

L5 NEWS

OCTOBER 1977



L-5 NEWS

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A Conversation Between Rusty Schweickart and Norie Huddle

by Norie Huddle

NORIE: I'd like to ask what effect the experience of going into space had personally on you, on your consciousness or worldview?

RUSTY: Norie, I have a tough time with your question. Everybody who has any sensitivity or association with philosophy, Eastern thought, the wholistic view, or such things, is interested in what happened to astronauts when they go into space and return. They're interested because Buzz Aldrin came back and had a problem with alcohol, divorced his wife, and went through a whole bunch of problems and became a member of Alcoholics Anonymous-or whatever. Anyway, he was an admitted alcoholic and has made almost a profession of confessing before the public the evils of alcohol and the effects that the program had on him.

Jim Irwin started a whole movement called High Flight. He's an evangelistic preacher and basically ascribes a good bit of his commitment to go into that field on his experience during Apollo 15 and walking on the moon, thinking about and realizing the hand of God.

Al Worden has written books of poetry which quite obviously express a profound and deep-seated effect of the experience of going into space. I've done a lot of things, talked about a lot of things . . . which indicate the same kind of effect. Ed Mitchell started the Institute of Noetic Sciences and went into ESP. There have been enough evidences of change of character among the astronauts that the public, and especially people who are sensitive to it, recognize that something is going on with these people.

Quite frankly, what this results in is an absolute deluge of people asking exactly the question that you asked now, to the point where you get absolutely sick of it and want nothing more than to *deny the whole thing!* You want to shut it off because it is so utterly demanding. And everyone-and I hate to do this to someone-but basically everybody asks the same question and is looking for magical answers from other people's experience to solve their problems.

NORIE: I think my reasons are a bit different, if I may explain. I've done quite a bit of reading about the whole space concept and I was also up at the UN Habitat Conference on behalf of the L-5 Society this past year. I came away from that and wrote a fairly extensive report on how I felt about the whole space program. Basically, you see, I am an "appropriate technologist" at heart. And yet, some part of me says that this whole space development concept is also appropriate technology . . . just that it happens to be at the high technological end of the spectrum . . . that true appropriate technology must embrace the whole length of the spectrum, from small to big.

RUSTY: "Appropriate" does not necessarily imply, "chop down a tree and build it yourself."

NORIE: Right. Anyway, what I've been trying to do is look for the common denominator, the thread that flows through all our problems. We talk about technology solving all our problems. I've been looking at the various elements of what Barbara Hubbard calls the "evolutionary edge" of different research and development going on in the United States-and elsewhere-today. For example, there's a lot of work being done

on life extension, or intelligence increase and, of course, the whole space program, which has many different aspects being developed. These offer some tremendous opportunities and changes in life as a whole. However, in all of these, it seems to me that we must get it together on an individual level, in other words, become more wholly integrated, first with ourselves and then with others and with the biosphere, and with the "flow of life" or God, or whatever you choose to call it.

If we don't do this, then we're not solving any of our basic problems. Sure, we may solve problems on a technological level, but unless we have an appreciation of the whole and the nature of reality, then we will be overlooking something and simply creating five more new problems in the process of solving that first one.

For example, if we go out into space and do things in the way they seem to be going now, it seems that we would just create an extension of the arms race out there in space. This is one thing. It seems too, for another, that in the future we could look forward to the sort of thing that we had in the creation of the United States: British colonies first, which then fought England and broke away. There are all kinds of scenarios you can create about what might



To maintain astronaut status Schweickart regularly flies a NASA T-38 high-performance jet. Meantime, with the Space Program slow-down, he flies a desk at Washington NASA Headquarters as Director of User Affairs, Office of Applications.

happen in space . . . both happy ones and grim ones.

But it seems to me that it basically comes down to the consciousness of the individuals involved. So, for that reason, I'm extremely interested in what happens to individuals who go out in space. What happens when you look back and see the living Earth floating out in that void.

RUSTY: Let me say this. First, I did this tape recording (hands me a tape). Well, I have talked about this, as I implied a moment ago, on many occasions. In some cases with modest success, whereas others were absolutely rip-roaring flops, and on rare occasions, done very well. Luckily -- and there may or may not be any coincidences in the world -- the time when this tape was made, I happened to do it the best.

NORIE: Was it at Lindisfarne?

RUSTY: Right. In 1974. I don't know if you have this tape, but I can loan it to you, and people interested can get hold of it through Lindisfarne Association, Box 1395, Southampton, New York 11968. There's no question at all that everything came together for me at that point. That was the best presentation of that total experience as a human being.

NORIE: I'm curious what you feel is the most exciting aspect of space development at this time.

RUSTY: I guess that depends on what time-frame you want to talk about, Norie.

NORIE: Let's start with the long time-frame.

RUSTY: OK, it is the relationship between the environment of space, this new environment, and the long-term evolution of the life force or consciousness, or, if you want to be "chauvinistic," of humanity; or, if you want to be religious, of God, the evolution of these as we move out into the universe.

I think that's what we're doing, without anybody here in these buildings at NASA thinking about it or being aware of it or agreeing with it, or being dedicated to it. I mean absolutely totally separate from what in my mind is a rather major milestone of "key event" in terms of the development of life or intelligence and its movement through the physical universe. What we're doing-and what Gerry O'Neill is doing-on a day-today basis, has very pragmatic, practical, utilitarian, political and other ramifications, justifications, motivations and all the rest of the -ations. But what is really happening, taking that long-term view of life (whether it is a specialized bacterium that exists only in the left ventricle of the leopard frog, or whether it's a slime mold, or whether it's humanity), it can survive -- and move and evolve into more and more complex organisms.

This is the kind of evolutionary process about which Julian Huxley wrote and Teilhard de Chardin wrote so eloquently. This is happening. And in this particular case, this transition, this really major change, this "symbiotic"--although this may not be quite the right description of the balance-relationship between man and machine, has evolved to a point where the machine part of it is allowing us to live now in an environment in which it never has been possible to live before-that is, the environment of the space vacuum. And that opens up opportunities for the evolution of life and progression of this evolutionary manifestation throughout the universe.

The Earth has been a womb for the development and evolution of intelligence, and I think that it is undergoing a very basic and radical change now. That is not a motivation-that is just an observation. I think you have to be very, very careful talking about things of this kind because people turn it into religion and it becomes a purpose instead of an "awesome observation."

NORIE: That seems like a very important distinction.

RUSTY: It is. It is a *crucial* distinction. And, as I think I indicated the other day, one of my problems with the L-5 Society is that it seems too many of the people in it (although I recognize it is a group with a diverse membership, too) have grabbed onto this aspect as a sort of new religion. I don't want to be unfair to those who don't feel this way, but there seems to be a tendency for needing a "god" who justifies "what I want to do" as a member of this group. And it becomes a religious thing. And I think that element, where it moves away from awe and becomes a "purpose" is a shadow side of religion that makes me very uncomfortable. Whether it is in the form of space religion, or traditional God religion, or communism, or what have you. I don't care what it is.

NORIE: In other words, using that as a religion, or a goal of one's life and behavior, it could justify a whole lot of very unpleasant things to the true believers?

RUSTY: That's exactly right. And if there is one thing that we need to understand-and this takes me back to an earlier point in the conversation-in terms of dealing with O'Neill's space colony concept, any of this stuff, is that the circle of yin-yang exists in all things. There is a shadow and a light side of every element of creation and whether that is war-which people love to label "black" and not "white," or whether it is space colonies, which devotees love to paint "white" and not "black," both are wrong.

I mean, you can condemn the nuclear bomb, and certainly to the extent that it is

used and kills people, it is negative, black, or an anti-life thing. But the fact of the matter is that if you look at the evolution of weapons, it is not at all clear that we would be at the point we are today if it hadn't been for these weapons. Such things as concern for the developing nations, equality, poverty on the global scale, feeding people . . . all kinds of things.

We are interested in higher things in some sense because we do have this deterrent standoff. We have developed weapons against which basically there is no defense. I hope we don't find a defense against nuclear weapons because by having this kind of parity, we have not had nuclear war. People are vulnerable and they recognize this fact.

One of the things that fascinates me about this space debate is people like John Holt, who in my mind is inexcusably shortsighted, even paranoid. He has religion, but on the other side from the L-5ers. I am very nervous about Holt. I admire the guy as an educator and it upsets me that he is so terribly unbalanced when it comes to something like this. True, the advocates of space don't point out the shadow side, and also true to a more limited extent, it is because some of them aren't sensitive enough to see it or acknowledge it.

NORIE: I think it is more that they are trying to sell a product. If you're selling cars, you don't point out that it will be obsolete in 3-4 years, or that you might well have an accident with it.



About the author: Norie Huddle is the author of *Island of Dreams*, a book on the pollution crisis in Japan. She is co-coordinator of *Mobilization for Survival*, a group opposing nuclear proliferation.

Who Is John Holt?

. . . and why does Rusty Schweickart think he's paranoid?

The following is an excerpt from a long letter by John Holt to Stewart Brand dated April 20, 1976. Mr. Holt sent a copy of this letter to MIT L-5 reporter Jonah Garbus.

There are many respects in which the Space Colonies proposal as put forward by O'Neill reminds me of the war in Vietnam. One in particular is relevant here. It's hard to remember now, but the people who planned the war in Vietnam, the proverbial Best and Brightest, were idealists. They meant to do good. And they had the modern vanity, or *hubris*, that if we mix good intentions with sufficient technical "know-how" and sufficient money, we are bound to come out with good results. Take a handful of experts who mean well, give them enough money to work with, and things are bound to

come out OK. We have now found out this isn't true. The same defects of character, intelligence, and imagination that led those guys to think of the war in Vietnam in the first place, *guaranteed* that they would not be able to fight it realistically or effectively, or to learn from their experiences there, or to make a rational decision to leave. The flaws in O'Neill's character guarantee that he will make a mess of the space project if he gets enough money to work seriously on it.

The fact of the matter is, if the Space Colonies or Space Exploration research is to proceed, it can probably only be under someone quite a lot like Wendell Berry, someone with a good deal of anguish, a sense of tragedy in him. I can't right at the moment imagine why such a person would undertake such a work, but that is the sort of person you would be looking for, not the Smiling Salesmen we see happily testifying before Congress, absolutely impervious to doubt, difficulty, or danger. It seems an absolutely certain thing to me that if O'Neill is given his big checkbook,

he will proceed far too recklessly, and that when this causes accidents and death, that he will lie to cover it up. Like all snow job artists, he will be easy to snow, and the program will be absolutely shot through with corruption-again, rather like Vietnam, where the people lower down the line soon discovered there was no use taking the truth to the people at the top because they didn't want to hear it.



John Holt is a teacher and author of numerous books, most recently Instead of Education: Ways to Help People Do Things Better (E. P. Dutton, 1976). At present, Mr. Holt is at work on what he describes as a "musical autobiography."

RUSTY: That's right. People who sell cars don't go around showing pictures of people wrapped around bridges or trees or banging into one another, or blood all over the streets. However, part of it is that the guy who sells the cars assumes that the customer is aware of those realities. And it is in somewhat the same way the NASA is charged with the development of the use of space. And you're not going to develop the use of space by talking about the fact that, yes, if you develop high power lasers, you can put them in orbit and point them at the ground, and maybe-although technically I'm not sure that it's even possible-do damage on the ground. I mean, the atmosphere does get in the way.

NORIE: The other day when you and Tim (Leary) were talking at the National Space Institute conference, I felt a bit somewhat uncomfortable with one of the exchanges that went on right at the end. It had to do with strong statements by each of you that you felt the whole space program should be carried out by the United States. I am a very strong advocate of an international and cooperative effort.

RUSTY: Let me short-circuit this. You needn't worry. The fact of the matter is -- and I am sure the same is true with Tim -- we may have been making a lot of assumptions of which you might not have been aware.

I've been in this game long enough that I know two things: first, real international cooperation depends on individuals and not on the system; and second, if you want real international cooperation, you actually start to do things and open it up

purposely to cooperative international efforts. If you go the other way-that is to say, we only start things when we, have agreed to international efforts-then *nothing* happens. You just have debating groups and nothing in the world goes on.

The model I think works well is the model we have used in NASA. We have a kind of unique charter as a Federal independent agency in that we are given authority in our charter to establish cooperative ventures and programs with other nations without going through the State Department.

NORIE: That's very interesting. Have you done this?

RUSTY: Oh yes! Now, I don't want to overstate this because there are lots of good people in the State Department, but if you take the State Department as an institution, we have basically dragged the State Department along in lots of our international activities. I'm just absolutely delighted with the degree of international cooperation that we have in our NASA program. We've got lots of things going there.

For example, we are developing -- and have flown, since 1972 -- resource satellites which make beautiful pictures of the Earth and which also contain very valuable information about the surface of the Earth . . . about the state of the wheat crop in Russia or China, or assessing the total volume of forests in the developing world, or the location of unknown shoals in shallow seas which are a danger to shipping. . . there's a tremendous amount of valuable economic information

contained in those pictures.

NORIE: Are these available to anyone?

RUSTY: That's the point. These are United States satellites, done with the United States taxpayers' money, but we are a global citizen and we have a very specific and hard and fast policy that everyone of those images is open to everyone for, frankly, less than the cost of reproduction. So the data center in Sioux Falls, South Dakota, literally sells those satellite images now to . . . I'd make a guess between 100 and 200 nations. . . including Russia directly and China indirectly through an intermediary.

NORIE: Going back to the discussion between you and Timothy, then you were just saying that our history as a nation is of people who take off and do new things, the so-called "pioneer spirit?"

RUSTY: I'm saying that the United States is the institutional location of the place in which there has evolved the highest level of sensitivity to the environment, to the development of technology in a form that is useful to people. We took off, after the industrial revolution because of our own wealth in natural resources and the basic nature of the American character (which goes along with the types of people who immigrated here). And it's the kinds of people who came to a frontier that characterized and still characterizes America. We're a group of doers, not a group of people who sit around in endless debates. That's dangerous in a way. There's a good side and a bad side to that.

NORIE: The yin-yang again?

RUSTY: Right. But this a fact. And as a result, we have ended up ahead of the rest of the world in terms, first, of just rampant development of physical and material systems. And because of that, we're the first to see the limitations of that mode.

In the '50's and the '60's, it became quite apparent, and those realizations are now being reflected in the '70s. The limitations of unrestricted technology are pretty clear to all of us and so we're a good bit more careful.

But if you look at the developing countries, the same ones that are complaining about the disparity between them and the West, they're the ones who are demanding the technology. And with very little judgment about what, in the long range, is good and bad.

NORIE: Rusty, I'd like to point out

another side of their feelings of those in developing countries, a side which I quite empathize with. That is, they see us as a country whose population is about 6% of the world's people, but we are consuming well over 30% of the world's resources. They see their getting higher technology as a chance to close the gap.

RUSTY: You have to be careful when you estimate consumption. We do have high consumption, but you have to subtract out of that consumption the stuff that goes back abroad in the form of foreign aid and products.

NORIE: But United States corporations make considerable profit on those products and are busy building and expanding markets in those countries.

RUSTY: Oh, sure. As I say, there is high consumption, but I feel it's important to

remember that not all the natural resources we handle are consumed here.

NORIE: Sure. I think what we see, however, is that the United States-and probably most countries in her position would do the same-wants to have control of the purse strings, of the financial arrangements.

RUSTY: Yes. And, in fact, other countries with resources are trying to get control. The OPEC nations are an excellent example of this.

NORIE: I think it is important to remember here that many of those who engineered this OPEC thing, were trained in our very own Harvard Business School.

RUSTY: Sure.

NORIE: But even if other countries would do the same thing, we are doing it because of our position as a sort of

NASA/USSR Cooperation Pact Signed

NASA and the USSR Academy of Sciences has agreed on further cooperation in manned space flight. The agreement was signed May 6, 1977, by Dr. Alan M. Lovelace, then Acting Administrator of NASA, and May 11, by Anatoly P. Aleksandrov, the President of the Academy of Sciences of the Soviet Union.

The agreement is designed to provide continuity of the joint technical, scientific and operational capability developed through the highly successful Apollo Soyuz rendezvous and docking mission conducted in July 1975. Three joint working groups will prepare recommendations for two new programs, one dealing with orbital human flight activities and the other with a possible international space station.

The first working group will begin studies soon on scientific and applications programs that may be conducted in joint operations of the American Space Shuttle and the Soviet Salyut space station in the early 1980's. A second working group simultaneously will develop plans for these joint operations. The two groups will seek to define projects that might benefit from the flexible delivery capability and large capability for longer stay-time in orbit represented by the Soviet Salyut. The emphasis will be on a "science first" program which will take advantage of these capabilities and fully justify the contemplated joint operation.

Studies of the Shuttle/Salyut program should be completed within 18 to 24 months, and should produce recommendations for consideration by both sides.

The agreement also established a third joint working group whose task will be to

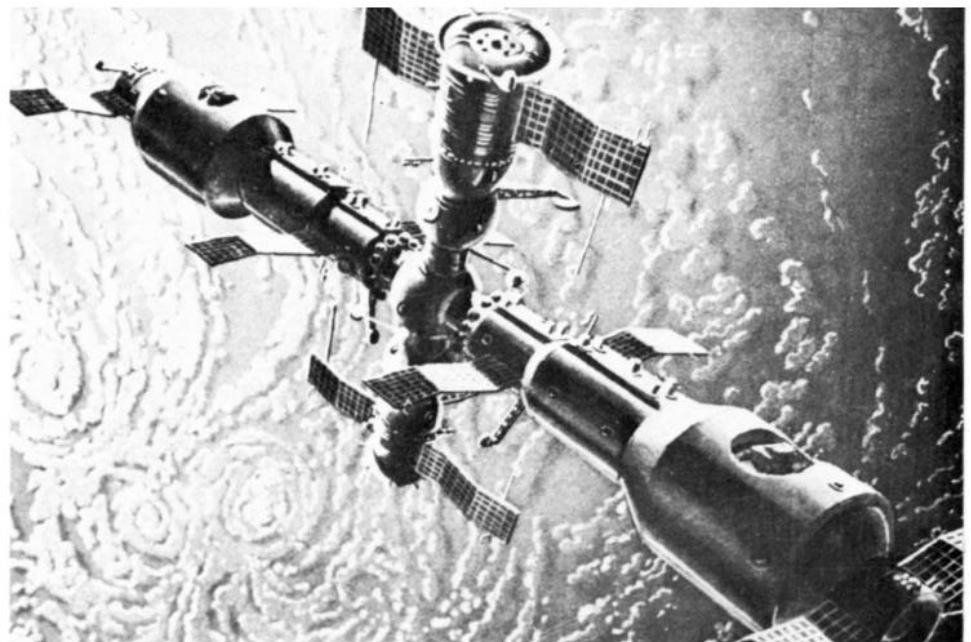
conduct a series of phased studies of an international space platform, or station. If such studies establish a consensus on the objectives of future space stations, further studies would be undertaken to explore possible agreement on their conceptual design.

Neither side is committed to steps beyond the initial studies and each reserves the right to proceed with its independent national space-station interests. The agreement does, however, establish the possibility that the two sides may be able to combine their space station interests to some degree, thereby offering potential economies and efficiencies.

The full text of the agreement follows.

"In accordance with the Agreement on

Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes between the USSR and the USA, dated May 24, 1972, and taking into account the results of discussions held in Washington, October 19-22, 1976, between the delegation of the USSR Academy of Sciences, headed by the Chairman of the Intercosmos Academician B. N. Petrov, and the Delegation of the National Aeronautics and Space Administration of the USA, headed by the NASA Deputy Administrator, Dr. A.M. Lovelace, the Academy of Sciences and NASA agree to undertake the following steps for further development of cooperation between the USSR and USA in the exploration and use of outer space for peaceful purposes."



Proposed Soviet space base, constructed utilizing two Salyut space stations.

“whipping boy.”

RUSTY: Which isn't to say that we're better than anyone else, we just happen to be out front in this. And this has come about for a variety of historical reasons. So we are foremost in the exploitation of technology, and we see both the limitations of it and the opportunities and we have a responsibility to use and direct this talent or position to good end.

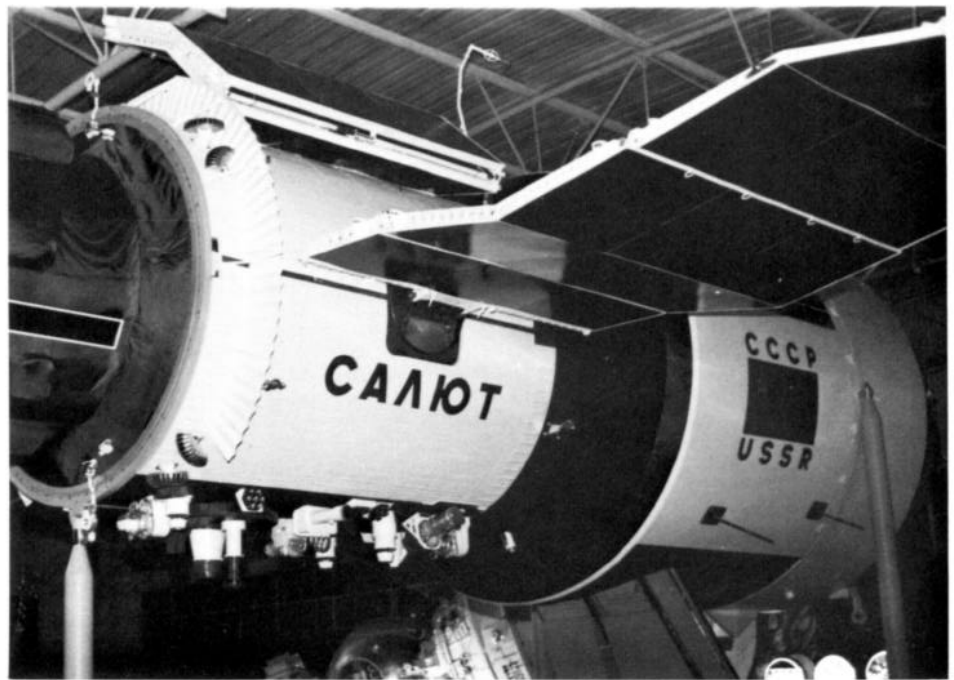
NORIE: What are some of the reasons people give you for opposing the space colonies project?

RUSTY: One of the big objections I've run into is that just about the time we're developing an environmental consciousness around the planet, as having to care for our nest, along comes another frontier, and we go right back into the cowboy-frontier mentally. And, boy, this is a strong gut reaction. And in fact, I was talking recently to Dr. Fletcher about just this thing. It is tied up in the word frontier. It is -- it is a space frontier.

The problem is that people look at a frontier as a Frontier: Put a bag over its head and every frontier is identical. What a bunch of garbage! To me the interesting thing about this is that the frontier in space, embodied in the space colony, is one in which the interactions between humans and their environment is so much more sensitive and interactive and less tolerant of irresponsibility than it is on the whole surface of the Earth. We are going to learn about how to relate to the Earth and our own natural environment here by looking seriously at space colony ecologies. It is an incredible learning tool.

So that frontier is totally the opposite from the usual concept of frontier. In fact, in the winter issue of the *Coevolution Quarterly*, there is an article where George Woodwell and Dan Botkin and John and Nancy Todd and Lynn Margulis and Juan Oro and a lot of other ecologists, and me, as an interloper sitting there, have been talking about space colony ecologies. And after talking about it from a space colony point of view, people begin to realize that the basic nature of that challenge, from a professional ecologist's point of view, that the kind of understanding of ecological or life systems necessary to enable one to move on seriously with some concept of space colonies, is going to serve as a focal point for much broader understanding of our own Earth ecology. It is a very interesting thing to watch people realize this. The article in the *Coevolution Quarterly* serves notice that the community has to get serious in looking at the feasibility of a closed space ecology.

NORIE: To shift again, and, I'm sorry but it means going back to the whole consciousness question again, have the American and Russian astronauts had any



Salut space station (photo courtesy Theo Piraud).

contact, and if so, is there any indication that they have also undergone the same kind of consciousness changes?

RUSTY: To answer this briefly, the answer is no. Nobody has communicated that well yet because of the language barrier. Some of the astronauts have studied Russian, but it is a long way from being adequate for deep philosophical questions. And the same for their speaking English. We can get along, in terms of getting our jobs done. But in terms of getting to know one another at that level, that has not happened. Now, there have been intimations that there is that interest, but it is very, very tenuous and, to my knowledge, it has not been pursued.

NORIE: I'd like your comment on how do you think that a group like the L-5 Society might better relate to and have a better impact on the whole course of space development?

RUSTY: I guess I would see the primary contribution of the L-5 Society as being able to communicate with younger people who, for one reason or another, have written off all agencies like NASA and all activities like space development as being thoroughly a negative kind of thing.

For the student population, the L-5 Society probably can break through those kinds of barriers better than something like NASA as an institution can--or even a guy like O'Neill, who, for all of his brilliance, is not that good at communicating with a certain group of people. He is great with people who are already technology-oriented. But I don't think he's that effective with those who are not.

NORIE: What I hear you saying then, is that L-5 Society can do a PR job?

RUSTY: (pause) Well, that is certainly what I said. Now, I guess the question is whether I think that is all L-5 can do. Let me be totally frank, Norie. I don't think it makes any difference at all what I think about the L-5 Society. I think they should do what they think is responsible as a group.

Nevertheless as I said earlier in the discussion, I really am nervous about the tendency toward the true believer in the L-5 Society. And, if a group which is really fanatical about something really starts pushing it, they can really do a lot of harm.

Now let me say that on the other hand -- as I discussed with Stuart and he printed in the *Coevolution Quarterly* a couple issues back -- to me, one of the best things in the world that could happen is that a lot of energy from society outside of the government and outside of the whole institutional setup deal with and recognize the space colony question/challenge/opportunity as something that belongs with the people and not something that belongs with the government or NASA. Whether that's individual courses in colleges, whether that's individual colleges, people, organizations like the L-5 Society, an offshoot of the Star-Trekkies . . . or whatever . . . in fact, the more the merrier.

There is such a host of things which need serious looking at, and O'Neill doesn't need to run it all, either. Lots of people can do lots of things. NASA shouldn't run it, O'Neill shouldn't run it, everyone should be encouraged to contribute to it. The task belongs to the public and people should take the task seriously. •

German Company Blasts Into Space Age

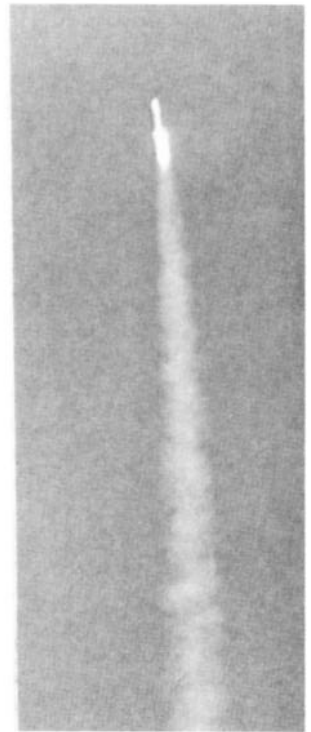
by Theo Pirard
European correspondent, Belgium

OTRAG or "Orbital Transport-und Raketen-Aktiengesellschaft" is a private society, created in West-Germany, which is making proposals for launching geostationary or heavy payloads with a modular launch vehicle. They project launch costs cheaper than the NASA space shuttle! OTRAG is working on the development of these standardized modules which will be used for the assembly of its "space truck."

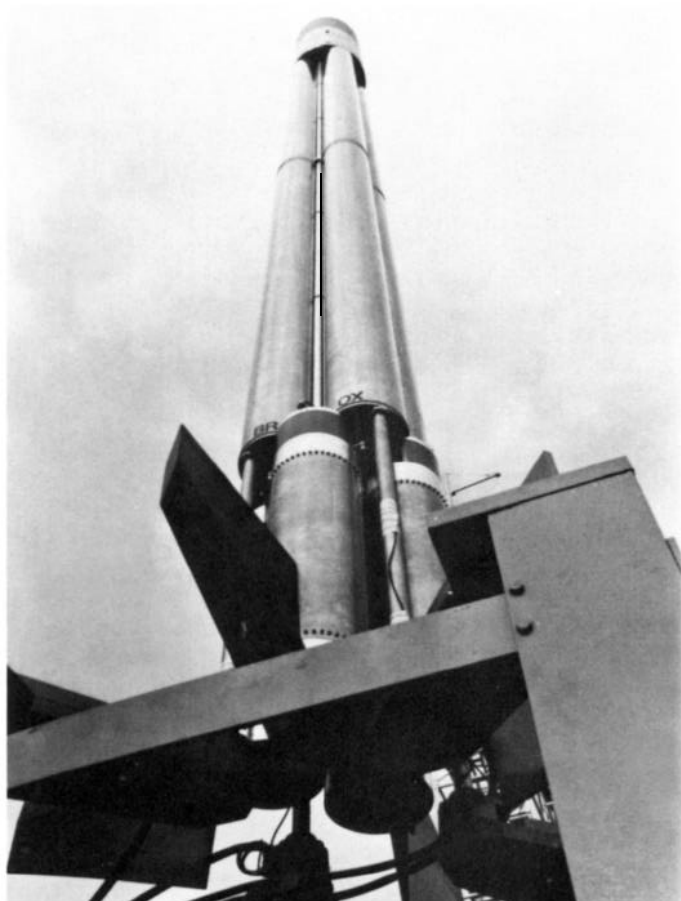
On May 17, 1977, the first modular rocket, developed by OTRAG, was successfully launched from a rustic launch pad, established in the South-Eastern territory of Zaire. It was the first German launch of a large rocket since the IInd World War and the V-2 missiles. The OTRAG vehicle was an assembly of four "pipe" tanks and of four ablative motors, was 9 m long, weighed 2.5 tons and the 4 clustered engines of 3 tons thrust each gave a total thrust of 12 tons. With only partially filled tanks, the OTRAG rocket reached an altitude of more than 10,000 m.



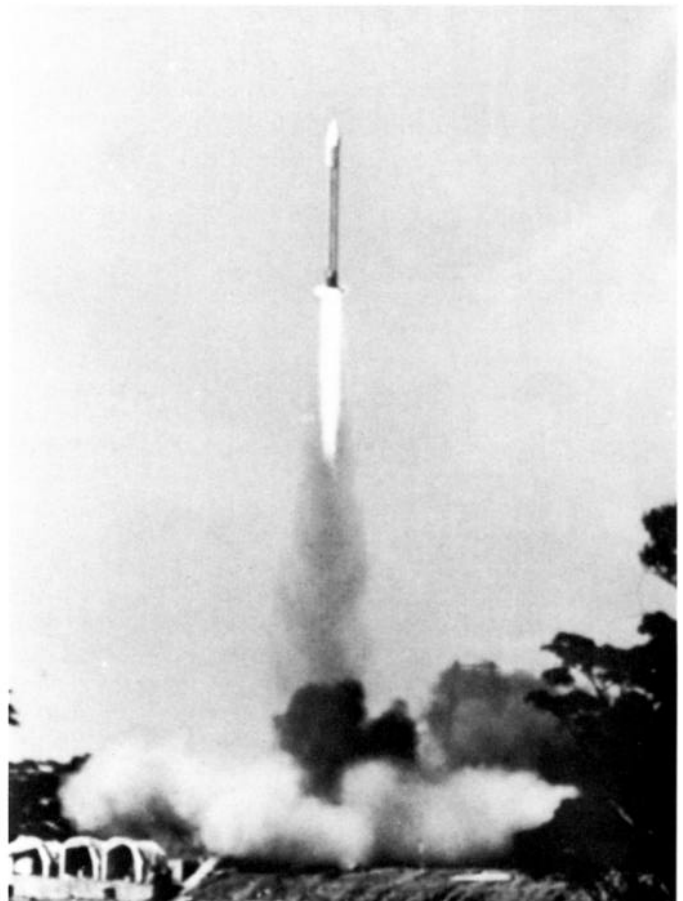
Dr. Lutz T. Kayser, President of OTRAG, showing a model of the "space truck."



Using partially filled fuel tanks, the rocket reached an altitude of somewhat over 10 kilometers.



The first OTRAG rocket: an assembly of 4 independent modules which burn diesel oil and nitric acid.



1st OTRAG rocket is launched successfully from Manono, North of Shaba.

. . . more on OTRAG

This test was important, because it verified the OTRAG concept of a powerful low-cost booster, which burns very cheap propellants in small and simplified engines, uses nitric acid for oxidizer and normal Diesel-oil as fuel. The most powerful model of OTRAG rockets would be a heavy launch vehicle, able to put 10 tons into a 300 km orbit or 1.5 tons into geostationary orbit (36,000 km high); this big rocket would be a compound with 600 basic units; its weight would exceed 1000 tons, its length would be approximately 40 m and its total thrust would be about 1600 tons at lift-off. The 600 modular units must be clustered in three packages, equivalent to the stages of the conventional launchers.

It was needed to find an appropriate launch site, near the Equatorial line, in order to have an easy access to the geostationary orbit. OTRAG and the Government of Zaire concluded together an agreement for the establishment of a large firing range on a territory of 38,000 miles² (100,000 km²). OTRAG is building its space launch facilities on a plateau of 1300 m altitude. These facilities are located near the small city of Manono, North of Shaba. From there, site of the May 17 launch, the "space truck" will be fired in the early 1980's.



OTRAG's launch facility in Zaire, used for the May 17 launch.

Students Evaluate Space Industries

George Washington University management science professor Stuart Umpleby and Dr. James K. Wertz of Computer Sciences Corp. have joined forces this fall to teach "An Evaluation of Space Industrialization".

In a show of impartiality, the instructors have given students their choice of either G.K. O'Neill's *The High Frontier* or T.A. Heppenheimer's *Colonies in Space* as textbooks. Required texts are *Space Settlements, A Design Study* (NASA SP-413) and a compilation of special readings prepared for the course by the National Space Institute.

Solar Energy Calendar

18-19 OCT 1977: Atlanta, GA. Solar Total Energy Systems Workshop. Contact: Lyle Wetherholt. Sandia Laboratories, Albuquerque, NM 87115, 505-264-7017.

3-6 NOV 1977: Anaheim, CA. Energy Fair '77. Contact: Shirley Solomon, Energy Fair, Inc., 15915 Asilomar Blvd., Pacific Palisades, CA 90272, 213-459-1050 or 459-2777.

5-7 DEC 1977: Miami Beach, FL. Alternative Energy Sources: A National Symposium. Contact: Dr. Nejat Vaziroglu, Director, Clean Energy Research Institute, University of Miami, P.O. Box 248294, Coral Gables, FL. 33124.

Saito Calls for Japanese Space Colonies

An ad hoc committee of the Japanese Space Activities Commission (SAC) chaired by Dr. Shigefumi Saito filed a report with SAC July 28 exploring wide-range possibilities for Japanese space development activities during the last quarter of this century.

The 250-page report will be used by SAC in formulating a 15-year space development policy outline as well as intermediate working program covering period of three to five years. It is a product of a 2.5 year study performed by the ad hoc committee with cooperation of 30 top-level space scientists and engineers in Japan.

Titled "Long-range Vision on Japan's Space Development," the report calls among other things for Japanese participation in the U.S. Space Shuttle project while pursuing the already established independent development course. Participation in the Space Shuttle

will not be limited to installing scientific equipment on board shuttle orbiter, but actual chartering of the shuttle and even having Japanese scientists on board is under consideration. Eventually, Japanese space activities would include a human space flight program with development of spacecraft and launch vehicles undertaken on its own, to meet requirements of the age of space stations.

Specifically the report proposes that Japan should charter the shuttle in 1982 to conduct useful scientific experiments and put Japanese scientists aboard the shuttle orbiter in 1983. Plans beyond that call for starting work for domestic development of a piloted spaceship and launch vehicle -- beginning with trial manufacturing of a 5-ton unpowered spaceship and putting it on board the shuttle around 1985, to test ocean surface recovery. Subsequently, a 10 to 15 ton spaceship for a crew of up to three will

be developed and launched into low orbit around 1990 using a cluster of liquid-hydrogen fueled rockets called H-1 (with a diameter of three meters) and H-2 (with a diameter of five meters.)

Space developments contemplated for Japan to undertake in the next 25 years cover a wide range of activities. Japanese scientists and engineers are visualized as using satellites and spacecraft as observatories for scientific exploration of space, as lighthouses in space for ships and aircraft, as communication towers in space and as a base for supporting ground operations. Spacecraft will also be used as laboratories for physical and chemical research and experiment, as materials processing plants, as biological experiment stations, and as space colonies. The report also envisages Japanese exploration of the moon, planets and comets.

The Retainable Expendable

by Leonard David

The only throw-away part of the upcoming NASA Space Shuttle program for the 1980's may have found a new lease on life and could lead to early development of an inhabited Space Station.

According to NASA engineers at NASA's Marshall Space Flight Center in Alabama and Grumman Aerospace Corporation in New York, the only non-reusable part of the Shuttle's propulsion system, the External Tank (ET), could be used as a core of a space platform for the mid-1980's.

The external tank, measuring 48 meters (157 feet) x 8 meters (28 feet), carries over 703,000 kilograms (1,550,000 lbs) of liquid oxygen and liquid hydrogen powering the Shuttle Orbiter's three Main Propulsion Engines. Working in tandem with the two solid strap-on engines, which are parachuted back to earth for reuse in a future Shuttle flight, the tank is unceremoniously "dumped" into a predetermined remote area of ocean after its work is done. The tank would be damaged beyond repair on impact.

However, NASA engineers see a brighter future for the tank. According to James Kingsbury, director of the Science and Engineering Directorate at the Marshall Space Flight Center, a major space platform could be placed in Earth orbit in less time than earlier believed, using the Space Shuttle's External Tank. "From this permanent space platform," Kingsbury believes, "the real business of space utilization can begin."

The new NASA thinking would have a Shuttle keep its External Tank and carry it directly into orbit, "parking" it in a specified location in space. This tank, empty of its liquid propellants, would be "offloaded" before launch of some 2,000 cubic feet of liquid oxygen, normally carried in the top portion of the tank. This empty space would hold equipment and supplies to handle a small crew for 90 days of habitation in orbit.

A second Shuttle launch would carry into orbit both an Airlock Module and a Multiple Docking Adapter, complete with solar electric conversion wing. All elements would be docked and clustered to the external tank, with the second Shuttle providing a crew to live in the platform. The assignment of this first crew would involve final construction of the crew quarters and establish structural integrity of the entire platform.

Expansion of this basic tank design could include additional external tanks,

OMB Weighs NASA Budget Cut

Budget Director Bert Lance, who recently resigned under fire, is reported to have told a group after touring Edwards Air Force Base in California, where the shuttle is being tested, that the National Aeronautics and Space Administration is being asked to "reassess its priorities."

Lance did not present details, but said the space agency's share of the federal budget—as well as expenditures by other agencies—would have to be measured in light of seeking a balanced budget and financing social programs.

It remained unclear what such a reassessment would mean to the projects for which the space shuttle craft is being designed. The craft, which is scheduled to be launched in March 1979, would be capable of carrying 65,000 pounds of

material into space and make as many as 100 trips.

Carter's budget for fiscal 1978 provides \$4 billion for NASA, about the same amount the Ford administration gave the agency this year.

But Lance reminded reporters in California that the 1978 budget was largely put together before Carter took office and only the 1979 budget would accurately reflect the President's budgetary views.

He emphasized that the administration remains committed to "zero-based" budgeting by which every agency of government is required to reassess its spending goals.

As a result, he said, there will be "a redirection of programs" in various agencies including those dealing with the space industry.

Spacelab modules, or even both, extending the station's capabilities. The platform could be used in a number of ways, providing ample laboratory space to conduct space processing experiments, or manufacturing large space structures.

Although far from being an "on-going" concept, as a target, the current studies are directed to an initial launch in calendar years 1983-1984. Kingsbury feels that the current studies indicate a permanent space platform, using the external tank method, could be in earth-orbit at a fraction of the cost now estimated for a new developmental program, and at an earlier time frame than once thought.

Use of the ET method, even though NASA hates to admit it, may be the only alternative for an unwilling Administration that, as yet, has declined to provide NASA with substantial funding for large space stations. Even though the external tank concept could provide experience in building large habitats in space, NASA would much rather build all new hardware, specifically designed for space station construction.

Frosch Wins Prize

NASA Administrator Dr. Robert A. Frosch has been awarded the L-5 Editor's Proofreading Prize. The reward? A public apology from editor Carolyn Henson, who let one caption and two headlines slip by which referred to someone named "Frosh." Additional proofreaders for the L-5 News are being sought avidly.

Schmidt Calls For "Starlaws"

Sen. Harrison Schmidt, (R-N.M.), ranking minority member of the Senate Commerce Committee Subcommittee on Science, Technology and Space and former Apollo astronaut, recently advised the American Bar Association that "An instantaneous and continuous view of earth and its total environment makes possible a wide spectrum of space activities. . . Starlawyers must quickly come to grips with the implications of this new view of Earth. . . There are numerous legal and regulatory questions that arise when one contemplates solar power systems in synchronous orbit around the earth. How do we establish national and/or international rates for power generated and transmitted to receiving points on earth? As more and more men and women work in space stations like this, what laws and judicial system will govern their interrelationships?"

"Possibly the most urgent area of starlaw . . . is the extension of medical, corporate and patent law to cover the infinite range of treatment, research and industrial activities that will soon begin in space. Precedents are being set which may not be in the right direction either with respect to the interests of business, the interests of future consumers or the interests of our country."

NASA: Priming the Pump

by Kenneth McCormick

In discussing the space industrialization concept with friends and acquaintances, I have discovered that what often underlies a seeming indifference to the subject in some people is a basic hostility toward NASA. Whatever merit space industrialization may have in its own right, it is inseparable, in the minds of virtually everyone I have talked to, from the history of the space program. The space program, judging from references in the mass media, is regarded by most to be a great thing, but neither justifiable as an extravagant expenditure of tax dollars, nor of any discernable benefit to the average citizen.

As a political statement, this attitude most often takes form as what has become one of the truly great clichés of our time: "Why are we spending all that money and effort in space, when there is so much to be done here on earth?" Proponents of this position usually offer as examples of what needs to be done here on earth: the elimination of poverty, improving public transportation, "cleaning up" the environment, and ending the spread of urban sprawl.

Thus stated, the attitude in question can be shown to rest upon two fallacies: (1) that NASA is a drain on public finances at a time when more money must be spent on social programs, and (2) that a political problem will yield to a technological solution.

I would like to recommend four studies which seem to me to be must reading for anyone promoting space ventures.

1. *The Political Economy of the Space Program*, by Dr. Mary A. Holman. Palo Alto: Pacific Books, 1974.

2. *"Economic Impact of Stimulated Technological Activity"*, Midwest Research Institute, Kansas City, Mo., November, 1971.

3. *"Quantifying the Benefits to the National Economy From Secondary Applications of NASA Technology"*, Mathematica, Inc., Princeton, N. J.

4. *"The Economic Impact of NASA R & D Spending"*, Chase Econometric Associates, Inc., Bala Cynwyd, Pa. April, 1976.

Few public libraries have any of these studies, but they can be gotten via

interlibrary loan. The book costs about \$30 new. The papers may be purchased from the National Technical Information Service, Springfield, VA. 22161. A reference librarian can be of assistance in placing an order with NTIS.

The U.S. owes its high standard of living to high worker productivity. Technological advances increase productivity. As less labor is needed per unit of output, unit labor costs are lowered which leads to lower prices. As prices are lowered (or at least grow at a less rapid rate), disposable income of consumers becomes greater. As consumers gain greater purchasing power, they demand more goods and services, which are now available due to increased productivity.

The Chase Econometric study demonstrated that NASA spending, in its long term effects, is quite uncharacteristic of government spending in general. NASA mission oriented R & D has been shown to be as effective in producing economic stimulation as any more highly diffuse R & D effort. The measured relationship between NASA R & D spending and technological progress was introduced into a number of simulations to measure the overall impact on the economy. It was found that if NASA R&D spending (R & D accounts for about three-quarters of the total budget) were increased by \$1 billion in 1975, and if the increase were sustained at that level, the GNP would be \$43 billion greater by 1988 than it would have been without a NASA increase. For a \$14 billion investment over that period of time, there would be a return to the economy during the same period of \$225 billion. Also, by 1984 the Consumer Price Index would be reduced to the extent of 2% lower than would otherwise be expected, the total number of jobs available would be 800,000 greater than would otherwise be expected, the Index of Labor Productivity would be 2% higher, and the rate of inflation would be 5.3%, rather than the expected 5.8%. Simulations using figures of \$100 million to \$500 million showed proportional results.

A decrease in NASA spending of \$1 billion would have reverse effects of the same magnitude.

Since the federal budget is about 20% of the GNP, we can see that if NASA were to consume an extra \$19 billion of public finances (\$14 billion for R & D, \$5 billion for construction and administration) over a 14 year period, federal finances would increase by about \$28 billion (20% of \$225

Impatient White House rejects proposed solar-energy satellites

By Jack Anderson

WASHINGTON—Americans are in a tizzy over the box office smash movie, "Star Wars." What they don't realize is that our own space agency is ahead of "Star Wars" in some of its concepts.

U.S. space scientists have come up with a futuristic scheme, for example, to supply the United States with all the energy it needs from outer space. It's a type of solar energy with a "Star Wars" twist.

The National Aeronautics and Space Administration would like to launch 20 giant satellites that would transform sunlight into electricity. The scientists claim that 20 satellites, microwaving the energy to earth, would be enough to supply the entire nation.

The solar-electric satellites would resemble enormous Venetian blinds. Each would measure several miles long. The

frames would have a thin cover, dotted with millions of tiny solar power cells.

The project would take years of research and cost millions of dollars. Space officials, therefore, have turned to Congress for help. They contacted House Democratic leader James Wright of Texas, who recently arranged for the space experts to brief White House energy czar James Schlesinger and Budget Director Bert Lance.

To Wright's dismay, the White House rejected the space project—at least for now. White House officials called solar-electric satellites a long-term solution. They want immediate results.

The space experts, nevertheless, are certain the solar satellites will work. So the day may come when our energy will come from outer space instead of underground.

billion from R & D and \$10 billion from the demand effects of other expenditures, minus the \$19 billion investment) as the tax base expanded. So much for the assertion that NASA is a drain on public finances. So much, also, for the assertion that NASA produces little in the way of tangible benefits for the average citizen. I have found few things more persuasive to the political opinion of the man in the street than money in the bank.

The influence of stimulated technological activity should be considered in assessing the possible cost benefit ratio of space industrialization. The economic benefits which would be reasonably expected to come out of the R & D investment in the development of space would probably go a long way toward paying for the entire project. I am referring here, to government-funded space development, and not to development by private sector investment.

I would also like to recommend to L-5 Society members two booklets which describe some qualitative effects of NASA R & D.

1. "Why Space is Important to Our Future", available free of charge from the office of Public Relations, Rockwell International, Space Division, 12214 Lakewood Boulevard, Downey, CA. 90214.

2. "Spinoff 1977", free from the Office of Public Relations, NASA Headquarters, 306 Maryland Ave., Washington, D.C. 20546. (This 116 page booklet also has some dazzling color illustrations of Pioneer spacecraft, the Large Space Telescope, Shuttle, etc.)

One example of a NASA spinoff is a computerized X-ray scanning device which replaces exploratory surgery. There is no anesthesia, no pain, and no hospitalization, since the operation can now be performed on an out-patient basis.

Another example is the Meal System for the Elderly, which will result in better nutrition for the handicapped or infirm. These are the sort of technological advancements that it is difficult to place a monetary value on.

Congress displayed a lack of wisdom in allotting \$16 billion for the creation of new jobs during 1977, while eyeing the already slim NASA budget for the possibility of further cuts. The \$4 billion NASA budget provides more jobs, in the long run, than the \$16 billion voted for make-work. Cutting back on NASA funds in order to get more money to eliminate poverty makes no sense, of course, since the Chase study shows that this action would, over time, create more new poverty than the money taken from NASA could eliminate. Any attempt to end poverty which would attack the means of production will benefit no one. The question of whether or not to

explore and exploit space is quite apart from the question of whether or not poverty should be permitted to continue in this country.

No amount of technological brainstorming by NASA rocket scientists will solve any problem of a social nature. It has been suggested that NASA talent could improve public transit systems. This has, in fact, happened, but the automobile remains the preferred means of transportation because the government spends many times as much to improve highways as to improve mass transit. Hence, this is a social problem.

Anyone appreciative of the subconscious determinants of political behavior will probably agree that much of the cause of hostility engendered by NASA is symbolic in nature. NASA's crew-cut, middle-class astronauts, with their technical jargon, conspicuous consumption, A-OK's and golf on the

moon, were always the ideal representations of the establishment organization man. At a time when it was becoming ever more clear to all that the establishment had denied full participation in society to great numbers of people, a prominent display of macho potency on the part of the establishment, as seen in the first great rocket flights, was out of place. (The skeptic may note that many people joked after the U.S.' first satellite's launch failure that the U.S. had failed to "get it up.")

To the degree that a person is alienated from the mainstream of society, that person will tend to view the success of space ventures as a cause for jubilation in the camp of his or her enemies. If we are to get general agreement on the desirability of the further use of space, then people will have to come to realize that it is, and always has been, something that benefits everyone.



So You Want to Lobby?

by Marc Boone

If you write to legislators . . . Ask them to vote a specific way, support a specific amendment, or take a specific action. Otherwise you will get a "motherhood" response. They will say in a general way, "Of course I am in favor of the space shuttle, solar power satellites" or whatever you asked. Then they might vote the wrong way.

The basic means by which a Congressperson keeps in contact with his or her district is through letters. Never underestimate their importance. Telephone calls to the local office or even to Washington are often useful, but letters provide the basic demonstration of interest and expression of opinion concerning an issue.

The volume of mail a Congressperson or Senator receives varies with many factors. Legislators from primarily rural areas usually receive less mail, but a speech or newspaper article may stimulate a large volume on a certain day. No matter how many letters are received, each one is opened, read, and catalogued. Thus, there is a tally in every Congressperson's office of voter interest and sentiment on different issues. The legislator is told daily, or at least weekly, how voter interest is running. He or she is told again before a vote.

Every Congressperson knows that voters are often too apathetic to express their preferences in writing. When a person does take the trouble to write, legislators assume that the writer's position must also be held by a large number of other people in the district. In other words, they feel that every letter represents the sentiments of 50, 100, or even 500 voters in that district. A letter-writing campaign, therefore, is an important lobbying tool. There are certain techniques of letter-writing that you should use and recommend to co-workers.

1. *Always be courteous.* Never reprimand legislators for taking the wrong position. Instead, try to convince them to take the right one-politely.

2. *Try to keep the letter to one typewritten page.* Complex letters are often put aside to be answered later and may lose their effectiveness. If you have more material than will fit onto one page, include extra background pages, but label them clearly as background and put your name and address on them in a corner.

These pages will probably be routed to the staff person handling the issue and so will have more impact.

3. *Do not write about more than one issue in each letter.* That only confuses the staff and dilutes your impact.

4. *Don't use a form letter.* It only takes minutes to write a few sentences of your own, and such a letter is much more effective. Try to add a few sentences about the issue's impact on the legislator's district.

5. *If you write to a Congressperson who is not your own,* try to think of a relative or friend in his or her district that you can mention; i.e., "although I am not now living in your district, my family has told me about your dedication to planetary exploration, space industrialization, etc. Also, . . ." Send a copy to your own legislator and clearly indicate that you have done so on the bottom of your page. Otherwise, your letter may be routed to your own Congressperson as a courtesy, and the legislator you want to influence will be bypassed.

6. *If you are writing to criticize or praise a bill,* be specific as possible. If you do not know the bill number, try to describe the bill by its precise name, such as the "NASA FY '78 Appropriations Bill."

7. *If you are writing about an amendment,* try to include the bill number, who will offer the amendment, and what the amendment will do.

8. *If possible, refer to the Congressperson's past actions on your issue* or some other related issue. Including this kind of reference shows that you are aware of his or her past record and that you are following the issue closely. If you write to the legislator and ask to be included on the newsletter list, you will become more aware of his or her attitudes.

9. *Be specific.* Ask him or her to vote a specific way, support a specific amendment, or take a specific action. Otherwise you will get a "motherhood" response. The legislator will say in a general way, "Of course I am in favor of the space shuttle, solar power satellites" or whatever you asked. Then he or she might vote the wrong way. In order to be effective, you must be specific so you can hold legislators accountable for their actions.

Be courteous Be specific. . . . Don't be a crackpot
WRITE!

"Congress in session is Congress on exhibition, Congress in committee is Congress at work."

-- Woodrow Wilson

10. *It is always wise to try to meet the Congressperson* (if you can do so without alienating him or her.) Then you can refer to your meeting in the first few sentences of your letter. Call the district office to ask for a schedule of office hours and public meetings.

11. *Do not come on like a crackpot.* If you support the space program because you want to see star ships or meet extraterrestrials, then write short polite letters asking your Congressperson for support for reasons that they would agree with.

By phone -- To reach Washington offices of Members of Congress or Congressional Committees, dial 202/224-3121 and "the Capitol" will answer and give you the proper extension upon request.

By letter--For Senators or Senate Committees, write to:
The Honorable _____
(or Senate Committee on _____)
United States Senate
Washington, D.C. 20510

For Representatives or House Committees, write to:
The Honorable _____
(or House Committee on _____)
House of Representatives
Washington, D.C. 20515

Although writing to any legislator is helpful, writing to one who sits on one of the committees which handles the NASA budget is ten times as good. The NASA budget request for the coming year goes through four different committees and is voted on four different times on the floors before it is presented to the President. The committees and subcommittees which must be persuaded are presented below in the order that a bill reaches them.

What Happens to the NASA Appropriations Bill?

First the bill goes to the HOUSE SCIENCE AND TECHNOLOGY COMMITTEE, 2321 RHOB, 202/225-6371.

Democrats:

Olin Teague, Tex., Chairman

Don Fuqua, Fla.
Walter Flowers, Ala.
Robert Roe, N.J.
Mike McCormack, Wash.
George Brown, Jr., Calif.
Dale Milford, Tex.
Ray Thornton, Ark.
James Scheuer, N.Y.
Dick Ottinger, N.Y.
Tom Harkin, Iowa
Jim Lloyd, Calif.
Jerome Ambro, N.Y.
Robert Kreuger, Tex.
Marilyn Lloyd, Tenn.
James Blanchard, Mich.
Timothy Wirth, Colo.
Stephen L. Neal, N.C.
Thomas J. Downey, N.Y.
Doug Walgren, Pa.
Ronnie G. Flippo, Ala.
Dan Glickman, Kans.
Bob Gammage, Tex.
Anthony C. Beilenson, Calif.
Albert Gore, Jr., Tenn.
Wes Watkins, Okla.
Richard A. Tonry, La.
Republicans:
John Wydler, N.Y.
Larry Winn, Jr., Kan.
Louis Frey, Jr., Ga.
Barry M. Goldwater, Jr., Calif.
Gary Myers, Pa.
Hamilton Fish, Jr., N.Y.
Manuel Lujan, Jr., N.M.
Carl D. Pursell, Mich.
Harold C. Hollenbeck, N.J.
Eldon Rudd, Ariz.
Robert K. Dornan, Calif.
Robert S. Walker, Pa.
(Minority Vacancy)
and then is voted on by the House. Then it goes to the SENATE COMMERCE, SCIENCE AND TRANSPORTATION COMMITTEE, 5202 DSOB, 202/224-5115
Democrats:
Warren G. Magnuson, Wash., Chairman
Howard W. Cannon, Nev.
Russell B. Long, La.
Ernest F. Hollings, S.C.
Daniel K. Inouye, Hawaii
Adlai E. Stevenson, Ill.
Wendell H. Ford, Ky.
John Durkin, N.H.
Edward Zorinsky, Nebr.
Donald Riegle, Mich.
John Melcher, Mont.
Republicans:
Robert P. Griffin, Mich.
Ted Stevens, Alaska
Barry Goldwater, Ariz.
Bob Packwood, Ore.
Harrison Schmitt, N.M.
John C. Danforth, Mo.
and the SENATE COMMERCE SUBCOMMITTEE ON SCIENCE AND SPACE, 2301 RSOB, 202/224-6477
Democrats:

Adlai Stevenson, Chairman
Wendell Ford
Russell Long
Ernest Hollings
Edward Zorinsky
Donald Riegle
Republican:
Harrison Schmitt
Barry Goldwater
Robert Griffin
and then is voted on by the Senate.
Then it goes to the HOUSE APPROPRIATIONS COMMITTEE, H-218 (Capitol), 202/225-2771
Democrats:
George H. Mahon, Tex., Chairman
Jamie L. Whitten, Miss.
Robert L.F. Sikes, Fla.
Edward P. Boland, Mass.
William H. Natcher, Ky.
Daniel J. Flood, Pa.
Tom Steed, Okla.
George E. Shipley, Ill.
John M. Slack, W. Va.
John J. Flynt, Jr., Ga.
Neal Smith, Iowa
Robert N. Giamo, Conn.
Joseph P. Addabbo, N.Y.
John J. McFall, Calif.
Edward J. Patten, N.J.
Clarence D. Long, Md.
Sidney R. Yates, Ill.
Frank E. Evans, Colo.
David R. Obey, Wis.
Edward R. Roybal, Calif.
Louis Stokes, Ohio
Gunn McKay, Utah
Tom Beville, Ala.
bill Chappell, Jr., Fla.
Bill D. Burlison, Mo.
Bill Alexander, Ark.
Edward I. Koch, N.Y.
Yvonne Brathwaite Burke, Calif.
John P. Murtha, Mich.
Robert Duncan, Ore.
Joseph D. Early, Mass.
Max Baucus, Mont.
Charles Wilson, Tex.
Lindy Boggs, La.
Adam Benjamin, Jr., Ind.
Norman D. Dicks, Wash.
Republicans:
Elford A. Cederberg, Mich.
Robert H. Michel, Ill.
Silvio O. Conte, Mass.
Joseph M. McDade, Pa.
Mark Andrews, N.D.
Jack Edwards, Ala.
Robert C. McEwen, N.Y.
John T. Myers, Indiana
J. Kenneth Robinson, Va.
Clarence E. Miller, Ohio
Lawrence Coughlin, Pa.
C.W. Bill Young, Fla.
Jack F. Kemp, N.Y.
William L. Armstrong, Colo.
Ralph S. Regula, Ohio

Clair W. Burgener, Calif.
George M. O'Brien, Ill.
Virginia Smith, Neb.
and the HOUSE APPROPRIATIONS SUBCOMMITTEE ON HUD-INDEPENDENT AGENCIES, H-143 (Capitol), 202/225-3241
Democrats:
Howard P. Boland, Chairman
Bob Traxler
Max Baucus
Louis Stokes
Tom Beville
Lindy Boggs
Bill D. Burlison
Bill Alexander
Republicans:
Lawrence Coughlin
Joseph M. McDade
C.W. Bill Young
and then is voted on in the House. Then it goes to the SENATE APPROPRIATIONS COMMITTEE, 1235 DSOB, 224-3471
Democrats:
John L. McClellan, Ark., Chairman
Warren G. Magnuson, Wash.
John C. Stennis, Miss.
Robert C. Byrd, W. Va.
William Proxmire, Wis.
Daniel K. Inouye, Hawaii
Ernest F. Hollings, S.C.
Birch Bayh, Ind.
Thomas F. Eagleton, Mo.
Lawton Chiles, Fla.
J. Bennett Johnston, La.
Walter D. Huddleston, Ky.
Quentin Burdick, N.D.
Patrick Leahy, Vt.
James Sasser, Tenn.
Dennis DeConcini, Ariz.
Republicans:
Milton Young, N.D.
Clifford Case, N. J.
Edward W. Brooke, Mass.
Mark O. Hatfield, Ore.
Ted Stevens, Alaska
Charles McC. Mathias, Jr., Md.
Richard S. Schweiker, Pa.
Henry Bellmon, Okla.
Lowell P. Weicker, Conn.
and the SENATE APPROPRIATIONS SUBCOMMITTEE ON HUD-INDEPENDENT AGENCIES, S-128 (Capitol), 202/224-7274
Democrats:
William Proxmire, Chairman
John C. Stennis
Birch Bayh
Walter Huddleston
Patrick Leahy
James Sasser
Republicans:
Charles McC. Mathias, Jr.
Clifford P. Case
Edward W. Brooke
Henry Bellmon

and then is voted on by the House and passed to the President.

If you want to learn more, the lobbyist's bible is the Congressional Directory, available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
\$6.50

JOP Scoreboard

by Carolyn Henson

July 19, 1977 was a historic date: for the first time, a House committee's recommendation to delete NASA funds was rejected by Congress. The rescued project? Jupiter Orbiter Probe, the first planetary exploration mission which will be launched by the space shuttle.

The House rejected the fund cut by a lopsided margin, 281 to 131.

Who were JOP's opponents? A quick check of the Congressional record reveals that the following Representatives voted for the deletion of JOP:

| | | |
|---------------|----------------|-------------|
| Alexander | Gephardt | Pritchard |
| Allen | Goodling | Quie |
| Andrews | Gudger | Quillen |
| N. Dak. | Harrington | Rahall |
| Aspin | Heckler | Rangel |
| AuCoin | Hefner | Regula |
| Baldus | Holtzman | Reuss |
| Baucus | Hughes | Richmond |
| Bauman | Jacobs | Rodino |
| Beard, R.I. | Jenkins | Roncallo |
| Bedell | Jones, N.C. | Rooney |
| Beilenson | Keys | Rose |
| Benjamin | Kostmayer | Rosenthal |
| Bennett | Krebs | Ruppe |
| Biouin | LaFalce | Russo |
| Boland | Latta | Ryan |
| Bonior | LeFante | Schroeder |
| Bonker | Lederer | Shipley |
| Bowen | McDade | Simon |
| Brodhead | McKay | Skubitz |
| Brown, Mich. | Mahon | Slack |
| Broyhill | Markey | Smith, Iowa |
| Butler | Marlenee | Slarz |
| Carr | Mazzoli | St. Germain |
| Cochran | Mikva | Staggers |
| Conte | Miller, Calif. | Stark |
| Coughlin | Miller, Ohio | Stoker |
| Daniel, R.W. | Minish | Studds |
| Danielson | Mitchell, Md. | Taylor |
| Delaney | Moakley | Thompson |
| Dellums | Murphy, Pa. | Traxler |
| Dingell | Murtha | Whalen |
| Duncan, Oreg. | Myers, Michael | Whitehurst |
| Edgar | Natcher | Whitley |
| Edwards, Ala. | Neal | Whitten |
| Eilberg | Nix | Wylie |
| Evans, Colo. | Oberstar | Yates |
| Evans, Ind. | Obey | Zablocki |
| Findley | Ottinger | |
| Fish | Panetta | |
| Fisher | Patten | |
| Fiorio | Pike | |
| Fraser | Pressler | |
| Frenzel | Preyer | |

Those who voted "nay" (i.e., who opposed the JOP fund deletion) were:

| | | |
|----------------|-----------------|-----------------|
| Abdnor | Burton, John | Dornan |
| Addabbo | Burton, Phillip | Downey |
| Akaka | Byron | Drinan |
| Ambro | Caputo | Duncan, Tenn. |
| Ammerman | Carney | Eckhardt |
| Anderson, | Carter | Edwards, Calif. |
| Calif. | Cavanaugh | Edwards, Okla. |
| Anderson, Ill. | Cederberg | Emery |
| Andrews, N.C. | Chappell | English |
| Annuozio | Chisholm | Erlenborn |
| Applegate | Clausen, | Evans, Del. |
| Archer | Don H. | Evans, Ga. |



PROBING JUPITER'S ATMOSPHERE -- Red-hot nose cone separates from probe portion of Jupiter Orbiter Probe as it "hangs on the shrouds" and samples the atmosphere of the largest planet in the solar system. Painting depicts key moment in flight of JOP, the new planetary project planned by Caltech's Jet Propulsion Laboratory. The JOP spacecraft will be launched in January 1982 -- the first planetary mission aboard

the space shuttle -- and will arrive at Jupiter late in 1984. The probe will enter the sunlit side of Jupiter's atmosphere and provide the first direct sampling of that planet's atmosphere. Jet Propulsion Laboratory has over-all management responsibility for JOP. NASA's Ames Research Center is responsible for development of the probe.

| | | | | | |
|----------------|------------------|--------------|-----------------|---------------|---------------|
| Armstrong | Clawson, Del. | Fary | Jeffords | Moorhead, Pa. | Stockman |
| Ashbrook | Cleveland | Fasell | Jenrette | Moss | Stratton |
| Ashley | Cohen | Fithian | Johnson, Calif. | Mottl | Stump |
| Badham | Coleman | Flood | Johnson, Colo. | Murphy, Ill. | Symms |
| Bafalis | Collins, Ill. | Flowers | Jones, Okla. | Murphy, N.Y. | Thone |
| Barnard | Collins, Tex. | Flynt | Jones, Tenn. | Myers, Gary | Thornton |
| Beard, Tenn | Conable | Foley | Jordan | Meyers, John | Tucker |
| Bevill | Conyers | Ford, Tenn. | Kasten | Nedzi | Udall |
| Biaggi | Corcoran | Forsythe | Kastenmeier | Nichols | Ullman |
| Bingham | Corman | Fountain | Kazen | Nowak | Van Deerlin |
| Blanchard | Cornell | Fowler | Kelly | O'Brien | Vander Jagt |
| Boggs | Cornwell | Frey | Kemp | Oakar | Vento |
| Breaux | Cotter | Fuqua | Ketchum | Patterson | Waggonner |
| Breckinridge | Crane | Gammage | Kildee | Pattison | Walgren |
| Brinkley | Cunningham | Gaydos | Kindness | Pease | Walker |
| Brooks | D'Amours | Giamo | Krueger | Pepper | Walsh |
| Broomfield | Daniel, Dan | Gibbons | Lagomarsino | Perkins | Wampler |
| Brown, Calif. | Davis | Gilman | Leach | Pettis | Watkins |
| Brown, Ohio | de la Garza | Ginn | Leggett | Pickle | Wayman |
| Buchanan | Derrick | Glickman | Lehman | Poage | White |
| Burgener | Derwinski | Goldwater | Lent | Price | Wiggins |
| Burke, Calif. | Devine | Gonzalez | Levitass | Purcell | Wilson, Bob |
| Burke, Fla. | Dicks | Gore | Lloyd, Tenn. | Railsbeck | Wilson, Tex. |
| Burleson, Tex. | Diggs | Gradison | Long, La. | Rhodes | Winn |
| Burlison, Mo. | Dodd | Grassley | Long, La. | Rhodes | Winn |
| Guyer | McFall | Runnels | Long, Md. | Rinaldo | Wirth |
| Hagedorn | McHugh | Santini | L o t t | Risenhoover | Wolff |
| Hall | Madigan | Sarasin | L u j a n | Roberts | Wright |
| Hamilton | Maguire | Satterfield | L u k e n | Robinson | Wylder |
| Hammerschmidt | Mann | Sawyer | Lundine | Roe | Yatron |
| Hanley | Marks | Scheuer | McClory | Rogers | Young, Alaska |
| Hannaforde | Martin | Schulze | McClosky | Rostenkowski | Young, Fla. |
| Hansen | Mathis | Sebelius | McCormack | Rousslot | Young, Mo. |
| Harkin | Mattox | Sharp | McDonald | Roybal | Young, Tex. |
| Harris | Meeds | Shuster | McEwen | Rudd | Zerferetti |
| Harsha | Metcalfe | Sikes | | | |
| Hawkins | Meyner | Sisk | | | |
| Hefel | Mikulski | Skelton | | | |
| Hightower | Michel | Smith, Nebr. | | | |
| Hillis | Millford | Snyder | | | |
| Hollenbeck | M i n e t a | Spellman | | | |
| Holt | Mitchell, N.Y. | Spence | | | |
| Hubbard | Moffett | Stangland | | | |
| Huckaby | Mollohan | Stanton | | | |
| Hyde | Montgomery | Steed | | | |
| Ichord | Moore | Steers | | | |
| Ireland | Moorhead, Calif. | Steiger | | | |

Those remaining on the sidelines were:

| | | |
|--------------|-------------|------------|
| Badillo | Ertel | McKinney |
| Bolling | Fenwick | Marriott |
| Brademas | Flippo | Nolan |
| Burke, Mass. | Ford, Mich. | Seiberling |
| Clay | Holland | Teague |
| Dent | Horton | Tribble |
| Dickinson | Howard | |
| Early | Koch | |

L-5 And The Jewish Community OR Yiddishkeit in Orbit

by Bruce Friedman

Well, folks, the Allen J. Reiter Lodge of B'nai B'rith in Annapolis, Maryland is getting involved with the drive for space colonization. How did this come about? Where will this lead?

The story starts early this year when I decided that I wanted to become more active in my relations with the Jewish community in my new hometown of Annapolis. I joined B'nai B'rith. About a month later, I attended a meeting at the local Synagogue at which a speaker from B'nai B'rith Headquarters gave a talk. It turned out that headquarters did not have much going in the way of energy policy. Not only that, it turned out after I had a conversation with this speaker later that he was not aware of potential new sources of energy, such as solar power satellites (SPS's). This situation struck me as not being very satisfactory, particularly from the point of view of the situation in the Middle East.

Next day, I was talking with my friend Dr. Ernest H. Halpern (henceforth to be referred to as Ernie) about the meeting, at which he had also been present. He suggested that I organize an energy committee for our lodge and that I be chairman of this committee. I thought about this for a few hours before I decided to do it. Picking up the phone, I called Mr. James W. Jacobs (Jim), the president of our lodge. He heard me out and as he is empowered to do, declared the energy committee to be in existence with myself as chairman. Fast work!

Since that time the energy committee has been gradually getting involved with people and issues of the multi-faceted exceedingly complex energy situation. Considering, however, that I am a long time space enthusiast and that I joined the L-5 Society in early 1976, explains why educating people about solar power satellites, space factories, and non-terrestrial resources is a significant part of our program.

The energy committee is small but has a lot of expertise in science and technology. Aside from myself, it includes Ernie

(whom I consider to be my "chief of staff"), Jim, and Dr. Herman B. Urbach. Ernie was originally somewhat skeptical about solar power satellites, space factories, and space colonies. Now, he has acquired some of my enthusiasm for all of these things. In fact, at one of our local B'nai B'rith board meetings he started referring to the energy committee as being the space committee!!

From the special point of view of the American Jew, what is the appeal of space colonization and SPS's? Well, one thought is that American-built and operated SPS's mean a U.S.A. independent of energy from Arab oil. In this event, America could formulate solutions to the troubles between Israel and the Arab world without the threat of an oil embargo.

Further thought upon the matter yields the possibility of something more positive. How about a joint Israeli-Arab SPS-space colony project? After all, the Arabs have all of that oil wealth and Israel has loads of scientific and technical talent. This could really advance the cause of peace in the Middle East. Anyhow, the Arabs should be worrying about what is going to happen to themselves when their oil runs out. An SPS-space colony project makes quite a bit of sense for the Middle East. Just picture it! The first space colony being peopled by Moslems and Jews (maybe with some token WASP's).

From a more somber attitude, considering the vicissitudes of the Jewish people throughout history, one could say that Jews, of all people, should be interested in space colonization. Space colonization could be considered a form of life insurance if things should get tougher again for the Jews on earth. More optimistically, colonization could be viewed as a wonderful opportunity for the expression of Jewish vitality in far-flung and diversified environments. (Actually, all of the ethnic groups could have their own colonies.)

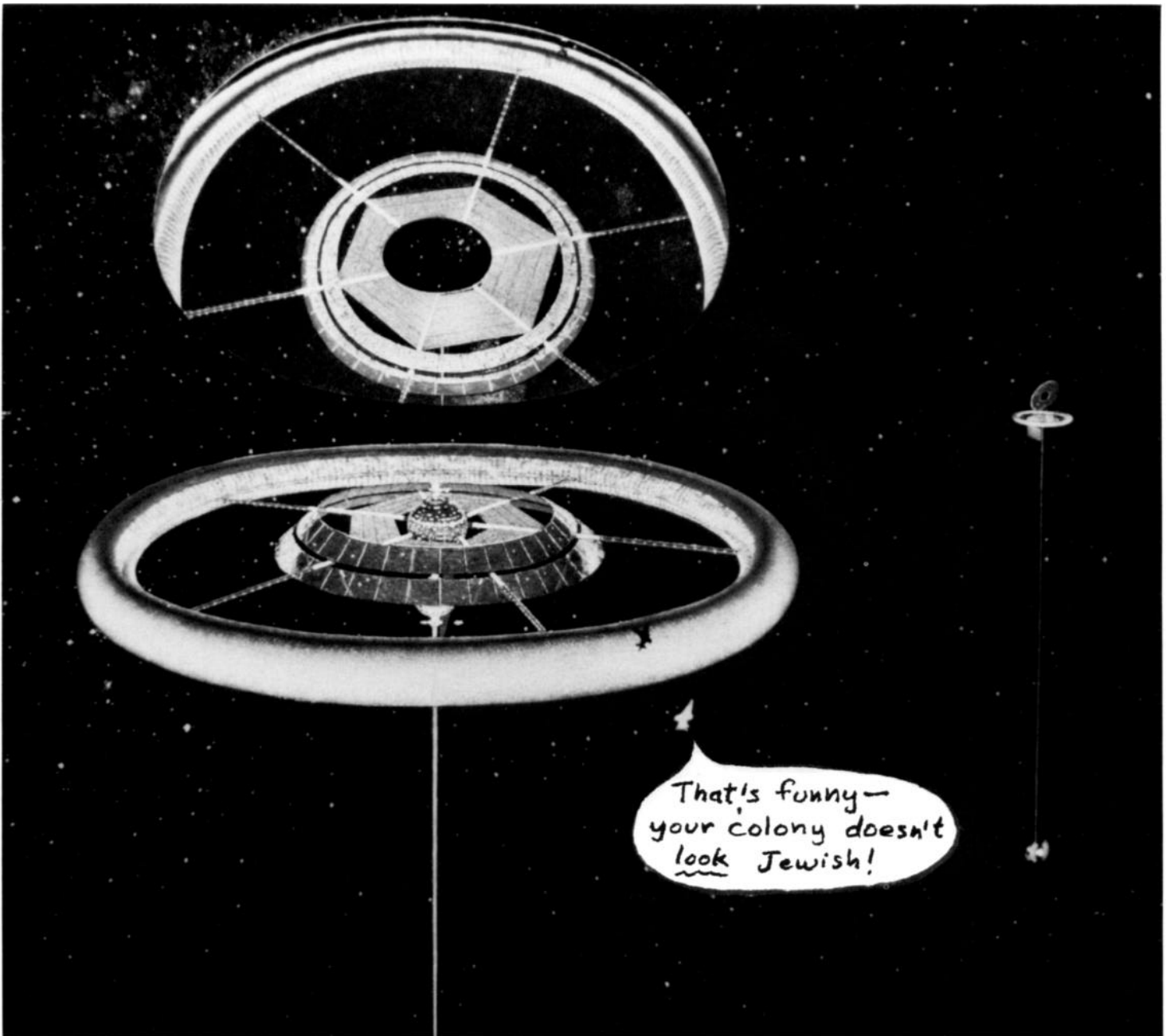
How does the energy committee go about gaining acceptance for its space proposals? One thing we do not do is talk about space colonization per se. We think

in terms of pushing for the construction of SPS's by a space factory using non-terrestrial resources. This, hopefully, avoids the "pie-in-the-sky" reaction from uninformed people upon first hearing about space colonization. We feel that the notion of people working and living in space would be thought of more naturally as a corollary to the SPS-space factory plan. It makes sense to have people living near their work instead of commuting between earth and space constantly. One would think of a company town as being an apt comparison.

What modes of communication does the energy committee utilize? We find a cookout to be an effective format. A few people, knowledgeable in an aspect of the energy problem, are invited to join us in Annapolis. We eat, drink and have fun while trading information and formulating plans for action. We hope to meet with state and national legislators, other B'nai B'rith lodges, and other influential people. We have already met with the Aberdeen, Maryland lodge of B'nai B'rith. As a result of this cookout the energy committee will be presenting a series of resolutions concerning the energy problem to the Maryland State Association of B'nai B'rith with the backing of the Aberdeen lodge. Particular mention of SPS's will be made.

Our activities are coordinated with other advocates of space colonization/industrialization. Since my joining the L-5 Society in 1976 I have been in touch with Dr. T. Stephen Cheston of Georgetown University who is well known to all L-5ers. Since the formation of the energy committee, Steve and I have been trying to coordinate our activities.

At the time at which I am writing this article, the energy committee is working on involving the members of the B'nai B'rith Youth Organization (BBYO) in its space activities. We are preparing a number of projects for BBYO in the areas of solar power satellites, space industrialization, and space colonization. The energy committee believes that BBYO



members could be of value in educating the public as to the benefits to be derived from these space programs. More directly, BBYO members could organize study groups in order to investigate various problems and perform experiments to help fill in the details needed to be known before implementation of these programs. This direct action on a volunteer basis could be of great importance in filling the gap between now and when the major funding becomes available. The BBYO is potentially a valuable resource of enthusiastic, intelligent young folks.

We believe that our experiences here in Annapolis can be of use to others in striving for the implementation of SPS's and space colonization/industrialization. For example, other ethnic service organizations could do the same things we are in B'nai B'rith. Why not have a Knights

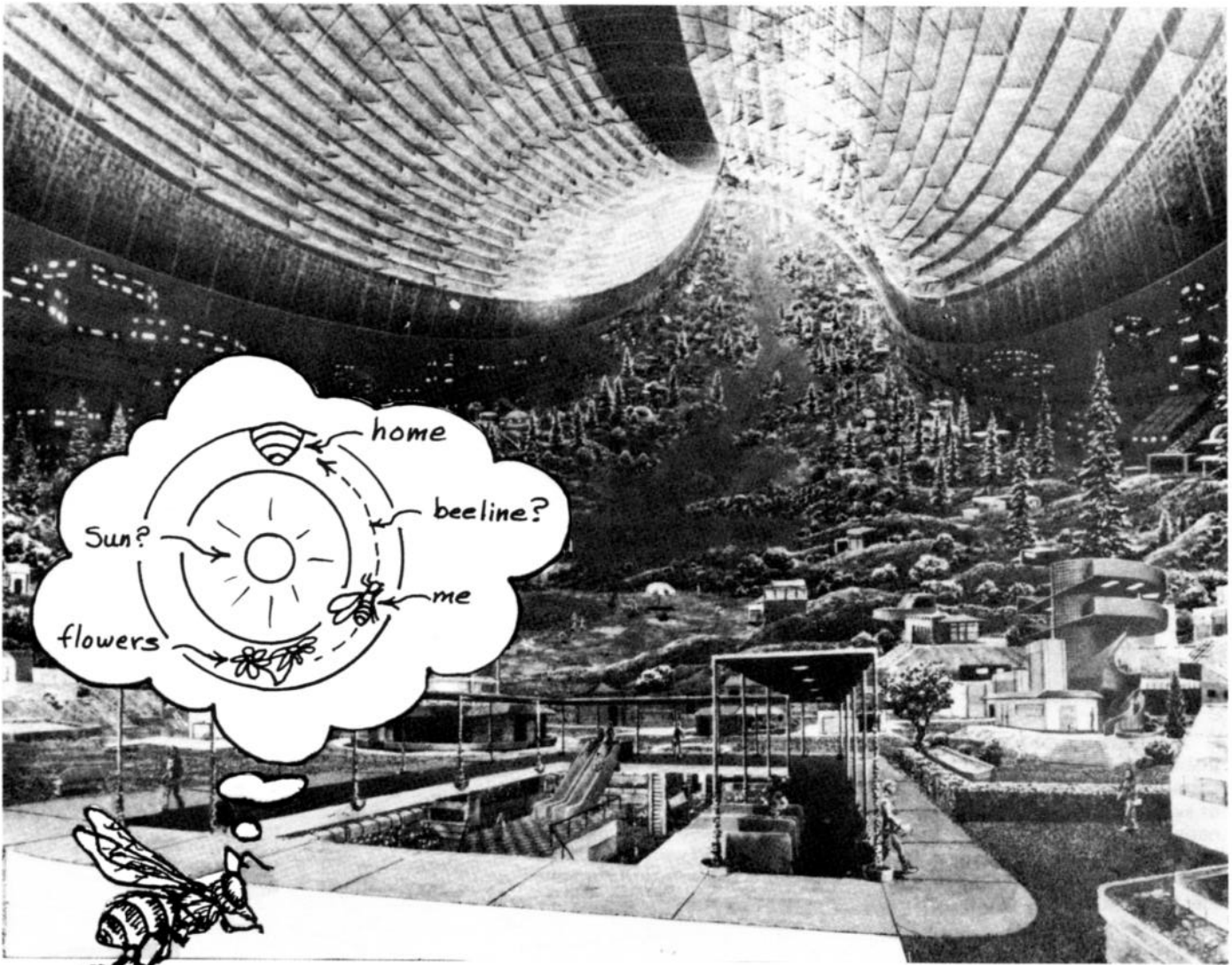
of Columbus lodge form an energy, or even a space committee? Then, possibly, our energy committee could link up with theirs and all of us could get into space sooner. Of course, we do not have to confine ourselves to religious-based organizations. Certainly the Lions and the Elks could help out also.

Another point that we believe to be important is convincing the minorities of our nation of the relevance of space to the fulfillment of their needs. We do not want these people to think of us as elitists but as people who are really concerned about them. This fits in with the Jewish ethic. One cannot be considered a good Jew unless one is a good person. The aid of the minorities could certainly help us in our goal of spreading out into the universe.

We have a very positive outlook over in B'nai B'rith. We want to accomplish our

goals for our generation and not have to wait for the next generation. Our thoughts and actions are strictly in terms of success now, in the coming years, in the next decade or so, certainly no later than the end of this century. Moses saw the promised land from afar but he was not allowed to enter it. We, on the other hand, will enter our promised land.

About the author: Bruce Friedman holds a Ph.D. in physics. He works at the David W. Taylor Naval Ship Research and Development Center in Annapolis, Md. His major area of research is pollution abatement. He encourages those of you who want to learn more about how to develop local L-5 oriented projects to write him at 1284 Graff Court Apt. 1B, Annapolis, MD 21403, or call him at 301/267-9271 (home) or 301/267-3543 (office).



A Land of Milk and Honey?

Not if the bees can't find their way home, according to Magoroh Maruyama.

With respect to pollinating bees' orientation, Gerard O'Neill has assured me that the direction of polarization of sunlight inside the space community will remain ground-stationary because the mirrors will be ground-stationary, and the direction of polarization is largely determined by the angle of the mirrors.

A problem may arise when several mirrors are used to cover several areas, and the bees have to traverse these several areas between the hive and the flowers. As you know, the bees' brain stores information regarding the location of the flowers in terms of (1) direction; and (2) distance. The direction is identified in reference to the polarization of the sunlight.

It is not known what happens to the bees' information system when they have to traverse several areas, in which the direction of light polarization is different from one another.

But this can be experimented on the Earth. In a large hangar, you can install a bee-hive. The hangar should be opaque to prevent natural daylight from coming in. Artificially polarized daylight by means of mirrors, in such a way that different sections of the hangar have different directions of polarization, can be installed. Then live flowers are put in, in such a way that the bees have to traverse many sections of the hangar to reach the flowers. We can then observe: (1) the shape of the "bee dance" in the hive to communicate the location of the flowers; (2) actual flight path of the bees who received the information from the dancer.

Another complication is bee's reaction to gravitationally non-Euclidean space (Torus, in which the equipotential surface is non-flat and eventually goes upside down; or cylinder and torus, in which the "bee-line" changes the tangential angle to the equipotential surfaces during one

flight). This can be experimented in a large centrifugal chamber.

"Space Settlements: a Design Study" (NASA SP-413), recently was published by NASA's scientific and technical office. It describes in vivid terms and illustrations the construction and operation of permanent settlements in space where as many as 10,000 people at some future time may work, raise families and live out their lives. The 185-page volume is based on a study sponsored by the American Society of Engineering Education and NASA, held at the Ames center and Stanford University, in which 31 engineers, scientists and students participated. The book is priced at \$5.00, on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20301 (stock number 033-000-00669-1).

Space Shuttle: Who Can Go?

by Carolyn Henson

Space, once the preserve of highly trained supermen (and one superwoman) is about to open up to ordinary people, according to Dee O'Hara, administrator of a NASA program at Ames Research Center (Moffet Field, Calif.) which is studying human response to simulated shuttle flights.

Last spring, a group of 10 women aged 35 to 45 volunteered to take a simulated shuttle flight. They were spun at 3 g's in a



Gloria Martinez of Milpitas, CA, is being strapped into a NASA human centrifuge during tests at Ames Research Center, Mountain View, CA, to see how women in the 35-45 age group react to 3 g's in simulated space flight. Assisting is Jerry Rose (left) and Don Gundo.

centrifuge to simulate takeoff and then were required to remain absolutely flat on their backs for a month so as to simulate the weightlessness of zero g. Even raising their heads higher than one pillow was verboten. They exercised, flew flight simulators and took tests in this horizontal position. The women were responsible for maintaining their complex medical monitoring equipment (biobelts) as well.

To simulate the isolation of space the subjects, while allowed phone calls, were not allowed visitors. (There was also concern that visitors might bring in the latest viruses.) Test participants had round the clock medical supervision. However, the test facility doesn't have a "hospital" atmosphere; NASA workers and test participants wear street clothes.

How did those women fare? They all passed the physical, mental and psychological tests.

Having determined that the average male or female up to age 45 can handle a shuttle mission with flying colors, NASA is now planning tests on women and men aged 45 to 55, followed by tests on people of both sexes up to age 65. If you would like to help NASA in this project, and get a paid one month vacation to boot, call: Lynne Dunham, Management System Associates, 415/964-0702.



Cardiovascular System Tests -- Nichelle Nichols, with Astronaut Alan Bean, demonstrates how the lower body negative pressure device operates in medical projects designed to help solve problems encountered in space. Volunteers at the Ames Research Center are participating in this and other medical research involving human participation in space shuttle voyages.



Charlene "Kitty" Johnson pedals a horizontal bicycle in an exercise test at NASA's Ames Research Center. Because of the requirement for test subjects to remain horizontal in order to simulate the effect of weightlessness on the cardiovascular system, exercise testing must also be done with the subject prone.



Nance Lou Deardorff, of San Jose, California, "flies" a small flight simulator at NASA's Ames Research Center. Ms. Deardorff is one of ten women in the 35-45 age group who participated in a month-long test program to see how they react to simulated space flight. A newspaper clipping taped to the top of the simulator reads "Can You Afford to Fail This Test?" The simulator, which is "flown" twice a day, is used to measure performance during the study. Bedrest simulates the weightlessness of space flight.



Volunteers for Stress Studies -- The ten women selected as participants in the 27-day medical test at the Ames Research Center were: (top row, l. to r.) Rita L. McIntire, electronics technician; Marion Hays, freelance writer-actress; Wendy L. Heyman, drapery manufacturer; Chrisula Asimos, teacher-medical researcher; Christine Smith, homemaker-registered nurse; (bottom row, l. to r.) Charlene D. Johnson, retail sales clerk; Mary C. Gerbino, housewife-freelance writer; Carol Pruitt, vocational nurse; Gloria A. Martinez, technician; and Nancy Lou Deardorff, banker.

SPORTS IN SPACE

Excerpted from "The High Frontier"
by Gerard K. O'Neill

For good health we should spend some of our time in Earth-normal gravity; yet much of the 'recreation in which the residents of space indulge will surely take advantage of a new option we can never experience on Earth: to have any gravity they like, simply by riding or walking to the right distance from the cylinder axis. On the axis itself gravity will be zero, and it will increase smoothly toward Earth-normal as the valley floor is approached.

Surely new sports will be invented to make use of this degree of freedom: three-dimensional soccer may be one example. Some old sports will also be a great deal more enjoyable in low-gravity. In a pool near the cylinder axis, a dive will be made in slow motion and the waves will break as slowly as in a dream. Those of us who enjoy diving find that under Earth's oceans the need for pressure equalization reminds us, with every foot of depth change, that we're not in our natural element. A pool near the cylinder axis, or an entire sea-world, perhaps on one of the external cylinders, could have a gravity as small as a thousandth that of Earth, and could give the swimmers of the habitat the freedom to forget pressure changes and swim as naturally and freely as the fish.

It seems unlikely that any of the communities will be willing to put up with powered aircraft, because of their noise and smoke, but soaring—the use of air currents to sail in three dimensions with a glider—should be possible. As a glider pilot, I find that people even on the ground seem to feel a sensation of joy and release in watching a glider fly; as Richard Bach has said, perhaps there is something of Jonathan Seagull in each of us.

From the time of classical Greece, and perhaps even before, some men have been fascinated by the idea of flight by human power alone. Leonardo da Vinci was obsessed by it, and filled notebooks with sketches of machines that he hoped might fly. In modern times, human-powered aircraft have been flown short distances, but under Earth-normal gravity human-powered flight remains an almost impossible dream. In space communities, it will become easy for everyone, not just for athletes. Near the cylinder axis, where gravity will not be more than a tenth or a twentieth that of Earth, almost every imaginable variety of human-powered flying machine, including some of Leonardo's, will work. We can imagine elderly ladies and gentlemen taking their evening constitucionals by gently pedaling their aircraft, while viewing the world two

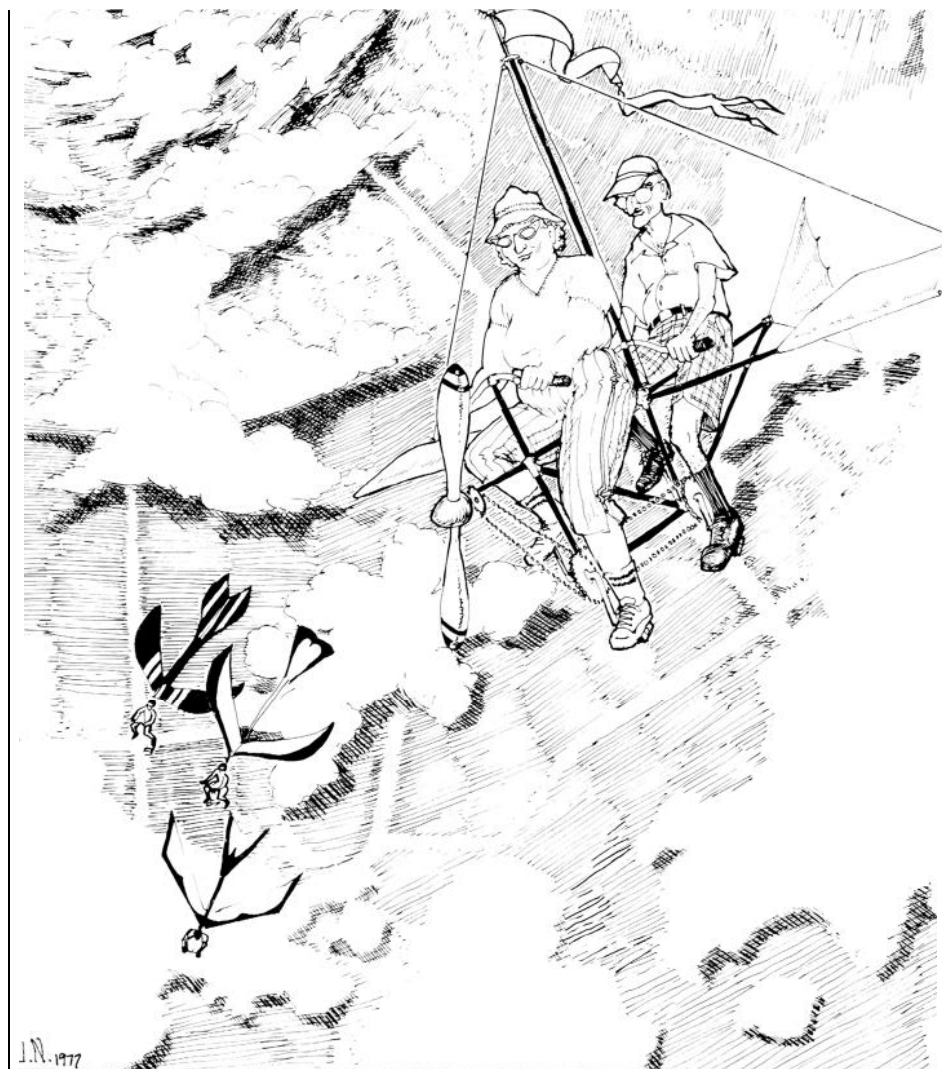
miles below them. Because they will be in a "gravity" which is produced by rotation, they will be able to change it at will, by flying with or against the direction in which the habitat turns. At a distance of a hundred yards from the axis, they will experience three percent of Earth-normal gravity. If they choose to fly against the direction of rotation, at a speed of only eleven miles per hour they will cancel gravity entirely.

As at swimming beaches, space dwellers may have to provide something to keep people out of danger—in this case a near-invisible cylindrical net to prevent a tired flyer from straying too far from the cylinder axis into a high-gravity region.

Where the valleys end and the hemispherical endcap begins its upward curve toward the cylinder axis, the temptation will be great to model the mountains of Old Earth. A hike up those mountains will be a good deal easier than on Earth: as the climber makes his way to higher altitude, and starts to become tired, gravity will be lessening with every foot of height gained. At the 7,000 foot elevation

above the valley floor, he will weight only 30 percent as much as he did on Earth or at the start of his walk, and can climb in bounding strides. At the top, 10,000 feet above the valley, he will weigh nothing at all. He will have passed the clouds at about the 3,000-foot level, so they will be far below him, but he will find that the atmosphere has lowered in density only as much as for a 5,000 foot climb on Earth.

Much of this chapter has been devoted to the less serious side of space colonization; not questions of economics and production, but of amusement and diversion. It seems appropriate to close with an account of one memorable lunchtime conversation: in the years before the topic of this book was well known, I had made a practice of challenging skeptics to name their favorite sports, and then always pointing out that the sport could be done better in space than on Earth. Finally someone named a delightful sport that, even in these uninhibited days, is carried on only in private. The skeptic instantly became a believer: can one imagine a better location for a honeymoon hotel than the zero-gravity region of a space community?



Science Faction Bookshelf by Robert Anton Wilson

Exo-Psychology

by Timothy Leary
Peace Press, Los Angeles, 134 pp., \$8

Prolongevity

by Albert Rosenfeld
Knopf, New York, 1976, 250 pp., \$8.95

The Immortalist

by Alan Harrington
Celestial Arts, Millbrae, 1977, 313 pp., \$5.95

It is getting harder and harder to draw a line between science-fact and science fiction, because the implications of current science are often more staggering than anything published in *Analog* or *Galaxy* ten years ago, or five years go, or even two years ago. The rate of acceleration of social-technological change is itself changing at an accelerating rate; Prof. Gerard O'Neill's latest space-city designs are already more futuristic than the Clarke-Kubrick space-ships in 2001.

Dr. Timothy Leary has accepted the interpenetration of science-fact and science-fiction cheerfully, as an inevitable development; he calls his new book, *Exo-Psychology*, "science-faction," on the grounds that his facts come from science while his style is deliberately science-fiction in flavor.

Exo-Psychology is an astonishing performance even for the Most Controversial Man in America. It's only 134 pages long, but it incorporates hundreds of new ideas in psychology, neurology, ethology, genetics, sociology and dozens of other sciences, making it one of the most compressed, condensed, highly charged books I've ever seen. Attempting to summarize it is like attempting to summarize the *Britannica*; to review it is like reviewing 20th Century culture itself.

Leary asserts that DNA was seeded on Earth (and on millions of other planets) by Higher Intelligence. This does not mean "the police-court Jehovah" of monotheism, he says. Higher Intelligence *might* be (a) an advanced interstellar civilization, as suggested by Nobel geneticist Sir Francis Crick, the first to propose that DNA was seeded here; or (b) ourselves-in-the-future traveling backwards in time, as suggested by physicists Jack Sarfatti and Saul Paul Sirag; or (c) sub-atomic consciousness, as suggested by physicist Evan Harris Walker.

Higher Intelligence, Leary proceeds, designed the DNA to evolve, through metamorphoses and migration, into ever more complex and more intelligent forms. Evolution is not guided by "least possible effort and greatest possible blunder"

(Nietzsche's caricature of Darwinsism) but by a pre-programmed "brain" within the DNA tape-loop.

All living organisms, then, are survival-machines designed by DNA to transport itself about, reproduce itself and create more and better DNA. In short, we are, as geneticist Herbert Muller likes to say, "giant robots" programmed by DNA for its own purposes; we are "fragile, easily replicable units," Leary adds, because DNA can make myriads of duplicates of us.

At each stage of development, each individual robot takes a new imprint in the ethological sense and thus mutates from one "tunnel-reality" to another. For instance, the emotional game-playing of the toddling infant recapitulates mammalian territorial rituals, and the infant lives in a primate tunnel-reality at the stage. The school-child learning to parrot lessons lives in a Paleolithic tunnel-reality. The adolescent gang recapitulates the barbarian horde (Attila, Genghis Khan, etc.) The domesticated adult lives in the tunnel-reality of his or her tribal guilt-virtue game.

No conditioning techniques, Leary insists, can permanently change such imprints. Skinner's Behavior Mod works only so long as the conditioner has the victim more or less imprisoned and totally controls reward and punishment. Once the subject gets free of the conditioner, behavior drifts back to the biochemical circuits of the original imprint.

On the other hand, Leary says, if you can learn to serially re-imprint your own nervous system, you graduate to a new level of evolution, which he calls I^2 , which means intelligence-squared, or intelligence-studying-intelligence, i.e. the nervous system studying and re-imprinting itself. You can then become as smart as you wish, as brave as you wish, as happy as you wish, as wise as you wish. This is a quantum jump above the robot-level at which animal life, and most of humanity have functioned hitherto.

There is no end to this serial re-imprinting. "The more intelligent you become," Leary says, "the more you see the advantage in becoming even more intelligent."

The result of this self-metaprogramming is that all the Utopias and Heavenly visions of our imagination can be achieved; we need only imprint these possibilities to make them neurologically real, and then we can begin making them physically real. "Since no one can allow the game to become bigger than Hir concept of the game (what is not imprinted is not real to the primate brain) therefore

let us define the game as large, fast, intense, precise as possible: Unlimited Space, Unlimited Time and Unlimited Intelligence to enjoy same."

Leary summarizes this goal into the acronym SMI²LE, which means Space Migration, Intelligence² and Life Extension. After the neuro-psychology of imprinting is clarified, most of *Exo-Psychology* deals with the practicality of beginning this Triple Mutation immediately.

Albert Rosenfeld's *Prolongevity* deals with 1/3 of Dr. Leary's Triple Mutation program -- Life Extension. Rosenfeld, who was science editor of *Life* for 11 years and is now science editor of *Saturday Review*, seems to have interviewed *everybody* engaged in Life Extension research in the United States-or, if not, he probably didn't miss more than a few of them. They all agree that a quantum jump in human lifespan is a very real possibility very soon.

There are degrees of optimism, of course; some speak of merely doubling human lifespan, adding another 70 years; others talk of extending life into centuries or thousands of years; one chapter is devoted to scientific Immortalists, who think we can conquer death entirely sooner or later.

Prolongevity (a title James Joyce would have loved) is sheer science-faction; the implications are staggering, but the sources are all reputable scientists, who have hard facts to back up their hopes.

Rosenfeld concludes with a 40-page philosophical discussion titled "Should We Do It?," in which he discussed the arguments against Life Extension and finds them all weak and short-sighted.

Longevity, to Rosenfeld, means "To have time to travel everywhere and go back again and again to favorite places. To go on learning-new skills, new sports, new languages, new musical instruments . . . To read everything you want to. read. To listen to all the music. To look at all the pictures, and even paint a few. To savor and re-savor experience and arrive, not at boredom but at new levels of appreciation . . ."

"There could arise a new breed of human being," Rosenfeld says, "who, merely by virtue of longevity, through

About the author: **Robert Anton Wilson** is a former senior editor of **Playboy**. He has since turned to freelance writing; his recent science fiction trilogy, **Illuminatus** (coauthored by **Robert Shea**, editor of the **Playboy Forum**) has been adapted to the stage and is playing to packed houses in Western Europe.

acquisition of a steadily maturing wisdom and a steadily expanding awareness, could finally become . . . a being worthy to be the trustee of our future evolution."

Rosenfeld agrees with Leary that DNA has programmed us (all life-forms on this planet) to survive, reproduce and die. He also suggests that, in creating humanity, DNA programmed a robot conscious enough to resent death and intelligent enough to do something about it eventually.

Leary and Rosenfeld could say, like Gurdjieff, "Our way is against God and against Nature"—except that they see DNA (the modern equivalent of what mystics meant by "God" and "Nature") as programming this rebellion also. As a "self-developing organism" (Gurdjieff's term), Humankind seems to have been programmed with all the characteristics necessary to transcend the limitations of biological life as it has hitherto existed on this planet.

The ultimate, or a kind of ultimate, in this line of speculation is Alan Harrington's *The Immortalist*, which may be as important as *Das Kapital* or *The Origin of Species* or *The Golden Bough*. Harrington, an old friend of Kerouac and Ginsberg and one of the original creators of the Beat Generation of the 1950's, has not mellowed out on Buddhism, tranquilized himself with Transcendental Masturbation, or collapsed into paranoia and bitterness. Instead, he has become more revolutionary and more Utopian over the years. *The Immortalist* is one of those rare books that challenges you to re-think your basic philosophy about the universe *totally*. It is the literary equivalent of finding a rattlesnake in your bedsheets; you can't ignore; you have to take a stand and make a decision about it.

When Harrington last spoke in Berkeley, a few months ago, he was shouted down and booed off stage in a demonstration of hooliganism that hasn't been seen here since Alan Watts was similarly mistreated by Left Fascists back in 1966. It is, of course, a tribute to both Watts and Harrington that they were not permitted to speak; this shows how powerful their ideas are, and how frightening such ideas are to certain neophobes.

The Immortalist carries current life extension research and theory to the logical conclusion: Humanity, Harrington proposes, can and should ultimately conquer death.

"Death," Harrington says, "is an imposition on the human race, and no longer acceptable."

"Let us hire the scientists," he says, "and spend the money, and hunt down death like an outlaw."

Where Rosenfeld provides the scientific evidence that longevity and eventual immortality are possible, Harrington tackles the much heavier question of their desirability, and does not hesitate to damn and blast every organized ideology based on the acceptance of death. Those who love death, Harrington insists, have the right to die; but they have no right to tell those who love life that we have no moral or metaphysical right to extend it indefinitely. He is quite willing to dance on their graves, but he is not going to let them persuade him to crawl into the grave next to them.

The Immortalist smashes more sacred cows, questions more "unquestionable" dogmas, assaults more prejudices than any

single book I have ever read. Gore Vidal has already said, with some awe, "Mr. Harrington may have written the most important book of our time." I would go further: Alan Harrington has written the most important book of the millenium.

"Poor Allen Ginsberg," Tim Leary said to me recently. "He lives in constant fear that the future is going to be different from the past." The same fate has overtaken most of the radicals of the '50s and '60s, who are now the most nostalgic and reactionary people around. Alan Harrington stands head and shoulders above all of them, looking bravely into the future while they day-dream wistfully of a dead and irrelevant past.

Entertainment

Space Opera Debut

L-5: A Space Opera will open at Keystone Korner in San Francisco October 31. The producer is Ron Giteck. Music director is Eddie Snakepit Edwards; models are being built by Blaine Lemert, and holograms of the models will be projected onstage by Multiplex, Corp. Technical advice is being provided by the L-5 Society.

Producer Giteck, a systems engineer/anthropologist turned Bay Area music critic and opera librettist, promises an "upbeat" view of the future that nevertheless "grapples with our fears."

Space Habitat Display

by Jay Vivian

The California Academy of the Sciences in Golden Gate Park, San Francisco, is currently showing a space settlement display of interest to L-5ers. It's bordered with excellent photographs, including one of a weightless Skylab astronaut blowing a water globule, and a view of San Francisco Bay from 200 miles up. It was apparently done by NASA; it is quite well-done, very accurate, and reasonably realistic.

The display consists of a series of consecutive windows which are arranged sequentially in an arc. They begin with a good moving-lights representation of the lunar mass-driver hurling pieces of Moon into space, including (get this, you detail freaks!) the buckets actually slowing down at the end of their track for their return and accelerating during their hurl cycle. Other windows include one on power satellites,

and a rotating Bernal Sphere, which is the best demonstration I've seen of watching the neighbors down the street "walk on the ceiling." If you put aside your embarrassment and crouch down to an 8-year-old's height (if you can push all the 8-year-olds out of the way!), you're actually *there*.

The display is a bit low-level; regular readers of the News won't get much out of it. But go anyway; the Academy is fun, and it's worth it to see all the excitement the display generates. When I was there I heard one very little girl ask "can we go there on our next vacation?" Maybe not her next one, but . . .

L-5 Radio News

L-5 members can now tune in to "The Joyful Wisdom Program," a music, news and information show scanning the planet Earth for signs of intelligent life. This futuristic radio show is nationally syndicated, usually as FM Sunday programming.

The show features music and commentary on futuristic topics with the likes of Jerry Brown, Timothy Leary, Barry Goldwater, Stuart Brand, Gerry O'Neill, Carl Sagan, and John Lilly; not to mention Grace Slick, Lindsay Wagner, Paul McCartney, Lonnie Liston Smith and Fleetwood Mac.

Of special interest to L-5ers is the "L-5 File" featuring, among others, Carolyn and Keith Henson, and "Evolution News." The show also carries special features called "Conversations With Higher Intelligence" and an evolutionary soap opera, "As the Earth Learns."

Check your local listings!

Synergy Coalition

The L-5 synergy coalition is changing its name to the 'Earthrise Synergy Coalition.' The coalition also has a new address:

Earthrise Synergy Coalition
c/o S.A. Varugnese
R.D. 2 Box 707
Sussex, N.J. 07461
Projects underway:

Project moonbase: object, to design a small, low cost personed research base on the surface of the moon.

Needed personnel: closed system ecologist/agronomist, nutritionist, social scientists, vacuum engineer, etc.

Project leader: Larry J. Freisen

Political Activities Committee: the need for positive action on behalf of the space colonies in the political arena is evident. The Political Action Committee will act as a lobby, generally making the government recognize solar energy from space and space habitation as a serious and timely matter.

Needed personnel: people to act as liaison between persons with various

interests such as national energy independence, equalization of world resources, clean energy alternatives, space resources utilization, etc., also needed are persons to write letters and to monitor congresspersons.

Project coordinator: Jim Bennet

If you are interested in any of these projects, or would like to get involved in an up-coming project, write to the coalition.



Is There a Mayflower in Your Future?

by Carolyn Henson

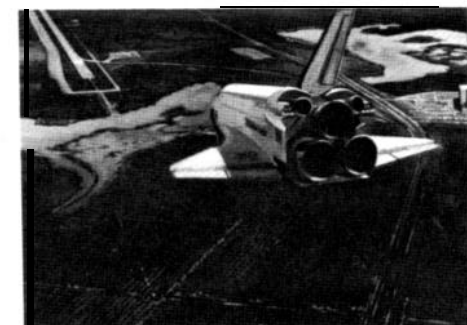
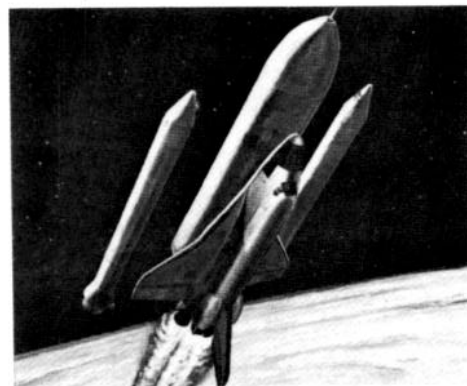
Many cultures have a history of epic migrations. The United States is one. For hundreds of years, wave after wave of people, eventually millions strong, boarded ships all over the world and sailed to their new land.

Some were prisoners or slaves; their fates wrote new chapters in humankind's grim history of brutally exiled and uprooted people. But others, like the Pilgrims, worked and prayed for the opportunity to make new worlds for themselves. The first ship they sailed, the Mayflower, was small, creaked in a distressing manner during storms, and was as crowded as the worst slave ship. But her people boarded freely. No government bureaucrat told them who had to go or who couldn't. They followed their dream.

The shuttleorbiter 101, now being tested in a series of free flights, was named Enterprise after a space ship in a popular television series, Star Trek. The U.S. government had originally planned to name it "Constitution" but adopted its present name after a nationwide letter writing and petition gathering campaign persuaded President Ford to back the Enterprise name change.

However, Enterprise will not be the first shuttle orbiter in space. Her yet unnamed sister ship, orbiter 102, is being outfitted for a space flight in 1979 which will be the first in what will soon become routine shuttle missions.

George Koopman (see Sept. L-5 News pg. 2) has suggested that we name orbiter 102 the "Mayflower". And as we watch the first shuttle breakthrough into space, perhaps we can dare to hope that within this century, free people all over the world will once again begin to board ships for new worlds.



As an eleventh-grader, it appears to me that, while your generation will be the one to appropriate the initial funds for the research into the developments of S.S.P.S.'s, space colonies, etc., our generation will be the one that actually votes "yes" or "no" for development of the first colony, that makes up the board of directors that says "yea" or "nay" to a proposed space factory, and so on. So, since our generation will be the one to -- or not to -- develop space exploitation, I think a major effort should be placed on "gettin' 'um while they's young". Now, for two questions in that respect:

- 1) What can supporters of space exploitation of all ages do to encourage young people to want to see space exploited?
- 2) What can us young people do to help encourage other young people to want space exploitation, and to help get the wheels turning?

Don Campbell
San Juan Capistrano, Calif.

You can help by getting your friends to join the L-5 Society and/or the National Space Institute. Write in to the L-5 office at 1620 N. Park, Tucson, AZ 85719 for free L-5 buttons, brochures, leaflets, etc. The National Space Institute is more strongly geared toward high school students than we are, although they put less emphasis on actually getting jobs and homes in space some day. They can be reached at 1911 N. Ft. Meyer Dr. Suite 408, Arlington, VA 22209.

And what makes you think us ancient folks over 30 will be too creaky to go in another 15 or 20 years -- you young whipper-snapper! -- CH

I believe that L-5 members who are also educators, will wish to know about *NASA Report to Educators*, a quarterly publication available to educators without cost by writing to the Educational Program Division, Office of Public Affairs, Code FE, National Aeronautics and Space Administration, Washington, D.C. 20546. The report often lists various

materials available from the government on space related topics. These include a number of excellent 16 mm films on Skylab, remote sensing of the Earth and exploration of the Moon and Mars, which can be borrowed by educators without cost.

Jay S. Huebner
Jacksonville, FL

I am unable to comprehend the logic behind the statement which was made by Budget Director Bert Lance. He has stated that work on the 1979 fiscal year federal budget has begun and a sharp cut in NASA's space programs is possible.

NASA is now working with a bare minimum budget which is less than one percent of the national budget. I cannot see how NASA could survive as a space agency if there is a sharp reduction in the size of the budget NASA now has.

I believe a dramatic example of how budget cuts affect NASA is the Jupiter orbiter/probe mission in 1978's fiscal year budget. At question was seventeen to eighteen million dollars, hardly a sharp cut in funding. However, without those funds America would no longer have a planetary flight capability.

As a private citizen the only thing I can do is ask my fellow American citizens to write President Carter asking him to support a strong and effective space program in the federal budget for fiscal year 1979.

G.M. Wannamaker
FPO New York

I am a student at John Muir High School, Pasadena, and one of motion picture production. I am currently working on a super-8 sound film project about space colonization. This effort won't be quite on the same level of "Star Wars," but could well pave the way for future releases of that sort. With my interest in filmmaking as it is, I realize the potential film has for bringing across concepts and ideas.

With a broad range of technical expertise help, it will be possible to produce a film communicating to the audience the possibilities of space colonization, the problems, and benefits. The film will revolve around a tightly scripted plot and story. Realizing that this type of project will have competitors already, I am refraining from detailed discussion of contemplated scenarios, specific technological concepts, etc. I am working in conjunction with several L-5 society members who have worked in the space industry for many years, and I am striving to form a team to back this effort on a conceptual, operational, and financial basis. Those who would like to learn more about the film, and partake in

our effort will be invited to attend a briefing in Pasadena this fall, upon inquiry to the following address. We're not asking L-5 members to do everything for us on a voluntary basis, but we do need the opinions, advice and talent from those members and associates who also feel a film is in order now, to educate people and get them excited about space colonization.

We solicit the interest of those who cannot attend the briefing also, and welcome their correspondence. The members of our team have a strong desire to promote the idea of space colonization-more rapidly, more graphically, more vicariously, so that more people can see the potential of space colonization, and back it more forcefully. We want to see this thing become a reality in our own lifetimes. Your support will be greatly appreciated, as in any effort in its beginning stages, we need it badly. Thank you for any help you may be able to give. In accordance with our new slogan, "Space is the place for the whole human race," we can most assuredly state, a star is born. . . . space colonization! Address inquiries to:

SPACEHAVEN
attn. Daren Nigsarian
1250 Wabash St.
Pasadena, California 91103

Much of the sunlight which could be caught by geosynchronous power stations and microwaved to terrestrial destinations for conversion to electricity would otherwise have shot right on by the Earth. A consequence, which I have not yet seen soberly commented upon, is increased insolation and, hence, a higher mean temperature. Under the climatic circumstances that man has enjoyed for 20,000 years, this extra heat would soon melt Antarctica's ice and flood all major seaports, rather forcing attention on the advantages of high-in-the-sky habitations. But, it appears, we are in luck. There is solid confirmation that we terrestrials are on the brink of a new Ice Age (if last winter did not convince you) born of certain resonance conditions in Earth's orbital mechanics. Unless the microwaves have untoward side effects, it look like we might make our migration to L-5 at a leisurely pace.

John R. Kirk
New Paltz, N.Y.

Well, you finally published a part of one of my letters, although my comment was placed in a negative light by the previous letter in the page. I am glad you didn't give my full address since I have no desire to receive 100 page refutations of my stand. Now, placing foot firmly in mouth, I will continue with commentary.

I feel that in the interest of international

cooperation we should send copies of all test results and design specifications of the experimental mass driver to every country with money invested in space, Russia in particular, since we only want into space who cares which country provides the means? If Russia decided to develop the mass driver in conjunction the Salyut space station as a viable space exploitation (yeah, I said "exploitation") device, maybe our government would get in gear on our programs.

The success of an organization as a lobbying force depends on the assurance that the members can write to Congress without using form letters. Also, petitions are probably as effective as letters, especially when from registered voters in the politician's district. We could take some pointers from the NRA in their fight against the attack on our right to keep and bear arms. They attack the politicians on the basis of their stand on one issue regardless of any of the politician's other attributes. Are we willing to do the same to achieve our goals?

Now, back to the original problem of the equatorial countries. These countries wish to claim the geosynchronous orbit space above their countries. This is about as significant as claiming a 23,000 mile coastal zone. While we are getting this straightened out, let's settle the problem of giving every country access to sea resources. The U.N. is useless in solving this problem since its directives have all the force of a wet noodle. If China, for example, went into space industrialization I doubt that the wishes of Equador would carry much weight. One of the reasons for space industrialization would be to free us from the scarcity of earth resources: we won't be hamstrung by international cartels trying to gouge the best price for materials that they couldn't use or develop on their own. Space should not be subject to piracy. It's not our nationalism, but that of small countries that is causing the problems. I can just see the Idi Amin memorial SPS. Neutrality is useless unless backed by deterrent. Maybe violence is the last refuge of the incompetent, but I am not too impressed by the competence so far exhibited by our leaders. I am afraid we will take our natures into space. In fact, space must be settled so that we will have a social group bound together by space instead of nationality. Conflict abounds and the easy or intellectual way may not prevail. Is there one economist or politician that has done as much to end large scale war as Einstein did with $E=MC^2$?

Richard Strong
Swartz Creek, MI

What's Available from the L-5 Society?

Books:

| | | |
|--|----|---------|
| <i>The Hunger of Eve, A Woman's Odyssey Toward the Future</i> , Barbara Marx Hubbard Stackpole Books, Hardbound. 1976 | B1 | \$ 8.00 |
| <i>The High Frontier: Human Colonies in Space</i> , Gerard K. O'Neill William Morrow & Co., Hardbound. 1977 | B2 | \$ 8.00 |
| <i>Colonies in Space</i> , T. A. Heppenheimer Stackpole Books, Hardbound. 1977 | B3 | \$12.00 |
| <i>The fourth Kingdom</i> , William J. Sauber Aquari Corp., Hardbound. 1975 | B4 | \$ 6.00 |
| <i>War and Space</i> , Robert Salkeld Prentice-Hall, Inc., <i>Unbound copy</i> , 1970 | B5 | \$ 7.00 |
| <i>Exopsychology</i> , Timothy Leary Peace Press, Paperback. 1977 | B6 | \$ 8.00 |
| <i>Colonies in Space</i> , Frederic Golden Harcourt Brace Jovanovich, Hardbound. 1977 | B7 | \$ 8.00 |

Posters:

| | | |
|--|-----|---------|
| Bernal Sphere Interior 14" x 22" full color | PO1 | \$ 2.00 |
| Bernal Sphere Exterior 14" x 22" full color | PO2 | \$ 2.00 |
| Pioneer XI in the Rings of Saturn Adolph Schaller 17" x 22" full color | PO3 | \$ 3.00 |

Postcards:

| | | |
|---|-------------|-------------------|
| Bernal Sphere Interior package of 50 | PC1 BPC1 | \$.15 \$ 3.00 |
| Bernal Sphere Exterior package of 50 | PC2 BPC2 | \$.15 \$ 3.00 |

Back Issues:

| | | |
|---------------------------------------|------|---------|
| L-5 News, Volume 1:1-16, Volume 2:1-6 | BI # | \$ 1.00 |
| Complete set of back issues | BIA | \$22.00 |

Otherwise Unpublished Papers:

| | | |
|---|-----|---------|
| "Space Resources and the Human Race," W. L. Hurd, Jr. 22pp. | UP2 | \$ 1.54 |
| "The Nature of Space Law," Scofield and Morgan 123pp. | UP4 | \$ 8.61 |
| "Space Manufacturing from Nonterrestrial Materials, 1976 NASA Ames/OAST Study" 240pp. | UP5 | \$15.00 |

Four color process T-Shirt Transfer,
8 x 11. Actually dyes into the
material as it is ironed-on. Won't
peel off!

This is a full color reproduction of a
NASA photograph, with the
continent of Africa, the Red Sea and
Saudi Arabia clearly visible. \$1.50 each

Reprints:

| | | |
|---|------|---------|
| "Satellite Power Stations," William C. Brown, <i>IEEE Spectrum</i> , March, 1973. | P1 | \$ 1.00 |
| "Colonies in Space," <i>Time</i> , June 3, 1974. | P2 | \$.37 |
| "Colonization of Space," Richard M. Reiss, <i>Mercury</i> , July/August, 1974. | P3 | \$.86 |
| "The Colonization of Space," Gerard K. O'Neill, <i>Physics Today</i> , September, 1974. | P4 | \$.93 |
| "Lagrangia: Pioneering in Space," Gerard K. O'Neill, <i>Science News</i> , September 21, 1974 | P5 | \$.37 |
| "An Orbiting Solar Power Station," <i>Sky and Telescope</i> , April, 1975 | P6 | \$.51 |
| "Colonizing the Heavens," Isaac Asimov, <i>Saturday Review</i> , June 28, 1975. | P7 | \$.65 |
| "The Garden of Feasibility," Gwyneth Cravens, <i>Harper's Magazine</i> , August, 1975 | P8 | \$.79 |
| "Space Colonies and Energy Supply to the Earth," Gerard K. O'Neill, <i>Science</i> , December 5, 1975 | P9 | \$.65 |
| "Wireless Power Transmission," John F. Mason, <i>Electronic Design</i> , December 6, 1975 | P10 | \$.44 |
| "Colonies in Space," Ron Chernow, <i>Smithsonian</i> , February, 1976 | P11 | \$.86 |
| "Moon Mines, Space Factories, and Colony L-5," Michael Guillen, <i>Science News</i> , August 21, 1976 | P12 | \$.44 |
| "Engineering a Space Manufacturing Center," Gerard K. O'Neill, <i>Astronautics and Aeronautics</i> , October, 1976 | P13 | \$ 1.00 |
| "The Impact of Space Colonization on World Dynamics," J. Peter Vajk, <i>Technological Forecasting and Social Change</i> , 1976 | P14 | \$ 2.38 |
| Complete set of reprinted articles | CP15 | \$11.25 |



WHAT IS THE L-5 SOCIETY?

"... I believe you are helping to pave the way for future developments that can profoundly affect mankind."

—Senator Barry Goldwater

"I see a lot of similarities between the L-5 Society and the American Rocket Society of the 1930's. In either case the groups were dealing with new concepts and ideas that had considerably more technical feasibility than was recognized by the technical community at large. The L-5 Society provides a forum for discussion and dissemination of ideas and concepts for the large scale human habitation of space that may occur in the future. These ideas are much broader in aspect than the technical concepts alone. The L-5 Society recognizes these broader aspects."

—Gordon Woodcock, *Solar Power Satellite Study Manager, Boeing Corporation*

"Those of us primarily concerned with detailed research and with the integration of university, government, corporate and independent activity into a united program welcome the help of the L-5 Society, as a citizen's organization publishing an informal, wide-ranging, and chatty newsmagazine and providing occasional grants particularly for student research activity."

—Gerard K. O'Neill, *Professor of Physics, Princeton University*

"I am proud to be an L-5 member."

—Robert A. Heinlein, *author, Stranger in a Strange Land, The Moon is a Harsh Mistress*

"The L-5 Society aids the public understanding of the benefits of outer space in many scientific and legal areas, including its practical importance with respect to world peace."

—Hon. Edward R. Finch, Jr., *Chairman, American Bar Association Aerospace Law Committee*

"I have read the Newsletter from the L-5 Society . . . with great interest. Space colonization as a future possibility for the peaceful use of outer space technology is gaining increasing attention from a number of member countries of the Outer Space Committee of the United Nations."

—Peter Jankowitsch, *Chairman, Outer Space Committee of the United Nations*

"The L-5 Society manifests the pioneering spirit that brought people out of the caves and onto the moon. It is an indispensable source of information for all concerned with the future of the human species. Don't miss it!"

—Barbara Marx Hubbard, *author, The Hunger for Eve*

The L-5 Society is an international organization working to make space settlements a reality-by 1990!

L-5 members receive a monthly magazine, the *L-5 News*, which covers fast-breaking developments in space industrialization, satellite solar power, and space settlements. Pertinent books and articles are reviewed; calls for papers, conferences, requests for proposals, contract awards and job opportunities are reported. In-depth articles and interviews with major workers in the field explore the problems and promise of moving into the space environment on a large scale. And, perhaps most important, the *L-5 News* is a forum in which Society members raise and discuss what history may judge to be the most significant issues of our century.

The L-5 mail order service provides

books, posters, postcards, slide shows and reprints of hard to locate articles, as well as pre-publication copies of papers and back issues of the *L-5 News*.

Special projects of the L-5 Society have included presentations at the "Limits to Growth '75" conference, the UN Conference on Habitat in 1976, and co-sponsorship of the AAS/AIAA Conference on the Industrialization of Space in 1977. The Society also provides small scale research grants to workers in the field.

Membership in the Society is \$20 per year, \$10 for students.

The L-5 Society is a nonprofit, tax-exempt organization under section 501(c)(3) of the Internal Revenue Code. Donors may deduct contributions to the L-5 Society as provided in section 170 of the Code.

L-5: A Place in Space

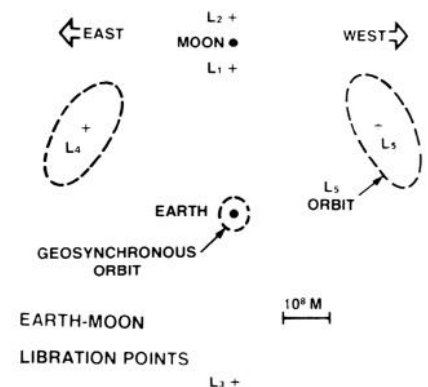
by T.A. Heppenheimer, *author of Colonies in Space*

L-5 is the fifth Lagrangian Libration point. But what are libration points? They are locations where a spacecraft may be placed so as always to remain in the same position with respect to the Earth and the Moon.

The French mathematician, Lagrange, in 1772, showed that there are five such points. Three of them lie on a line connecting the Earth and Moon; these are L-1, L-2, and L-3. They are unstable; a body placed there and moved slightly will tend to move away, though it will not usually crash directly onto the Earth or Moon. The other two are L-4 and L-5. They lie at equal distance from Earth and Moon, in the Moon's orbit, thus forming equilateral triangles with Earth and Moon. The Sun is in the picture, and it disturbs the orbits of spacecraft and colonies. It turns out (from an extremely messy calculation done only in 1968) that with the Sun in the picture, a colony could be placed not directly at L-4 or L-5, but rather in an orbit around one of these points. The orbit keeps the colony about 90,000 miles from its central libration point.

But what has people excited is not what orbit might be used, but rather what could be done there. Space industries in high Earth orbits could manufacture solar power satellites (SPS) from lunar or asteroidal resources. Each SPS could deliver twice as much low cost, environmentally safe energy to Earth, via microwaves, as the Grand Coulee dam, and forty five of them could meet the total present electrical power needs of the U.S.

This activity would create tens of thousands of jobs in space as well as on Earth within as short a time as 15 years, and getting tens of thousands of us living and working in space is the goal of the L-5 Society.



EARTH-MOON LIBRATION POINTS

