

## **SOCIAL SCIENCE AND SPACE PROGRAMS**

A Space and Society Lecture  
Master of Space Studies and Summer Session  
International Space University

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In this paper, I will first of all give my understanding of what "space humanities," "space and society", and the social sciences generally are, and the contribution they could make to space studies and space programs.

I will then survey the contribution which the social sciences have so far made to space studies and actual space endeavors--which is very, very slight indeed. I will end, as might be anticipated, with a plea for the systematic, early, and omnipresent inclusion of social science research into all future space activities. Indeed, let me say at the outset that it is my conclusion that the best justification for the international space station--for example--is in order to do good social science research in preparation for space flights and settlements of longer duration elsewhere in the solar system.

### **I. WHAT IS "SPACE HUMANITIES" AND/OR "SPACE AND SOCIETY"?**

The MSS and Summer Session ISU courses in the Humanities and Social Sciences seek to apply the traditional and evolving perspectives of all of the various academic disciplines of the arts, humanities, and social sciences to space-related activities both on Earth and in space, and to space-Earth interactions.

Within ISU, the Space and Society (or Space Humanities) department is especially responsible for actively developing, freely examining, and rigorously critiquing the various historical, philosophical, ethical, esthetic, and social issues and perspectives concerned with space exploration, and humanity's place on the Earth and in the cosmos.

In contemporary academic terms, the humanities and social sciences are concerned with at least the following things:

1. Intra personal (psychology, spiritual, esthetic/expressive)
2. Inter personal (social psychology)
3. Social
  - Sexual
  - Gender
  - Ethnic
  - Class
  - Family
  - Education/socialization
  - Play/sports
  - Religion
  - Economics
  - Governance

4. Socio-biological  
 Genetic/environment interaction  
 Social aspects of medical/health  
 Mental health

5. Socio-environmental  
 The natural environment  
 The built environment  
 Technology  
     Communications  
     Transportation  
     Other "infrastructure"  
     Biotechnology  
     Nanotechnology

6. Cultural and Cross-cultural

7. Philosophical/Ethical

8. Historical and Prehistorical

9. Futuristic

Sources for all of the above are (each with limitations and strengths, and none privileged over the other):

One's own personal experiences  
 One's culture and language  
 Fiction (written, drama, dance, visual, TV, films, games)  
 Academic disciplines in the Humanities and the Social Sciences

Examples of some key questions in the humanities and social sciences:

"Human nature?"  
     "good" or "bad" (conflict or cooperation)?  
     freedom or order (adventure/novelty or safety/familiarity)?  
 Human needs (beyond those of all living things; hierarchy of needs)?  
 Humans and nature (and technology)?  
 Humans and other forms of life?  
 Humans and other intelligent entities?

The academic institutions of different nations combine and divide these concerns in different ways. In North America and Japan, schools of higher education often organize knowledge as follows:

Natural Sciences (physics, astronomy, chemistry, biology, mathematics, computer sciences, zoology, geology, oceanography, meteorology)

Social Sciences (anthropology, economics, geography, linguistics, political science, psychology, sociology) (sometimes geography and psychology are listed as natural sciences)

Humanities (history, philosophy, religion, ethics, languages)  
 (sometimes art, dance, and music are included here. Sometimes they are separate as "performing arts")

Applied and/or Professional schools (law, architecture, business, medicine, engineering, social work, public health, agriculture)

None of these academic divisions are as clean and clear as that list might imply. But it is worth remembering that from 1912 through 1948 there were medals given in the Olympics for a "sport" called "Fine Arts". Medals were awarded for literature, sculpture, painting, architecture, and music. Many people wonder now why figure skating and gymnastics are included currently--if break dancing is not. What is and is not a "sport" worthy of inclusion in the Olympics is a point of constant debate and controversy (Sports Illustrated for Kids, January 1996, p. 62). We should not be surprised that it is difficult to divide up the seamless web of the cosmos, and human knowledge about it, into uncontested divisions and departments.

In general, Space & Society/Space Humanities at ISU uses the perspectives of the Social Sciences and Humanities to understand and/or guide:

1. Space-related activities on Earth

(eg., history of human's ideas about space; history of human space exploration; sociology of human space exploration; opposition of some humans to space exploration)

2. Space-related activities in space

(eg., governance systems of space settlements; art in space; human-AI interactions in space)

3. Space-Earth interactions

(eg., conflicts between mission ground control and space crews; evolution of Spacekind from Earthkind; SETI; UFOs)

## II. THE STATUS OF SOCIAL SCIENCE RESEARCH IN SPACE ACTIVITIES.

There are four key sources for discovering the role of social science research in space activities so far:

Mary Connors, et al., Living Aloft: Human Requirements for Extended Spaceflight. Washington, DC: NASA, 1985.

Albert A. Harrison, et al., editors, From Antarctica to Outer Space : Life in Isolation and Confinement. New York: Springer-Verlag, 1991.

Philip Harris, Living and Working in Space: Human Behavior, Culture and Organization. New York: Ellis Horwood, 1992.

Patricia Santy, Choosing the Right Stuff: The Psychological Selection of Astronauts and Cosmonauts. Westport, Conn: Praeger, 1994.

In addition, the bibliography at the end of this paper lists many other books and articles as well, many of which are authored by researchers who have contributions in or are cited by these four volumes.

This evidence from all of these sources leads me to the following conclusions:

Human behavior is the least studied aspect of space studies (in terms of funding, number of studies, number of researchers, replications, etc.)

Physical/geological and biological/environmental aspects of space are the best studied.

Then engineering/construction/operation/maintenance (of vessels and habitats).

When humans are studied, it is primarily in biological/medical terms.

Then psychobiological or psychiatric or maybe psychological.

Seldom social psychological.

Less likely social (even biosocial) EXCEPT how to organize and manage a settlement in order to further the political or commercial interests of the sending/funding organization.

Never political (or biopolitical) EXCEPT in terms of the national and international politics and/or law involved in deciding to do and continue the exploration/settlement (i.e., the politics OF the activity, not the politics WITHIN the activity).

The two "exceptions" noted above are often the subject matter of the Space Law and Policy department within ISU.

Whenever there is a concern about human behavior in space, it is generally as "human factors" which is focused mainly with making the interaction between humans and their machines be as efficient as feasible (For example, Stoklosa and Dickson, "The human system in space").

There also have been studies of the relation between human behavior and psychology, and the built environment (Eg., Clearwater and Coss, "Functional esthetics to enhance well-being in isolated and confined settings;" Haines, "Windows: Their importance and functions in confining environments;" Klaus, "Decreasing stress through the introduction of microenvironments," all in Harrison, et al. Indeed, this is one important aspect of Space Architecture generally).

Given the severely limited resources which ISU is able to devote to Space and Society presently, and the fact that Space and Society is basically a two-person department which can only occasionally bring in outside resource persons, Space and Society does not pretend to do all of the things which we know we should do, and which rightly fall under the auspices of Space and Society. We hope that the resources available to Space and Society, and ISU generally, will grow so that it will be possible to do all that should properly be done in this, and all other areas of space studies.

At the present time, Ben Finney focuses on the history of the space age, the prescient contributions of Tsiolkovsky, the cosmicization of humanity, and the search for extraterrestrial intelligence.

My own interest is two fold: using techniques of futures studies to anticipate and design the future of space exploration and settlement, on the one hand, and the social, economic, political, and informal behavior of humans in space settlements, on the other, about which there has been very little research or even speculation.

### **The Evidence from Patricia Santy.**

One of the sources that best documents this lack of social science research in space studies is Patricia Santy, Choosing the right stuff:

"Thirty years of space flight experience in this country [USA]," Santy says, "have yielded a gold mine of data and knowledge about the human body and its response to the space environment, but no objective data on the human psyche in that same environment has been produced--and many scientists consider psychological issues to be a limiting factor in the human exploration of the universe" (xvii).

NASA permitted extremely extensive psychiatric and psychological testing during the original Mercury series. Then Santy says, "All of the original data from the Mercury psychiatric and psychological evaluations were confiscated and mysteriously disappeared from not only the medical records of the astronauts, but also the NASA Archives where I looked for them twenty-five years later" (p. 28). "For some reason," she notes, "--possibly merely organizational paranoia--NASA became fearful that information on the psychological status and performance of their astronauts would be detrimental to the agency. No longer was theirs a normal reluctance to participate in such research--there was outright hostility toward the collection of any psychological data. From a psychological perspective, one cannot help but speculate that NASA's behavior strongly suggested that the agency believed that there was something to hide. The exclusion of behavioral research from NASA's research agenda has continued until very recently" (p. 29).

In the earliest days, the astronauts were basically "spam in a can." They were not able, much less expected, to exercise much judgment or do any "flying." But with the shuttle and all subsequent flights, human aspects have become crucial (p. 48). Nonetheless, apparently no astronaut performance data were recorded by NASA from 1959 to 1990 (p. 52).

Yet, Santy notes, "Embarking on missions to other planets and living and working in the space environment for weeks, months, and years at a time require the long-distance astronaut to possess something more (more interpersonal awareness and sensitivity) than the classic 'right stuff'--as well as something less (less of a neurotic need to prove one's self)." (p. 99. Emphasis in original). "The most effective astronaut," Santy concludes, "can best be described by their data as a 'hard-headed humanist'--someone who cares about others, but is not a day dreamer" (p. 122).

I must re-emphasize Santy's point that there was somewhat more interest in and support for human behavior research in the 1960s than there was during the 70s and 80s--or so far in the 90s.

For example, I have papers in my personal library from a "Conference on social-behavioral problems of long-duration space missions," in 1966; a "Symposium on factors affecting team performance in isolated environments," in 1967, and a "Conference on the social system model for the multi-man extended duration spaceship," all sponsored by NASA and held at Texas Christian University.

And there are many documents with similar titles and concerns from throughout the 1960s (See bibliographies in Harrison, et al., and Santy).

There apparently was no social or behavioral science research involved in any US space mission, including Skylab which of course was America's longest mission in space with the largest number of people involved, and with all sorts

of stories about behavioral conflicts and problems while in space (Taylor, in Harrison, et al., p. 52f), but apparently no systematic research undertaken.

In the late 80s, Santy shows--by her appointment (1984-1992?) as a Medical Officer at NASA Johnson Space Center, and the crew surgeon for several shuttle missions, and especially as chair of the NASA in-house working group on psychiatric and psychological selection of astronauts--that NASA regained some mild interest in some aspects of human behavioral research.

However, Santy also shows that the US space program has been the most negative toward and fearful of human behavioral research of all in the world. She devotes a chapter each in her book to ESA, Japan, and the Soviet Union, clearly showing that these space programs take psychological testing much more seriously than Americans do.

She concludes: "Of all the astronaut selections taking place in the world today, the Japanese probably have developed the most valid, reliable, and comprehensive system for the psychiatric and psychological evaluation of astronaut applicants" (p. 170).

Also, while the US, and Germany, seem mainly interested only in psychiatric and psychological testing and research, France, and especially Japan and Russia, seem equally interested in social/group testing, training, and research.

Clearly, much more needs to be done by all space agencies. As one researcher puts it, "Human beings, unlike robots, have personal and interpersonal qualities that can either enhance or diminish their performance. Anyone who contemplates extended space missions, space stations, and space colonies without considering those human qualities will court disaster" (Taylor, Antarctic Psychology, p. xi).

### The Thagard Incident.

A vivid example of this happened recently. The American astronaut, Norman Thagard, was interviewed on his birthday, and his 111th day in space, about his experiences on board the Russian Mir spaceship.

Thagard was reported as saying, "My impression is that psychological aspects probably loom the largest. There don't seem to be any big problems physiologically." Thagard said that there are "problems of cultural isolation among crews of mixed nationality." He said that he would sometimes go for 72 hours without speaking English, and that he was very tired of Russian-style food. (Honolulu Star-Bulletin, July 3, 1995, p. A-7).

This statement produced a storm of protest. In an article titled, "Russian hosts 'shocked' by astronaut's whining," "The cosmonauts regret Norman Thagard's scandalous interviews," [Izvestia reported]. "The common assessment was that he had been whining." "The newspaper said Russian space officials saw that the 115-day flight had become difficult for Thagard during the televised interviews with the crew, when the astronaut appeared passive and reluctant to speak. 'However, it was hardly reasonable for Mission Control to switch into

English,' it said. 'And it was impossible to set a separate table for the American,' the Izvestia story" concluded. (Honolulu Advertiser, July 7, 1995, P A-1).

Thagard was also quoted as saying "I think anybody can do three months or four months. Six months and longer is a different matter entirely. We need to address some things for the folks who plan to be up here six months and longer" (Space News, July 10-16, 1995, p. 8).

"NASA Administrator Daniel Goldin promised quick action. 'I think this is going to turn out to be one of the major findings of this mission,' he said. 'If we expect to send people on missions of two or three years, we darn well better deal with the psychological aspects in addition to the physiological ones. This hasn't been our tendency in the past'" he concluded (Loc. cit.).

"Tom Sullivan, mission scientist for the Atlantis' flight, said Thagard's observations were similar to those of researchers spending winters in isolation in Antarctica. 'It's just culture shock,' Sullivan said. 'When you go to any foreign country, whether its Russia, Japan or whatever, you're going to be out of sorts. That's a well documented phenomenon. It's just isolation.'" "I think if we pay attention and provide some of the amenities, the communication with home, the camaraderie of crew mates you can relate to well, all of those things will go a long way toward providing an...environment that will be easier for the crew.' Sullivan said" (Loc. cit.).

It should also be noted that an editorial in Space News, July 24-30, 1995, p. 24, stated that the Izvestia reports were "overblown." "As one of the Russian cosmonauts put it last week, 'Certain journalists like to use an element of sensationalism. Sometimes rumours are taken as reality.'"

Nonetheless, the editorial found the discussion useful:

"Such topics were a far cry from the rote astronaut-speak of a group of highly skilled professionals who attend NASA's own version of charm school.

"More typical catch phrases of shuttle crews are those that stress what an honor it is to be part of a terrific team. Who would argue with that? But who can learn anything from it? After scores of space flights, the public rightly yawns at such prepackaged happy chatter.

"As space enthusiasts worldwide ponder ways to revitalize interest in space endeavors, they would do well to take notice of what got the public's attention this time. The human interest aspects of manned space flight cannot be ignored.

"NASA must stop worrying about institutional perceptions. Astronauts should not worry about how their comments will play in the worldwide media. Let the public see and hear first-person accounts of human space flight without the glossy editing."

"Indeed, the naked truth may generate far more support for space missions than the standard 'Golly, it was great' statements that form the bulk of public flight debriefings" (Loc. cit.).

An article in Spaceflight, September 1995, reiterated much of the above, but added additional important information.

Thagard, and his two companions on Mir-18, Cosmonauts Vladimir Dezhurov and Gennadi Strekalov, performed 29 separate science experiments on themselves in seven research areas. Only one was labeled as involving "behavior and performance."

"However," the Spaceflight article noted, "the science programme was far from easily conducted as evidenced by the comments and behaviour of the Mir-18 crew who were described as 'testy'. Thagard complained at one stage that the treadmill tests were too hard for a crew completing an almost four-month long mission.

"Thagard refused to wear the halter monitor more than once because of the discomfort of shaving his chest repeatedly for the electrodes to be stuck on.

"Mir-18 commander Dezhurov actually refused to wear the NASA LBNP and even complained to the Kaliningrad [Mission Control Center] about the experiments, whilst Strekalov balked at certain procedures involved in the experiment.

"NASA's science team replanned their schedule constantly to accommodate the changes. There was much discussion about the attitude of the three men during these tests and a NASA spokesperson even ventured that the men were volunteers and could pull out of the tests if they wished. It was noted, however, that Thagard, despite his protestations, had followed the protocols of the scientific experiments" (p. 313. See also an interview with Thagard in Countdown, July/August 1995, pp. 50-55).

All of this is very, very familiar. Both anecdotal stories, and attempts at social science research, show that the entire history of manned space flight is replete with episodes exactly like these (See, for example, Andre Bormanis and John Logsdon, Emerging policy issues for long-duration human space exploration. A report of a June 4th and 5th, 1992 Workshop. George Washington University, Washington, DC: Space Policy Institute, December 1992, and Robin Auger, et al., Policy issues in space analogs. Prepared for the GWU-ANSER Workshop, 16-17 March 1994. George Washington University, Washington, DC: Space Policy Institute, 1994).

### **Social Science and Commonsense.**

Let me return to what Tom Sullivan, mission scientist for the Atlantis' flight, was quoted as saying.

"'It's just culture shock,' Sullivan said. 'When you go to any foreign country, whether its Russia, Japan or whatever, you're going to be out of sorts. That's a well documented phenomenon. It's just isolation.'" "'I think if we pay attention and provide some of the amenities, the communication with home, the camaraderie of crew mates you can relate to well, all of those things will go a long way toward providing an...environment that will be easier for the crew.'" Sullivan said."

Now, I can not be sure this is what Sullivan actually said, but let's assume it is, and review it for a minute. First of all, he says that Thagard was experiencing "culture shock." How does he know this? One does not get the impression from the Countdown interview with Thagard that he was culture shocked. It

appears his command of the Russian language was good, and he had spent some time in Star City before he joined the cosmonauts in Mir.

But then Sullivan said, "Its just isolation." But that is not the same as "culture shock" at all. Any way, this was not Thagard's first mission in space. He should have been prepared for isolation.

Then Sullivan apparently said: "I think if we pay attention and provide some of the amenities, the communication with home, the camaraderie of crew mates you can relate to well, all of those things will go a long way toward providing an...environment that will be easier for the crew.." Here we have a bundle of more problems:

Is it a question of "the amenities?" The literature is full of references which state that the interiors of Russian space craft are always functional but ugly and crowded, with all of the wires and tubes exposed. American craft are neat and clean--antiseptic, in fact. If it is a question of "amenities", whose esthetic is going to be satisfied? And whose sense of safety and easy repairability?

Concerning Sullivan's other point, there is a very lively debate in the literature about whether it is good to have people in space in regular communication with their families at home or not (especially when there are crises--even deaths--at home). And whether these should take the form of writing, radio, or two-way video.

(Note that two-way video and email communication between astronauts and their family and friends has been included in subsequent Mir visits.)

And yes, if there is anything the literature seems to confirm, it is that it is the interaction of the crew (a question of sociology) rather than the mental toughness of the individuals in the crew (a question of psychology or psychiatry) which is the most important. And yet the ONLY thing that has gotten some attention in past crew selection has been tests of mental condition, rather than attention to group dynamics (On the possible primacy of group interaction over individual mental soundness, see the data I reported on in my paper on "Space Analogs" previously. The issue is also re-emerging in the social science literature generally. See, Bruce Bower, "Return of the group: People may have evolved to further collective as well as individual interests." Science News, November 18, 1995, pp 328-330. Indeed, this may be a good case of how ideology--American individualism and libertarianism--has triumphed over group-oriented Marxism on the one hand and over the actual facts of the matter on the other!).

My point in deconstructing Sullivan's apparent statement is not to focus on him but to make it clear that there is ALWAYS some kind of "social science" or "social analysis" going on. If it does not involve trained social scientists, doing the best they can to be accurate and useful, then it will be engineers, managers, media flacks, spin doctors, or politicians who will use "common sense" (also called "folk sociology" or even "crackpot realism") to analyze and "fix" whatever social problems might be anticipated or actually happen.

Let me put it this way: You would not want me to design a rocket ship you had to ride in. Then you also should not want a rocket scientist implicitly to

"design" your social interaction within the rocket ship by default. Nor, in my judgment, should you want it to be entirely a matter of "human factors engineering" which tends (to overstate it a bit) to try to fit you into the hardware rather than design the hardware to facilitate your--and your groups--preferred behaviors which is what I think good social science research should strive to do.

### Ethnocentric Social Science.

Let me conclude this discussion by returning to a point which I also made in my earlier paper on "Space Analogs."

Unlike medicine and psychiatry which focuses mainly on pathologies and disease, most knowledge in the social and behavioral sciences derives from "normal" human settlements and describes "normal" human behavior. There are of course studies of deviance and/or abnormal behavior, and studies made of "atypical" human environments, but they are certainly the minority. Most of what social scientists think they know about human behavior comes from studying "normal" humans in "normal" environments.

However while there is some, and growing, cross-cultural or pan-cultural social and behavioral research, most social science research is narrowly focused on the social scientist's own culture. Hence, often what we think we know about "humans" generally is actually restricted only to "humans like us" rather than "humans everywhere in the world."

Nonetheless, the range of human habitats and human cultures is truly vast, and thus our notions of "normality" are truly extremely restricted.

It is imperative that social and human behavioral research become truly humanity-wide, and not remain narrowly national and cultural.

For example, if Thagard refused to wear a piece of equipment that required him to shave his chest hairs, recruit more from groups which don't have chest hair. If he suffers from "isolation," recruit from among people who prefer to be alone with their thoughts. If he wants to be alone, and is annoyed by always being in the presence of other humans, recruit from groups which prefer to be as crowded and close together to each other as possible. If it is cold in space, recruit from groups who "normally" live in cold environments, and not people from the temperate climates of the Earth. If smooth group interaction is the key to mission success, recruit more women and less men.

And so on! There is no particular reason to believe that males from the Heartland of America, with a military background, are the best suited for the social and psychological realities of space, now or in the future. People from many other cultures and backgrounds might already be much more nearly pre-adapted to space than are the Americans and Russians who have carried the burden so far.

Yet, I must also warn against "anthropocentrism" and "geocentrism". At best, we Earthbound humans only know life as it is here on Earth, and not as it can, and possibly will, be--or (given SETI) as we might come to encounter it--in the cosmos.

"Space in the service of humanity" is not necessarily our most noble or lofty goal. "Space in the service of all life in the cosmos" might be better.

### III. SPACE SOCIAL SCIENCE AND THE FUTURE.

I believe that the immediate future will be a bleak time for rapid advances in science, technology, and especially social science. With the end of the Cold War has also come to an end a very abnormal period of human history--1940-1990--when "military necessity" made it possible for nation-states to tax, borrow, and spend for big science and big technological projects.

While big science and technology research and projects will not totally fade away, we should not expect to return any time soon to the spending heights characteristics of the second half of the 20th Century.

And social science research is in BIG trouble, especially in the United States where it has never enjoyed much respect, either among the academic or the political communities. Politicians, especially, are very suspicious of anything that proposes to study them in any critical or even objective way. And they tend not to understand the need for basic social science research at all. Moreover, entire categories of human experience--sex, for example--are virtually taboo.

Given the present governmental budget crises throughout much of the world, it is not likely there will be much social science funding for the foreseeable future.

Yet, in spite of what I just said, social science is probably better understood, respected, funded, and used in North America than in most other parts of the world. Some parts of Europe, Japan, and South America have very robust social science sectors to be sure, but social sciences as a rule are wholly lacking, or quite weak, in universities or government agencies elsewhere.

This means that there is not a global constituency for social science research in space studies as there is for technology, engineering, and the physical or natural science side, which has enormous institutions and interest groups laboring on their behalf.

Nonetheless, from my point of view, and on the basis of all evidence available to me, the greatest research and funding need of the present and future of space exploration is on the social science, and indeed, humanities side. Political controversies, cultural differences, esthetic preferences, interpersonal conflicts--and the opposites of all of these (political agreements, cultural identities, and interpersonal harmony) are all central from now on.

In a recent article, Patricia Santy comments that "currently there is no formal program at NASA which focuses on international and intercultural issues which may affect flight safety or mission success" (Santy, "Multicultural factors in the space environment," p. 196). At least three of the studies in my bibliography--Rose, et al., Kelly/Kanas, and Santy, et al.--are based on questionnaires to US astronauts only, or to international astronauts and cosmonauts, well after their flight experiences. Less than half of the

questionnaires were returned. This is obviously not a very scientific way to conduct multicultural research, as the authors freely admit.

Thus, if there is any reason for funding the international space station, it must be so that the social science and humanistic issues of space will be front and center in funding and in public relations.

How could it be otherwise?

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