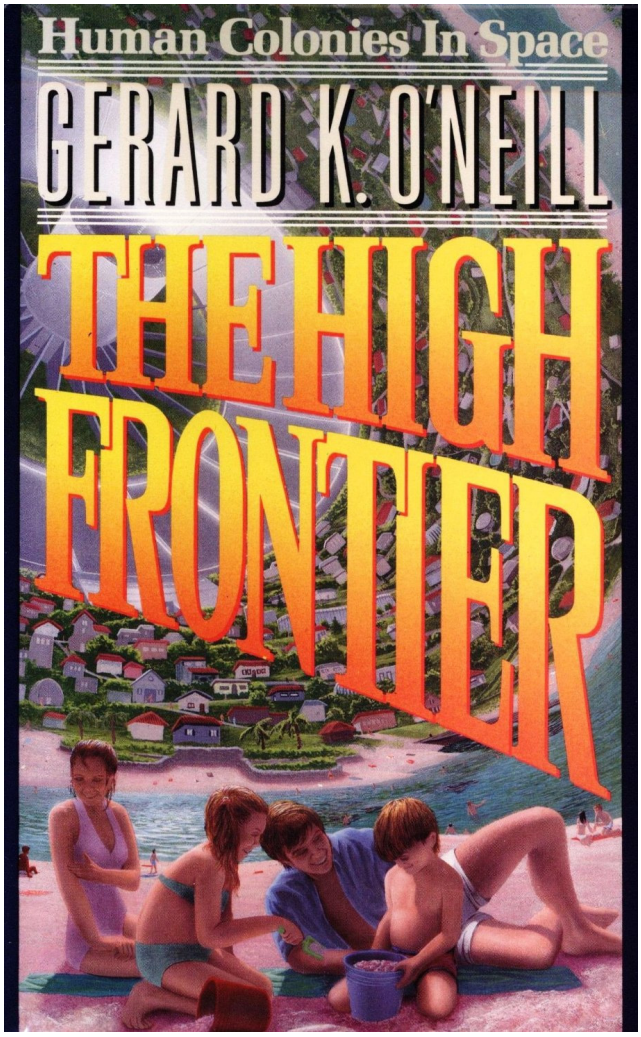
The High Frontier



Thanks to the re-issue of the 1976 published book as an e-book in 2013 I had the chance to read this highly interesting book for the first time.
Being written under the spell of the achievements of space exploration in the 1960's, studying the book today allows the reader to separate sci-fi from reality.
Gerard O'Neill's book outlines a technical feasible scenario for what he calls a bootstrap approach: live from the resources available in space ("using the material and energy resources to build manufacturing capacity") and have something to sell, i.e., establishing an in-space industry the colony population can live from.
The starting element is "Island One" with a spherical shaped geometry providing living space for around 10.000 inhabitants, earth like climate and gravity (different gravity zones are achieved through rotation of the ring around a hub). A lot of investigations went into depicting sophisticated illumination schemes of the different structures. Transportation and logistics (other than from earth) is achieved by "mass driver" reaction machines (magnetic accelerator for satellite propulsion and/or payload/material transport).

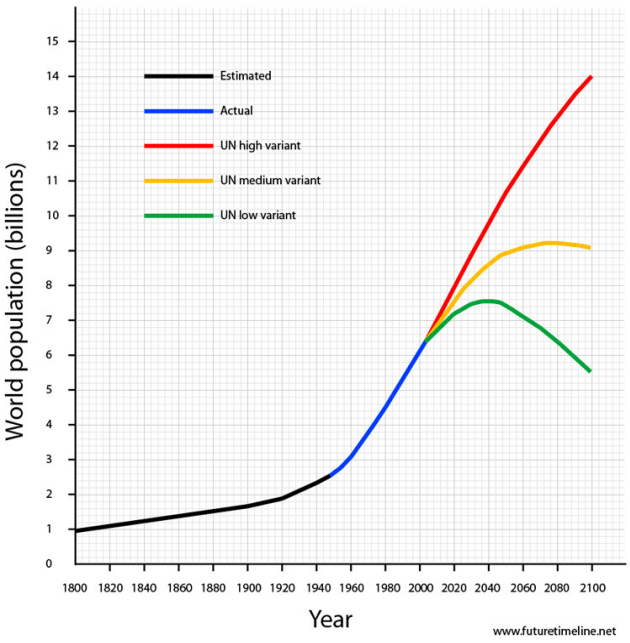
According to the author the advantages for space colonies would be the availability of "unlimited resources" and "unlimited power". Preferred location for starting space colonization would be the earth-moon Lagrange point L5.

One of the main "export" industries would be energy supply to earth by colony-built and operated power satellites. Expansion to the Moon and asteroids or the Asteroid belt is expected.

Although the book - like a professional Phase-A study report - lists all assumptions and justifies the conclusions either by experiment (mass driver), calculations or extrapolations using the technical "state-of-the art" from the Apollo program and the build-up of the shuttle fleet. A lot of the assumptions and predictions turned out to be unrealistic, not necessarily because of their technical flaws but of economic and political reasons.

One key assumption, the cost of transport per kg from earth to LEO would go down to around 200. - US$ per kg turned out to be not realistic (we still are orders of magnitude off that price tag).

Although mentioned by Hermann Oberth in 1923 already, Solar Power satellites did not come about yet, although the energy cost on earth rose dramatically since 1977.
If one looks at the development and implementation problems of the international space station ISS which took over 20 years to be completed the projection of the first fledgling colonies by the year 2100 were in my opinion too optimistic – and still are.



The "High Frontier" book is still very worthwhile and highly recommended to be read because it deals with a number of basic non-technical issues which must be solved sooner or later: The primary one is the question why humans shall leave the Earth and live in space. One reason could be "overpopulation" (which is also mentioned in the book). This pressing issue (see predicted population growth) might be a strong reason, however is being pursued globally only on a low priority basis (see Dan Brown bestseller "Inferno").
In my opinion in this respect O'Neill's book is very topical because it provides a sweeping overview of possibilities, constraints and their implications for the reader to make up his own opinion, in particular whether a huge amount of "up-front" money should be spent for space colonization or whether the amount is better spent on maintaining the survivability of human kind on our unique earth.

For more information about the current status of space colonization please refer to the Space Studies Institute (http://www.ssi.org)

Joachim J. Kehr Editor SpaceOps News, September 2013