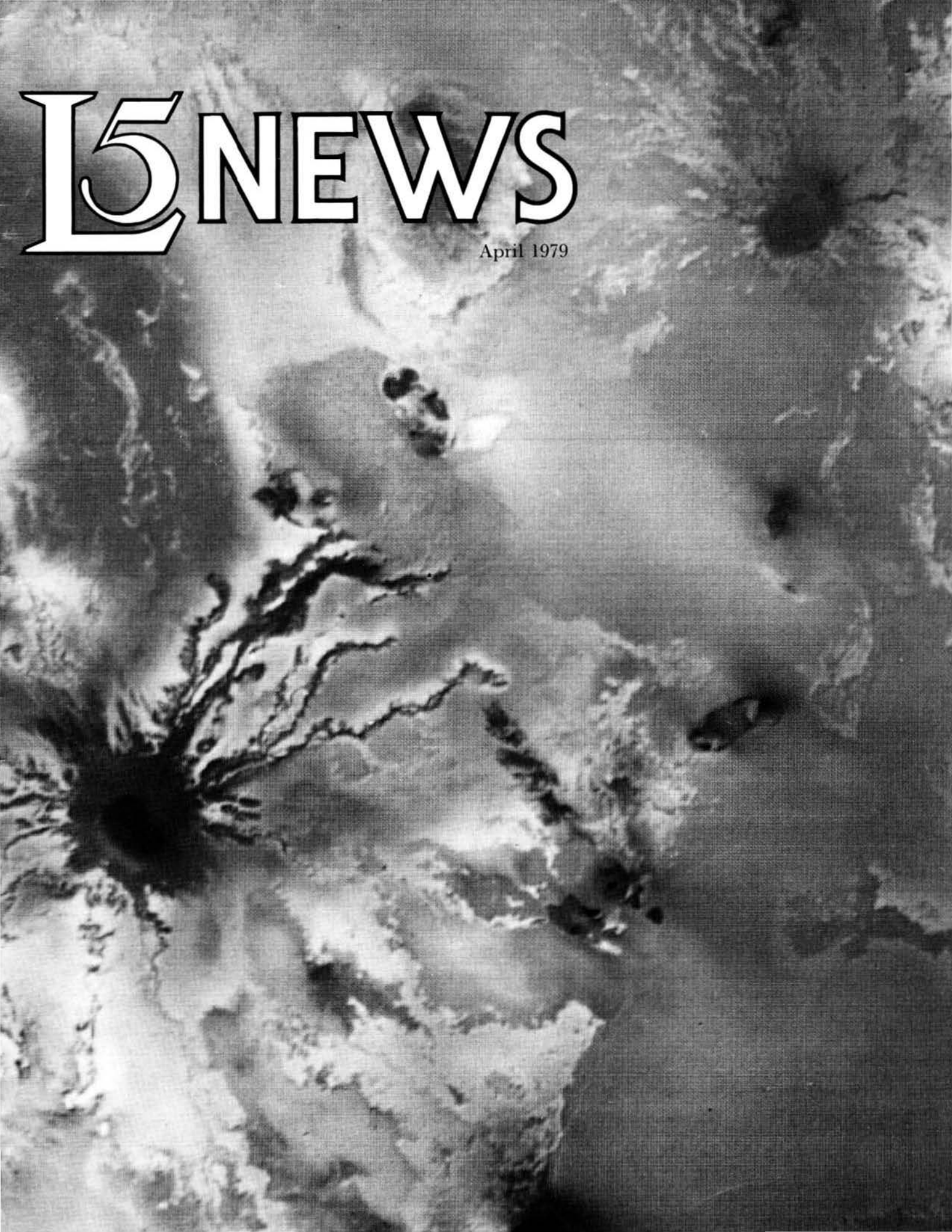


L5 NEWS

April 1979



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Publication office: the L-5 Society,
1060 E. Elm, Tucson, Arizona
85719. Published monthly.

Subscription: \$12.00 per year,
included in dues (\$20.00 per year,
students \$15.00 per year). Second
class postage paid at Tucson,
Arizona and additional offices.
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1620 N. Park Avenue, Tucson,
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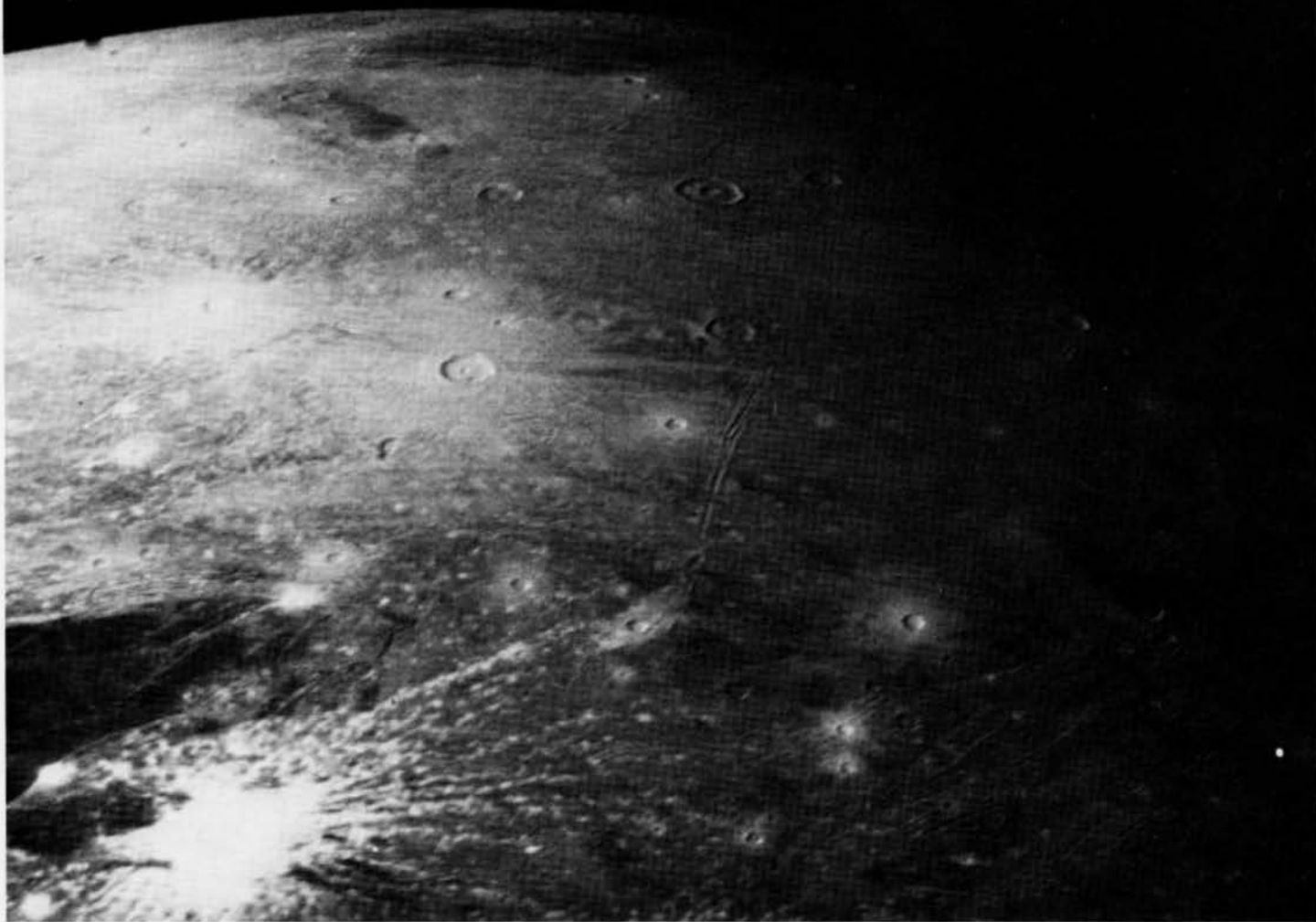
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Cover: No, not modern art but the surface of Io, Jupiter's innermost Galilean satellite. This photograph was taken by Voyager I from a distance of 77,100 miles. The dark spot with the irregular radiating pattern may be a volcanic crater radiating lava flows. (See **New Worlds**, pages 1-7).

New Worlds!

The Exciting Discoveries of Voyager I



Above: The surface of Ganymede as seen by Voyager I on Monday afternoon, March 5th. The most striking features are the bright ray craters; these relatively young craters appear to have spread fresh ice materials over the surface.

Excerpt from
PASSAGE TO INDIA
by Walt Whitman (1868-1871)

Passage to More than India!
O Secret of the Earth and sky!
Of you O waters of the sea! O winding
creeks and rivers!
Of you O woods and fields! Of you strong
mountains of my land!
Of you O prairies! Of you gray rocks!
O morning red! O clouds! O rain and
snows!
O day and night, passage to you!

O Sun and Moon and all you stars! Sirius
and Jupiter!
Passage to you!

Passage, immediate passage! The blood
burns in my veins!
Away O soul! Hoist instantly the anchor!
Cut the hawsers—haul out—shake out
every sail!
Have we not stood here like trees in the
ground long enough?
Have we not grovel'd here long enough
eating and drinking like mere brutes?

Have we not darken'd and dazed ourselves
with books long enough?

Sail forth—steer for the deep waters only
Reckless O soul, exploring, I with thee,
and thou with me,
For we are bound where mariner has not
yet dared to go,
And we will risk the ship, ourselves, and
all.

(Thanks to the Texas L-5 for locating this
appropriate poem.)

Comments on Voyager I

by William K. Hartmann
Planetary Science Institute
Tucson, Arizona

The first week of March, 1979, culminated a voyage of discovery whose full significance still hasn't been appreciated by most of the press. President Carter's peace initiatives in the Middle East (certainly a worthy enterprise) dominated the front pages along with the usual murders and outrages (why are these items still considered *news*, since they happen all the time?). The latest photos of Jupiter and the hitherto unmapped worlds of Callisto, Ganymede, Europa, Io, and Amalthea were treated as not so much as real news, but as the latest scientific amusements—curiosities such as the discovery of a new fossil fish.

It took us eleven years to go from the first closeup photos of the Moon in 1964 to the first surface photos of Venus in 1975, completing closeup surveys of the five large planetary bodies and two small bodies in the inner solar system: Mercury, Venus, Earth, Moon, Mars, Phobos and Deimos. What we witnessed in the first week of March, 1979, was the addition of four more planet-sized bodies to our list in only three days, not to mention the closeup photography of an additional small potato-shaped world, the discovery of a whole new ring system, plus the discovery of aurorae and lightning on Jupiter, and the discovery that Io is the most geologically active world known in the solar system.

Before March, 1979, we already knew that the four large satellites of Jupiter—called the Galilean satellites after their

discoverer—were weird. They seemed to be getting more interesting by the year. Recent data showed they are all probably bigger than the planet Pluto and that Ganymede (diameter 5216 km) and perhaps Callisto (4890 km) were bigger than the planet Mercury. Ganymede is just over 3/4 the size of Mars. They may have seemed minor curiosities in the early Voyager encounter pictures when seen as small blips against the looming presence of giant Jupiter, but they are real worlds in their own right. Spectroscopic measurements indicated powdery surface materials probably

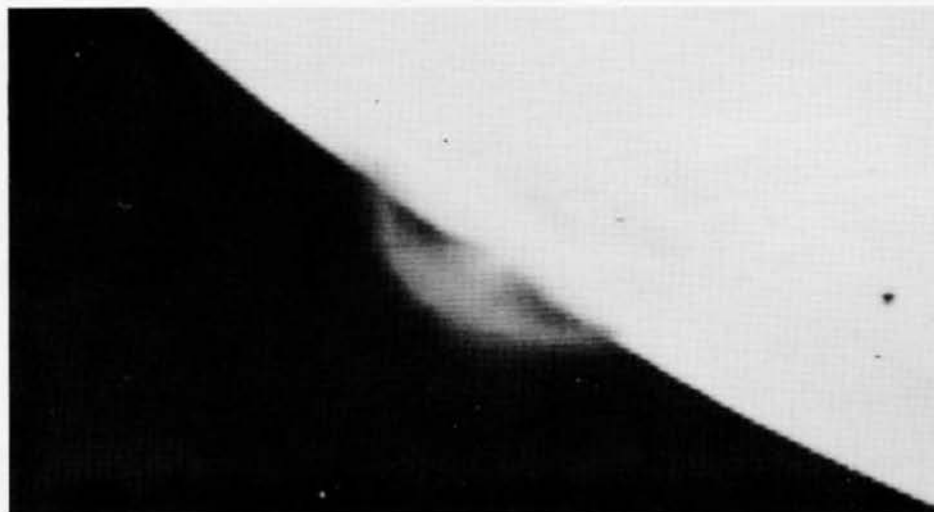
"The latest photos of Jupiter... were treated . . . as scientific amusements."

consisting of mixtures of snow and "dirt" such as silicate soils, sulfur compounds, or salts. The density of each world increases as we go inward toward Jupiter: Callisto, 1.8 gm/cm³; Ganymede, 2.0; Europa, 3.2; Io, 3.5. A similar progression is found in the inner solar system. The general theory is that the central body (the Sun or Jupiter) served as a heat source during the formation of the minor bodies, evaporating away the lighter compounds such as ices from the inner bodies.

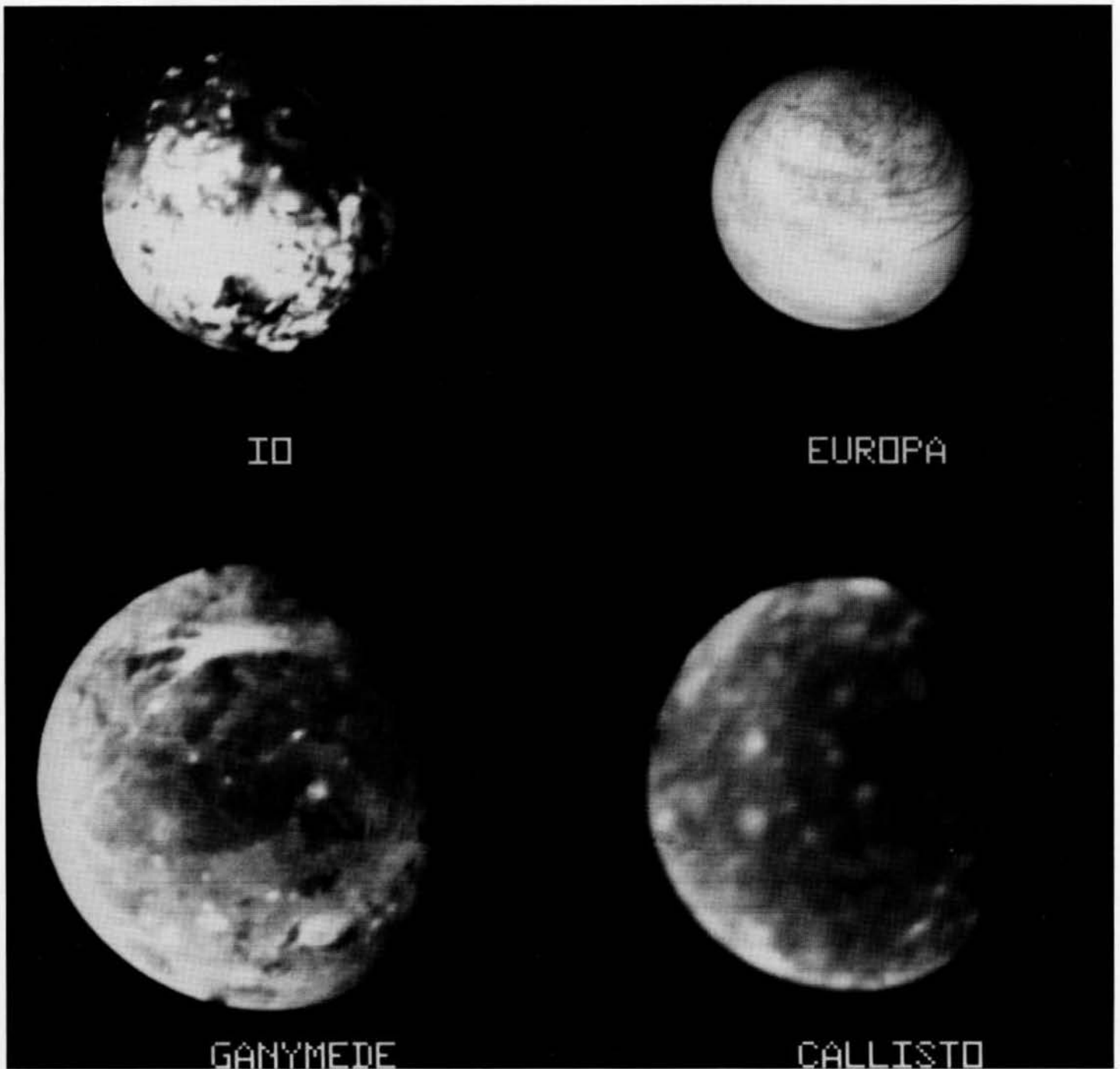
Io especially was known to be very strange. In the 1960's, astronomers discovered that sometimes when it

emerged from the coldness of Jupiter's shadow, it would be brighter than normal for ten or fifteen minutes, possibly indicating condensable substances that formed in the cold and evaporated in the Sun, or surface compounds whose reflectivity changed with temperature. The observations still aren't well explained. Pioneer 10 showed Io had an atmosphere, but only with about a billionth the surface pressure of Earth—hardly more than a minor concentration of interplanetary gas. Bright colors were known from Earth-based photos which showed only vague patches of color. Geochemists suggested sulfur and salts might explain the red and yellow tones. This seemed supported in 1973, when observers discovered a yellow glowing cloud around Io which turned out to be sodium atoms emitting the famous yellow sodium "D" spectral line. Energetic particles in Jupiter's magnetic field were suspected to be blasting sodium atoms off salt (NaCl) deposits on Io, where they would be thrown into space and emit a yellow glow after being excited by sunlight. An astronaut on Io would sometimes see a yellow auroral sky.

Voyager showed the Galilean worlds were still more interesting. They all appear different one from another. Outer moon Callisto is very heavily cratered, each crater showing a bright splotch perhaps due to ice formations caused when melted ice was sprayed from the impact sites. A giant system of concentric rings on one side may mark an old giant impact, much as systems



This photo is of volcanic eruption on Jupiter's satellite Io—the first such activity ever discovered outside of the Earth. The fact that several eruptions have appeared to be occurring at the same time suggests that Io has a more active surface than the Earth, with volcanism going on continuously. Another characteristic of the observed volcanism is that it appears to be extremely explosive, with velocities more than 2,000 miles an hour. This is more violent than any terrestrial volcanoes like Etna, Vesuvius or Krakatoa. Volcanic structures on the surface of Io have been identified by Voyager I's infrared instruments as being abnormally hot—several hundred degrees hotter than the surrounding terrain.



Above: Photos of the four large Galilean satellites of Jupiter, taken by Voyager between March 1 and 3, 1979. On this picture they shown at their correct relative sizes: the two biggest, Ganymede and Callisto, are larger than the planet Mercury, while Io and Europa are about the size of our Moon. In order of increasing distance from Jupiter, the satellites are: Io, Europa, Ganymede, and Callisto. Like our solar system, with rocky planets near the Sun and the less dense planets further away, the Galilean satellites get lighter as they get further from Jupiter. Ganymede and Callisto are barely twice as dense as water.

of concentric cliffs mark the largest impact basins on our Moon. Ganymede seems moderately cratered with large flat plains marked by peculiar mottled, irregular splotches of a type not seen before. Europa, seen only in a distant view, has a system of major linear features which seem to be faults or fractures as much as 1000 km long and 3 km wide.

An interesting confluence of theory and

observation came with Io, since a paper published a few months before the encounter pointed out that Io is so close to Jupiter that tidal flexing of Io generates appreciable heat in its interior. Its interior should be hot, and might have melted icy or other compounds. First looks at the Voyager pictures revealed a surface with volcanic-looking mountains and few impact craters, indicating that the surface

is geologically young and has covered or obliterated its impact craters faster than they can form (rather as Earth has done). Within hours of Voyager encounter, researchers concluded that the planet probably had recent volcanic activity—apparently even more recent than on sparsely cratered Mars with its huge volcanic mountains. A few hours later, scrutiny of close-up photos revealed



Above: Ganymede, Jupiter's largest satellite, with a radius of 2,600 kilometers—about 1.5 times that of our Moon. Ganymede has a bulk density of only about half that of our Moon, indicating that it is probably composed of a mixture of rock and ice. The large dark regions and the white spots resemble features found on the Moon—mare and impact craters respectively. The long white filaments resemble rays associated with impacts on the lunar surface.

umbrella-shaped erupting clouds on the limb of the planet, projected against the black background of space. The clouds shoot up more than 100 km (325,000 feet) and are coincident with hot spots several hundred degrees warmer than the surface, detected by infrared instruments. They are the volcanoes of Io actually erupting, and at least four simultaneous eruptions have been found.

So the Galilean moons of Jupiter, once dismissed without much thought as frozen, dormant iceballs of the outer solar system, have been found to be a system of worlds with great variety, including the most volcanically active surface observed in the solar system, and probably with abundant hot and cold running water. It may be that someday when our descendents are ferrying back and forth among the Jovian satellites, using these new worlds, the first week of March, 1979, will no more be remembered for our diplomatic forays than 1492 is remembered for the travels of Queen Isabella and King Ferdinand.

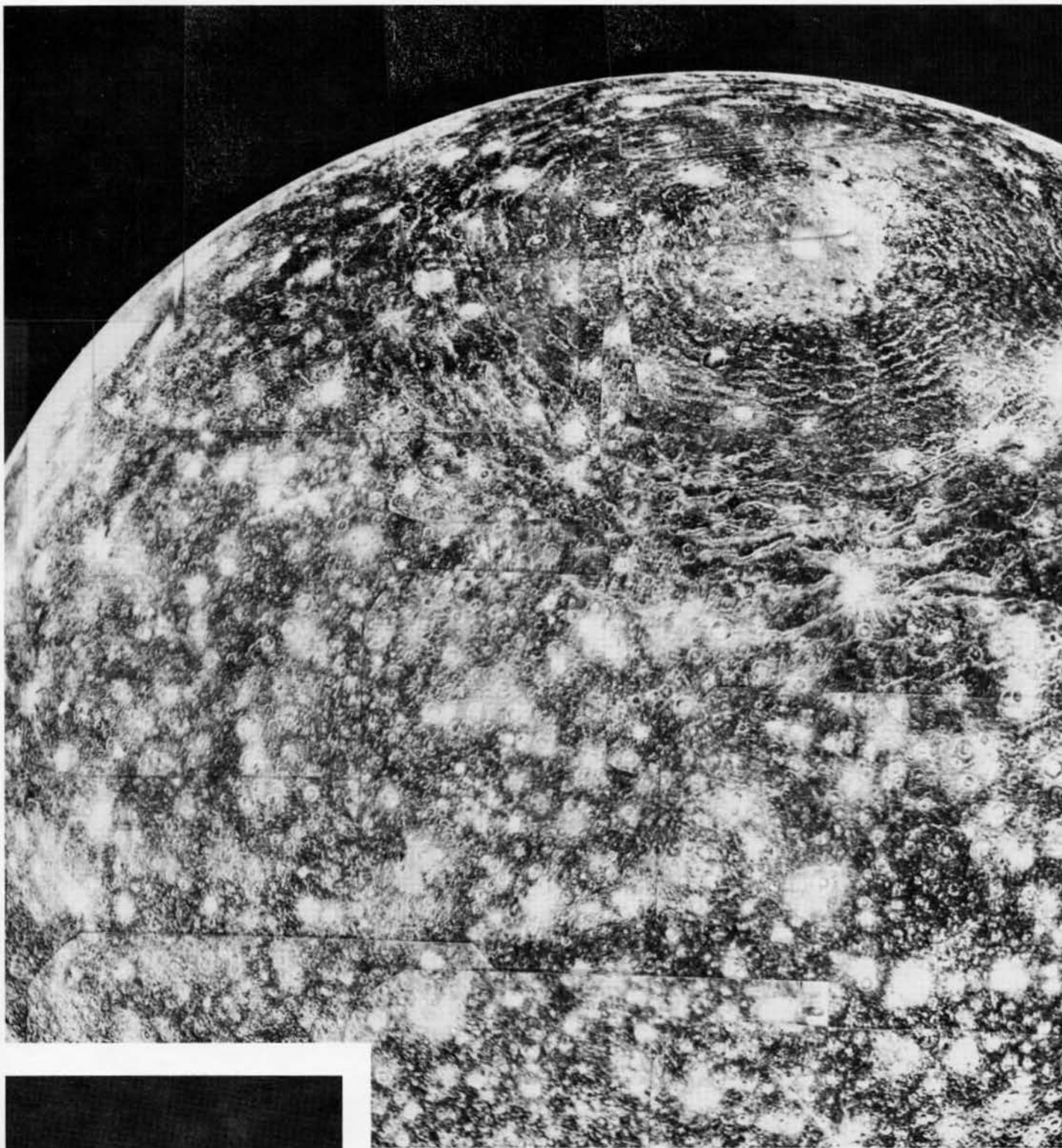
Through a ho-hum approach to science

journalism, our society is missing the major news of our time. The television capacity existed to broadcast the Jupiter and satellite encounters *live* from Jupiter into our living rooms, but except for Public Broadcasting Service coverage in a few major cities, most people missed this. In my capacity as press liaison of the Division of Planetary Science of the American Astronomical Society, I contacted the commercial networks to encourage live coverage and received the response that "well, if they get anything interesting, we'll get it on the evening news." There was rather minimal coverage on the evening news. They apparently did not think the first mapping of four new worlds in three days was very interesting. If L-5 members think it is interesting, there are two things you had better do to keep it going: Contact your senators and representatives again and point out that space exploration is exciting and that further missions should be supported; and write to the New York news headquarters of the major networks and tell them you want better coverage of the Voyager II

encounter with Jupiter and the satellites in July.

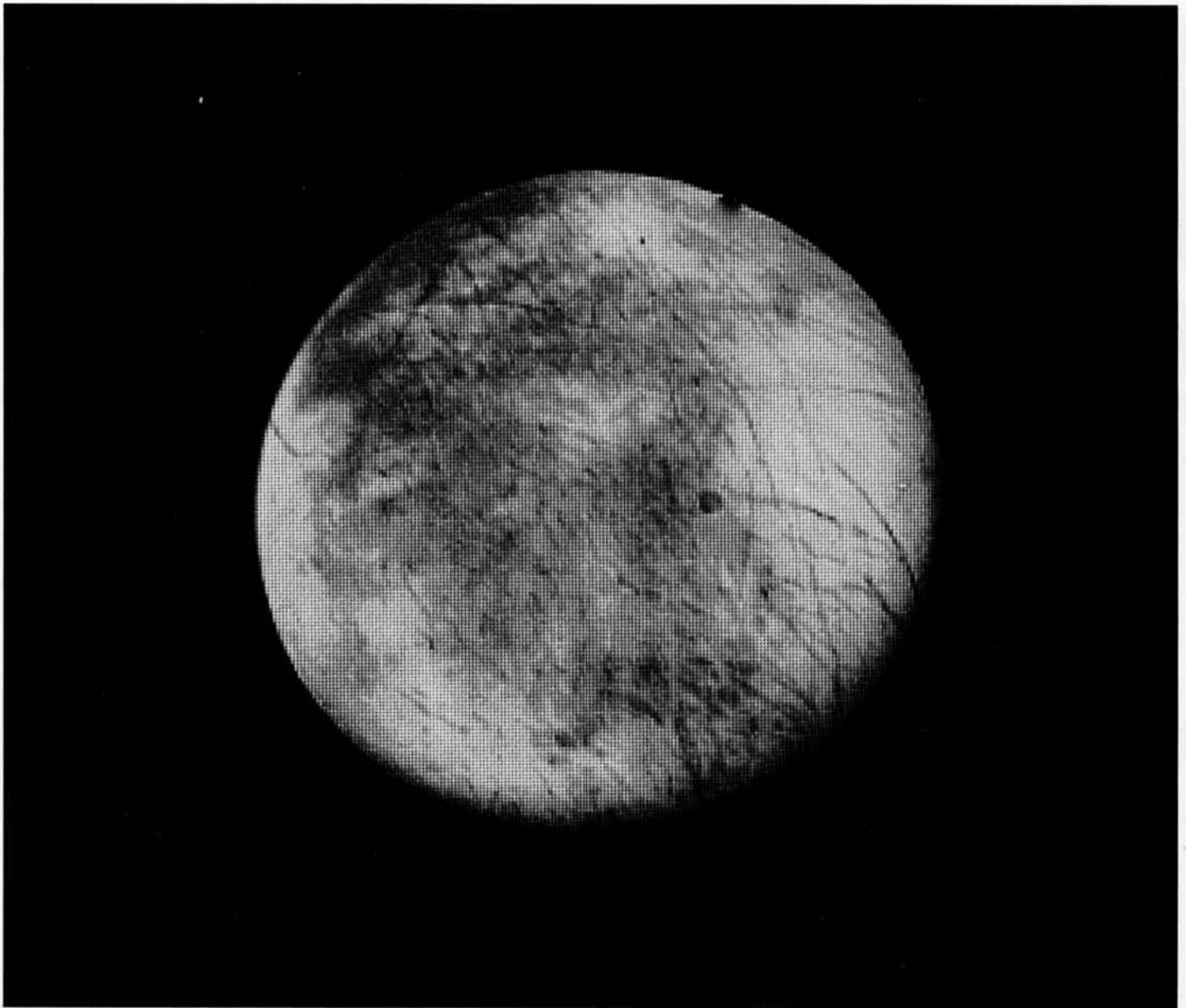
William K Hartmann is Senior Scientist at the Planetary Science Institute in Tucson. His research has dealt with star and planet formation and the evolution of planet surfaces. In 1971, he was a co-investigator on the Mariner 9 mission that first put mapping cameras in orbit around Mars, and in 1968 he was a photo-analyst on a study of UFOs sponsored by the Air Force. He is currently serving as press liaison of the Division of Planetary Science of the American Astronomical Society. In addition to being a professional astronomer, Hartmann is also an astronomical artist.





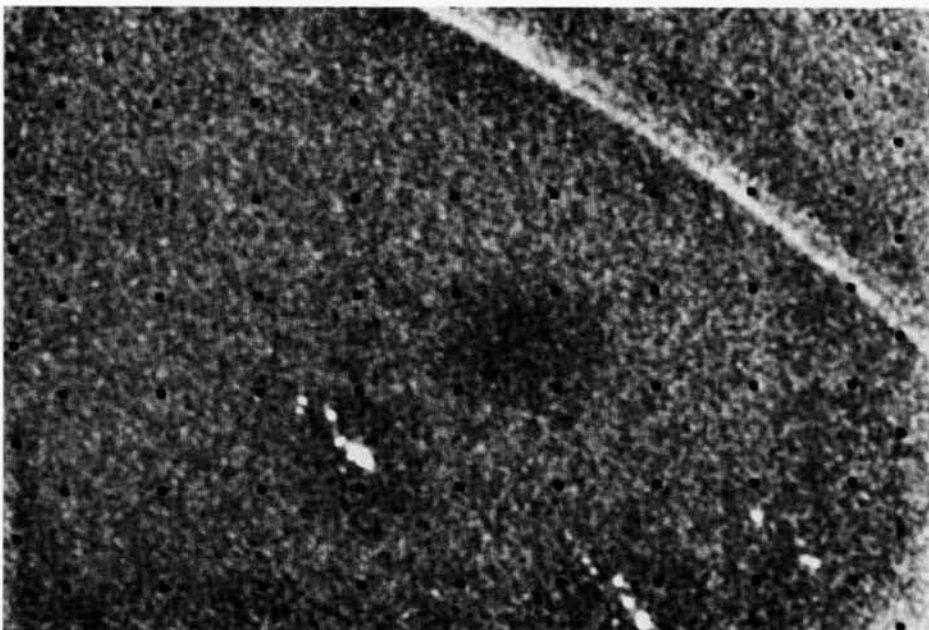
Above: This photomosaic of Callisto was assembled from pictures taken by Voyager I from a range of 202,000 kilometers (121,000 miles). Callisto is the darkest and most distant of the galilean satellites and has probably the oldest surface. The surface has been heavily cratered by meteorite impacts with many craters displaying bright ray systems similar to those on the Moon. The surface of Callisto is primarily rocky while the interior contains large amounts of water or ice.

Left: Tiny red Amalthea, Jupiter's innermost satellite which whizzes around the planet every 12 hours, only 1.55 Jupiter radii from the cloud tops. Amalthea's irregular shape probably results from a long history of impact cratering. The satellite appears to be about 80 miles (130 kilometers) high by 100 miles (170 kilometers) wide.



Above: Europa, the smallest Galilean satellite. The bright areas are probably ice deposits while the darkened areas may be the rocky surface or areas with a more patchy distribution of ice. The most unusual features are the systems of long linear structures which cross the surface in various directions. These could be on the scale of great canyons or merely surface streaks.

Left: This picture is a 3 minute, 12 second exposure by a wide angle camera of Jupiter's dark side. The long bright double streak is an aurora near Jupiter's north pole. The bright spots are probably lightning, but they could be auroral features. As lightening flashes they are comparable to the brightness of superbolts seen at the tops of terrestrial tropical thunderstorms. As auroral features they would be much brighter than those on Earth.



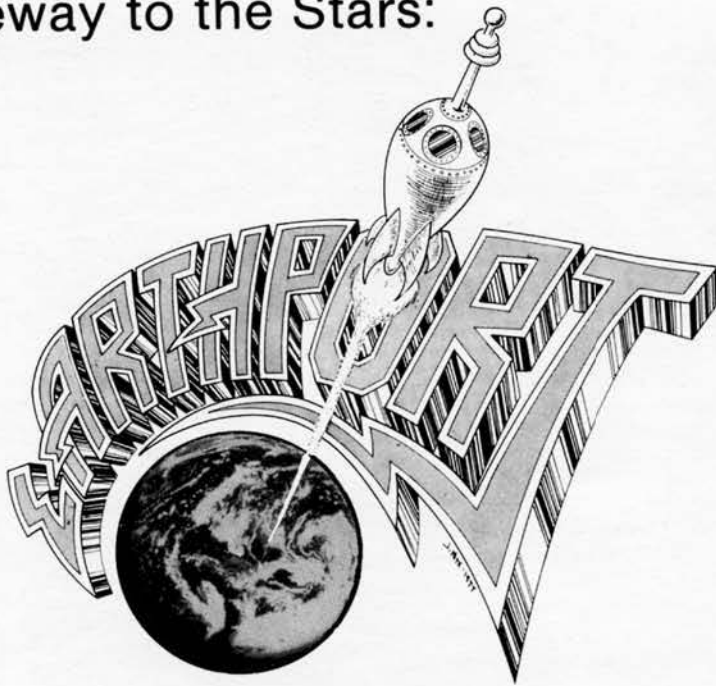


Above: The Great Red Spot, an enduring feature on Jupiter's turbulent cloud surface. Vividly-colored convoluted patterns circuit the planet in a tumultuous state of currents and flows. One of Voyager I's major goals is to discover the nature and chemistry of the colors that we observe in these patterns.

Center: Jupiter in a photo taken by Voyager on February 5th at a distance of 28.4 million kilometers (17.5 million miles). Jupiter embodies more than 70 percent of the mass in the solar system that did not end up in the Sun.

Bottom: The first evidence of a ring around Jupiter is seen in this 11 minute, 12 second exposure photo. The multiple exposure makes the extremely faint ring of particles appear as a broad light band across the center of the picture. The ring has been invisible from Earth because of its thinness (30 km or less) and its transparency when viewed from any angle except straight on. (The background stars look like broken hairpins because of the movement of the spacecraft during the lengthy exposure, and the black dots are geometric calibration points in the camera.)

Gateway to the Stars:



"Hop into the time machine with me to see why nations such as Liberia and Indonesia pant after Earthport."

by Carolyn Henson

Right now the big action in the equatorial Third World centers on Earthport. Several nations are negotiating to set aside a 200 square mile tax-free, regulation-free trade zone which will become the heart of a giant international spaceport.

Hop into the time machine with me to see why nations such as Liberia and Indonesia pant after Earthport. We step out in 2005AD under the blazing sun; to the left is the seaport, where hundreds of freighters are unloading passengers and goods. Far off to the right we see the gleam of gantries and hear the roar of a giant passenger liner as it rides a pillar of fire into the sky. On the edge of the horizon bright objects flash noiselessly upward one right after another, lofted on the tips of laser beams. Those are the freighters, shipping goods to space cheaper than the US Post Awful ships first class mail. You hear a distant boom, boom, boom, not the beating of native drums but the sonic booms of reentering freighters. And before you spreads the megopolis of Earthport. The richest city in the Solar System. Her fabled streets teem with people babbling hundreds of Earth-tongues. And everywhere you go you meet the proud spacefolk: Belters from beyond Mars, Lunans and Lagrangians and more. Street

vendors hawk souvenir asteroid nuggets, fragrant mangoes and cheap watches; dudes with leopard skin hats cruise the street in flashy pink hovercraft. Shops overflow with duty-free goods: jewels from the laboratories of Leo (low Earth orbit), Martian surface-rated camping gear, cheap pocket tridee sets, and more. There's the recruiting district where thousands of companies hire more than a million people every year to go to work in the factories of space. The sign over the Galactic Enterprises office proclaims "Earn your own home in ten years!" next to a hologram of a giant space colony interior featuring banana trees and a honeyskinned maiden whose tresses are held back by red hibiscus blossoms.

We hop back to 1979 and you ask, "How do I get in on the action?"

Call Jim Bennett or Mark Frazier at the Earthport office, (805) 965-7947, 221 W. Carrillo St., Santa Barbara, CA. You can apply for a job! Earthport needs just about every skill under the Sun. Feeding the copier and stuffing envelopes isn't fun and doesn't show off your skills, but it means you're on the spot when a better job comes up. (That's how Jim Bennett got his job at Earthport.)

Also, you can give money to the Earthport project. Earthport is operated

under the aegis of the Sabre Foundation, so your donation is tax-deductible. If you give them money you'll be in good company: famed science fiction writer Arthur C. Clarke is one of their donors. In exchange the Earthport project will keep you up to date.

Who are the people who aspire to build the greatest port in the history of this planet? Arthur C. Clarke sees his beloved Sri Lanka as the gateway to the stars. He has just finished a novel, **The Fountains of Paradise**, which centers about a giant skyhook, a ladder into the sky tethered at the Sri Lanka Earthport. As I mentioned above, Clarke has the guts and vision to invest his time and money into building the dream of his latest and, so we hear, best novel.

Mark Frazier is a young Harvard graduate who left a thriving career as an investigative reporter to direct the Earthport project. Mark is super handsome, somewhat slight of build with short curly black hair and a voice that melts hearts. He gave up luxuries and even scrimped on food so that his money could go into the real necessities: postage, printing, phone bills, travel funds, and more for Earthport.

Jim Bennett is a tall, broad shouldered anthropologist specializing in agricultural research. He left a good paying job to work as a full time Earthport volunteer, and when its first suitable job came open, he got it. He's running a study of Third World space program leaders' attitudes toward solar power satellites, Manhattan-sized energy systems which could turn the energy crisis into a relic of history.

Former scientist/astronaut Phil Chapman is putting voluntary labor into the Earthport project. Thanks to NASA budget cuts his career went into cold storage before he had a chance to make it into space. Undaunted, the urbane, articulate and — you guessed it — handsome Chapman went to work for Avco-Everett Research Laboratory on laser rocketry. By boosting small ships into space with lasers it may be possible to cut freight costs to \$10/kg to geosynchronous orbit. That's a passenger ticket to space for about \$1000!

After working on how to get him (and us) into orbit cheap, Phil went over to Arthur D. Little, Inc. to work with Peter Glaser on solar power satellites. He's there now, hammering out an economic driver that will give us jobs at the other end of the cheap passenger routes to orbit.

Earthport — today it's no more than a dream on the drawing boards of a group of visionaries. But they have the guts and savvy needed to make it happen.



NASA Talks to Students

Fur Flew when Students Confronted Bureaucrats!

by Stan Kent

"Come and see me", was NASA Administrator Dr. Robert Frosch's response to persistent student questioning during the 1978 International Astronautical Federation Congress held in Dubrovnik, Yugoslavia. Stan Kent, a recent graduate of Stanford University, had raised questions surrounding NASA's relationship with the student community, and after several months of frustrating letter writing by students (otherwise known as the bureaucratic paper shuffle) Dr. Frosch followed up on his Dubrovnik invitation and met the issue of student involvement in the space program face to face in his NASA Headquarters Washington D.C. office.

The meeting centered upon the contribution students can make to the space program during these lean budget years. Both Frosch and Kent agreed upon the need to involve students in the various NASA programs and particularly the use of students in the area of educational programs. Some of the activities proposed by Kent which met with Frosch's approval are:

Student Ambassadors of Space—Many students are capable of acting as intermediaries between NASA and the wider body of students who are interested in space, but require direction and fail to receive it because of NASA's funding and labor restrictions. Frosch said NASA could prepare packets of slides and handouts for the "ambassadors" to use.

Student Management of the Space Mobile Program

The Space Mobile, a self-contained travelling space roadshow, has had a very uncertain future because of the lack of labor and operating funds. Rather than scrap the vehicles, the space mobiles could be managed and operated by a student group under the "parental

supervision" of a local AIAA or similar professional society section. (Such as L-51)

Student NASA Advisory Board—A student forum, composed of several nominated students, would prepare a yearly white paper detailing student views of NASA programs, what programs students would like to see NASA undertaking, and directions for future NASA student activities.

Student Flight Experiments—Planning should begin on student experiments to be flown on Spacelab, although one of the largest obstacles to allocation of a portion of Spacelab resources to student experiments would be scientific jealousy by senior members of the scientific establishment.

Such items as the above programs are promising, but students must realize that NASA has firmly deposited the ball of student involvement in the space program into the waiting courts of student groups throughout the country. It is up to students to take the initiative and drag the NASA/Administration/Bureaucracy into the Space Age. At least students now have a channel of communication, but it is important to realize the difficulty of the task.

As an illustration of the obstacles to be overcome, consider some of the comments made by Arnold Frutkin, NASA Director of External Affairs, to Stan Kent in an interview following Kent's talk with Dr. Frosch. Frutkin, like Frosch, was supportive of the student ambassador and space mobile programs. He was a little less enthusiastic about student payloads on Spacelab adding that, "any student payload should be judged on the same merits as every other potential payload." Such objections were mild compared to Frutkin's opposition to the idea of student input into NASA's planning procedures.

With the characteristic arrogance of a typical bureaucrat, Frutkin launched into an all out attack on student competency and responsibility. Here are a few of his comments:

- "It is absolutely absurd to think that undergraduate students, with limited expertise and experience, would make any useful contributions to NASA planning."
- On the subject of FASST's DOE contract to solicit student viewpoint on Satellite Solar Power, Frutkin offered the following gem of wisdom—"DOE's awarding of the FASST contract was extremely ill advised, and if it had been up to me (Frutkin) FASST would not have received any support."
- "There may be some extremely talented undergraduate students out there, capable of making a contribution to NASA's complicated planning procedure, but if there are, you're going to have to show me that they are worth consideration."

The list of Frutkin's comments goes on, but it should be clear to all students just how much opposition there is to their involvement in such things as policy determination, future programs, etc. No student pretends that their point of view is correct, or better than the considered opinion of NASA planners, but what students do offer is a different, fresh approach to tackling a problem, an approach the experienced professionals may have overlooked. Frutkin asked for proof of students' ability to contribute to the planning procedure. If Frutkin will reflect upon his discussion with Kent, he should realize that proof was staring him in the face. After all, NASA has been trying to decide what to do with the Space Mobile program for quite some time. One experienced planner wanted to scrap all of the vehicles, but then along came this unexperienced, naive student suggestion...

Space Wars

Whenever one or more nations are gathered together, sooner or later there is going to be a war. That seems to be an axiom of history.

When I was a kid, we also knew that everybody got measles and mumps and sometimes polio. Kids don't catch that stuff any more.

We're moving into a new age and a new frontier. Maybe in this age war will be as obsolete as polio.

The pioneers who overcame measles and polio didn't use wishful thinking or pious pronouncements. They put their theories to the test and chucked out the ones that didn't work.

Today a new group of pioneers are using the space arena to test their theories of war and peace. One is the United States Dept. of Defense (DOD).

SANE, a citizen's anti-war group, has its own theories. And it doesn't think at all well of DOD's space policies. SANE's objections are detailed in a 19-page pamphlet, "Star Wars Revisited — a Look at the Arms Race in Outer Space," Mark C. Hallam, 1978 (available for \$1.50 from SANE, 514 C. St. NE, Washington, D. C. 20002).

In the following article, former Air Force officer James Oberg defends US military activities in space. Ironically, Oberg recently resigned in the face of the flak the Air Force had been giving him over his vocal public pronouncements on space war. — CH

By James Oberg

"Star Wars Revisited" pulls together some interesting and useful data, particularly the suggestion that the Soviet antisatellite (ASAT) program is aimed at Chinese rather than American satellites. An excellent bibliography is included.

But the primary thrust of the booklet is way off course. SANE argues that the Soviet ASAT is no threat to the United States and that the United States should not respond with space weapons of its own. (SANE does not comment on whether or not it might be provocative for the US to "harden" its satellites against any anonymous attacker.) These premises may be arguable, certainly; but the arguments put forward by SANE are unconvincing. Their primary value seems to be to highlight the level of reliability and logic of SANE itself.

To begin with, SANE brands as "fictitious" the stories of an ASAT gap, a bomber gap, a missile gap, and a megaton gap. SANE's use of the term "fictitious" is fraudulent: the "missile gap" may have been illusory, based as it was on known Soviet capabilities and public Soviet threats, but nobody was lying about it. In hindsight it was not real, but there was no way of telling at the time. Nor is the "megaton gap" either fictitious or imaginary or illusory: it is quite real, although observers are divided on its significance. So SANE itself is resorting to fictions.

It is interesting to consider SANE's argument that the current Soviet ASAT system is harmless since it can only reach our reconnaissance and navigation satellites. SANE dismisses those navsats as superfluous ("... additional systems can fill the gap ..."), thus pinpointing the photoreconnaissance satellites as the likely target for the Soviet ASAT weapons.

That leads to a damning indictment, if the logic is correct, since a key provision of the SALT I agreements was that neither side will interfere with the other side's "technical means of verification", a term which is universally understood to include just such photoreconnaissance satellites. So SANE's logic leads inexorably to *proof of Soviet preparations to break the Salt I accords*. Yet nowhere in the booklet is this suggestion enunciated.

If our reccesats were destroyed, SANE shrugs that "this loss would be temporary, since the United States could quickly launch additional surveillance satellites and/or reconnaissance planes". Quickly dismissing the laughable contention that the US could still send spy planes over Russia almost twenty years after the U-2 incident, the other suggestion still sounds valid — but it is not.

US reccesats fly long duration missions, up to and exceeding many months in orbit. The number of such satellites "in the pipeline" at any one time is thus very low, and the number on hand as short-notice spares is even lower (just guessing, more than one or two would be extravagant). Soviet reccesats fly short missions (two weeks), with up to thirty flights per year, so dozens of vehicles are "in the pipeline"; during international crises, a flurry of reccesats have been shot off, suggesting that the Soviets may have a dozen or more reccesats on hand for just such replacement duty.

What this means is that the Soviets

would only have to destroy a very small handful of US reccesats in order to blind our sensors for months; to get the same effect, US forces would have to destroy a dozen or more Soviet vehicles.

(This disregard for US-USSR operational differences when playing a numbers game of unjustified comparisons is not uncommon. The best example that comes to mind is in bar charts of strategic bombers, showing how many more such planes the US has than the USSR has. Such charts usually ignore the offset factor of the powerful Soviet air defense system, vis a vis the far less well endowed US air defense system.)

Besides, SANE argues that the Soviet ASAT tests have not been very successful anyhow, and the US space technology is so superior to Soviet space technology that we will eventually outsmart them anyhow. Now, Secretary of Defense Harold Brown has said that the Soviet tests have been very successful; SANE says not. Who to believe?

Obviously, a non-governmental (better yet, a foreign) space authority is needed. There is one: Geoffrey Perry of Kettering, Great Britain, acknowledged as the world's foremost non-government expert on the Soviet space program. He and his team of high school amateur radio listeners track, analyze, and catalog all Soviet space shots with a phenomenal level of accuracy and insight.

SANE ignores his existence, so you can guess what Perry's unbiased assessment is of the success of recent Soviet ASAT tests. Also left out of the otherwise very thorough booklet are the conclusions of the Stockholm International Peace Research Institute (published in *Outer Space - Battleground of the Future?*, 1978, Crane, Russak & Co., 347 Madison Ave, NY, New York 10017) and of the British Interplanetary Society (published in their monthly magazine *Spaceflight*, from London), who are both more impressed with the success of the Soviet ASAT.

SANE raises the key point that the Soviet ASAT *as tested* cannot threaten American satellites in high geosynchronous orbits. A reasonable question to ask next, then, is this: once tested in low orbit (within range of radar and telemetry tracking), could the Soviet ASAT vehicle *then* be used operationally in high geosynchronous orbit?

SANE refuses to address this obvious question, because the answer is "quite possibly". The most important issue is payload weight capability: the ASAT is launched by a modified ICBM, and it probably weighs about three tons. Using a larger booster called the "Proton", the Soviets have been routinely launching satellites of that weight into geosynchronous orbit since 1974. There is

no known reason why they could not launch an ASAT on a Proton rocket tomorrow, right into the geosynchronous orbit which SANE insists is invulnerable.

(SANE says that attacks against US geosynchronous satellites "would signal hostile Soviet intentions"—but that is true only if the attack could be distinguished from a natural breakdown or other non-hostile calamity. As for the "military response" that SANE advises be taken in such a case, what space weapons would SANE have allowed: astronauts with slingshots?)

Besides, on page 10, SANE admits that "the Soviet Union is seeking an ASAT device capable of countering (US geosynchronous satellites)" and SANE thinks the USSR has good reasons to do so. So why the false flim-flam about how the current ASAT as tested is no threat?

And SANE misses a subtle point, although the hints are all there. In low Earth orbit, it is much more economical and reliable to shoot down such satellites with ground-based systems. The present Soviet ABM system around Moscow has such a capability right now, if you think about it. What good then is a space-based ASAT system, then, except for regions of high space beyond the orbits of low satellites: that is, geosynchronous orbit. There is no present or projected operational need for a space-based ASAT system for low Earth orbit: a space-based ASAT system intended for geosynchronous orbit would first be tested in low Earth orbit anyway.

SANE blames the US for the whole problem: "In reality," the pamphlet says, "the United States has been working on ASAT systems for about twenty years, some ten years longer than the Soviet Union." This apples-and-oranges gambit cannot be interpreted as anything but an attempt at fraud by SANE, since the booklet lets us know that the Soviets began space flight testing of an orbital ASAT twelve (not ten) years ago, while the US has not even begun testing. Nobody knows how many years before the Soviets began studies, such as those to which the US has limited itself (regarding orbital ASATs). Knowing the Soviet passion for secrecy and defense, observers can speculate that the Soviets must have begun ASAT studies at least as early as the first USAF Discoverer satellite flights in 1959, since that program was a prototype of a satellite photoreconnaissance system.

Logic fails again: on one page the Soviet ASAT is pooh-poohed because "it cannot hit maneuvering targets." None of the US potential targets can maneuver, so this is not a restriction. But a few pages later, the US planned ASAT systems are discussed, and lo and behold: they will not be able to hit uncooperative evading targets either! So the pooh-poohing of the Soviet ASAT,

for not now having a capability which the US does not even plan for its future systems, is clearly specious.

One space weapons system conspicuous by its absence in this SANE pamphlet is the Soviet orbiting H-Bomb, the FOBS ("Fractional Orbit Bombardment System," in Pentagonese—the Soviets have never told what they call it). SANE's research must have noticed it, so its omission is deliberate. When it suits SANE's purposes, other historical US systems are mentioned—but why not the FOBS?

Clearly because the existence of the FOBS was a testimony to Soviet aggressive space intentions: it called for the

US to Bring Back U-2

The days of secret U-2 reconnaissance flights are on their way back. U-2 flights over the Soviet Union were cancelled when downed pilot Gary Powers revealed to his captors that he had been flying spy missions for the US. However, claiming that the U-2 gets "better pictures" than spy satellites, the US once again has several of the glider-like jet aircraft under production.

Skeptics who are aware of the high resolution of spy satellite optics suspect that the policy change is motivated by the Soviet ASAT satellite killer. The US can't launch very many new spy satellites on short notice—but it can field U-2's.

What's to keep the Soviets from shooting down another aerial intruder? Nothing; but US officials plan to restrain their range to Eastern Europe air space which might not be so vigorously defended.

placement of nuclear warheads in low Earth orbit (*presumably* the tests used only dummy warheads, but nobody knows for sure) and their subsequent deorbiting over enemy territory. Since the FOBS warhead does not complete a full orbit of the Earth (hence, "fractional", as opposed to a hypothetical MOBS, for "multiple orbit"), Western apologists have waffled that it is not a violation of the prohibition of nuclear weapons in orbit.

But this is totally a phony-baloney argument, since the warhead is physically placed into a stable orbit and, but for the deliberate rocket retrofire an hour later, would stay in orbit for days. Moreover, the Soviets, tried to disguise FOBS tests under

the "Kosmos" satellite program for "scientific research," thus acknowledging that the vehicles were in all respects in Earth orbit. Besides, the "less than one full orbit" dodge does not work anyway: Yuri Gagarin is universally recognized as the first person to orbit the Earth, even though his spaceship followed a FOBS-like trajectory and did not ever complete one full orbit.

What was frightening about FOBS (and there have not been any test flights in seven years, leading observers to suspect that the system has been scrapped) was that it made sense only as a "first strike" system, using its low orbit (100 miles, compared to a height of about 600 miles to which ICBMs usually rise on their arcs) to slip under radar beams (actually, stay over the horizon from radar longer) and strike with minimal warning. Subsequent nuclear exchanges would have no need of such stealth.

Moscow's willingness to secretly test systems made illegal by the Outer Space Treaty of 1967 also vitiates the high-sounding SANE proposal that the space treaty be amended to ban ASATs. The treaty already banned FOBS, but in the very year the treaty was negotiated and signed, the USSR was engaged in a major FOBS test flight program which did not slacken when the treaty went into force. So no wonder the "FOBS Affair" is not mentioned by SANE! Nor is SANE's bookkeeping any more balanced than its reasoning. Somehow SANE comes up with the numbers that show that nearly half of NASA's budget is for military purposes! This includes all Space Shuttle funds (since the DOD will use it for satellite launching), all LANDSAT funds (since the DOD has allegedly bought LANDSAT pictures, as has Red China and this writer), and all Spacelab experiments for "Earth resources." Now, a reasonable approach might have been to pro-rate the military usage of these systems against their developmental costs, plus to subtract all DOD expenses in support of NASA scientific missions . . . but such a reasonable approach would not have given numbers anywhere near as high as the ones SANE wanted to flaunt!

(Speaking of LANDSAT, the "table of military satellites" lists LANDSAT as a military photoreconnaissance satellite, and gives its altitude as "approx. 100 miles," which is way way off.)

Essentially the pamphlet was written to justify an obviously preconceived notion, that the United States should not develop any new space weapons systems. As mentioned earlier, there may well be good arguments for this course of (in)action, but SANE sure does not use them. As such, it is a failure in its own cause. The book, most certainly, is a four star failure.

Seven Space Shuttles

by Ken McCormick

At hearings before the Senate Subcommittee on Science, Technology and Space, Dr. James C. Fletcher, Administrator of NASA from 1971 to 1977, commented on the Office of Management and Budget's (OMB) desire to cut the size of the Shuttle Orbiter fleet from five vehicles to four:

"I am very concerned about the current trend to move from five Shuttle Orbiters to four. I was the one who arbitrarily picked the number five at the beginning of the program. After looking at it further, I could see that was a minimum. I had a lot of discussions with the late Chairman of the Joint Chiefs of Staff, George Brown, who could see the military potential of these Shuttles. He said: 'Jim, you are wrong in going for five; you should go for seven at a minimum because even though now the military is not going to support the Shuttle program — it's a NASA program — some day they will have need for a larger fleet than the five that you have asked for.'"

"Although I agreed with him, perhaps I made a bad political decision. I was afraid to up the number — the original five that I started with. So we stuck with that. Even though the

so-called mission model seems to show that four will produce the mission model, the mission model isn't all that good. It was a brainstorm pulled together to make cost effective analyses for the OMB. Nobody really believes the mission model will be the model. Nobody will begin to invent uses of the Shuttle until the Shuttle is actually flying. I hope whatever plan we develop does not foreclose the option of increasing the number of Shuttles from, I guess, the current four up to at least seven.

"I wanted to get at least that on the record now that I have left the government."

No Enterprise?

by Ken McCormick

NASA has settled on the names of historic ships of exploration for the first four Shuttle Orbiters scheduled to fly into space. They are, by order of launch date: Columbia (Orbiter 102), Challenger (Orbiter 099), Discovery (Orbiter 103), and Atlantis (Orbiter 104).

When NASA Administrator Dr. Robert Frosch first revealed the new names before the Senate Subcommittee on Science, Technology and Space, he was questioned by Senators Adlai Stevenson and Harrison Schmitt about the status of the fifth Orbiter.

Schmitt: Dr. Frosch, how are we going to explain to the Trekkies that you discarded the word Enterprise?

Frosch: *Enterprise still exists.*

Stevenson: That's for the fifth Orbiter?

Frosch: *It is not yet clear whether if there is a fifth Orbiter, it will be used or not.*

Schmitt: Can we expect to see that name fly again, with the next ship?

Frosch: *I don't know. I don't know whether we will reuse that ship as the fifth Orbiter, and at this point, we don't know whether there will be a fifth Orbiter.*

"Oh yes we do," quipped Senator Stevenson, apparently referring to his own well-known determination to save the fifth Orbiter from administration budget cuts.

Shuttle Launch Date

by Ken McCormick

November 9, 1979 still stands as the launch date for Orbiter 102, the Columbia, but NASA does not hold high hopes of meeting that schedule. While a tight schedule has been set to ensure that the launch will take place at the earliest possible time, NASA concedes that further difficulties are quite possible. December 1979 or early 1980 will more probably see the first U.S. Shuttle launch.



The former Shuttle orbiter Enterprise in early tests that had the Shuttle carried by a 747 carrier aircraft.

NEWS BRIEFS

Was the Soviet Ekran III satellite, launched Feb. 20, 1979, the first test of an antisatellite (ASAT) system aimed at geosynchronous orbit? Geosynchronous satellites are too far from Earth to be accurately spotted by radar. So when Ekran III inched along 1/9 of that orbit before settling into its slot, some observers speculated it was "taking inventory" of communications satellites. The Soviet delay of 7 days in announcing and registering Ekran III as a communications satellite added to suspicions.

Ekran III is not an ASAT, say U.S. officials. The United Nations has studiously ignored the entire affair.

\$13 million is in the pipeline for NASA's Advanced Programs in FY '80, up from \$7 million this year.

Convair's lunar utilization study for NASA has concluded that Moon mines and space factories will cut solar power satellite costs.

Georgetown U. is winding up a social sciences space interests survey for NASA. No decision has been made on a followup.

M.I.T. is completing a lunar resources study under NASA/Marshall, as well as an underwater simulation of space hard hat workers. Inflatable space structures are one brand new concept being tackled by M.I.T. Its National Magnet Lab is working on the mass driver, an electric rock thrower which could ship lunar ore, under NASA and Dept. of Defense contracts.

O'Neill's Princeton group has \$50,000 from NASA/Ames for space industries planning and shares mass driver research with M.I.T. Their goal: 500 gs acceleration by this May.

NASA life sciences is planning 6 months to 2 years O-g stays for space workers. Space farm funding is expected to increase.

DOE has \$8 million in the pipeline for SPS in FY '80. \$3 million goes to NASA for systems development, \$3 million for environmental assessment, to be spent at the Argonne, Battelle Pacific Northwest and Los Alamos laboratories, and \$0.5 million for social issues.

DOE is working with Rice, U. of Washington, Colorado State, UC Davis, UC Berkeley, U of Illinois, South Dakota School of Mines, U of Tennessee, U of Mississippi and Stanford University on SPS.

DOE has distributed 3,000 copies of its recent white papers on SPS to major universities libraries, photovoltaic and solar researchers, aerospace companies, technical journals, newspapers and magazines.

NASA's budget request for FY '80 totals \$4.595 billions. Dept. of Defense is asking \$3.365 billion for its space activities. If current trends continue, by 1982 DOD will dominate U.S. space efforts.

Two U.S. government agencies have recently gotten involved in space industries for the first time. They are the Environmental Protection Agency, with a \$1 million study of SPS, and the Congressional research arm, the Office of Technology Assessment.

OTRAG, the private West German rocket firm with operations in Zaire, has requested United Nations monitoring of its activities. Last May their Zaire base was the target of an unsuccessful Angolan-based rebel invasion.

According to the U.S. National Research Council Advisory Board, the space shuttle may not fly until April or May 1980.

A Job of the Future: Space Economics

by Mark M. Hopkins

Looking for a job that deals mainly with space has excellent employment prospects, and does not threaten to overspecialize you to the point of losing sight of the big picture? Try Space Economics.

The industrialization of space has begun, and in time it will become a major force in economic affairs. The resulting demand for economists with relevant training is the driving force behind the development of a new subdiscipline within economics. In the past, such increases in the demand for economists trained in a particular way was the main reason for the creation of new subdisciplines. For example, the civil concerns of the '60's spawned the new specialties of urban and environmental economics, and the OPEC oil embargo was responsible for the creation of energy economics. The subdiscipline, being created by the rapidly increasing demand for economists concerned with space has no generally agreed upon name. The author will therefore take the liberty of christening it Space Economics.

The Apollo program was undertaken primarily for the purposes of basic research and international prestige—reasons which traditionally lie outside of the economists's trade. As a consequence, economics was of minor concern to NASA during this period. Since then, the mix of programs funded by NASA has increasingly shifted towards those in which economics plays a major role. When the space shuttle becomes operational, this trend will be accelerated.

A New Direction

President Carter's recently announced space policy is indicative of this new direction. Emphasis is being placed on programs that provide direct economic benefits to citizens. In the natural course of events, economists will be called upon to compare these benefits with the corresponding costs. Advanced communication satellites employing large space-assembled antennas are one example. These satellites allow receiving

stations on Earth to be vastly reduced in size, which in turn makes possible such innovations as inexpensive wristwatch-like telephones with personal phone numbers for everyone. Another example is the area of gathering data by viewing Earth from space. Satellites of this type will be able to do such things as make improved forecasts of crop outputs and locate new sources of valuable minerals.

Even the planetary program is not immune to assaults from economics. One justification that is being used for the Lunar Polar Orbiter project and for unpiloted trips to the asteroids is the potential economic use of materials from these locations, a proposal no doubt familiar to the readers of the *L-5 News*.

Humanity's Destiny

In addition to training economists for space industrialization, there are important questions of a more academic nature that fall within the province of Space Economics. Space colonization proposals, NASA's search for extraterrestrial intelligence program, and the recent work of the British Interplanetary Society which has heightened considerably the expectation of eventual interstellar travel, have all stimulated interest in some of these other questions. For example: What should be done to insure long-run human survival? What is it worth to do so? To the extent that we have anything to say about it, what should humanity's destiny be?

Defining Space Economics

We shall now make an attempt to define more precisely what Space Economics is by dividing it into six categories and discussing each one briefly. They are: Theoretical, Institutional, Methodological, Applied, Normative, and Historical. The author considers this effort to be only a first attempt at a definition because Space Economics is sufficiently new that a general consensus on the boundaries of the discipline has yet to develop.

Theoretical Space Economics is concerned with a number of issues, some of which are also of significance to economics as a whole. One of the more important of these is the determination of the optimal relationships between the government and private enterprise in industries characterized by large amounts of research and development, high risk, and substantial capital requirements.

In the province of Institutional Space Economics lie such questions as: How, in the real world, can a theoretically optimal relationship be effected between private enterprise and the government (once the optimum is determined)? In what way should international space organizations be structured? How should relations between NASA and other government agencies be conducted? Other questions deal with the impact of NASA contracts on local economies and on the degree of monopoly in certain industries.

Methodological Space Economics concerns itself with the various tools of the trade. Cost benefits analysis, expected value analysis, expected utility analysis, and econometrics are all examples of the weapons that a practicing space economist employed by NASA, Comsat, or some aerospace firm might use to attack the problems which he or she is paid to solve.

Certain topics exist in which involvement by a practicing Space Economist is particularly likely. Examples are communication satellites, space materials processing, and data gained from a space-based view of the Earth. Applied Space Economics is the study of the details concerning such topics.

The analysis of differing value systems and their implications for society in general and the economic system in particular has long been a major concern of economists. The space program emphasizes value systems which have been neglected in these studies. Normative Space Economics aims at overcoming this deficiency. Currently, virtually everyone agrees that a particular space project should be undertaken if it can make a reasonable rate of profit after adjustments

are made for such things as possible effects on the environment. Many space enthusiasts would go further, arguing that in addition to making profits, other reasons for promoting space projects are important. These include increasing the chance of long-run human survival, gaining knowledge for its own sake, and fulfilling the desire to develop an invigorating frontier spirit within society as a whole. The implications of such beliefs need to be studied in much the same way that economists have already studied the implications of other values—for instance, the idea that income should be

distributed equally among all citizens.

The last of the six categories of Space Economics is Historical Space Economics. Analogues from economic history of such things as new frontiers and colonization indicate the types of items that this area of study involves. Another concern would be the extent to which the space program has already paid for itself via direct benefits and spinoffs.

Economics Within NASA

If Congress were to have its way, economics would probably come to play an

even larger role within NASA. For instance, Satellite Power Stations are currently looked upon more favorably by Congress than by the administration. A successful NASA program aimed at building such energy sources would no doubt dominate the agency for many years, and in any such project economics would play a crucial role.

As money-making possibilities become increasingly available in space, private enterprise can be counted on to take advantage of them. Thus additional jobs for space economists will be generated.



Space Day: How to Get Organized

by Wayne Jefferson

The tenth anniversary of Neil Armstrong's "giant step" onto the surface of the Moon is coming up July 20. Several states in the U.S. are planning Space Day activities in celebration of the event. Your community, with your help, could join in on these celebrations.

It is my impression that, with one exception (Gov. Hugh Carey of New York), governors generally sign whatever proclamations are submitted to them. Therefore, your first step should be to draft a proclamation to name July 20 your state's Space Day or the week of July 16 - 22 your state's Space Week.

A number of public events can be held during this period: films, lectures, appearances by scientists, astronauts, legislators who support space, etc. You can obtain slides from the L-5 Society (write in for a slide catalog), the American Institute of Aeronautics and Astronautics (1290 Ave. of the Americas), and a number of companies that advertise in Sky & Telescope. Films can be obtained on loan from NASA. A limited number of exhibits are available from NASA as well, but at this late date you might find no more available for July. However, give it a try. You will have to arrange insurance, crating and return shipping for NASA exhibits. Call NASA Headquarters at 202/755-2320 to find out which NASA centers handle loan requests for your region.

If you are ambitious enough to want to sponsor a large number of events, you need people to help you. Other L-5 members will probably want to help. One invaluable local resource is the Jaycees (Junior Chamber of Commerce.) In Boston Eric Drexler and I presented a short slide show to a Jaycees meeting and got seven people interested in helping and almost as many more interested in L-5. You will find the people in the Jaycees are oriented along

practical lines of accomplishing things and they have organizational experience. If you send me a letter I will give you a number of tips on approaching the Jaycees.

Acquiring money may be necessary, especially for renting films and return shipping of NASA exhibits. It may be necessary to rent public facilities. Local technology companies will probably want to be useful, especially if you give them good publicity for their efforts. However, companies need to make their contributions to a legally incorporated nonprofit organization. Either find out immediately what you have to do to form such an organization, or, and this is probably easier, have the companies donate their money through the L-5 Society with the stipulation that the funds be earmarked for events in your area. Maybe the companies can be talked into paying directly for slides, speakers, films and lecture hall. Before you attempt to raise funds, however, do your best to cost out the entire series of events you plan.

If you are even more ambitious and want to schedule a parade you will need a lot more help and probably an additional \$1,000 or so. Find out who in your area is experienced at marshalling parades and go right up and ask for help. Some professional parade organizers get \$3,500 per parade but you will find in your efforts that there are a lot of people willing to help for free. The Masons, Shriners, Knights of Columbus, Veterans of Foreign Wars, American Legion and other civic and fraternal groups frequently do this kind of thing. Also you can go down to the traffic department of the police department and find out file for parade permits and contact them.

Finally, if you would like a twenty page booklet on organizing and marshalling a

parade, send a check for \$1.25 to me c/o Massachusetts Committee for a Space Week Celebration, 575 Boylston St., Boston, MA 02116 and we'll send you a fully detailed outline and description of what you need to do.

Massachusetts Space Day Proclamation

Whereas:

The achievements in space by many nations have enriched the lives of Earth's inhabitants, from expanded employment in many fields and through the development in many fields and through the development of new technologies; and

Whereas: The Apollo lunar missions, and present and future activities in space demonstrate that our planet is part of a vast and expanding system, rich in opportunities, a "High Frontier" which will renew the spiritual qualities that built the United States; and

Whereas:

Many citizens and industries of Massachusetts have participated in and contributed greatly to these historic activities in space; and

Whereas:

July 20 is the anniversary of the Apollo 11 lunar landing mission, when two Americans became the first men of our planet to walk on another world, saying, "We came in peace for all Mankind."

Now, therefore, I Michael S. Dukakis, Governor of the Commonwealth of Massachusetts, in accordance with Chapter 124 of the Acts of 1972, do hereby proclaim that July 20 shall be known as Massachusetts Space Awareness Day, and urge the citizens of the Commonwealth to take cognizance of this event and to participate fittingly in its observance.



Inside the L-5 Society

Space Day

Through correspondence with the VA Tech Chapter of the L-5 Society, Governor John N. Dalton of Virginia has expressed interest in naming July 20, 1979 Space Day in the Commonwealth to commemorate the 10th anniversary of the first lunar landing and Virginia's participation in the space program.

This year is also the 20th anniversary of the state's involvement in the space program. The Mercury program along with the original seven astronauts were headquartered at Langley, VA and the Mercury space capsule was flight tested from the rocket complex at Wallops Island, VA.

We would like to encourage all members in Virginia to write the Governor in support of this dedication and we recommend to members in other states that they write their elected officials and make similar suggestions.

For more information, contact:
David R. Jones
Information Officer, VA Tech L-5
711-9 Townside Rd.
Roanoke, VA 24014

Speakers, Slides

To promote the formation of L-5 chapters in the far West, OASIS and the Bay Area chapter of the L-5 Society will provide a speaker and slide show for the initial meeting of any chapter forming within about six hours driving time of either Berkeley or Los Angeles, California. We will need food and lodging (private home is fine) for our speaker but will provide our own transportation. For further information call:

Ross Millikan (415) 223-2463 (home),
(415) 486-5074 (work).

Terry Savage (213) 536-3209 (weekdays after 8 pm).

Milwaukee L-5

An L-5 chapter has been chartered as a student organization at the University of Wisconsin in Milwaukee. The primary aims of this branch will be generation and dissemination of technical information. To find out more, contact:

Blaine Wisniewski, President
3514 S. 17th St.
Milwaukee, WI 53221

Announcing The First East Coast L-5 Conference & Business Meeting!

May 19-20, 1979, Philadelphia

The Space Futures Society, a recent L-5 chapter, is planning a two-day conference for L-5 members along the East Coast and neighboring areas. Purpose of the conference is to unite L-5 chapters in the East for greater effectiveness in bringing about the goals of L-5—colonization of the solar system.

Saturday, May 19

Free Library of Philadelphia

2 PM - 5 PM

● "Libra Colony" Film

● Lecture on the Human Aspects
of Colonization—Brian Jones,
Professor, Villanova University

6 PM Meeting, Heads of L-5 East Coast
Chapters

8 PM Dinner

Sunday, May 20

10 AM Planning 10th Anniversary
of Moon Landing: July 29

12 Noon

● Workshops

● Tour of Franklin Institute

Please notify us immediately of your intentions to attend and of how many days you wish to stay. We are arranging for meeting rooms and overnight accommodations.

Write: Space Futures Society
1627 Spruce Street
Phila PA 19103
(Include your telephone number)

Notice of Elections And Request for Volunteers

Elections to the L-5 Society Board of Directors will be held in July, following the annual membership meeting. Voting will be by mail, using a ballot to be printed in July issue of the L-5 News. The Secretary will certify the election of all nominees who receive a majority of the ballots cast.

To accomplish this, we need a nominating committee which must include at least three persons who are not members of the current Board. The Committee will make its report to the Secretary and President no later than May 15. The list from this Committee, plus any nominations made at the annual meeting or by members through the mail, will comprise the official ballot. Nominations should have the consent of the nominee.

PLEASE: willing service on the nominating committee is needed (surely it would count in your favor with the selection committee for the first colony at L-5!). If you can serve (it means making some phone calls) or care to recommend someone, act at once! Call or write the Secretary, Jack Salmon at 904-476-5189 or 904-476-9500, ext. 445; 4243 Burtonwood Circle, Pensacola, FL 32504.

Bristol, Ct

A new L-5 chapter has been formed in Bristol, Connecticut. The next meeting will be held on April 4th and thereafter on the first Wednesday of each month. Plans are being made to have a speaker from Hamilton Standard Division of United Technologies, contractor for life-support systems on the Space Shuttle. A film festival is being considered for May.

For more information, contact:
Jordan D. Marche II
28 Trout Brook Rd.
Bristol, CT 06010

L-5 in Massachusetts

An L-5 chapter is being organized in western Massachusetts. Anyone wishing to join this chapter, particularly in the Pioneer Valley/Five College area is urged to contact:

Eric Carlson
318 Lincoln Ave.
Amherst, Mass. 01002
(413) 549-6873

Announcements:

Update on Space

California State University at Northridge is sponsoring a conference on the industrialization and settlement of space. There will be over twenty-two speakers, all prominent people from the aerospace industry, NASA, the military, and the University.

Speakers currently working in areas of the space program will present up-to-date briefings on plans, issues, problems and possibilities. The overall focus will be the sociological dimension of the move into space—the impact on the quality of life on Earth, the political, cultural, and psychological problems and potentials in new roles, new occupations and new challenges.

The conference will be held on June 25th to August 3rd, 1979. Total fees are \$128.00. For further information and application forms, contact:

Dr. B.J. Bluth
Dept. of Sociology
California State University
Northridge, Calif. 91330
(213) 885-3591

SPACE/FUTURES SEMINAR

The Maryland Alliance for Space Colonization, a non-profit, student-run, educational organization of concerned citizens is sponsoring a Space/Futures Seminar on April 19th & 20th, 1979.

The Space/Futures Seminar will be held in the Student Union Building, at the University of Maryland College Park Campus (Parking is available in adjacent garage).

The major event of the Seminar will be a presentation by Dr. Gerard K. O'Neill, the foremost authority on the possibilities of space industrialization and colonization. This presentation will take place at 8:00 p.m., on April 19th, in the Colony Ballroom of the Student Union Building, UMCP. A \$2.00 donation is requested, from non-U. of MD students and other members of the community that attend, to help defray costs.

Contacts:
Gary Barnhard 454-3095
Ray Hoover 454-4620, 422-9398 (night)
Address:
MASC
3112 Student Union Bldg.
College Park, MD 20742

Anaheim Conferences

The Andromeda Foundation and OASIS (Organization for the Advancement of Space Industrialization and Settlement) will be conducting a series of conferences to examine and design in detail a cultural system for a space settlement. The first of the series, limited to 50 participants, will be June 16-17, 1979, at the Grand Hotel, Anaheim, California (across the street from the main gate at Disneyland), and will determine the significant questions that need to be considered. Resumes or a description of relevant coursework or activities must be received by May 1st. Registration fee for participants is \$15.00. Please address all correspondence to: The Andromeda Foundation, 10151 Heather Court, Westminster, CA 92683.

Conference on Humanization

Widener College and Philadelphia's Space Futures Society are sponsoring the first non-technical conference in the East on humanization of space. Funded by a grant from the Delaware Humanities Forum, the day-long conference, "Humanization of Space" will lead off with NASA's Office of Space Transportation Systems' Jesco von Puttkamer.

A four-member panel (Dr. Stephen Chester, Georgetown University; Dr. Paul Durbin and Dr. George Basalla, both from the University of Delaware; and Dr. Radford Saucer, former assistant director of training and personnel selection for NASA) will comment on the opening speech.

An afternoon discussion will include four additional panelists (Dr. Roger Wescott, professor of linguistics and anthropology, Drew University; Dr. Arthur Harkins, sociologist, University of Minnesota; Dr. Kerry Joels, educational director for the Smithsonian's National Air and Space Museum; and educator, author of SPACE TREK, Jerry Glen) who will present their views of the future of space colonization. The moderator for both panel discussions and coordinator of the conference is Widener psychologist, Dr. Gary Berg-Cross.

The conference will be held on Saturday, April 21, from 9 am to 5 pm at Moon Court Room, Delaware Law School of Widener College, located on Brandywine College campus, Route 202 North Delaware. For more information, contact Pam Sheridan,

Department of Public Relations, (215) 876-5551 or at (215) WA5-5328.

April Events in Washington D.C.

MONTHLY SKY LECTURES

Free lectures will be given by staff members of the Smithsonian's National Air and Space Museum. Each lecture will have two subjects: the topic indicated by the title and a discussion of celestial events due to occur in the weeks before the next lecture. Monthly Sky Lectures begin at 9:00 a.m. and tickets are not required; however, you are urged to arrive by 8:45 a.m. Persons arriving after 9:00 a.m. may not be admitted.

"Star Clusters"
Saturday, April 7, 1979, 9:00 a.m.
Albert Einstein Spacearium

EXPLORING SPACE WITH ASTRONOMERS

A continuing series of free lectures are given in the National Air and Space Museum's Albert Einstein Spacearium. The series brings well-known astronomers into contact with the public, under the stars of the Museum's planetarium, to discuss their work and its impact upon society.

"Megalopolises of Spaces"
George O. Abell
Wednesday, April 18, 1979, 8:00 p.m.

George O. Abell, Professor of Astronomy at UCLA, has been active as an astronomy educator for nearly 30 years. The author of a widely used astronomy textbook and more than 100 other publications, he has helped popularize astronomy for students and laymen. His research interests, ranging from planetary nebulae to clusters of galaxies, have taken him to many of the world's great observatories.

A New Exhibit

A new aerial photography exhibition, "Our Beautiful Earth: The View From Air and Space," will open at the Museum in early May.

The exhibit features the work of four contemporary photographers who specialize in aerial views of the Earth—William Garnett, Georg Gerster, Robert

Bucknam and George Hall. Three photographers, Garnett, Gerster and Bucknam, shoot from small aircraft at altitudes of 100 to 1,000 feet; Hall works from a blimp.

Also included are photographs of the Earth taken both by NASA astronauts and the unpiloted Landsat satellite from altitudes above 170 miles.

In addition, the exhibit contains a small historical section which features reproductions of a few of the "firsts" in aerial photography: the first successful aerial photograph taken in black and white in 1860; the first in color (1930) and the first picture of the crescent Earth and Moon together in a single frame taken by a Voyager spacecraft in 1977 at a distance of 7.5 million miles.

Also shown in this section are early pictures taken by automatic cameras borne by kites and rockets and a photograph taken by a camera-carrying pigeon.

The aerial photography exhibition, which will be in place for approximately one year, is located in the Museum's Flight and Arts Gallery. This gallery is devoted to presenting the artist's special perceptions of flight.

The National Air and Space Museum is open seven days a week from 10 a.m. to 5:30 p.m. Beginning April 1, the Museum will remain open until 9 p.m. daily through Labor Day. Admission is free.

Letters

In the May issue of the **L-5 News**, there was an article concerning the Earthport Launch Site Proposal. Although the Earthport idea appears to be an attractive and beneficial program, a great deal of caution should be taken when considering not only the site, but also the "ownership" of such an immense facility. I think it is safe to say that if the United States participated in such an endeavor, we would certainly end up paying the lion's share, in both dollars and technological know-how. Although this may only be fair, since the United States along with the European Space Agency would probably be the initial major users. But let us not forget the Panama Canal controversy.

Some may not consider these two facilities even comparable, and although the article did not speak of any specific U.S. involvement, it is only logical to assume that such an undertaking would not succeed without a substantial amount of U.S. support.

It would only be to our own protection, having made so great an investment, that we have solid assurances (possibly under

new International Laws) governing the ownership, leasing, and administrative authority of the facility.

John C. Hughes
Newport, MN

I've been a member of the L-5 Society for two years. In that time I've seen it go from a group that was actively trying to change the future course of technology to one that has become a cheering section for a couple of big corporations. The goal is still important, but the means have changed. I wish you people good luck, but I don't want to help support Boeing and Grumman, etc.

Steven Lubar
Chicago, IL

A few random thoughts . . .

If NASA (or OMB) is unwilling to fund the 25-kW power module, why not form a private corporation, and sell energy to Space Shuttle users? How much study and development has been done on the Power Module? What would it cost to build one and put it in orbit? (This is another golden opportunity for Neil Rest's Orbital Services, Inc.). Of course, after the first one starts paying back, bigger and better modules will have to be built. Perhaps eventually a permanent manufacturing facility could be added, not to mention a renovated Shuttle external tank to house a permanent crew . . . Who knows where it could lead? . . . If I had a billion . . .

Can solid fuel ICBM's be used to put multi-ton payloads into low Earth orbit? What does the government do with "obsolete" missiles, and is it possible for private contractors to buy and launch such devices (using NASA facilities at the Cape, of course)? This sounds like a good idea for a story in **Analog**, at least. Who has info on this subject?

Unfortunately, due to several factors, big business is not (yet) beating a path to our door. The general feeling seems to be "wait and see." This is only to be expected in the pre-shuttle era, but it will change after more data has been acquired. The question is, will the Carter Administration continue to let it slide, or can we convince it to push for space industrialization? What we need is for someone like Howard Hughes or the King of Saudi Arabia to just go out and do it, but short of that, how do we convince potential investors that "S.I." is a profitable idea unless and until we have experimental proof that we can profitably manufacture stuff in orbit? (What has Chris Basler been up to lately?) It's beginning to look like we'll just have to keep the faith for another couple of years . . . and that gets us back to the current

gang of idiots in Washington and what they are doing (or allowing to happen) to NASA in Fiscal year '80 . . .

Maybe Jerry Brown and Adlai Stevenson will run against Carter on a "space" platform (we can do more than just hope for such things . . .). Maybe the Russians will send an expedition to Mars (the "Red" planet, indeed!), pulling us into another space race. Maybe I'll inherit a million dollars, produce a good science fiction movie about space colonization, and put all the profits into making it come true . . .

Hm-m-m . . . now, *that's* the kind of thing we might want to look into . . .

Robert Lovell
Baltimore, Maryland

There seems to be a subtle bias in the **News** that bothers me; the idea that building a space dwelling is only a technical problem. This is natural given the large numbers of physical scientists and engineers interested in the L-5 concept. As a former humanities student and an active teacher I see building a community in space as a tremendous social experiment. We should ask ourselves questions concerning the details of the homes we are building, remembering the tremendous difference between a house and a home.

First, what sort of government will L-5 have? Will it be a company town with all maintenance expenses deducted as part of operating expenses with no individual payment of taxes? Perhaps the authority will be a municipal corporation with all residents paying taxes at an agreed upon rate. Will the Administration be internal or external? Further, are the community and its residents government or civilian property and employees?

Second, what provision for change will be made? People should be able to do domestic and civic alterations to buildings as changes are desired without disrupting any subsurface functions. Houses should give the greatest possible individuality with the strictest avoidance of modular design and the maximum amount of input from the future residents.

Third, there should be great emphasis on plant life including lawns, vines and ivy, hedges and, most important, flowers. The colony should be swarming with green fields, flower gardens, house plants to de-emphasize the necessary mechanical nature of L-5. Also, pets should be encouraged, especially warm puppies and fat sassy cats. Is there a child among us who wouldn't be comforted by the idea of coming home from the stars to your little four-legged piece of Earth?

Ed Altenritter
Flint, Michigan