



The Apollo-Saturn—ready and waiting.

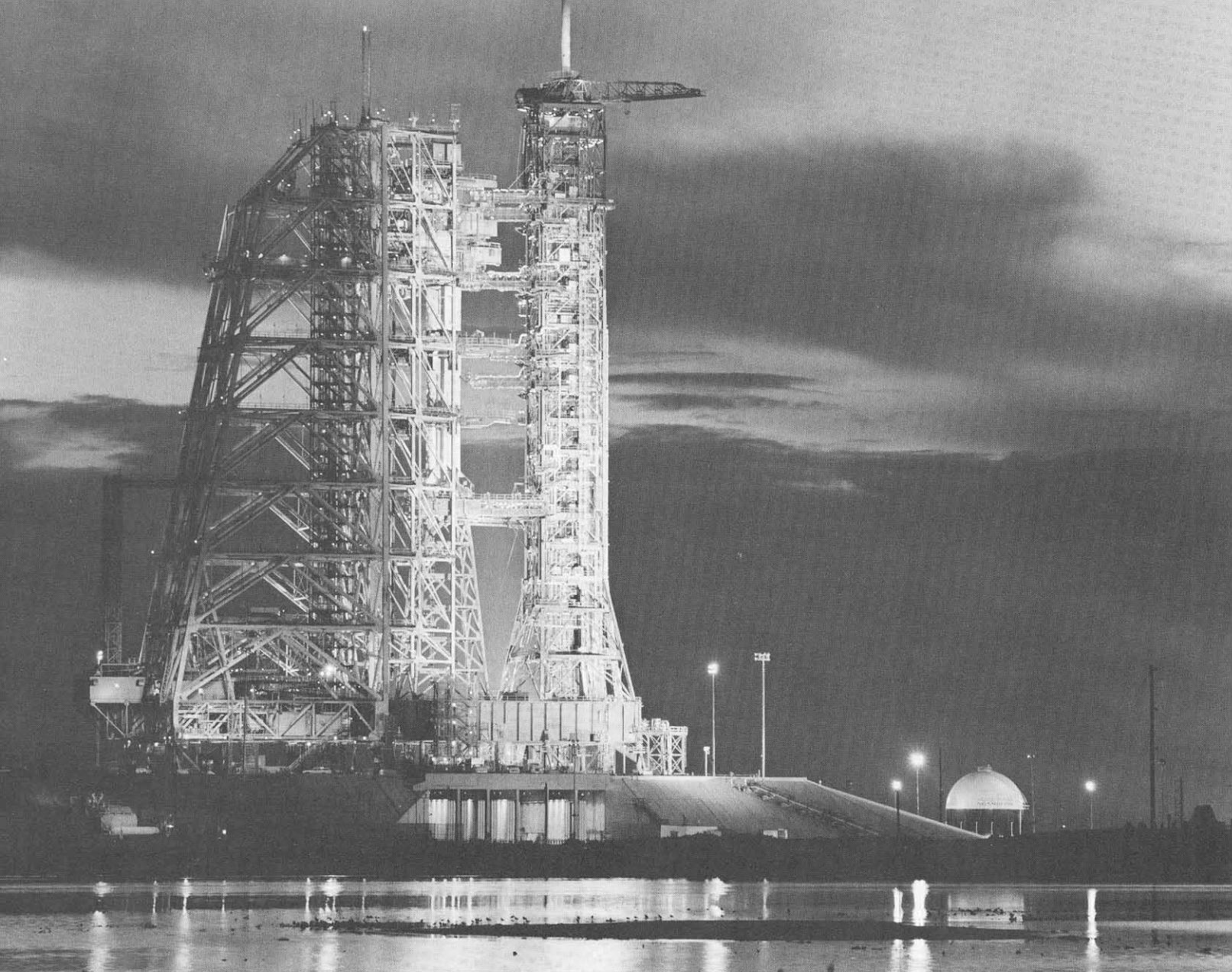
## Thoughts at Liftoff

by POUL ANDERSON

**A noted science fiction writer  
reports for E&S  
on the launch of the last Apollo**

**S**HE had not all the terrible beauty of her moonship forerunners; but when the Saturn IB blazed aloft, trailed by thunder, bearing her Apollo to rendezvous off Earth with Soyuz, there were tears in more eyes than mine.

Every launch has been unique, wholly unforgettable in its particular ways. Even those parts which, like love, have been written about in untold millions of mostly banal words — such as the sheer size of things — must, like love, be directly lived to be understood, and are never twice the same. It was always a fresh marvel how the Vehicle Assembly Building has no scale in the flat Florida landscape as you approach across miles, how the immensity does not yet register as you stand below the main entrance, but a dread of heights may awaken when you go inside and look up. The crawler which brought the rockets from there to the launching pads remained impressive enough in its own hugeness, though with a hint of comedy about it, like a hippopotamus (which, after all, was the Biblical Behemoth). As for the Saturns them-



The Apollo-Saturn, shot at sunset, before the Mobile Service Structure rollback.

selves, their magnitude soon became secondary, in the face of so much loveliness.

We visitors always got a specially sharp sense of how exquisite they were when we stretched our press privileges and sought the right vantage point on nights before a liftoff. Then searchbeams limning the ship silver on black would stream back in haloes and tails, far across heaven, as if this were a comet already outward bound. The supreme experience, akin to seeing the Winged Victory or hearing the last movement of Beethoven's Ninth, was when she rose, fire, shout, and triumph. This likewise was forever new. Time of day, weather, each circumstance created something unrepeatable. It is right that the last Lunar mission to ride a Saturn V went in a glory made double by suspense beforehand and darkness around.

Other joys have been plentiful, too — delight in virtuosity, in the fact that nature in the form of our largest bird sanctuary surrounds the whole space center, in belief that here human-

ity is accomplishing something altogether worth doing. They will abide. But the world will not likely ever again witness a sight as splendid as those which have now come to an end.

That is as it should be, a kind of maturing. We can't afford very many inefficient marvels. Man will only get into space to stay by cheaper, less spectacular means, of which the shuttle is the harbinger; and that will mean turning adventure into commonplace, as has happened with aviation. Still, we don't forget our youth. Aren't its visions what keep us going for the rest of our lives?

This is my reason for bringing aesthetic, spiritual questions into a publication oriented toward technology. Man does things, including engineering and science, because he wants to do them. Economics and politics are not his sole motivations, nor are they any more rational than a wish for the purely passionate. In an era of swelling technophobia, the technologist is wise to bear in mind how much more he has to offer than kitchenware and bombs.

Watching the rocket go up, I thought — no, not really, because you don't think at such times, you simply are — afterward, I thought that the fakiness in this mission didn't matter. Let me explain that at once. They were fine, brave, dedicated men aboard both Apollo and Soyuz. The scientific experiments were legitimate and valuable. But the public relations side on which world attention focused, the joining, the cooperation, was as meaningless as the rest of "detente."

Rescue capability? Here was the last Apollo. Our next manned flights will be with the shuttle, several years hence; and it, if a Soyuz is then in trouble, can lay alongside and take the whole capsule into its cargo bay.

Exchange of information? We know how reciprocal that was.

Symbol of a happier era among nations? Well, never mind. Let's just say that some of us remember many and many a gesture of the same sort during the past half century, and what came of them.

Regardless, at launch time, at linkup, at the safe returns which we all heartily wished both crews, the bunkum didn't seem important. It hadn't seemed so either when it consisted of Madison Avenue flackery about "spinoff," as if sending men to the moon were a reasonable way to develop new plastics. Athens financed the Parthenon with money embezzled from the Delian League; sordid quarrels went on while Michelangelo was painting the Sistine Chapel. What got done is what still touches our lives.

The knowledge that human beings were outbound lay deep within the feeling about a mission, among that coterie of science fiction people who for years had been getting together for these occasions. But surely it did also in the hordes who came to watch, not in the comfort and nearness of a press grandstand, but from afar, oftenest beneath an unmerciful subtropical sun. Why else would they?

And what's wrong with romance and beauty? Don't we the public buy ourselves plenty of both? Wanting them, needing them, we maintain city parks, art museums, orchestras, historic sites, scenic regions, wilderness preserves. Space exploration has likewise given them to us.

True, a great deal there has come from unmanned craft, in the form of soul-catching unexpected visions of the universe. So too has a great deal of the workaday benefit, such as a revolution in meteorology which I claim has already returned a profit on the entire program. But manned expeditions have made their own contributions. Furthermore, perhaps most vital in the long run, they have bestowed a glamor without which the whole enterprise could never have gained the support it did. Men and women will be needed in the future to keep its momentum, as well as for practical tasks.

This came rather poignantly home to my wife and me when we went upstairs in the NASA center for journalists, to a room maintained by the group preparing for the Viking flight to Mars. The attendants looked so lonely, they were so pleased when anyone dropped in for a bare minute. And yet what they had to tell, and the exhibits around them, were fascinating. Whether or not it finds signs of life, Viking will

be immensely more significant than Apollo-Soyuz, fully comparable to robot Lunar landings, quite possibly more revelatory than any probe before it. Nevertheless, that room had few guests. *And as I write, the survival of projected Pioneer Venus is uncertain, despite the numerous clues to Earth's own atmospherics, fluorocarbon chemistry among them, which earlier sendings have found.*

At the NASA facility at Ames, California, where we had been not long before, we heard about quite a few crises in the course of unmanned missions. The resourcefulness with which the staff met these challenges is in itself a great wonder, and the human circumstances were apt to be as dramatic, in a quietly tense fashion, as any lover of good stories could wish. However, little of it ever reached the world at large. What captured the news media and the public was danger to human life in Apollo 13, or human hands actually on the spot rescuing Skylab.

To this, some of the people at Ames would no doubt reply tartly that had they been in charge, neither the peril nor the necessity for elaborate repair operations would have arisen. They'd not have designed vehicles involving live crews in the first place. That philosophy is worth a close and respectful look.

In Earth satellites, Rangers, Mariners, Pioneers, not to mention numerous foreign vehicles, from Mercury to Jupiter and now beyond, it has paid off brilliantly. The knowledge gained won't be fully evaluated and understood for years; and by then, much more will have come in. The engineers have magnificent things on their drawing boards.

For instance, there is a Mars orbiter which will fire probes *into* that planet, to examine conditions below the surface; instruments will survive forces in the millions of gravities. There is a Jupiter orbiter which will not "merely" send a lesser vessel down into atmosphere; by judicious jet nudges, it will make the moons Ganymede and Callisto swing it through petal-shaped paths into distant regions, to study the high latitudes and the further parts of the magnetosphere. *There is a pair of craft, launched toward Jupiter by space shuttle, which the Jovian world will throw out of the ecliptic plane, north and south, and back toward the sun, to give us our first real view of its poles.* There are missions to the outer members of the Solar System, to asteroids and comets. There is Pioneer 11's present course for Saturn, whose moon Titan just may hold life and certainly holds something strange. And nobody can guess how much remains to be done nearer home, in Earth orbit or by crawlers on Luna.

Undeniably, for a long time to come, perhaps always, the large majority of our quests into space must be carried out by machines. Besides doing many jobs which men could, at far less cost and hazard, they can do many others which are impossible for men.

And still . . . that Ames philosophy also turns on the idea of the "dumb" spacecraft, closely controlled from the ground — humans an integral part of the whole. Besides saving the expense and development time of elaborate automation, it gives flexibility and quick response to an unforeseen problem

or opportunity. People are in charge of each of these vehicles throughout its service life. None can be called unmanned.

Moreover, we have had failures, several of them grievous, which a man could have retrieved had he been present. One purpose of the shuttle is to get technicians up, quickly and cheaply, to do precisely such work. Soon they will also find themselves making original assemblies in the void, more handily than machines could. Later they will become the logical agents of detailed explorations, follow-ups to necessarily limited investigations by crewless craft. And a number of them will find they like it out there.

Ames itself played host (without any actual endorsement) to a ten-week conference in the summer of 1975, on the O'Neill proposal to establish self-supporting colonies at the stable Trojan points of the moon's path. Given that capability — which physicist Gerard O'Neill of Princeton calculates we have today — then, if we exercise it, we will certainly continue into deeper space. For as Robert Heinlein has remarked, considering the energetics involved, once you're in Earth orbit, you're halfway to anywhere.

Notice again how O'Neill's ideas have caught the general imagination at a time when more sober-looking projects are being undeservedly ignored, starved, or strangled. We do not live by equations alone. It is a terrible mistake to leave out of our plans the fact that a big rocket rising is beautiful, doubly so when the payload is human.

The immediate, urgent, realistic reason to continue our

space endeavor is the knowledge to be won: in physics, chemistry, planetology, biology, every science. Three centuries of history since Galileo show what impact that will have on mankind as a whole. The expenditure of resources is negligible compared to what we throw away on international strife, domestic crime, avoidable inefficiencies, or simply booze and cigarettes. It is infinitesimal compared to the gains to be made. Another science fiction writer, Hal Clement, has observed that when people are adrift in a lifeboat, they don't share out every bit of food; some they chop up for fishbait.

The reason to give flesh and blood a direct share in the enterprise is equally practical. Man, or woman, is the only instrument that can perceive or do what it is not specifically designed to perceive or do, the only computer that continuously reprograms itself, the only thing that gives a damn. But overriding this is the likelihood that nothing except a continued human presence in space will keep alive indefinitely a human interest in it. We work that way.

Whether or not many of us will ever be out yonder is, today, moot. So is the question of whether any of us will ever reach the stars. Some say not or, like Bernard Oliver, think that at best we can do it in spirit, by communication with extraterrestrial intelligences. Others, like R. W. Bussard, think travel beyond the Solar System may someday be possible, if we want it enough. I like to think he's right, and to envy our descendants. But *we* saw the beginning. Whatever we do, let's not make it the end. □

Floodlights from the launch complex fan out across the night sky.

