

L-5 NEWS



AN EVOLUTIONARY IMPERATIVE?

William J. Sauber,
author of *The Fourth Kingdom*

I would like to view the history of flight from the simplicity of a biological perspective. I view the human primate and the machines created by humanity as a biological phenomenon, the proof of an evolutionary imperative in Nature to assure the survival of life. We humans are, no more and no less, specialized animals with two functions: to carry the miracle of living awareness as do the other animals; and to support the tree of

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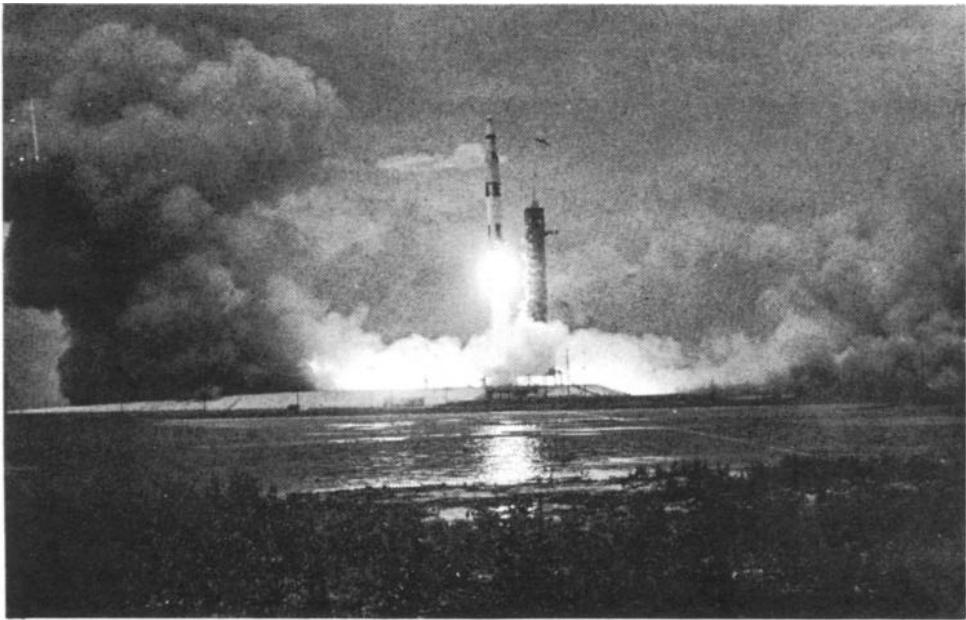
JANUARY, 1977

technology, rooted in our brain and supported by our intellect. This tree of technology contains the seed blossoms of the life of planet Earth whose purpose will be to spread life to other planets in the Galaxy in the same way the seed blossom of a dandelion allows the otherwise stationary plant to spread to other meadows.

Our first space arks launched to the gravitational currents of the Milky Way will be life's seed pods in the same

context and no more miraculous than the seed pods launched by a coconut palm to the unknown currents of ocean as insurance for survival, to take root on another island, in case its island explodes or sinks. The act is the same; for the survival of life. For the Earth is a cosmic island, someday to be destroyed by its nearby star, when it becomes more unstable.

Creation will not rest until this miraculous life system is seeded to many



planets around many stars; I am convinced that any society which does not recognize the biological imperative for its members is destined to deteriorate and its power structure will fall. Professor Thomas Hughes noted that history has shown that centers of technology shift from one society and one part of the world to another and that we should consider the possibility that the United States will not maintain its technical preeminence in the future. I believe a society loses its scientific preeminence when it matures but fails to recognize Creation's plan for humanity.

Reducing this weighty philosophizing to a short term goal, we should be colonizing Mars instead of looking for the improbability of alien life. Colonizing Mars would be good practice for our longer term destiny of seeding the Galaxy. In the meantime it would give our life system a little more insurance in the event our planet's ecology fails us or we fail it before we can start out for other stars.

I can suffer the burden of whatever piloted space flight costs as long as our life system finds more chances for survival around other stars.

WHY SPACE NOW?

"... it is time to establish our extraterrestrial base in freedom."

Barbara Marx Hubbard, co-founder of The Committee for the Future, Inc., Washington, D.C., is a leading futurist and evolutionary philosopher. She is also an advocate for moving into space now. She was asked, "Why space now?"

"Although we cannot know the timing of the development of extraterrestrial capabilities until we compare ourselves to another planet that has developed, I assume that there is a critical timing factor for optimum development of universal capabilities. The timing logically

would be when we recognize the finiteness of our planetary resources and still have the energy to establish a foothold for human activity in space.

"That time appears to me to be now. The net energy costs on Earth are rising, but the moment we establish a productive facility using Lunar materials and solar energy in space, the net energy costs will fall. Therefore, I believe it is urgent to begin now, before we are constrained by a totally controlled society monitoring limited resources on the planet.

"Now is the time to establish our extraterrestrial base in freedom; later it may be under the coercion of necessity."

SPACE TRAVEL: IS IT IN THE STARS?

Duncan A. Lunan

I think you did very well to print the remarkable views of John Shuttleworth, of *Mother Earth News*, in your newsletter (no. 9) as an example of the emotive arguments space research has to cope with. I can't resist remarking, with respect to "the white man's eco-technology," that the biggest scar on the Earth's surface to date is the Sahara -- largely a product of other races' "eco-technology" in the form of goat-herding. But my main point is to discuss the Hopi Indian spokesman's prophecy, to which John Shuttleworth attached such weight.

It would be possible to argue that there is no such thing as prophecy, and predictions which "come true" do so only by coincidence. That isn't my own view, because I've seen some startling examples which convinced me that true predictions do occur, so let's suppose for the sake of argument that the Hopi spokesman's prophecy is in that category.

The key question then is, are we bound by the prophecy (the Cassandra effect) or can we change the outcome? Modern physics regards the present as a

matter of relative probabilities, so it seems that the future cannot be fully determined. My own minor brushes with predictions have suggested that a sufficiently determined individual *can* alter the course of events, having foreknowledge-i.e., that the prediction just by being made changes the probability of whatever's being predicted. That's only my own opinion, however, so let's consider all the possibilities.

1) *The prophecy is genuine and unavoidable.* In that case L-5 colonies are coming into being regardless before the disaster, so we may as well promote them now in hopes that as many people as possible will survive. Applying Occam's Razor, then, since there are human beings living in the sky near the Earth, the "Purifiers" who are to inherit the blighted Earth are more likely to be reclamation teams from Lagrange cities than to be extraterrestrials or divinities.

(Some curiously similar cases have been suggested concerning the Brahan Seer of Scotland. His prediction of a ship riding at anchor inland, apparently indicating a dreadful flood, was eventually "borne out" by an airship. Likewise his vision of a black rain which must come before the Highlands were repopulated, thought for many years to mean atomic war, is now suggested to mean North Sea oil!)

2) *The prophecy is genuine and avoidable.* In that case, since Lagrange cities are not the cause of the ruin of the Earth, we don't have to cancel them in order to prevent. (But let's prevent it by all means.)

3) *The prophecy is not genuine.* I note that it was published in 1971, and it would have had to be published before 1950, if not sooner, to convince me that the Hopi spokesman hadn't found out about space stations, directly or indirectly, from the national news. It might be genuine all the same, but if the details all came from newspapers then we have no test for validity to apply. That takes us back to 1) and 2), both of which indicate that we should build Lagrange cities anyway; or, if 3) the prophecy is false, then there's nothing to stop us. . . so we may as well go ahead.

WHAT IS THE MAXIMUM HUMAN LIFESPAN?

"There is strong evidence that we can live to be at least 200 years of age," says Saul Kent, editor of *Aging Tomorrow*, "and indications that our ultimate potential for life may be unlimited. Scientists have already doubled the maximum lifespan of laboratory animals by dietary manipulation and developed a host of drugs to extend mean lifespan." Kent is currently criss-crossing the nation to tell people how life extension research will add years of youthful vigor to their lives. To arrange for Saul Kent's appearance, see information on page 10.

MOVEMENT INTO SPACE: A VIEW FROM TWO WORLDS

Part 2 of Interviews
with Dr. Timothy Leary
and Captain Robert Freitag

Elizabeth Robinson

A consensus on space-is it possible? Dr. Timothy Leary, well-known figure in the sixties consciousness movement, and Captain Robert F. Freitag, Deputy Director, Advanced Programs, National Aeronautic and Space Administration (NASA), represent two ends of a political spectrum.

They were interviewed separately; the juxtaposition of their remarks is the author's work. The opinions expressed are personal, and do not necessarily reflect those of any organization.

In Part 1 (December *L-5 News*), the focus was the evolutionary philosophy of the space movement and citizens' participation in the movement. Dr. Leary maintains that the movement from Earth into space is as natural as the movement from water to land, millions of years ago. He believes it is the inevitable next step in the evolution of humanity: it is "our genetic fate" to move into the universe. Captain Freitag sees the movement as *an alternative*, but not necessarily inevitable. He also feels though, that there is "some great force moving us in that direction" (e.g., into the Cosmos).

Leary believes the movement will be a grass-roots citizens' movement and a "free enterprise situation." Freitag says it will have to be institutionalized at first. Not only are the costs of space migration prohibitive for citizens' groups, but the massive organization and planning required would demand "something comparable to the U.S. government on a purely voluntary basis."

Part 2 will focus on four areas: 1) new options in space, 2) cooperation and control in space, 3) the urgency of the space movement, and 4) the effects of space migration on the future of humanity.

New Worlds in Space?

Dr. Leary, why do you think it is necessary for the human species to go in to space?

Why is it "necessary" for a tadpole to become a frog? Why is it necessary for a baby to become an adult? Why is it necessary for a caterpillar to become a butterfly? It's just the way we are built. . . it's our genetic fate.

Some people say that space will increase our options: do you agree?

Yes, that's one of the many indications to me of the genius of Gerard O'Neill . . . that he has been wise enough to define a multiplicity of options as the

basic social and philosophic purpose for space migration. If we remain on this planet, we will inevitably become a crowded, homogenized, uniform ant-like species. The only way to preserve diversity is, I believe, in the proliferation of many kinds of space habitats.

What would you say is the role of Gerard O'Neill as far as the movement into space is concerned?

I consider Gerard O'Neill to be the most important human being alive today, and possibly one of the most important and intelligent human beings ever to live. . . . He has sparked the work that has given us the engineering, the economics, the philosophy, the sociology, the psychology, and even a mythology of space migration. I think he has successfully bridged the gap between the hardware/scientific and the humanistic/artistic.

What about people such as Krafft Ehricke and Barbara Marx Hubbard, who are relatively unknown to the public, but who have been talking about space colonization for a long time?

I think we must be tremendously grateful to Krafft Ehricke. His ideas, especially the extraterrestrial imperative, have probably influenced every literate person who is now involved in space migration. Barbara Hubbard . . . is a key person in humanity's movement into the future. Her books, her conferences, and her genteel and elegant agitating have focused the attention of many powerful industrialists and politicians on future perspectives.

Limited World in Space?

"In the space habitat. . . you have no flexibility."

Captain Freitag, do you think people will have more options in space than they do on Earth?

Never-until you build a habitat as big as Earth. Let's take, for example, the biosphere of the largest of all O'Neill's space habitats. The amount of oxygen per person is one one-hundred-thousandth (1/100,000) of the oxygen per person available on Earth. Each person on Earth has a hundred thousand times more personal oxygen-in the air. . . pure oxygen-as in O'Neill's habitat. This oxygen has to be created out there.

When you have a hundred thousand times as much oxygen per person on Earth as you have in the habitat, you have eliminated millions of problems. You can pollute that oxygen and still survive. In the habitat, you can stand zero pollution; you have to have a whole

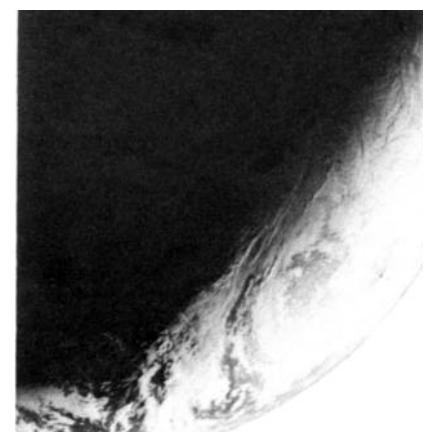
ecological system that makes sure that even the smallest of trace contaminants are accommodated and taken care of. On Earth, you can make gross mistakes-like shooting off nuclear bombs in the atmosphere-and get away with it. It's this type of comparison that says it's so far away.

The space habitat has to be system engineered and thought through to a degree of elegance beyond anything we are able to do. We're not able to do it technologically; we're not able to do it organizationally; and, we're not able to do it sociologically. We can't even agree with other branches of government, who are supposedly under the command system of a President, whether this is the right or wrong thing to do.

I point out something that is very, very significant. On the Apollo program, we had a unique situation. We had one guy in charge, and he ran three people, who, in turn, ran ten people-these were industrial firms, who ran one thousand people, who then ran twenty thousand people. Finally, the bottom is 400,000 people. That was an absolute command structure. This single man had authority, resources, know-how, and he was able to do that.

Now, when you're talking about a sociological system, you just invert that thing. You can never get a consensus when you have that sort of thing (e.g., no hierarchy). I'm talking about the management of a million different enterprises. You pick your own butcher, your own baker, your own candlestick maker, and everything else. . . you have this freedom and flexibility. In the space habitat, you don't. You have no flexibility. It's got to be a dictatorship to start out with. Maybe you can get flexible like this later on. It's a long way away.

I think in time, we may want to go to a colony, but certainly not to solve the population explosion. You'd set up an



elite core of a few millions or tens of millions that would go out to solve the problem of ten, twenty, thirty billion people left back on Earth . . well, I don't think that will ever happen.

I can see us establishing a colony on the Moon to mine the resources, to bring these resources back to Earth; I can see establishing a colony on the Moon or in low Earth orbit, if you want to call a Permanent station a colony, for the purpose of putting manufacturing processes which are dangerous or polluting in the biosphere into space where they have an unlimited sink.

But to go there to live, to the extent of colonizing in a manner like the Americas were colonized in the fifteenth, sixteenth, and seventeenth centuries is a different situation. I just don't see that happening in the next fifty to one hundred years.

Do you think the movement into space could be a grassroots situation, with the citizens involved?

I think it will be a highly institutionalized-not necessarily governmental-expensive proposition. Right now to go to the Moon it still costs us tens of thousands of dollars a pound. Even with the best technology which we can comprehend in the next twenty-five years, we don't get those numbers down to small numbers for a long, long time. It may turn out that we discover something we don't know about-a form of propulsion which will allow us to get up there fairly cheaply. I think that will happen; it'll happen in the twenty-first century.

Do you think space could be, as Dr. Leary puts it, a "free enterprise situation?"

Absolutely . . . the real way we're going to go. The industrialization of space will be the big thrust in the next twenty-five years.

Do you mean private industry building their own rockets to go into space?

Exactly right. We'll probably see this happening as early as the eighties. We have it today, of course; we have private industry like the COMSAT Corporation placing satellites in space for commercial communication as do all the rest of our communication companies. Now, we also will see tourism where you can buy a ticket for a week in orbit. I don't think that will be too far away.

Efficient Cooperation: Macaulay and Space

"It is evident that many great and useful objects can be obtained in this world only by cooperation. It is equally evident that there cannot be efficient cooperation if men [and women] proceed on the principle that they must not cooperate for one object unless they agree about other objects."

-Thomas B. Macaulay, 1839

Dr. Leary, do you think the words of Macaulay are appropriately applied to the

movement in to space?

Well, it's obvious that the migration into space with current technology is going to require the cooperation of hundreds of thousands of people. It's also obvious that there can be no ironclad uniformity or orthodoxy linking the lifestyles or aspirations of such an enormous group of people.

The basic goal as I see it is to migrate to space safely and harmoniously with the greatest ecological care. Any attempt to restrict, to eliminate, or to preselect or predetermine the quality and the kind of people involved in space migration according to any other criteria is ridiculous in the long run.

As long as one is reliably and effectively committed to the goal of harmonious migration, other personal, racial, stylistic, temperamental, political differences should be welcomed rather than eliminated by bureaucratic selectivities.

There will always be battles for control and priorities. And those of us who believe in diversity are always going to be vigilantly involved in loosening up those that want uniform control. But I just take that for granted . . . that's just the way the game is played . . . nothing to get upset about. We can always laugh the bureaucrats out of office. We've always done it-look what we did to Nixon.

Do you think a certain level of cooperation will be achieved before we go into space, or do you think that cooperation will be a survival necessity forced upon us after we are there?

An example is what developed during World War II. There was a tremendous amount of cooperation among all aspects of American society simply because the time had come-we had to do it. When the survival necessity of space migration becomes obvious, everyone will work together.

Money Talks in Space, Too

"You just can't have a welfare operation in space."

Captain Freitag, would you comment on Dr. Leary's statement that "personal, racial, stylistic, temperamental, political differences must be welcomed rather than eliminated by bureaucratic selectivities" if one is committed to harmonious space migration?

I don't disagree with what he says, but what he neglects in that comment is *who is paying for it?* Whoever pays for it does the selecting. If the United States is paying for it, this doesn't mean we're automatically going to give this benefit and resource to every country in the world. If the *world* is paying for it, then, that harmonious selection goes.

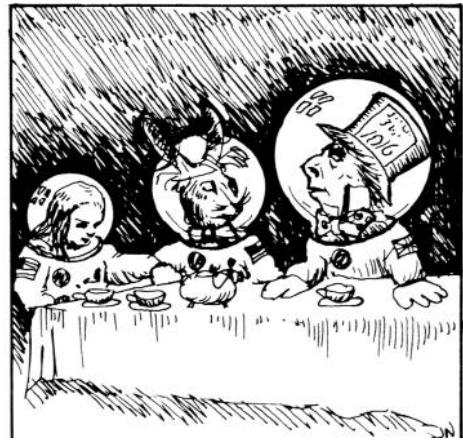
Now, I would also share one other point there-I don't know if he implies it or not-survival in space is going to be a

difficult thing. It's going to take tremendous capabilities. It's bad enough to survive on Earth with limited capabilities, whether they be physical, mental, dexterity, or whatever.

We have found that at least until the time has arrived when you have a very large number of people, the people that go will have to be highly trained and highly capable. Now that doesn't mean to say that any restrictions are applied to anyone; you just can't at first have a welfare operation in space, where someone is unable to contribute according to a very high average.

Everyone has to be a superb contributor; of course, that will gradually erode to the point where non-contributors can come along. When I say "non-contributors," I mean they may be people who are contributing very much less.

Who Will Go?



Who will be the people chosen to go out into space, and who will do the choosing?

I think that the first will be the explorers, of course. Those will be the people who have been associated with things like Apollo, and the experiments on the Shuttle. Next, we'll see the second generation in near Earth orbit, where people like you and I will start flying into space. We're actually talking about (in NASA) the possibility of someone who is not associated with the space program flying in the eighties as the earliest time. It could be a newspaper reporter, or it could be a poet; it could be anyone you could imagine.

Shortly thereafter, the industrialization of space comes about; we'll begin to see everyone from blue collar workers to scientists to sick people who are there to be treated in hospitals in zero gravity. I think all that will happen in the eighties-very, very fast. Now, it will be highly subsidized by government or industry, or once in a while, a few enterprising groups outside. It will probably be not until the nineties that we'll see the voluntary activity of tourism; that type of tourism will start out with those who can afford it. It will

not be a tramp steamer sort of thing; it will be rather expensive, but gradually it will become cheaper and cheaper.

Then I think we'll establish our first colony on the Moon; that colony will probably occur in the late nineties or early in the twenty-first century. It could happen earlier; it could happen later. Again, it would be highly proficient workers-not explorers. It won't be too long afterwards that we will literally have motels on the Moon. That will gradually become a colony early in the twenty-first century.

Where we go from there, I don't know. It could be an artificial habitat; it could be a planet; it could be anywhere. But what happens is just like any other enterprise: first, you have the unique explorers; then, it's the exploiter who is subsidized; then, the exploiter who is there voluntarily. I see that cycle repeated over and over and over: near Earth orbit, far Earth orbit, Lunar, and then beyond that.

Do you think the level of cooperation that we will have in space will be achieved before going there or by necessity after we have arrived? For example, Dr. Leary states that Barry Goldwater, Jerry Brown, Eldridge Cleaver, and himself are all space proponents covering "a political spectrum that is irresistible."

I think just like any other enterprise that cooperation comes from a multitude of people because something in the program satisfies the needs of the individual, whether they be young or old, conservative or liberal; supporting space supports their basic beliefs, whatever they are.

Goldwater supports space because, first, it's a powerful tool for national security; it's a powerful tool for national defense; it's a powerful tool for economic growth of this nation. Some of the other names. . . it'll be based strictly on the sociological glue that it provides.

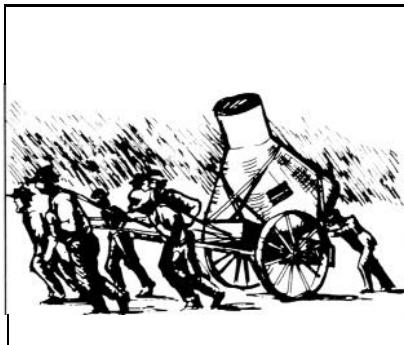
The Ralph Abernathy Story

One of the things you asked is what are people thinking. During the Apollo program, I had the opportunity to talk with lots of people in many walks of life. Unless you could really talk face-to-face, you could never really get the enthusiasm that was demonstrated during that time . . . I'm talking about walking around at a launch, like at Apollo 11. For example, I spent the day one day with Ralph Abernathy . . . this was in 1971-1972, after he had taken over from Dr. King. He was at a launch; he came to the launch in a horse-drawn wagon and all the demonstration symbols.

I was standing beside him as the Apollo went off. And, he said, "I'm really proud to be an American and see this being done. There's many things wrong with America, but that -- the exploration of space -- isn't one of the things. That's just absolutely tremendous. Any way that I am ever able to support that, I will

support it, because it means so much -- I don't know *what* it means-but it means so much to this country, I am convinced."

You talk to labor union people. . . and we've had many leaders down at the launches. Out in Michigan, we've got a small museum. The Teamsters Union walks in and says, "We will provide all the support for the establishment of this museum, because we think the space program is tremendous. If you've got any exhibits, or artifacts, that you're bringing in, just let us know; we'll make sure that they're brought here free of charge, because we think the youth of the nation ought to have it."



Now, that's shared not just by this one local, but by a lot of people in the Teamsters. It's not because it's giving them any new business, or that they're trying to get local number so-and-so on the Moon; it's just that as individuals they believe in this thing.

Space is Going to Encompass Us

The medical people-you don't have to say how many times space has benefitted us. The legal people-they're trying their best to try to think through the precedents, so that we won't have the problems on the Moon or in space that we have here now.

The whole surge in education from 1962 to now came primarily because of the stimulation by the space program. I spend a lot of time with young kids, particularly in elementary school. If you look at the textbooks and listen to the teachers, nine times out of ten, the example of something that's forward-looking and good, is the space program.

You can go through any group. Politicians . . . if I've heard it once, I've heard it a thousand times-nothing like the space program has been able to open up Russia. This is something which permeates the entire life that we're with, and I think that that permeation is just going to go on and on and on . . . you'll never know when the time comes that we're going to leave this planet.

It's just like aviation . . . you just can't imagine living today without aviation. If you had to give up aviation and all that we're doing, the world would come to a

standstill. Intercontinental travel would stop; mail would stop; and so on. You just don't think about it. I think that space is just going to encompass us. Eventually, there will be outposts in space that will become natural.

A Common Ground

Captain Freitag and Dr. Leary were asked their views of cooperation among nations in the movement into space-and, in particular, the role of the United States.

Dr. Leary:

We should involve the peoples of every country . . . but notice, I say the *peoples*, not the *governments*. It must be continually reiterated, every hour of every day, in every one of our publications, that *people* and *not governments* (are the important factor). Governments are simply bureaucratic servants of people; governments come and go. It is the peoples of the different countries who must be alerted and invited to join us in space migration.

Captain Freitag:

I see things like the Apollo-Soyuz mission, where we join with the Soviets. Apollo-Soyuz is the first and only case in post-World War II where we have really embraced the Soviets in a common ideal. That's probably because there was no precedent.

President Kennedy suggested before he started the Lunar landing program that we do a joint program of landing on the Moon. The Russians flatly turned us down on that; they'd rather compete; and they lost. They joined us in [Apollo-Soyuz].

I wouldn't be surprised if ultimately some form of space occupation, whether it be planetary, whether it be Lunar, or whether it be a habitat, might eventually be a world program. If not, I expect we'll do it ourselves.

Captain Freitag, do you believe Macaulay's statement on cooperation is appropriate to the space movement?

That's kind of what I was saying. The reason that you get a lot of cooperation is that you've found a common ground that's not a threat to either side. And when you've found this common ground which is not a threat to ourselves or the Soviets, or between a Mondale and a Goldwater, or a liberal and a conservative, you have an unlimited path.

If you take the virtue of both, you end up with a very, very powerful tool. That's exactly what's happening, and I agree with it. I think the space program does form that catalyst . . . does form that basis, or arena, in which people can operate.

Timing -- Space Now?

Dr. Leary, some people believe that the movement into space is urgent. . . that if we do not dedicate the resources

and the energy to it now, we will not have those options available to us in the future. Do you believe this is true; and if so, why-or why not?

Some people think there is an urgency because we will not have the options later that we have now. Well, this is all rhetoric. I'm totally full-time involved in broadcasting the signal of space migration and the necessity for humanists and plural-option people to become involved.

There's no urgency. It has to happen for the survival of the human race; so it will happen. It's a wave that's going to form at the right time. All we can do is to alert our fellow citizens to its coming and to the aesthetic way of surfing it.

Captain Freitag, what is your opinion on the urgency question?

My opinion of the space colonies is that it is a long, long way away. It's something that eventually will happen; but we are living in a space colony here. We're on a spaceship right now. To build artificial colonies such as Gerard O'Neill is proposing is a long way off. We've got to understand why we're going there -- understand how we're going there.

I have proposed, for example, what we ought to do at this point in time, is to undertake a long term program of research, which will yield us results perhaps twenty, thirty, or forty years from now. O'Neill doesn't agree with me on this; he wants to go right now [So do we! - Ed.]

I think what you have to do is to think in terms of near-term, mid-term, and far-term. Near-term is the next ten years; mid-term, the next ten to twenty years after that; and far-term, beyond twenty-five years.

In the near-term, we have to think in terms of hardware-things like the Space Shuttle-and what to do with this type of hardware. There are many things we have to do in this area that are very new and economically strong for our country. In the decade of the eighties, we'll see these things happening in great numbers.

Do you think technological advances in the space industries--such as the rapid development in computer technology -- could dramatically reduce the time table for space colonization as you see it?

I think there are two things to look at on technology. I graduated from college thirty-five years ago: there were no such things as computers; there was no such thing as space flight; there was no such thing as television; there were no antibiotics; there were no organ transplants; there were no supersonic airplanes, no jet airplanes. You can name a thousand and one things that didn't exist; many of those weren't even comprehended. Those, in my lifetime, became realities.

Computers are extremely dramatic; but I can name just as many things that were thought about at that time that never happened, because technology

wouldn't allow it to happen. For example, from day one you've heard about an atomic airplane. We tried to fly one back as far as 1952. As good as technology is, we've never been able to build an atomic airplane. You can name many other things. Even back in those days, there were strong proposals for death rays as weapons. Maybe the laser might become that, but we don't know.

What I'm saying is that some technology has this tremendous growth and some doesn't. I am one who believes that space will have a tremendous growth, and the growth will be way beyond our expectations, and even comprehension at the present time. But I have a feeling it will be Earth-oriented, and not Earth-departure-oriented.

I think we'll end up building large structures in space. . . large space stations. But these will primarily have as their benefits doing things in space that cannot be done on Earth for the benefit of the billions of people on Earth-not for the benefit of the very few people who will be in space. I think that we'll see that happening in the next twenty-five years.

The Henry Ford Story

We are seeing a growth in space; we're just too close to it to understand the perspective of space. It's been nineteen years since the time we started. When we sit back and look at it in the perspective of the year 2000 or 2050, we'll have a totally different point of view.

I always joke about asking Henry Ford to write an environmental impact statement the day he invented the Model T. He'd say, "Well, the first thing you've got to do is you've got to plan on sacrificing 60,000 lives a year just in America alone. Maybe 150,000 people -- you're going to have to kill that many every year. We're going to pollute the entire atmosphere and make it unsafe. We've got to pave the whole nation with roads; we've got to create new industries; we've got to invent things like gasoline." That's a mere seventy-five years ago, and things have developed pretty rapidly.

But he was operating on a very benign and comfortable base, in which every step he took gave an immediate benefit to the people who were involved. When you talk about space, the benefits have to be interpreted so that the investment of the few that go into space -- and the 100 million out of 20 billion is a few -- are worth the sacrifice that those 20 billion have to make. It's a step-by-step process which is going to take decades. I just caution everyone who thinks about it, maybe it's going to take seventy-five to one hundred fifty years before we have our first habitat in space.

Jules Verne in 1878 was all ready to go to the Moon, and he wondered why we took so long to bring it about. Tsiolkovsky in 1902 said we ought to go to the Moon. He knew how to do it; he

had devised a thing called a "rocket." Of course, it took twenty-five years before anyone could make the darn thing work, even though Tsiolkovsky expounded the principles clearly . . . not until 1927 did Goddard fly one. No one could make it work; there weren't the materials, and there weren't the techniques.

My argument is not on the philosophy, but on how and when,

S.M.I.²L.E.

Dr. Leary, what significant results came from the Apollo program?

I think the analysis of the Lunar soil samples is one of the most underestimated pieces of information that has ever been given to the human race. Very few people yet understand that the Lunar soil samples contain most of the elements that we will need to construct habitats.



If I were designing a biological planet like Earth, inhabited by a species I wanted to migrate from the planet into space, I could do no better than put into orbit around it a Moon that contains the minerals that our satellite contains. It almost seems divinely planted there to facilitate our migration.

In your lectures, space migration is one concept of a dynamically intertwined triumvirate which you call "S. M. I.² L. E." -- Space Migration, Intelligence Increase, and Lifespan Extension. What do you mean when you say that 'increased intelligence' is necessary to migrate in to space?

People do not understand what I mean when I say intelligence increase. I don't mean doubling the vocabulary level or doubling your multiplication speed. The first step in increasing intelligence is to understand that the brain is a tool and to get control and disciplined direction of our own nervous systems.

Up until the present time, we have been passive users of our neurological equipment. We haven't learned nearly enough about how we create our internal realities; how we imprint; how we can change, grow, evolve.

Step number one in the increase of intelligence is to learn how to manage our heads. Once we do that, we will increase our intelligence, not in a linear fashion, but we will develop many different forms

of intelligence.

How do we learn to control our nervous systems?

Well, I think that the consciousness movement of the sixties which is now the consciousness industry of the seventies is a mass example of this concept. People understand that they can grow and evolve personally; they can get better control of their consciousness; they can raise their consciousness; improve it; they can create new internal realities. This is already happening; it's a social reality.

Sex, Space and the Future

Some evolutionists believe sexual differentiation is a mechanism to accelerate the process of evolution. Do you agree?

The forms of life which reproduce asexually just continue the individual's own DNA, so that the amoeba is a continuation of the first amoeba that ever lived. It's obvious that sexual differentiation is an evolutionary mechanism to speed up the process. . . to increase the options. I couldn't agree more.

What happens to the differentiation of sexes, death, and birth if we extend the lifespan, as you suggest in the acronym S. M. I.² L. E.?

I think we can have more children. If you live eight hundred years, you can have lots of children-possibly with many different women or men-because there is the possibility of living dozens and dozens of lifetimes. There will be no problem of overpopulation because we've got practically an infinity of space to populate. We'll need more people for things like starflight. I don't see that lifespan extension is going to cut down sexual reproduction.

If there is no death, do you think there is still a need for reproduction?

Sure. Death wasn't the cause of sexual reproduction. Death was necessary as long as we inhabited the planet, because we couldn't clutter up the planet with too many older bodies. Also, there was nothing much to do on our planet before technology reached the point where we could increase intelligence and migrate. As we get smarter, we will rejoice in sponsoring our many children to continue our evolutionary thrust.

The Future of the Human Being

What will happen to human emotions as we evolve and move into space?

I think some emotions are "mammalian" not "human." They're lower forms of possessiveness and competition, egocentric territorial status, and so forth.

Emotions of these types are survival emergency devices which are necessary for lower levels of self-defense and should be used just as you might use a weapon in

self-defense-only in case of great emergency. There is a basic necessity in space for higher linkages, love, friendly rivalry, plurality of options, uniqueness.

Why do you feel life extension goes hand-in-hand with space migration?

Life extension was an impossible nightmare before space migration for the obvious reason that we'd just clutter up the planet. But, once space migration has begun and we start moving out into space and to the stars, life extension is a technical tool to make the long voyages feasible.

Captain Freitag, do you agree with Dr. Leary's belief that lifespan extension is a technical tool which makes long voyages possible?

I agree with that; but, it all depends what a "long voyage" is. A voyage to the planets is not a very long voyage. If you're talking about stellar distances, I just don't know.

I think that the human being is an extremely adaptable device; it can adapt better than anything we've ever devised in machinery. But also, it's a very fragile device, too. It takes just a little bit of a lack of oxygen or lack of other physical environments and the body is gone, it just doesn't survive.

I think we'll see interstellar travel with automated machinery, certainly in our lifetime; and I think we'll begin to see migration to the planets. But escape the solar system? There's a fundamental restriction. I think you can probably put people in space for long periods of time, perhaps even decades or even generations. But you've got to change the entire training, lifestyle, education that has been developed from day one.

I'm just saying that certain concepts of freedom, for example, are gone when you get into space migration. I said earlier that it's a highly disciplined thing. Once you've committed yourself to a planetary voyage or a longer voyage, that's the only objective . . . that's the only ball game in town. If someone decides they don't really want to do that, they'd really rather be a major league ball player, it can't be done. No options exist after that.

Sure, you can change from being a cook to a mechanic. But once you commit yourself, you don't have that flexibility, because everything that is natural on Earth has to be created physically out there *in advance*. This business of building everything in space ad hoc is a long, long, long way off. . . two or three generations beyond even the first habitat.

Are there any scientists who are working on lifespan extension in conjunction with NASA?

Only from the product improvement point, extending life in a normal fashion-conquering disease, conquering aging. Nothing that I know of. . . I don't think I've ever read any serious activities which

are fundamentally approaching it from a basic change of environment.

Space Life and the Code Clerk

Dr. Leary, what do you imagine a space lifestyle might be in one to two hundred years?

I think the human race will have evolved into something very different in one or two hundred years. It is more interesting and more profitable for people to consider what their life might be like in space migration habitats in twenty years.

What is a typical lifestyle scenario twenty years from now?

I'm not ready to do that right now. In the sixties, I never wanted to impose my visions on people's consciousness alterations. I would really encourage other people to speculate about lifestyles. I would prefer a more modest role, of simply being a broadcaster . . . telling people about the possibilities.

Do you think there are other forms of life, elsewhere in the universe, evolving in similar ways?

Yes. I think life has been seeded on millions, possibly billions, of planets like ours. When we move out of the solar system and join the galactic community, we will possibly find more advanced and probably find more retarded forms of ourselves evolving throughout the Galaxy.

Do you think we will evolve beyond physical technologies once we have extended life?

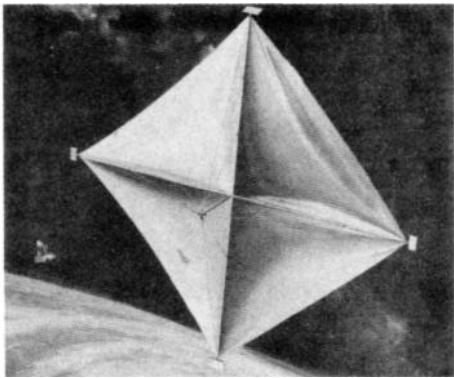
I think that might be the third or fourth level of evolution beyond space migration; but I do think it is inevitable . . . yes. I think we all sense that it's our eventual destiny.



SOLAR SAIL SYMPOSIUM Invitation and Call for Speakers

The Space Flight Mechanics Committee and the Los Angeles Section of the American Astronautical Society are organizing a small symposium on solar sail design, problems and applications. Interested L-5 members are invited to attend this symposium and are encouraged to participate as speakers. The informal nature of the small symposium has made past meetings quite successful in bringing out new ideas and topics for discussion in new technology areas.

The theme of this symposium is *The Solar Sail-Its Feasibility and Promise for Future Space Missions* and will be held at the Jet Propulsion Laboratory (or at CalTech) in Pasadena, California, April 20-21, 1977.



Artist's concept of a solar sail, a half-mile square sheet of aluminum-covered plastic. Computer-maneuvered mirrors at the corners would steer the sail. (NASA Photo)

JPL for the past year has been seriously studying the possibilities of the solar sail for future interplanetary missions. Preliminary efforts indicate that the solar sail may be operational in five years, if properly funded. Some results of these studies were presented at the AIAA/AAS Astrodynamics Conference in San Diego, California, on August 18-20, 1976 (see References 1 & 2). There is much more work to be done. Literally hundreds of papers have been written concerning spacecraft and missions using conventional propulsion systems, and for solar-electric or low thrust engines, but no studies have been performed for the solar sail in the past 10 or so years. This small symposium has been organized to begin the process of correcting this situation. We will need all the support we can get.

Practically all technical areas relating to the solar sail need further study and are appropriate for this symposium. Some of these areas, and some question which need answers are the following:

Structure -- How should the solar sail be designed? Currently, there are three concepts being studied at JPL. These are (1) a three-axis stabilized boom supported structure, (2) a spin-stabilized disc, and (3) the heliogyro (see References 3 & 4). Are there other concepts which should be

considered, and what are the advantages or disadvantages of each?

Stability -- Given a structural design, is the solar sail stable? Will natural frequencies, for example, cause stresses which may tear the sail?

Controllability -- Depending upon the mission, the sail will have to be oriented at specific angles at specific times along the trajectory. How can this attitude be controlled? Does the technique provide for self-correction?

Trajectories-What techniques are available for the computation of solar sail trajectories? What trajectories are best for planetary escape, transfer, and capture?

Navigation -- What problems are associated with navigation for the solar sail? What solutions are best?

Missions -- Currently, JPL is studying the application of the solar sail for missions to Mars and Halley's Comet. What other missions, including Earth orbit applications, are possible for the solar sail? Can the solar sail be combined with missions using conventional propulsion systems to make the mission more attractive?

The main thrust of the small symposium will be with more immediate problems and applications of the solar sail (say the next ten years); however, a fraction of the meeting will be devoted to more futuristic topics. How could the solar sail best be used for solar system escape, asteroid capture, or space colonization? Speculating in these areas provides a better understanding of the solar sail potentialities of the future and a perspective and motivation for today.

The symposium will consist of four sessions over a two-day period. Depending upon the response, each speaker will have about 30 minutes for his talk and questions. Elaborate preparation is unnecessary; the audience will be small, and a viewgraph projector and blackboard (and other equipment needed) will be available. No written paper is required; however, speakers are encouraged to complete their analyses in a formal manner and submit papers to larger meetings, such as the Astrodynamics Conference.

Those interested in attending, should call or write for further information to: C. W. Uphoff (M/S 156/220), Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91103, (213) 354-5594.

References:

1. "Solar Sail Mission Applications," J. L. Wright and J. Warmke, Paper 76-808, AIAA/AAS Astrodynamics Conference, San Diego, Calif., August, 1976.
2. "Optimum Solar Sail Interplanetary Trajectories," C. G. Sauer, Paper 76-792, AIAA/AAS Astrodynamics Conference, San Diego, Calif., August, 1976.
3. "Heliogyro Solar Sailer Summary Report, NASA CR-1329," R. H. MacNeal, J. M. Hedgepath, and H. U. Schuerch, June 1969.
4. "Structural Dynamics of the Heliogyro, NASA CR-1745A," R. H. MacNeal, 1971.

UPDATE ON SETI CONFERENCE

World famous biochemist Dr. Stanley Miller will discuss "The Origin of Life" at a special student symposium to be held February 24-25, 1977, at the Ames Research Center, Moffett Field, California, titled "The Search for Extraterrestrial Intelligence (SETI)."

Dr. Miller conducted the early classic experiments in 1953 of creating amino acids by sending electric sparks through water vapor, ammonia and methane in a sealed container. The mixture is similar to primeval conditions on planet Earth, with electric sparks substituting for electrical discharges in the Earth's early atmosphere.

Other confirmed speakers include Dr. Richard Berendzen, astronomer, lecturer, author and Chairman for the Boston SETI symposium, "Life in the Mind of Man"; Dr. John Billingham, Chief, Program Office for SETI -- NASA/Ames; Ronald Bracewell, Professor at Stanford University and author of *The Galactic Club*; David Black, Project scientist/SETI; Dr. James Christian, philosopher and author of *Extraterrestrial Intelligence: The First Encounter*; and Bernard Oliver, Vice President for Research, Hewlett-Packard, and formerly Director of the study group on constructing large arrays of radio telescopes, designated Project Cyclops.

For further information, contact: FASST, 1785 Massachusetts Avenue, N.W., Washington, D.C. 20036; (202) 483-2900 or the Ames Center (415)965-5543.

SPACE BASE PUT ON ICE

NASA's proposed space base (see October L-5 News) has not been included in the fiscal year 1978 budget request on the grounds that not enough justification has been given for it. Included in the space base proposal are plans to test a number of space industries such as the construction of solar power satellites, and to develop large scale life support systems for people to live and work in space. The base has also been regarded as a "construction shack" for space settlements such as those proposed by O'Neill.

Some NASA insiders are hopeful that the space base (which requires only the Shuttle for transportation) will be funded in the fiscal year 1979 budget.

"COMMUNITY IN SPACE" SEMINAR REPORT AVAILABLE

"A Community in Space" program report (60 pp.) of a seminar featuring Dr. Isaac Asimov held on July 11-14, 1976, dealing with the political, social and economic problems of space colonization based on the theories of Gerard O'Neill, is available for \$4 from the Institute on Man and Science, Rensselaerville, NY 12147, att: Terri Rapoport.

UN TO CONSIDER POWER SATELLITES IN '77

Austrian Ambassador Peter Jankowitsch and the delegation of Argentina have placed the issue of solar power from satellites on the agenda of the UN Outer Space Committee for consideration in 1977. The US representative on the Committee, W. Tapley Bennett, Jr., has commented on the move, saying, "Of course, the Outer Space Committee is not competent to consider energy problems generally, and it will not be getting into the energy business. But we agree that its mandate can properly include a consideration of the use of space technology for possible programs involving solar energy generation and transmission. . . ."

This study of power satellites by the Outer Space Committee will set the stage for their consideration by the UN Scientific and Technical Subcommittee.

MIKE GRAVEL ON POWER SATELLITES AND SPACE COLONIES

On July 21, 1976, Senator Mike Gravel (D-Alaska), Chairman of the Senate Subcommittee on Energy, inserted Gerard K. O'Neill's December 1975 Science article, "Space Colonies and Energy Supply to the Earth," into the *Congressional Record* for that day ("Solar Energy," *Congressional Record*, 122, 21 July, 1976, pp. S12053-5). In his remarks on the floor of the Senate, Senator Gravel had the following to say:

"I call to the attention of my colleagues a project which, while it is still in its infancy, could have the most far-reaching effects on the world's supply of energy.

"Some years ago, Peter Glaser proposed the construction of solar energy satellites. These satellites would convert huge amounts of the Sun's energy and beam this to Earth by means of microwave. The capability of a single power satellite could be five times that of the largest nuclear plant.

"This basic concept is now being refined by a group including Gerard K. O'Neill, a professor of Physics at Princeton University. Professor O'Neill suggests that not only is the solar energy satellite a promising idea, but the economics of this proposal might be improved by using the Moon's minerals to construct the satellites.

"The idea involves building satellites to contain manufacturing facilities, then acquiring from the Moon the materials needed for the orbiting solar power stations. The great cost of lifting materials from the Earth would then be avoided.

"This seems to me to present a worthwhile follow-on to our country's great effort to reach the Moon, and I hope NASA will seriously examine proposals like Dr. O'Neill's."

News from ERDA

"This country now relies on oil and gas for 75 percent of its energy and domestic production is down 15 percent. We must develop alternatives. Among the possibilities are geothermal, shale, coal and nuclear-the light water reactor now and the breeder later-along with solar electric and fusion for the long-term."

-ERDA Administrator
Dr. Robert C. Seamans, Jr.

NOVEL RESEARCH IDEAS ENCOURAGED UNDER ERDA'S FOSSIL ENERGY "STARTER GRANTS" PROGRAM

To encourage the submission of more novel, coal-related research ideas from the Nation's universities, the Energy Research and Development Administration is beginning a new program of small grants for high-risk projects with long term potential.

Under the program's guidelines, an individual "starter grant" to a university would provide up to \$20,000 per year from ERDA for a maximum of two years. Up to 20 grants are expected to be made during the first year of the trial program. ERDA's Fossil Energy office will administer the starter grants program.

Emphasis will be on new, untried research to use the Nation's coal supplies to produce energy. Projects showing potential value under the starter grants program could be expanded by more substantial funding under future contracts.

Deadline for submitting starter grant proposals is April 1, 1977. Each proposal will be reviewed by teams made up of experts in coal-related research from ERDA's headquarters, Energy Centers, and National Laboratories, and from other relevant federal agencies.

Awards will be announced on or before June 1, 1977. For copies of the program guidelines, contact Division of Procurement-Fossil Energy, ERDA, Washington, D.C. 20545, (202)376-9119.

ERDA CONTINUES SUPPORT OF LASER FUSION RESEARCH AT MICHIGAN FIRM

The Energy Research and Development Administration (ERDA) has signed a one-year, \$7 million contract with KMS Fusion Inc. (KMSF), Ann Arbor, Michigan, for continued research of the laser fusion concept.

KMSF scientists will perform research to fabricate target pellets for use in laser

fusion experiments. The pellets will then be tested using the ERDA-owned laser systems at KMSF.

In a laser fusion experiment, a laser beam is focused on a pellet containing heavy isotopes of hydrogen. The beam force causes a compression of the pellet, resulting in the fusing, or joining together, of some of the hydrogen isotope atoms and a release of energy.

The ERDA-KMSF contract will run through September 30, 1977, and will incorporate the work which was performed under a two-month letter contract during the period October 1, 1976, through November 30, 1976. KMSF was incorporated in 1971 to develop laser fusion as an energy source. ERDA support for KMSF is provided by the agency's Division of Laser Fusion.

NEW TECHNOLOGIES FOR ELECTRIC UTILITIES

A draft report assessing the future technological needs of the nation's electrical utilities has been released for public comment by the Energy Research and Development Administration (ERDA).

The 250-page report, "Comparing New Technologies for the Electrical Utilities," is the first comprehensive attempt by ERDA to project the needs of the electrical generating industry and to review the agency's research, development and demonstration (RD&D) programs which are designed to meet those needs.

Currently, about two-thirds of ERDA's energy research, development and demonstration budget is for programs with potential application to electric utilities.

"While the report does not purport to establish ERDA's policy, it does attempt to analyze which technologies, if judged satisfactory with regard to development costs and technical risk, would be the most attractive candidates for support," said Roger W. A. LeGassie, ERDA's Assistant Administrator for Planning, Analysis and Evaluation, who coordinated the year-long preparation of the report.

Copies of the draft report are available for review and comment by any interested group or individual from the Office of Evaluation, ERDA, Washington, D.C. 20545. Comments must be received by January 31, 1977 to be considered in preparation of the final report.

1976 SUMMER STUDY

Anyone who would like a copy of the NASA/Ames Research Center Summer Study on space settlements can write to Dr. William Gilbreath, Code 240-1, NASA/ARC, Moffett Field, CA 94034. The report is approximately 200 pages.

AEROSPACE SCIENCE FEATURED IN SCHOOL FILM SERIES

In less than a century, the science of flight has developed from a curious pastime of a few inventors and mechanics, to a major tool and focus of scientific inquiry, and a global technological enterprise which shapes, even as it is shaped by, society. January's *Science Screen Report* profiles the discipline of aerospace science-past, present and future. The *Science Screen Report* is an international film series for schools that presents the most recent developments in science and engineering.

This report uses rare old film footage and amusing animation sequences to chronicle the ancient dream and early history of man's efforts to fly, described by such notables as Alexander Graham Bell and John Dos Passos. The development of the art of flight into the science of astronautics is then outlined and exemplified with exciting scientific film sequences of wind tunnel experiments and man/computer aircraft design.

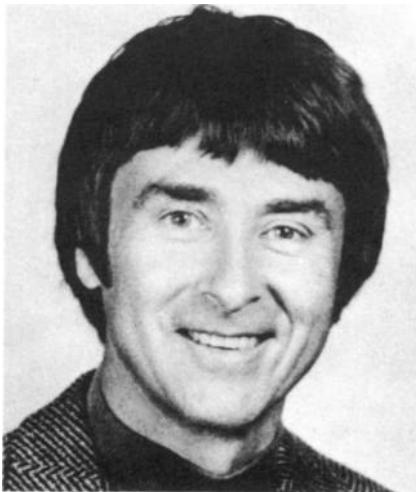
More film footage shows how the new science reshapes the world, and is reshaped in turn. For example, the film suggests the problems involved-both social and technological-in building the S.S.T., as shown in research into jet lag fatigue by the National Research Council of Canada. The film concludes with an exciting preview of a future space project-a large space colony established in orbit.

For more information, write the *Science Screen Report*, 201 W. 52 St., New York, NY 10019; (212) 586-3057.

"AGING TOMORROW" EDITOR AVAILABLE FOR LIFESPAN TALKS

Saul Kent would like to appear on radio and television shows and give talks to groups interested in life extension. In addition to being editor of *Aging Tomorrow*, a unique bimonthly newsletter that deals with health and longevity, Kent is a contributing editor to *The Immortalist*, writes a column called "New Frontiers of Research" for *Geriatrics* magazine, and is consultant to The Alza Corporation, Trans Time Inc., The Futures Group, the Ageing Research Foundation and The Foundation for Infinite Survival.

To arrange for Saul Kent's appearance contact: *Aging Tomorrow*, Box 617-S, Cathedral Station, New York NY 10025, or phone (212) 666-0352 or (914) 679-7948.



BOOK REVIEW:

The High Frontier, Gerard K. O'Neill, William Morrow and Company, Inc., 1977

Carolyn Henson

At last-a book that sums it all up! Anyone interested in space settlements should add this book to their library.

The author, Princeton physics professor Gerard K. O'Neill, who is widely regarded as the central figure in the space settlement movement, builds a compelling argument for the need for the human species to move beyond this planet.

O'Neill asked his freshman physics students in 1969 the question, "Is a planetary surface the right place for an expanding technological civilization?" The answer was "no." Now, the incompatibility of a forever-expanding technology and our home planet has been observed by many others. But O'Neill differs in that he does not see an either/or choice. He believes we can have both an unspoiled Earth and an expanding technological civilization. He envisions a near future in which lifeless chunks of matter--first a small portion of the Moon; later, the Asteroids--are transformed into living, space-faring organisms, symbiotic combinations of a multitude of plant and animal species and our technology. O'Neill sees a future in which planets are treasured as sources of natural beauty.

He doesn't expect them to be exploited, however, due to a combination of economics and physics which he details in his book.

O'Neill (who, after a long struggle, is rapidly picking up support in the scientific and technical community) tells us that, within this century, life can begin spreading outward into the Galaxy. But he adds, "This is one of the rare occasions in human history in which a new technological option is being subjected, deliberately, to wide popular debate before, not after, the decision to go ahead with it has been made. I prefer it that way. . ." O'Neill's book is a major step in opening up that debate.

We now have the technological ability to set up large human communities in space.. communities in which manufacturing, farming, and all other human activities could be carried out. Substantial benefits, both immediate and long term, can accrue to us from a program of expansion into that new frontier.

The normal first reaction to such a statement is disbelief: isn't such a development beyond us? Not at all: the settlement of space by humans could be carried out without ever exceeding the limits of technology of this decade. But even if it is possible, should we make the effort? I believe we should; the reasons go from an immediate and severely practical one: solving the energy crisis which we face here on Earth; to the slightly longer-term problem of population size and Earth's capacity to support it; finally to a nonmaterial problem, compelling but not to be reckoned in dollars: the opportunity for increased human options and diversity of development.



This is one of the rare occasions in human history in which a new technological option is being subjected, deliberately, to wide popular debate before, not after, the decision to go ahead with it has been made. I prefer it that way: I believe that the concept of the humanization of space can stand on its own merits, survive detailed numerical checks, and survive logical debate; to support it requires no act of faith, only the willingness to study unfamiliar ideas with an open mind. In my opinion the long-term goals we should set, relevant to space habitation, should only be those with which nearly every rational human being, possessed of goodwill towards others, could agree. I think that the following goals satisfy that criterion, and that they should be our most important goals not only for humanitarian reasons, but for our own self-interest; and I do not

believe that those two justifications must necessarily be in conflict.

1. Ending hunger and poverty for all human beings.
2. Finding high-quality living space for a world population which will double within forty years, and triple within another thirty, even if optimistic estimates of low-growth rate are realized.

3. Achieving population control without war, famine, dictatorship, or coercion.

4. Increasing individual freedom and the range of options available to every human being.

To achieve such an exponential growth of wealth, and therefore the opportunity to reach the four great goals listed, we would need:

1. Unlimited low-cost energy, available to everyone rather than just to those nations favored with large reserves of fossil or nuclear fuels.

2. Unlimited new lands, to provide living space of higher quality than that now possessed by most of the human race.

3. An unlimited materials source, available without stealing, or killing, or polluting.

[The High Frontier is available through the L-5 Society, see below.]



NORTHWEST L-5 SOCIETY

Members of the Northwest L-5 Society held a slide show and panel discussion on SSPS and space colonization at SeaCon '76, in Seattle on November 27. About thirty people from a larger audience engaged in a lively and probing discussion, until they were displaced by the Star Trek blooper films.

The next meeting will be held

January 21, 1977 at 7:30 pm at the Bellevue Community College Planetarium, in Bellevue, Washington. There will be a planetarium show preceding the business meeting and discussions.

SAMPLE CONSTITUTION FOR L-5 CHAPTERS DRAFTED

Steven Hamm, secretary-treasurer of the L-5 Society chapter at Southwest Texas State University, has drafted a constitution for chapters which, with slight changes in wording, can be used for any chapter wishing to be recognized as an on-campus organization. Copies may be obtained by sending a self-addressed, stamped envelope to Troy Welch, Physics Department, Southwest Texas State University, San Marcos, TX 78666.

WHAT'S AVAILABLE FROM THE L-5 SOCIETY?

- Xerographic reproductions of articles from other publications (please ask for list).
- *The Hunger of Eve: A Woman's Odyssey Toward the Future*, Barbara Marx Hubbard, Stackpole Books, 1976. \$8.00.
- *The High Frontier: Human Colonies in Space*, Gerard K. O'Neill, Wm. Morrow and Co., 1977. \$8.00.
- *L-5 News*, back issues of Volume 1, 1-16. \$1 each.
- Bernal Sphere postcards (interior; exterior). 15¢ each; 50 of one kind, \$3.
- Bernal Sphere 14" x 17" posters (interior, exterior). \$3.50 for one, \$3 each for two or more, \$2.10 each for 10 or more, \$1.75 each for 50 or more.

Note: Postage and handling per order, add \$2.

ABOUT THIS ISSUE --

The January *L-5 News* does not contain any technical articles by request of members who wanted a "soft" issue. However, we have much more technical material on deck for the coming year.

ADMINISTRATOR'S DESK

The L-5 Society is currently growing at a rate of about 15% per month. At that rate, we will pass the hundred-million mark in seven years!

Actually, the rapid rate of growth of the Society, although it provides us with the funds necessary to continue serving you, creates problems of its own. It seems that as soon as we develop a procedure adequate to deal with the volume of orders of a given kind, the procedure is obsolete and inadequate to handle the increasing volume.

The classic answer to this difficulty would be to set up methods adequate to handle order volumes much greater than current volume, but this would take capital investment, which brings us to the point of this discussion: we still need substantial donations to bring the Society to higher levels of operation.

This newsletter is shorter than our recent norm of sixteen pages, primarily due to the simultaneous production of the Volume One Index. The Index is being mailed separately by bulk mail, so if you do not receive it within a month or so, let us know and we will send you another copy. Also, we are still working on the oft-postponed Slide Catalog, which will present about seventy slides, and is now scheduled as part of our February issue.

As this is written (January 13), we have not yet shipped O'Neill's book, due to problems with our paper company in getting the envelopes we need to mail the books. We have sold about one hundred copies so far. Hopefully, those who have ordered *High Frontier* will receive it before this issue of the newsletter-I don't think the paper company can hold out much longer.

Thanks to all those who send us news and who arrange for government and private-industry artwork to be sent to us.

The posters are at the printer, but probably will not be ready before the end of January.

L-5 SOCIETY
1620 N. PARK AVE.
TUCSON, AZ 85719

L-5 SOCIETY MEMBERSHIP FORM (please type or print)

NL 701

NAME: _____

ADDRESS: _____

CITY/STATE/ZIP: _____

AFFILIATION/TITLE OR POSITION: _____

(OPTIONAL)

- I am _____ am not interested in being active locally. Phone (optional) _____ - _____
Please enroll me as a member of L-5 Society (\$20 per year regular, \$10 per year for students). A check or money order is enclosed. (Membership includes *L-5 News*, \$3 to members; the balance -- \$17 or \$7 -- is a tax-deductible donation.)
Please enter the above as a nonmember *L-5 News* subscriber (\$20 per year). A check or purchase order is enclosed.
Enclosed find a donation of \$ _____ . (Donations to L-5 Society are tax-deductible.)

Letters

In reference to the comments about "the wisdom of involving science-fiction fans in the space program," ("Credits," *L-5 News*, vol. 1, no. 15, p. 14) I find it hard to believe that anyone involved in the space program is unaware of the support they get from s-f fans. Most of the people I know who really believe in the space effort are fans; other people are all too often "down to earth" types who cannot be convinced of the validity of any basic research, or any expenditure without a clearly defined goal ("what do I get out of it?").

Also, the science-fiction conventions seem to me to be a good place to catch people's attention. Despite magazine articles I had read, I would not have joined the L-5 Society if I hadn't attended a fascinating lecture at Desert Con this year, and been impressed in person by the knowledge and enthusiasm of the L-5ers.

By all means, we need the widest possible coverage, public lectures, newspaper interviews, etc.; but never let anyone question the support of s-f and *Star Trek* fans. Considering the organized strength of Trekkers and Trekkies alone, we may find in the future that they did more to help keep NASA going than almost any other group. There's a lot of energy among the devotees of the Enterprise!

M. Ruth Minyard
Jackson, Mississippi

I've been an avid science and science fiction fan and have been fascinated by the idea of space travel and colonization for as long as I can remember, but only recently did I begin to realize that I might see a permanent space colony in my own lifetime. It's nice to know that there are people like you in this world, people who share the dreams that I and millions of others have had for years. I would dearly like to help you make our dreams come true. Although I will

probably be too old to go up to help build the first colonies, I am almost certain that I will be able to celebrate my hundredth birthday in a low-gee old folks' home near Juno or under Tycho Dome. Perhaps our children (our grandchildren for sure) will take the L-5 concept to its logical conclusion and set out for Tau Ceti, or wherever.

Robert G. Lovell, Jr.
Shawnee, Kansas

In the letters section of the October '76 *L-5 News*, Jeff Bytoff of Cardiff, California asked about the availability of information on atmospheric and biologic effects of microwave radiation. I don't know of any data on atmospheric absorption of substantial microwave power flux but there is an excellent reference that estimates atmospheric attenuation in the *Journal of Microwave Power*, Vol. 5, No. 4, December, 1970, entitled "Atmospheric Attenuation of Microwave Power," by Vincent J. Falcone, Jr. The *Journal* can be obtained in any large engineering library, or by writing the International Microwave Power Institute, Box 1556, Edmonton, Alberta, Canada. The entire issue containing this article is devoted to microwave aspects of SPS engineering.

The November 1975 issue of the AIAA's *Astronautics and Aeronautics* has a very thorough SPS overview article "Geosynchronous Satellite Solar Power," by J. Richard Williams, which, in part, summarizes microwave biological effects and lists several references on the subject. There are, by the way, volumes of studies on biological effects of both high and low microwave radiation levels, e.g., "Biological Effects of Nonionizing Radiation," *Annals of the New York Academy of Sciences*, Vol. 247, 1-545, 1975, published by the New York Academy of Sciences, 2 East 63 Street, New York, New York; also "Biologic Effects and Health Hazards of Microwave Radiation," proceedings of an International Symposium, Warsaw, 15-18 October '73 sponsored by the World Health Organization, U.S. Department of HEW and the Scientific Council to the

Minister of Health and Social Welfare, Poland. You can probably get this last by writing HEW. In addition, sessions on both high power techniques and microwave biologic effects were presented at the 1976 International Microwave Symposium which I reported in the July '76 issue of *L-5 News*. Preprints and proceedings of those sessions can be obtained for \$25.00 with a 25% discount for IEEE members by writing the Institute of Electrical and Electronic Engineers, 445 Hoes Lane, Piscataway, N.J. 08854. A recent article that appeared in the *New York Times Sunday Magazine*, November 7, 1976 reviews continuing studies by the Food and Drug Administration and HEW on low level microwave biologic effects. So far, no conclusive evidence has been found of adverse effects at 10mW/cm^2 or less. In the decade since microwave ovens were introduced not one illness, injury or syndrome due to microwave leakage at the required U.S. safety limit of 5mW/cm^2 has been reported.

The word radiation and its association in the public mind with radioactivity is probably the major source of apprehension, but, of course, microwave energy is no more radioactive than TV transmission. Nevertheless its thermal effects and possible neurological impact, as well as potential pacemaker interference effects, merit the close continuing studies underway.

Bill Agosto
Somerset, New Jersey

On the subject of changing the name of the Society, two votes "Nay." L-5 is a catchy name and a good conversation starter-great for recruiting. If someone wants to start a "Space Colonization Society," more power to him! Our objective is to get into space, not to hamper the creative instincts of other possible leaders in our field by usurping all his options and greedily hoarding good ideas for our special interests,

Greg Bennett
Northwest L-5 Society
Kirkland, Washington

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