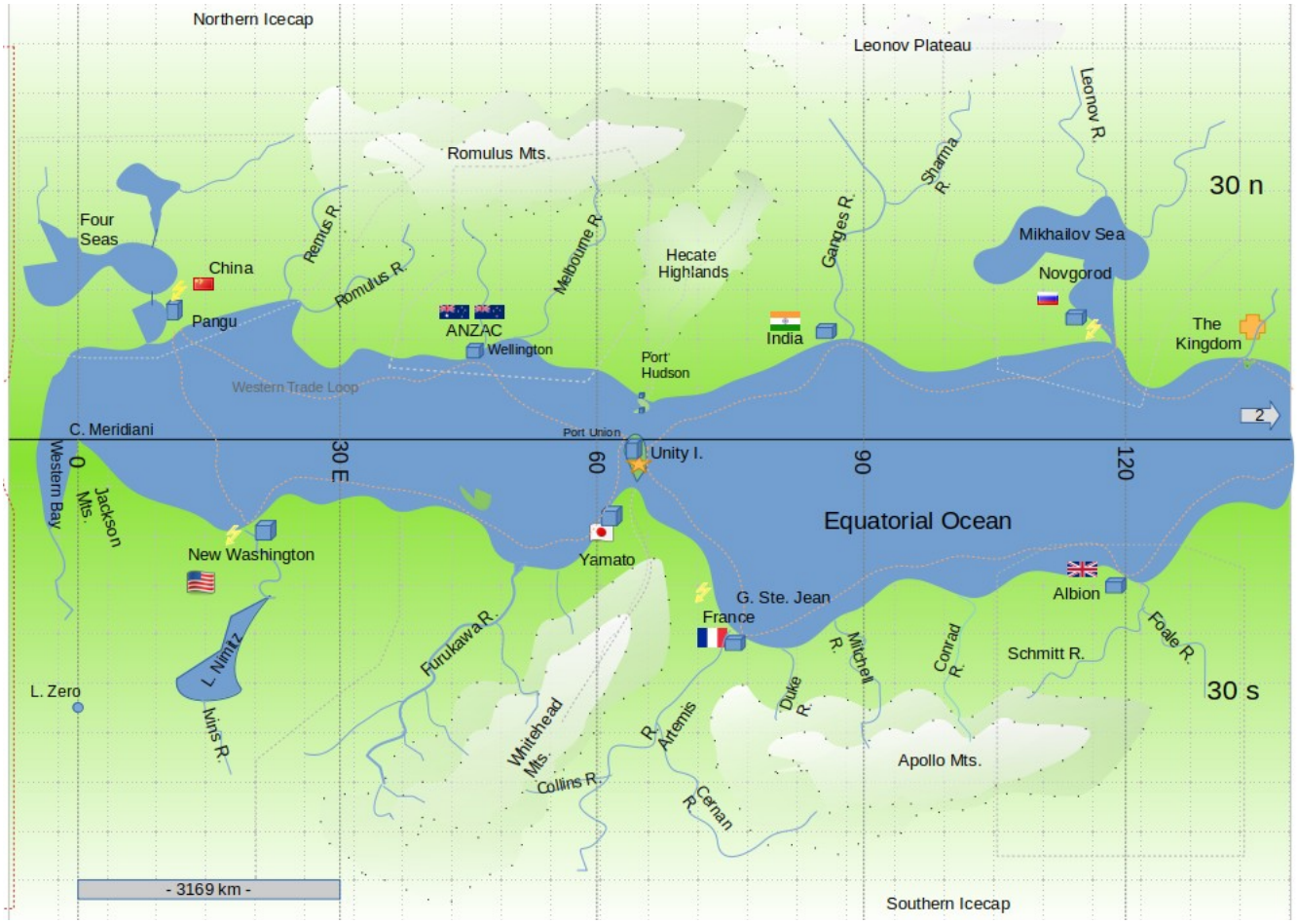
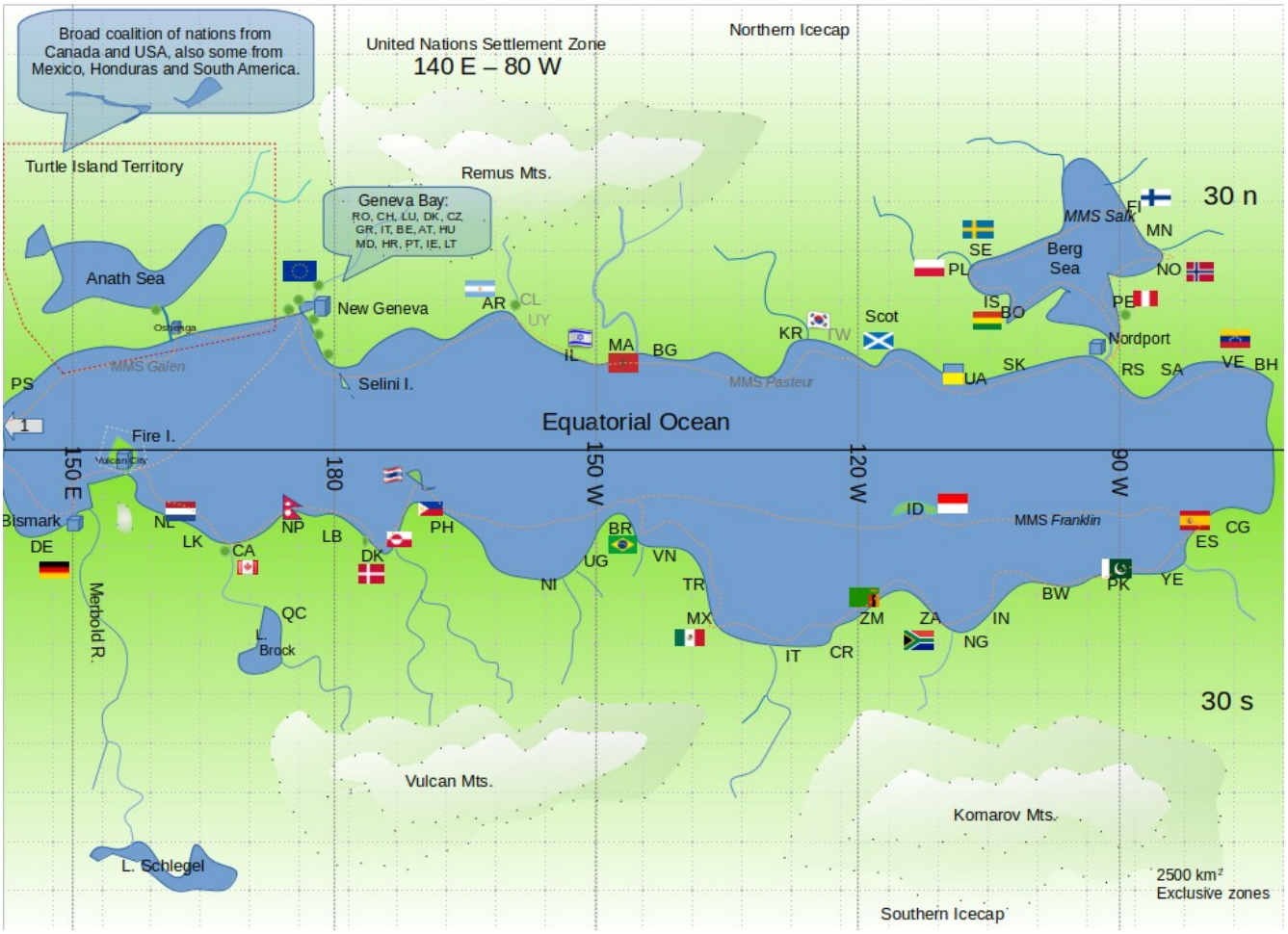


Illustration 1: Western Equatorial Ocean region c. 2170 CE


Broad coalition of nations from Canada and USA, also some from Mexico, Honduras and South America.
United Nations Settlement Zone
140 E – 80 W
Northern Icecap
Turtle Island Territory
Remus Mts.
Geneva Bay:
RO, CH, LU, DK, CZ
GR, IT, BE, AT, HU
MD, HR, PT, IE, LT
Anath Sea
New Geneva
Selini I.
MMS Galen
MMS Pasteur
MMS Franklin
MMS Salk
Berg Sea
Nordport
Scot
30 n
30 s
Equatorial Ocean
Fire I.
150 E
180
150 W
120 W
90 W
Bismark
Merbold R.
L. Brock
Vulcan Mts.
Komarov Mts.
L. Schlegel
Southern Icecap
2500 km²
Exclusive zones
PS
DE
NL
LK
CA
QC
NP
LB
DK
PH
NI
UG
BR
VN
TR
MX
IT
CR
ZM
ZA
NG
IN
BW
PK
YE
ID
ES
CG
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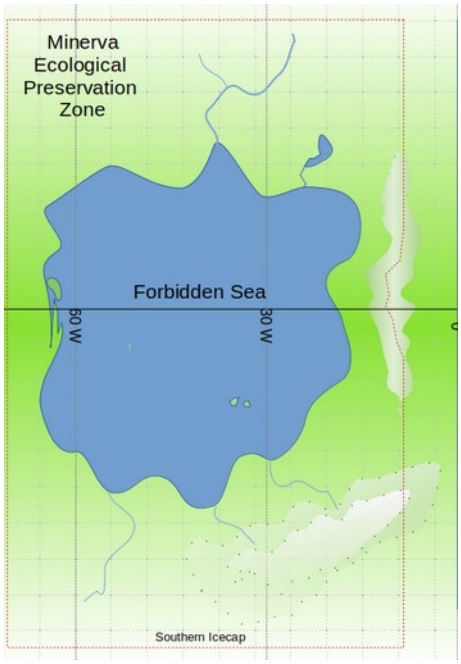
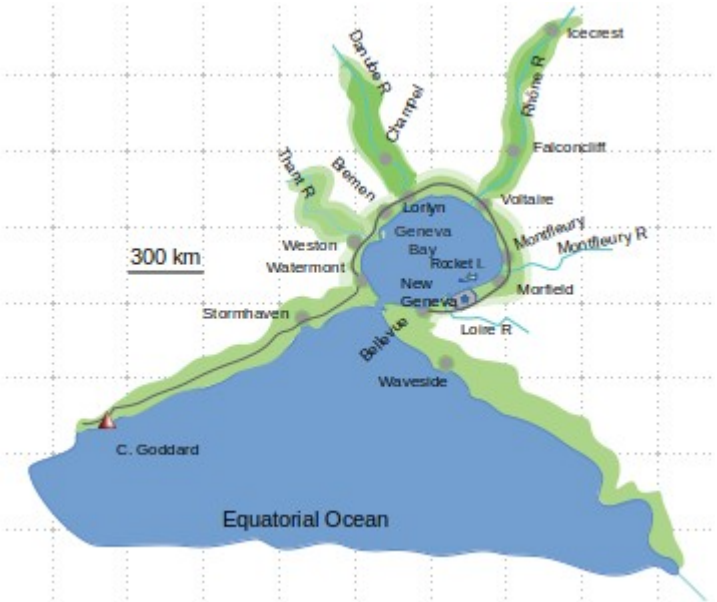

Minerva Ecological Preservation Zone
Forbidden Sea
60 W
30 W
Southern Icecap


300 km
Icecrest
Danube R
Champel
Rhone R
Falconcliff
Thant R
Bremen
Voltaire
Lorlyn
Geneva
Bay
Weston
Watermont
Rocket L
New
Geneva
Montfleury
Montfleury R
Morfield
Stormhaven
Loire R
Bellevue
Waveside
C. Goddard
Equatorial Ocean

Getting To Minerva

You don't just get up and decide to travel to Minerva. Like any space travel, even in the 22nd century, you need to be medically fit for exposure to microgravity and have a limited amount of lifetime exposure to ionizing radiation.

The fast boat, if you can afford it, will get you from Earth or Luna to Minerva in four to six weeks, depending on positions of the planets. A ride on one of the cycler towns will take anywhere from 3 to 6 months.

Communications between Earth and Minerva takes longer than it does with Luna. While you can hold a slightly awkward video call to your sister as she tours the Tranquility historic site, tolerating the short delays, you can't do that with Minerva. Round trip messages take anywhere from eight to forty-five minutes to travel from one world to another and back, depending on the relative positions of the planets. As you travel away from Earth your calls back home will get gradually more awkward until you quit trying for anything live and transition to recorded messages.

If you don't want to undergo rocket launch from Earth, you can climb one of the six equatorial tethers that link to Earth's new orbital ring.

If you make it past all the screening by your sponsoring country, your intended colony, and the representatives of other sponsor nations without going space happy, you'll have weeks or even months of often boring travel in low gravity and relative isolation. If that isn't enough, there will be more examinations and quarantine when you get to Minervan orbit. You'll be on one of the moons – probably Strix – for some time, loking down at that beckoning blue and white ball and wondering when you'll finally be able to stand there. But from there you will eventually take an exciting ride down the tether or glide by shuttle to one one of the main spaceports.

First Steps

The moment you step out of your capsule or shuttle craft, you'll notice a few things that you've read about or seen in documentaries, but this is where it gets real. First, it's probably cold. Sure, you might arrive on a summer day with sunshine and eighteen degrees Celcius, but it's more likely you'll be wearing a coat. It will probably be windy. Settlements are near the sea, and Minerva spins faster than Earth, so the air moves. Even in the height of summer, wind can give you the shivers if you aren't prepared.

Gravity is a tenth lower than Earth. You won't really notice though, because you've been getting used to it over the many weeks it took to get this far.

If you skimped on the acclimatization protocols, you might find it hard to get your breath when you do strenuous exercise. Minerva's air is nearly as thick as Earth's and it isn't thin near sea level, but it is still low in oxygen content. At a mere 14.3 percent oxygen content, getting enough of the vital substance to your cells could be a challenge for some, at least at first. Most people require supplemental oxygen at elevations above 1500 meters, while long time Minervans and populations from ethnic groups adapted to high elevation life – Nepalese, Aymara, Tibetans, etc. --

Major Colonies

New Washington (USA)

One of the earliest separate colony efforts, New Washington is also one of the largest (61,000) and most developed. Local industries can produce most manufactured goods in small quantities. The Minervan Research Institute has a major facility on the outskirts of New Washington.

Situated near the far western end of the Equatorial Ocean, across the waters from the Chinese zone, New Washington is relatively distant from most of the more friendly colonies. It's large population, fusion power plant, and spaceport drive considerable trade in domestically manufactured goods and imports. There are regular flights between Newash (as the locals call it) and both Yamato and Anzac. Flights to Pangu have resumed, and ships carry goods when ice conditions and politics are favorable.

Yamato (Japan)

Pop. (2170) 27,000 **Yamato City** features Minerva's only human cloning facility, and is a focus of expertise in advanced robotics. Yamato has an airport but relies on the spaceport at Port Union on Unity Island and the French colony for access to orbit.

The smaller community of **Meiji** (pop. 1700) to the west is a gateway to the valley of the Furukawa R. and the eastern slopes of the Jackson Hills.

Novgorod (Russia)

Pop. 22,700.
Fission power plant. Industries: iron mining, other minerals, biofuels, fish farming.
Situated on the southwest shore of the southern arm of the Mikhailov Sea, Novgorod is somewhat isolated from the other settlements, with the exception of The Kingdom, with which it has some trade. Ruled from Moscow with some autonomy, it is permitted more interaction with other Minervan settlements due to the necessities of life on a distant planet. Aided by a nuclear power plant to supplement wind turbines and a small hydroelectric plant on the Crimea River.

Budaringrad, named for Vladislav Budarin, the early cosmonaut and explorer of Minerva, is a small port town of 1200 people on the Equatorial Ocean near the passage into the Mikhailov Sea.

Nouvelle France

Pop.: 23,420. Not to be left out, France made another attempt at establishing a bit of the home land elsewhere. Planted in unusually fertile soils, fed by steady streams and tended by hardworking hands, Nouvelle France supplies much of the food consumed by other colonies. Oil and coal deposits have been discovered. A strongly regulated light manufacturing industry, powered by a mix of the usual wind farms and a fission reactor, is growing in both variety of products and global reach.

The Boulevard des étoiles is a popular place to stroll during the warmer season, and boasts some of the better restaurants on the planet, though the quality is not as reliable as it once was.

European Union Settlement Area (Minervazone)

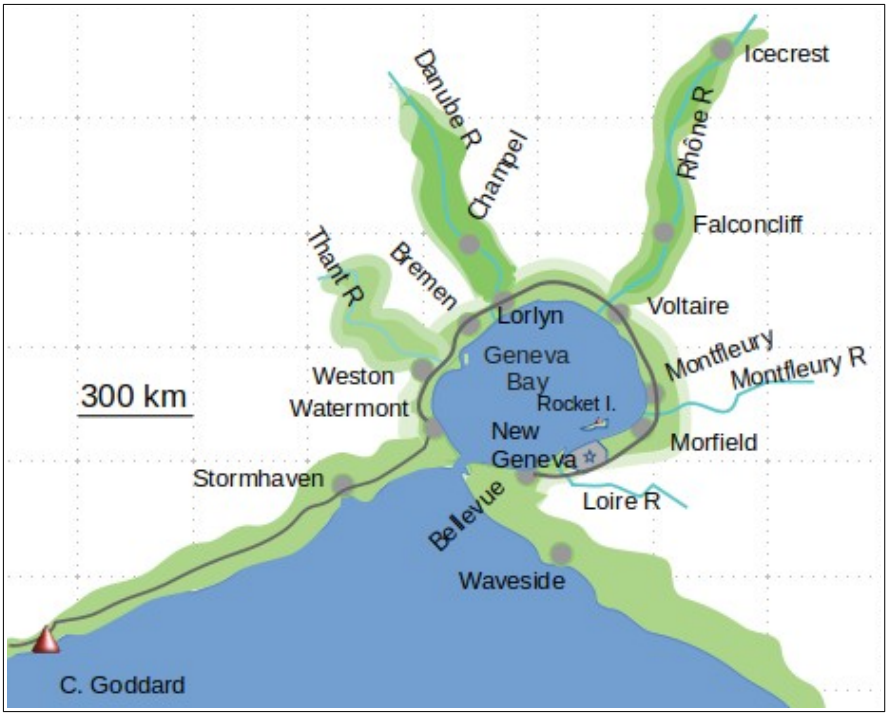
This settlement area includes the waters that flow into Geneva Bay and more than 2800 km of coastline on the north shore of the Equatorial Ocean. Geneva Bay is roughly the size of Earth's James Bay, though more circular and with a narrower, more direct connection to the wider ocean.

Several towns ring the bay near the mouth of substantial rivers that lead inland, often to smaller settlements dedicated to mining or resource extraction upstream. A major all season road links all of the coastal communities on Geneva Bay.

The various nationalities of the European Union states and the cooperating partners are distributed throughout the Geneva Bay towns, but often have distinct enclaves within them, and a few towns are dominated by certain nationalities. New Geneva is the most cosmopolitan settlement on the planet, and while English is the lingua franca, you can hear most anything. Trade among the towns is extensive, with ship traffic steady during the ice free months. When the ice is solid, travel across the ice is common, and there is regular passenger service by boat, road, and air.

Pop. 220, 654. Members and associated partners: UK, Ireland, Luxemburg, Netherlands, Switzerland, France, Scotland, Norway, Sweden, Denmark, Italy, Austria, Spain, Czechia, Rumania, Greece, Poland, Slovakia, Hungary, Slovenia, Finland, Albania, Iceland, Estonia, Lithuania, Latvia, Ukraine, Georgia, Croatia, Malta, Portugal.

New Geneva City, population: 81,070. Largest city on the planet.
Minervan Research Institute
Minerva University
Henry H. Smithson Generating Station (fission power plant)



Notable towns

Lorlyn, pop. 6,800

Bremen, pop. 12,430

Weston, pop. 15,912

Watermont, pop. 6,497

Stormhaven, pop. 5,205

Champel, pop. 4,735

Icecrest, pop. 3,486

Falconcliff, pop. 5,200

Voltaire, pop. 6,861

Montfleury, pop. 6,390

Morfield, pop.

Bellevue, pop. 25,789. The last major city past New Geneva City on the ring road that circles the bay.

Waveside, pop. 4176. A mid-sized seaside community focused on fish farming, agriculture and mining. Only recently connected by unpaved road to Bellevue, further development awaits a road upgrade.

Cape Goddard pop. 2030
Major space launch facility

Rocket I., Pop. 1,140, plus transitory workforce
A suburb of New Geneva City, Rocket Island is both a spaceport and home for the hustlers and assorted characters that tend to congregate where opportunity exists. Rocket Island is the second busiest immigration point on Minerva.

Albion (Great Britain)

Pop.: 21,604
Yes, the British were coming. The first of His Majesties Minervan realms was founded in 2038. The tiny, struggling outpost is now a bustling little group of communities on the southern coast. Residents here fish, farm, and mine the iron, manganese, uranium, and other ores found to the south in the Apollo Mountains. A mid-sized airport and deepwater port connect Albion with the other colonies, particularly Nouvelle France to the west and Bismarck to the east. After a series of minor disputes with Novgorod, relations have more recently thawed.

Bismark (Deutschland)

Population: 19,555
Under new local government following a major political scandal, Bismark has returned to a focus on expanding its industrial capacity and export of locally manufactured goods to other Minervan regions.

Pangu / Four Seas (China)

44,000 people.
Six significant towns, two airstrips, one fission power plant. Established in the heady days of the early 21st century, when China was a growing power on the march to show the world it could outdo the best, the Pangu colony languished when support faltered following the housing bubble and demographic crises that followed. Yet the new regime that rose from the ashes of the old, aided eventually by outside powers keen to avoid another period of confrontation, was able to continue a basic level of support, eventually leveraging the mass of people looking for opportunity to renew the colonies growth. The factions within contemporary 22nd century China are somewhat reflected in differences among the Minervan towns, but to a lesser degree, as the necessities of frontier life reinforce unity.

ANZAC (Australia/New Zealand)

Pop.: 21,280. Capital: Wellington. Situated at the mouth of the Anzac River, the ANZAC colony resulted from necessity as untimely fluctuations in the global economy and climate impacts impeded Australian plans for going it alone. The partnership with New Zealand enabled the project to continue.

Today, despite occasional disagreements between factions, it has been largely successful, and the colony is a major producer of foodstuff, farmed fish, and extracts a variety of minerals. Efforts to expand manufacturing beyond the minimal necessities is beginning to see progress. The current administration aims to acquire a small nuclear fission reactor to support industrialization efforts.

The Kingdom (religious group)

9400? The Kingdom, a religious movement born from an evangelical Christian group that fled the USA after the failed rebellion of 2049.

Lonar (India)

Pop. 24,355 Founded by India in 2077. A cluster of settlements on the north shore of the Equatorial Ocean west of the Ganges River. Lonar, named for a similar impact crater lake on Earth, is the base for mining operations upstream near the headwaters of the Ganges and Sharma Rivers.

Berg Sea League

Population: 17,000 (Partner nations: Sweden/Finland/Norway/Poland/Bolivia/Iceland/Estonia)
Under the umbrella of the Baltic Cooperation Council, Scandinavian and Baltic nations formerly under the sway of the Soviet Union, with the participation of Bolivia), settled the Berg Sea area. Famous for its many icebergs calving from an arm of the northern ice cap, the Berg Sea is challenging to navigate at times. Extensive high grade deposits of certain ores in various locations around the periphery spur continued exploration and development of mining industry.
There are several towns, the largest of which is Northport with a population of just under 10,000.

Turtle Island Indigenous People's Settlement Zone

Population: 16,000

Scattered around the Anath Sea and the nearby shore of the Equatorial Ocean north of Fire Island, this region's most significant settlement is **Osheaga**, a town of some 8500 people at the entrance to the Anath Sea.

Indonesia

Population: 13,943. Inhabiting several towns on the shore of Javamatra Island, a 600 km long cresent-shaped mountainous landmass just south of the equator. This Indonesian colony is focused on fish farming, mining and trade. With active volcanoes and a mild (for Minerva) climate. The capital of Barong City (pop. 6105) has a secondary spaceport, sea plane port and geothermal power. A new campus of the University of Minerva recently opened.

New Canada

15,200

Industry: light manufacturing, intensive agriculture, mining

University of Minerva campus. A semi-autonomous Quebec settlement area upstream has been agreed upon but not yet occupied on a permanent basis.

Various independent colonies

Scotland, Mexico, Zaire, Pakistan, Spain, Denmark, Phillipines, Thailand, Nepal, Netherlands, Morrocco, South Korea, Greenland, Zambia, Peru.

The Moons of Minerva

By the terms of the Minerva Accords, both moons are neutral territory governed by the Planetary Council.

Neith

Minerva's smaller (270 km), outer moon orbits at 150,000 km, making one revolution in just under 180 standard hours. Neith is a secondary port with a low gravity spin torus (0.4 g) and a full time population of 450.

Strix

Strix is the innermost and far larger of the two moons. It orbits at a mere 78,000 km from the barycenter, taking a bit longer than 67 hours to completely circle Minerva. With a diameter of 700 kilometers, it is roughly spherical and massive enough to cause small tides on the planet below. Strix contains the main quarantine facility for new arrivals. There are two gravity centrifuges, one providing 0.4 g (mimicking the gravity of Mercury or Ares), the other simulating up to full Minervan gravity.

Permanent population: 920.

Skyhook

The Minerva Skyhook is a 200 km non-rotating momentum transfer tether in low equatorial orbit that boosts cargo from various laser-powered launch vehicles to higher orbit.

A Day In The Life

Time

If you're lucky, you were on a ship that gradually changed over to Minervan timekeeping before you even got into orbit, or you had some time to adjust during quarantine. If not, you will learn.

Minerva spins significantlly faster than Earth, in a bit over 18 hours, 18 h 4m 22s, to be exact. A day on Minerva, commonly called a sol, goes quickly.

Minerva Calendar

Many systems for reckoning the passage of time were proposed, but only one remains in common use. In Earth year 1984, Robert S. Ketchum devised a calendar of 840 day years, counting from January 1, 1998, the year Athena 5 brought the first humans to Minerva.

Minerva's year is a long one. 840 sols, long. With two moons, it isn't obvious what a month is. Historically, a calendar with 12 months based on the sun's background zodiac constellation was proposed. Eventually a scheme with 24 shorter months was adopted planet wide.

Minervan Month	Days (sol)	Earth Day*	Note
Libra	1-35	1-26	New Year, Yamato Founding Day
Newton	36-70	27-53	
Virgo	71-105	54-79	Alt. Boötes
Hubble	106-140	80-106	Alt. Corvus
Leo	141-175	106-132	Landing Day Planetary Holiday
Galileo	176-210	133-159	
Cancri	211-245	159-185	Second quarter begins. Spring equinox on 214.
Cassini	246-280	186-211	
Gemini	281-315	212-238	
Darwin	316-350	239-264	
Taurus	351-385	265-291	
Curie	386-420	291-317	
Aries	421-455	318-344	Middleday, Solstice (Northern summer)
Einstein	456-490	344-370	
Pisces	491-525	371-396	
Kepler	526-560	397-423	
Aquarius	561-595	424-449	
Da Vinci	596-630	450-476	
Capricorn	631-665	476-502	3/4 equinox*
Maxwell	666-700	503-529	
Sagittarius	701-735	529-555	
Magellan	736-770	556-581	
Scorpius	771-805	582-608	
Copernicus	806-840	609-634	Northern winter solstice

A day on Minerva is short compared to Earth, and the typical work shift reflects that by being six hours long. Most workers live close to their workplaces, and the typical shorter shifts do not encourage long

distance commuting. Workers who live farther from where they work are typically provided accommodation onsite.

Activities vary with the season. In the summer, supervising the greenhouse systems

Transportation options follow the seasons too. In the summer, boats carry passengers and cargo between settlements, and hospital ships provide health care resources to outlying locations. While the water is open, long range flying boats connect villages and remote camps that don't have adequate runways to more established centers.

Winter is long on Minerva, even near the equator. Ice covers the seas and much of the Equatorial Ocean, scattering icebergs where glaciers meet the sea. To extend the shipping season in Geneva Bay and the Mikhailov Sea, some ships have been built for breaking ice. Other ships have been built for moving on or above the ice.

Aircraft equipped with skis provide various levels of service to smaller communities when weather permits.

Illustration 2: Photo by Andrea Pokryzywinski CCA2

In the frontier settlements, Minervans spend more time in subsistence tasks than most residents of developed Earth nations. Annually, activities are tied to the seasons and to arrival of planes and ships from elsewhere, especially from the larger centers that they rely on.

Supply of consumer goods is limited and intermittent. This is true in all but the largest centers, whatever the founding culture or economic system. In the more planned economies.