

# **A Look to the Social and Historical Aspects of Space Research**

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# Definition of (civil) engineering

**Thomas Tredgold, 1828**

**"That species of knowledge which constitutes the profession of Civil Engineering; being the art of directing great sources of power in Nature for the use and convenience of man, as the means of production and of traffic in States both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks, for internal intercourse and exchange; and in the construction of ports, harbours, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purpose of commerce; and in the construction and adaptation of machinery; and in the drainage of cities and towns."**





## A SMALL WORLD

First environment of humans was a few kilometers around their habitats. They were exploiting the resources in that environment. They knew the characteristics of the “nature” which was prevailing in that area.

# THE WORLD IS GETTING BIGGER

As time went on, that area got bigger and bigger.







AND EVEN  
BIGGER ...

As their environmental area got bigger, the resources became richer and the humans met new natures. Increased richness enabled humans to discover larger areas thus to enlarge their environmental area. New natural conditions made them more flexible and more powerful to deal with new difficulties thus increasing their technological abilities.

This spiral of  
**increased environmental area <> increased use of resources and  
higher level of technology**  
has continued until now so that we have finally reached at the point of using  
the term “**globalization**”.

OUR WORLD  
NOW IS THE  
WHOLE GLOBE.  
WE ARE NOW  
CONCIOUS  
THAT WE ARE  
LIVING ON A  
GLOBE IN 3  
DIMENSIONS



# WORLD OF TOMORROW

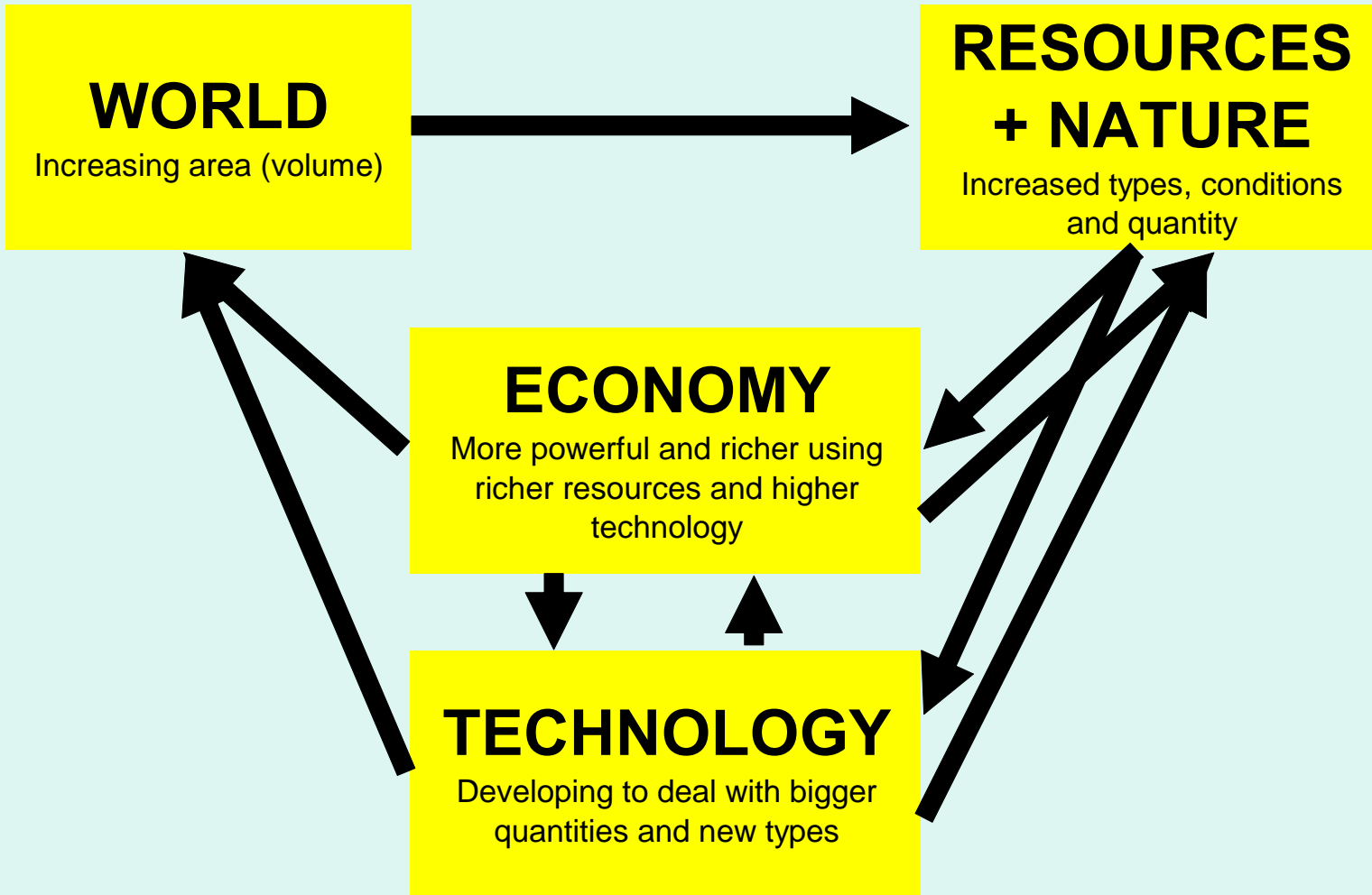
This picture of the Earth and Moon in a single frame, the first of its kind ever taken by a spacecraft, was recorded September 18, 1977, by NASA's Voyager 1 when it was 12 million km from Earth.

<http://space.about.com/od/pictures/ig/Earth-Pictures-Gallery/Distant-Earth-and-Moon.htm>

Mars is soon to be added to this “world”







So, we can look to “space research” simply as a new attack to increase the dimensions of our world, a push outward of current frontiers.

This means that it is a natural phenomenon. As history has shown all through the passed milleniums, mankind will stop at no boundaries. On the contrary, humans will always go beyond, following the moto “Man goes to everywhere he can go”.

# CONCIOUSNESS AND DIFFICULTY

Perhaps the most important differences between the current enlargement of the living area and the previous ones are

1. The level of consciousness
2. The level of difficulty

# Consciousness

In the past, most of the activities to push forward the frontiers were made unconsciously or at least in a half-conscious manner. Full consciousness was rare.

The activities of today are all made in a completely conscious way, every step being well calculated and measured.



# Current difficulties

Effectively, this new attack is much more difficult than the previous ones. It necessitates

- a powerful economy,
- an advanced level of technology,
- scientific research organizations,
- political will and decisiveness.

Very few nations and unions can bring all these together in order to follow space research and push the boundaries.

But the fact is that, remembering the spiral which defines our current position, if a nation does not take place in this process, it will probably lack the relevant benefits, coming from new resources and new technologies.

Thus, mankind has to find a solution to attract the highest number of nations, groups, and unions into this process.

The remedies for achieving this goal may be

- To encourage internationality and multinationality in space research projects, and
- To encourage breakdown of the big projects into smaller activities which can be afforded by a larger community.

**Point 1: Space Research is a natural continuation of the historical activities starting from primitive habitats to globalization**



**Point 2: Space Research is not  
a Single Dimensional Activity**

# Advances in Space Technology (Direct and Indirect)

Space research is expensive. Developing a rocket to launch a spacecraft to comet Halley, or establishing an outpost on the south pole of the Moon necessitate billions in any currency.

But there are activities which can be run by nations who cannot be categorized among the richest ones.

# Examples of Indirect Research Areas

In the following are given some indirect research subjects which could well be attacked by smaller sized research and development organizations that can be found in many places over the globe.

# WIND TURBINE



For over 20 years, NASA's 4-megawatt wind turbine held the world record for maximum power output.

The researchers in NASA were able to arrive at this result because they had an expertise in propellers, propulsion, rotating equipment, and power systems.

NASA's efforts also led to other industry innovations in similar subjects that are standard today. As researchers explored ways of reducing the weight and cost of turbine structures, they developed steel tube towers that replaced the rigid truss towers traditionally used. "Today, virtually every large wind turbine uses a steel, tubular tower, which was novel technology at the time."



# WATER BALLASTED RAFT

The raft, designed to guarantee the rescue of astronauts returning from a space flight, relies upon a heavy, water-filled ballast. A flapper valve allows large amounts of water to enter the hemispheric chamber placed under the raft. This water provides the ballast that keeps the center of gravity constant, much like the thousands of pounds of lead keel used to stabilize sailboats. This design makes the raft nearly impossible to capsize.

To date, the producer company has sold several thousand of the ballasted inflatable life rafts, and this space-age technology is credited with saving the lives of over 450 seamen.

Apollo astronauts and a Navy frogman in biological isolation garments await pickup from a helicopter.



# VISCOLEASTIC FOAM

In 1960s, one of the research subjects of NASA was to build a recovery system for the Apollo command module. For this purpose the researchers tried to use a “memory” foam material with unusual viscoelastic properties; possessing both high-energy absorption and soft characteristics. This material is then fitted into a new airplane seat design that not only offered better impact protection in the event of an accident, but enhanced passenger comfort on long flights, due to an even distribution of body weight and pressure over the entire contact area. Initially referred to as “slow spring back foam,” the material flowed to match the contour of the body pressing against it and returned to its original shape once the pressure was removed.

Applications of this material now extends from aircraft seatings to medical cushions and seating systems for the severely disabled. Eighty percent of the production is used in the medical industry, being used for orthopedic seating pads, mattress pads, and the Foam-In-Place Seating system, a custom-molded seating solution for the severely disabled. There are also many other applications extending to buffers and various types of saddles.



Initially referred to as “slow spring back foam,” temper foam matches any pressure against it and slowly returns to its original form once the pressure is removed.

# AGENTS FOR SAFER RAILROADS



Search for an anti-icing and deicing agent to be used in upper atmosphere resulted in developing materials to make railroads safer and more reliable during wintry conditions.

The anti-icing fluid thus developed is an effective and environmentally friendly, biodegradable fluid that has proven its capabilities over a broad range of low temperatures. The fluid is also non-corrosive, and will not damage the railways when applied. It is safe to use with the electrical wiring associated with railways, because it is not conductive.

These products form a protective - coating barrier that prevents the buildup of ice and snow. Applying the fluid to the railway components prior to ice or snowstorm works as an anti-icing fluid. It also functions as a deicing fluid. If applied to an already frozen switch or rail, it will quickly melt the ice, free the frozen parts, and then remain in place to prevent refreezing.

It seems that, until now, there have been more than 30000 innovations like the ones given above. Most of them are indirectly related to space research, and many of them have helped to give birth to unexpected by-products which can be used in areas not related to space affairs.

This means that space research is not a single dimensional activity. On the contrary, it is a multi-dimensional task if not infinite dimensional. This is true for the aims and for outputs at the same time.



**Point 3: Research on these side subjects can be run by nations or unions who have limited capabilities**

- In this way, a higher percentage of the population will be contributing to the space research, directly or indirectly.
- This will also mean that more people will benefit from the economical and technological benefits of space research.
- Such an approach will be helping to a more evenly developed world.

# Summary

- Point 1: Space Research is a natural continuation of the historical activities starting from primitive habitats to globalization, i.e. the advent of civilization
- Point 2: Space research is not a single dimensional activity. There are direct activities which are very expensive to run. But there are also some side activities that necessitate less amount of resources but are equally productive.
- Point 3: Research on these side subjects can be run by nations or unions who have limited capabilities. If this is realized, it will help to form a more uniformly developed world.

# ADDENDUM

- News agencies are revealing that a decision is taken to stop spending about 100 billion dollars for space research.
- This does not mean that this activity is ending. It only means that it will be realized not in the 20 years to come, but somehow later.
- Remember Christof Colomb who was trying to raise money for going west.

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