

***Gagarin + 50 Years, Tito + 10, What Next***

or

***An Ice Age, a Thaw, & a New Spring***

*A very annoying claim:*

RLVs  
space hotels  
If { lunar colonies  
etc } were possible,  
we would have them by now.

Technologies don't automatically happen just because they are feasible.

# Technologies develop via an **evolutionary** process.

- Lots of approaches initially, e.g. dozens of car & auto makers in early 1900s.
- Endless variations in components & designs
- Competition drives survival of the fittest
- Gradually optimized over time

Biological evolution thrives on warmth.

Evolution took place in the Arctic,  
but much more slowly.

Technological evolution:  
Funding == Heat

Big technologies need lots of heat.

## Between Gagarin and Apollo 17, views about space became frozen:

- \* Space is hyper-expensive & always will be
- \* Only governments & giant firms can afford space

## And institutions became frozen:

- \* NASA, molded by Apollo, required a giant program.
- \* For military, ELVs good enough.
- \* For comm. satellites, ELVs good enough.

Frozen views led to slow evolution for rockets.

Instead of multiple vehicles overcoming the myriad challenges to a fully reusable space transport,

**NASA built the Space Shuttle**

As its budget got smaller,  
payload and cross-range demands got bigger.

**The first attempt to create the RLV animal  
was doomed from the start.**

Starting in 1990s, a sign of a thaw.

Many began to think low cost space possible.  
Some of these people were rich.

After Tito and SS1 the thaw quickened

Smaller RLVs, e.g. suborbital,  
emerged that needed less funding.

More and more RLV variations  
as warmth spreads.

## Next 10 years:

Multiple space vehicle designs competing.

These enable private space habitats & private beyond earth expeditions.

More melting of the views of more & more people.

Leading to more participants, more rich investors.

=>

A teeming diversity of space activity