

Space Research

By Bob Krone, PhD

Research to facilitate Space exploration, development, and human settlement is as important for Kepler Space Institute leadership as Space Education. The for-profit corporation, Kepler Space Institute, Inc. (KSI, Inc.), registered in the State of Florida of the United States (authentication ID = CC3821618653), will be involved in research while it plans for creating the Kepler Space University to deliver degree programs within the Space and Earth Sciences.

Readers will find Research articles in the two first issues of this Journal at www.keplerspaceuniversity.com. Click on a “Journal” Issue to get the Contents, then click on the “Research” article to open or download.

The Fall 2012 issue Research article contains hypotheses and research questions on twenty-nine subjects from Bacteria to X-Prizes. The authors for those were Space professionals who had been co-authors of chapters in *Beyond Earth: The Future of Humans in Space*.¹

The research article for the Spring 2013 issue was prepared by the Journal’s Research Editor, Dr. Kseniya Khovanova-Rubicondo. It contains hypotheses and research questions – submitted by five professionals – on humankind’s survival, philosophy, leadership, resource management, spiritual aspects of Space, and curiosity.

This third issue of the *Journal of Space Philosophy* covers “*Theory for Space Research*.” A review of the hypotheses and research questions documented in the previous issues of this Journal confirms the fact that there may be an infinite number of unknowns to solve as the movement of humans to living and working in Space evolves.

Research Theory

Knowledge is the understanding of information, of a science, of a paradigm, a theory, an art, or a tool. Knowledge is the goal of learning and learning is the purpose of research.

*Learning is the only thing the mind never exhausts,
never fears, and never regrets. It is one thing
that will never fail us.*

Leonardo da Vinci (1542-1519)

Wisdom is the ability to use the results of research in support of values, visions, goals, plans, and projects known to be good.

¹ Ed. Bob Krone (Toronto, ON: Apogee Space Press, 2006).

Space fiction and Space Research is filled with hypotheses.

Hypotheses provide expectations for the future. They have four possible outcomes:

- 1) Future events and research may validate them,
- 2) events may prove them to be invalid,
- 3) they may contain some mix of truth in the projection,
- or 4) insufficient evidence may be found to state any findings or conclusions.

A huge number of Space research questions have been answered. Evidence of that comes from the all the manned and robotic systems that have been successfully accomplished in the 20th Century and those exponentially increasing as the 21st Century gets underway.

But the unknowns of the universe and the current state of Space exploration, development, and human settlement are vast. Research has opened the Space Epoch. Research will be a major vehicle that drives all future achievements. What are the fundamental principles that will assure Space research will achieve the philosophy and goals we are documenting in this Journal?

Research has two quite distinct forms. The first form is the traditional academic one, where libraries and electronic data sources are searched for relevant information and for the experience and views of scholars and experts in the field. The second form involves extracting the know-how of those who actually do the work. This second form has been recognized increasingly as being essential. It is projected to increase in value as the rate of change in science, technology, and society continues to increase.

Fundamental Space Research Categories

There are three necessary and sufficient categories of research that apply to both the library and Internet search and the personal know-how search forms of research. They are:

- BEHAVIORAL RESEARCH, to discover what exists.
- VALUES RESEARCH, to reveal what is preferred.
- NORMATIVE RESEARCH, to prescribe what should be done.

Behavioral Research asks Who? What? When? Where? How many? How much? and What interactions? The behavioral research scientific statement is:

**“If certain facts are observed over time, then a known result will occur...
with probability (P).”**

This is the bread-and-butter category of any research. It discovers just what exists and what is happening within the system. It relies heavily on the inductive logic for which Sir Francis Bacon (1560-1626) is famous.

Values are things or principles preferred. Values Research identifies what beliefs, assumptions, and preferences underlie decisions and actions. It asks: Why? For what ends? With what priorities? With what commitment? for different players and stakeholders. The basic values research scientific statement is:

“The [system] [decision makers] [groups] [individuals] prefer(s)...”

Normative research identifies, confirms, and justifies what should be done. It uses all three logic forms: inductive (of Bacon), deductive (of Aristotle), and abductive (of Hegel and James Peirce). It specifies: “How to (improve/solve)...” It is the prescriptive side of research for Space solutions. It creates alternatives for decision makers. The normative research scientific statement is:

“If you want certain results, then follow prescriptions #1 through #n and you will succeed with probability (P).”

For your decision-maker to accept your recommendations, your prescriptions must be perceived as economically, technologically, and politically feasible now or in the foreseeable future. Space programs always have a longer future than Earth programs because for Space all the variables need analysis and resolution for it to go. Earth programs can often have a go followed by incremental decisions as knowledge accrues from implementation.

Behavioral research can focus on the past or the present. Values research can be done on the past, present, or the future. Normative research is aimed at the future.

Making decisions primarily on the basis of research in only one category has high risks but frequently happens. When one category of research is done poorly, the quality of findings should be carefully investigated. That does not mean that decisions based purely on experience and intuition, without additional research, are necessarily of poorer quality than those after lengthy research. The wisdom of experience is certainly better than bad systems analysis, but Space decision makers should have a caution flag flying if their policymaking system consistently ignores one or two categories.

Research Evolution from data to wisdom

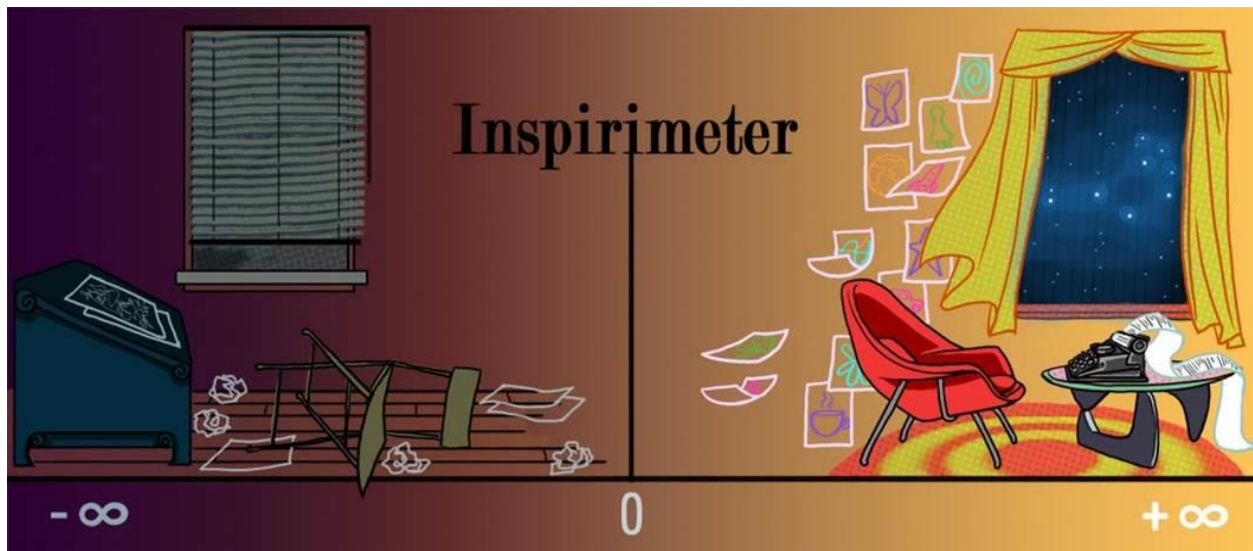
Data results from research, no matter how accomplished. Information emerges when meanings can be attributed to the data. Knowledge is the understanding of information, of a science, of a paradigm or theory, of an art, or of a tool. Wisdom is the ability to use data, information, and knowledge in support of values, goals, plans, and projects deemed good.²

² The above research theory discussion is an abstraction of “On Research.” Chapter 7, in Robert M. Krone, ed., *Essays for Systems Management: Leadership Guidelines* (Daniel Spencer Publishers, 1991).

From Research Theory to Space Benefits for Earth

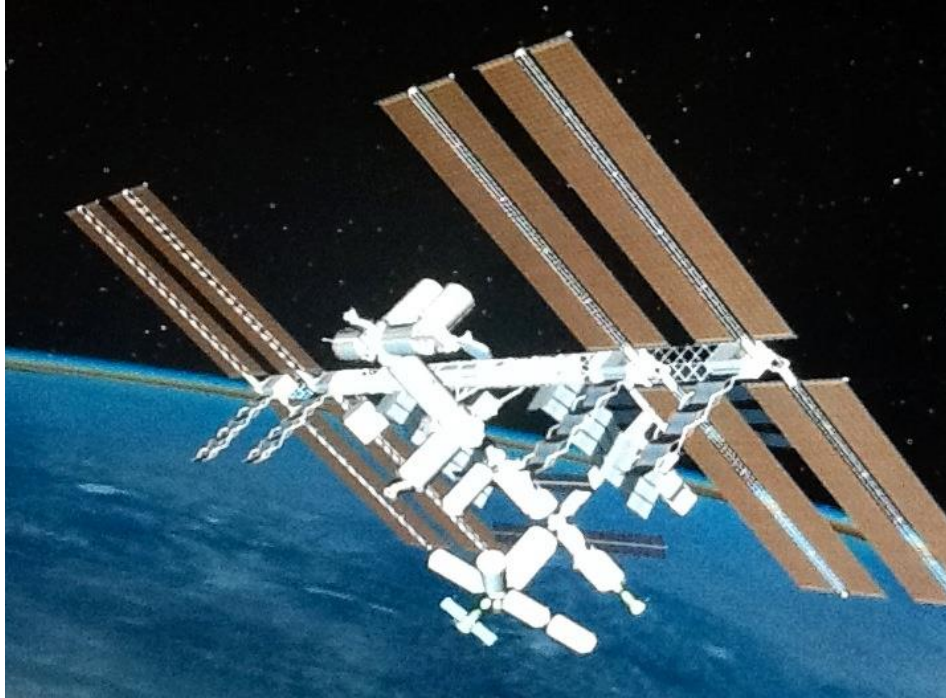
There has been an interesting evolution for the history of Space research. We chose Johannes Kepler for the name of our Institute because of his life-long research (1571-1630). His research gave us his Three Laws of Planetary Motion in 1605. Those laws permitted the calculations for Space missions to today.

Our first President of Kepler Space Institute, Dr. Richard Kirby, designed the *Inspirimeter* in the following image:



It portrays the requirement for innovative research for the future including research of the universe and its benefits for humankind.

I refer readers to all the other articles in this issue which relate to Space research past, present, and future. This article is not the place to document the huge benefits Space research and missions have brought to humankind as of 2013. Our *Journal of Space Philosophy* is dedicated to that task. I will just end this article with an image of today's best example of international Space research, which brings benefits to people on Earth every day – the International Space Station:



Bob Krone, PhD, Fallbrook, California, USA, 1 October 2013.

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About the Author: Dr. Bob Krone is Co-Founder and Provost of Kepler Space Institute and Editor-in-Chief of *The Journal of Space Philosophy*. His 17-page Curriculum Vitae can be found at www.bobkrone.com/node/103.

