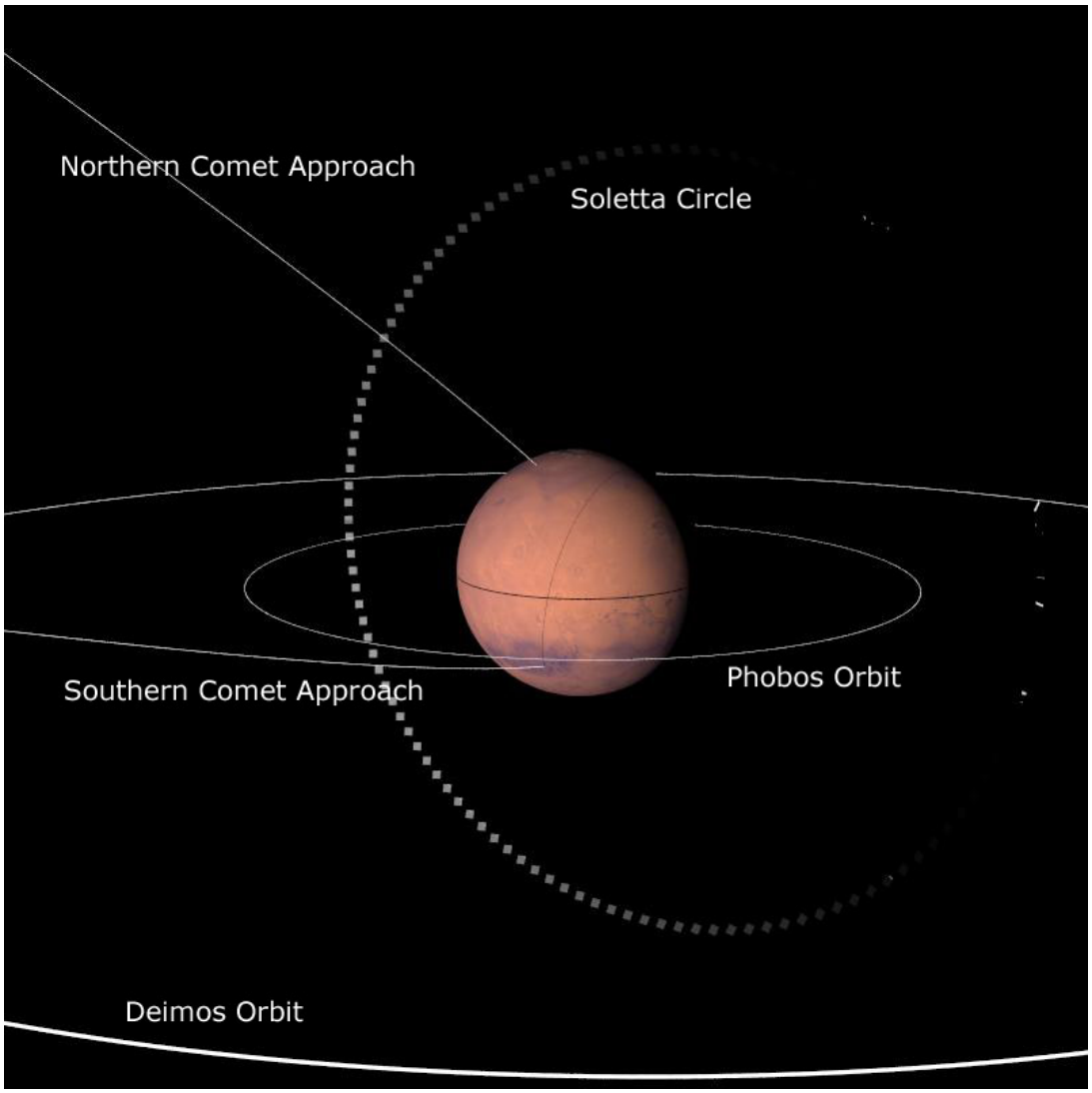
Terraforming



> And then, the Earth being small, mankind will migrate into space, and will cross the airless Saharas which separate planet from planet and sun from sun. The Earth will become a Holy Land which will be visited by pilgrims from all the quarters of the Universe. Finally, men will master the forces of Nature; they will become themselves architects of systems, manufacturers of worlds.
> - Winwood Reade, The Martyrdom of Man, 1872

The terraforming process included some major geoengineering and nanotechnology, but also a careful design of ecology. The MTN had a complex tug-o-war between the technocentrics and biocentrics debating on the proper way of transforming the planet. The compromise reached was based on using a large amount of “technological overkill” at the beginning followed by an increasingly “soft” approach after the basics of a biosphere had been established.

The first steps involved the construction of solettas to increase the energy inflow of the planet, heating the poles (which were covered by dark dust spread by automated units) and the violent impacts of several asteroids into low-lying areas. Factories produced super-greenhouse gasses and carbon dioxide, heating up the atmosphere further. In some regions with abundant carbonates and ice nuclear explosives were used to release volatiles. The mobile factories produced deuterium for enormous nuclear charges that vaporized the volatiles, releasing them into the atmosphere.

The first phase ended when the dust-shrouded Mars “popped” – the heating shifted the equilibrium from the cold state of old Mars to a warmer and wetter environment where a denser atmosphere with greenhouse gasses maintained enough heat to keep the water from freezing.

Freely replicating hard nanotech replicators were never used (due to opposition to more ecocentric fractions), but genetically modified algae were spread everywhere to produce oxygen and further greenhouse gases.

Automated mining systems in the outer system sent a long stream of asteroid chunks containing water, ammonia and methane to Mars. This stream lasted well into the 2300’s. They increased the amount of water and constituents for a biosphere to enable life to thrive.

As Mars became wet the landscape began to shift. Landslides, aquifer eruptions and settling occurred everywhere. New river channels were carved, but often the terraformers had to direct the water away from the uplands were it would tend to freeze into ice buildup by digging enormous channels from south to north. Setting up a stable hydrological cycle proved far more troublesome than anticipated, and much energy had to be spent breaking down crater walls or opening up underwater rivers (“plumbing”).

The initial ecopoiesis bacterial and algal blooms soon died out, erased by designer nanoviruses. Their biomass became food for the second and third generation, which in turn was the basis for the increasingly complex sequence of ecosystems carefully planted by the ecoengineers. The first simple arctic ecosystems were followed by boreal and temperate ecosystems, slowly expanding from the equator. In many cases the strict biocentrism had to be compromised in order to get truly stable ecosystems (e.g. with the borers and certain designed soil organisms).

Biome bootstrapping stations were scattered across the landscape and undersea, rearing organisms and planting them in the surroundings. Ecology monitors traveled around, checking the vigor and stability of the emerging ecosystems. The first years the bootstrapping was very much trial and error, but over time as the planet began to stabilize the old biomes spread well on their own and new biomes could be created with greater ease building on top of the soil and carbon cycles that already existed.