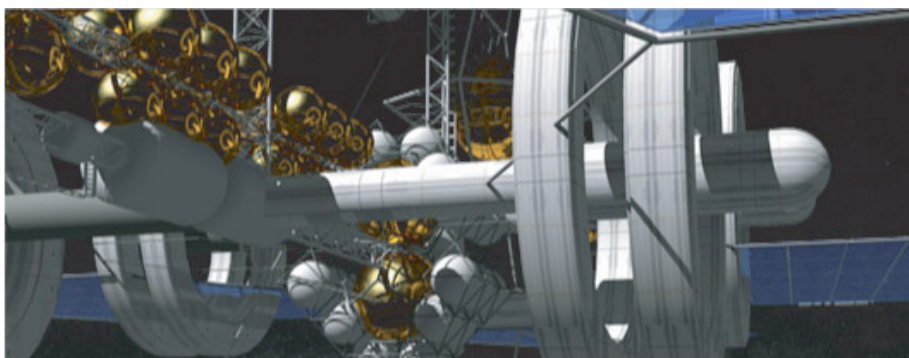




STEP 3

AUTONOMY AND EXPANSION ...



Space station - Image O.Boisard

Industry of space is rising. Thousands of persons – and soon tens of thousands - live out of the Earth. Most of them are on the Moon where, for the first time, a birth is registered. The event becomes a subject of polemic: could this artificial low gravity environment be dangerous to the child? Is it safer for him to come back to the Earth, which is, thanks to regular space lines, only two days from the Moon?

The quality of life far from the Blue Planet, however, made considerable progress. **The development of artificial "biospheres" is a major improvement** compared to the former monotonous hydroponic cultures: in immense greenhouses of a few hectares, a rich and varied environment is proposed to astronauts. The mastering of these perfectly closed biological systems took a long time, but it is now possible to recreate forests far from the Earth, to reproduce the cycle of water, and – it is totally new in space - to raise some animals. Some people think that this progress is first interesting at breakfast time, as it is now possible to find on the Moon milk, eggs, and bacon...



Biosphere II

Private companies exploit very profitable Earth-Moon regular space lines. They are first interested by the transport of manufactured goods produced by lunar industry. Exchanges flows with the Earth are changing: space activity is now able to respond to its own consumption and development, exporting to the Earth rare ores, electronics components designed in micro-gravity, pure crystals useful for nano-technologies, and energy from orbital Solar Power Stations.



SpaceShip One

Space tourism generates an intense flow of passengers in low-orbits hotels, proposing – at an attractive price for its middle class customers - short stays of a weekend or more. From each cabin, a fabulous scenic view to the Earth is guaranteed.

Building new Lunar or Martian stations is not only a question of engineering and architecture: it becomes, too, a question of urban planning. **More than being protected from the environment, the question is to be integrated in this environment.** Ground transportation systems are developed on the surface of the Moon and Mars, between multiple inhabited areas. A delicate question – prudently forgotten during the times of exploration – is re-debated: human activity must take care not to inconsiderately destroy natural environments preserved during billions of years.

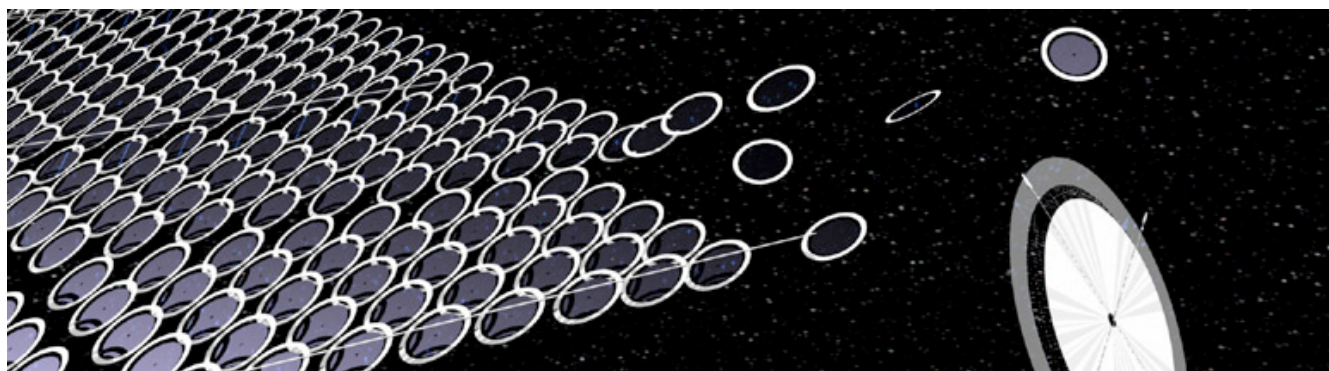
It is decided that immense "sanctuaries" zones will be preserved and forbidden to man, except during punctual scientific expeditions. An ambitious lunar project, judged too destructive for the environment, is abandoned: this project planned to work opencast mines of hundreds of square kilometers, extracting from the precious regolith - i.e. the layer of lunar dust issues from the meteoritical bombing – rare elements such as helium 3 useful for nuclear fusion reactors.

Mining resources exist elsewhere, beyond Mars, in the great belt of asteroids. Exploration probes already identified there hundreds of thousands of rock blocks – from a few meters to a few tens of kilometres – and manned missions landed on the most remarkable of them. A new kind of machine appears: the asteroid tugboat. It is used to bring closer two large asteroids, then to connect them by a ten kilometers length cable, the whole system being put in rotation in order to produce, on the interior faces of the asteroids, an artificial gravity useful for future inhabited stations. **Where there is no planet, "space polders" are created...**



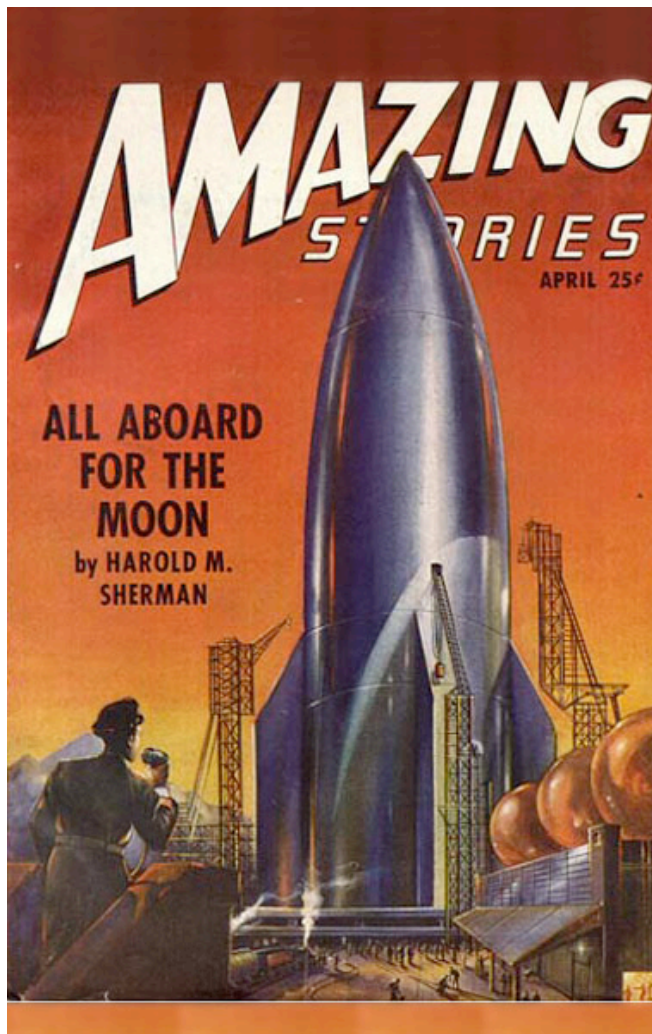
Astéroïd Hayabusa - JAXA

It is at that time that **is discovered, coming from the remote places of Kuiper's belt, a comet likely to collide with Earth in few decades ...** Alarm was given by the constellation of surveillance satellites launched years ago : statisticians had demonstrated that such a risk was low but not null, and it was decided to keep a eye on these dangerous bodies called the "geocruisers". The giant one which destroyed the dinosaurs sixty millions years ago was exceptional, but little asteroids are more common, and in 1908 for example, in the Siberian region of Tunguska, an impact was registered, devastating forests in a radius of tens of kilometers. Considering the density of population on Earth, the damage caused by such a catastrophe, even if it occurs only once per century, corresponds to a risk of mortality comparable to road accidents...



Space moucharabieh - Image O.Boisard

It is first proposed to use a space tugboat to deviate the comet: too much time would be spent to reach it, and the propulsion system of the tug was not powerful enough "to push back" a comet. Another solution is to try to destroy it using nuclear bombs : too risky, as fragmentation could produce a cloud of meteors maybe more dangerous than the whole comet. The solution is finally found: it would modify its trajectory by itself ... **Large solar sails are sent, and precisely positioned between the comet and the Sun, forming an immense "space moucharabieh".**



Amazing Stories

Constantly in the shade, the rock block mainly made of ice stay cold during its approach, and does not develop the usual tail of comets due to the gas jets produced by the solar heating ... The action of these small "geysers" is weak, but in their absence, the comet slightly modifies its trajectory and crosses the Earth's orbit without any risk, a few millions kilometers away.

The "high frontier" is now located near Jupiter and Saturn. Exploration airships are sent in the high atmosphere of the gaseous planets. This place is forever forbidden to man : gravity is too strong there. But in orbit, a new kind of space station is built: composed of a vast inhabited platform, connected by a cable to a counterweight located thousand kilometers lower, this giant "pendulum" is stabilized by the effect of the "gravity gradient", and reproduce onboard an artificial gravity without using the traditional centrifugal force.

The adventure starts again on the extraordinary satellites of the two giant planets: here is reproduced the exploration/colonization process engaged decades ago on Mars. Men approach the liquid methane lakes of Titan. The vulcanologists are particularly interested by Io. The faults of Ganymede and Callisto are explored. The rings of Saturn are closely observed. And, in Europa, astronauts penetrate under the ice of the satellite to join the first underwater station immersed out of the Earth.

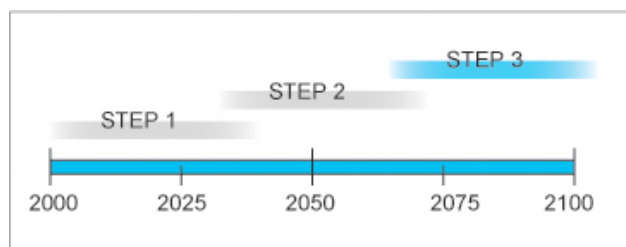
Technologies are ready to send a fast automatic probe beyond the solar system. After a reasonable journey of twenty years, the **next stopover is Proxima Centaurus.**

And everyone agrees that Earth will remain, anyway, one of most pleasant planets in this part of the galaxy.

MAJOR FACTS

- For the first time a birth is registered on the Moon,
- Giant biospheres are built on the Moon and Mars,
- Space industry and space economy are rising,
- Exchange flows with the Earth are inversed,
- The lunar and martian territories are fully colonized,
- Astronauts walk on the surface of Jupiter and of Saturn's satellites,
- Giant space stations are built on asteroids,
- An automatic probe is sent to another stellar system.

STEP 3 : AUTONOMY AND EXPANSION



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