Horizons

Volume 39
Issue 1

The Newsletter of AIAA Houston Section
The American Institute of Aeronautics and Astronautics

July / August 2013
www.aiaahouston.org

Images of Earth from Two Distant NASA Spacecraft

Also, Continuing in this Issue! Part 7 of 8:
Man Will Conquer Space Soon!
(Collier's 1952-54)

Near the top of every page is an invisible link to return to this page.
The link is in located here (the blue bar), but not all pages display this bar.

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AIAA 2013 National Communications Third Place Award Winner: Section Chair Daniel Nobles

Horizons is a bimonthly publication of the Houston Section of The American Institute of Aeronautics and Astronautics.
Douglas Yazell, Editor
Editing team: Dr. Steven E. Everett, Ellen Gillespie, Shen Ge, Don Kulba, Alan Simon
Regular contributors: Dr. Steven E. Everett, Douglas Yazell, Scott Lowther, Philippe Mairet
Contributors this issue: Wes Kelly, Dr. Betsy Giusto, Jim Wessel, James C. McLane III, Melvin Schuetz, John Sisson

Cover: Image credit: NASA.

This page: part of Vincent van Gogh's 1889 painting The Starry Night.

Back to Basics

From the Chair

MICHAEL FROSTAD, CHAIR

The AIAA Houston Section, one of the largest sections of the American Institute of Aeronautics and Astronautics, kicked off the 2013-2014 season on August 6th with an executive council kick-off meeting, a leadership retreat. As with any beginning, we started with the basics: What is our Objective? What is our Mission?

Our Objective is to further within our territory the purposes and programs of the American Institute of Aeronautics and Astronautics.

We accomplish this objective by fulfilling four primary missions:

- Provide the AIAA Houston Section Membership with opportunities for continuing education, professional growth, and recognition for accomplishments.
- Stimulate the exchange of information within the scientific and technical community.
- Provide support and encouragement for students learning math, science, and engineering.
- Assist the general public in understanding the benefits of aerospace systems technology.

At the kick-off event many great ideas were discussed on how to fulfill these missions over the year and already we have been working towards their implementation.

One of the main concerns is one that recurs over and over in any organization – Communication. To this end the email lists have already been updated and scrubbed so that we can insure members get the benefit of members only information and yet still reach out to past members and others in the area that might be interested in our public programs. Already a "members only" email with STEM event training was sent out so if you did not receive it, be sure your membership is up to date or contact us to help sort it out. Other emails about upcoming events and our Horizon's newsletter announcements have also gone out to help you stay up to date. Furthermore we plan to expand the use of our social media to spread awareness, and perhaps reminders, of upcoming AIAA Houston events so look for us on Facebook and LinkedIn if those are your preferred avenues of staying in touch.

In addition to Communication, we want to make sure our technical branch is providing a good base community for each discipline. Examining our organization chart you will find that the Houston Section has 14 technical committees. I highly encourage you to find your technical committee (or a closely related one) and to contact the technical committee Chair to get on their lists so you are the first to know when the next meeting or Lunch and Learn is – or even to offer a talk about your current work. A technical Lunch and Learn is a great way to share your information locally and perhaps help you to hone that presentation before a national conference.

As the AIAA year ramps up, AIAA Houston Section has already coordinated a local STEM event, provided information for national STEM training courses, and volunteered at the 100 Year Starship Symposium. Upcoming events include a booth at Wings Over Houston airshow, sending a speaker(s) to a local elementary school, and technical lunch and learns; so be sure to always check the website and pay attention to those emails to stay in the loop.

As we move forward, continuing to build our capabilities, the AIAA Houston Section plans to make this year another great one for the Houston area. Putting together a general schedule for the combined Operations and Technical branches we have a goal of over 100 area events and meetings for the year. These events, varied in size and scope, will require effort and time from an already busy community. It is a community that sometimes feels like it is flying through a storm or meteor shower, depending on the day, yet together it accomplishes its missions and objectives. As we come together this next year to accomplish the AIAA Houston Section missions and objective, we will be building a stronger aerospace community and promoting the technical exchanges needed for the future. We look forward to seeing and working with you at the next event!

Michael Frostad
chair2013@aiaahouston.org

Above: The official name of Orion is 'Multi-Purpose Crew Vehicle' as the spacecraft can be used to complete different missions. Presently NASA wants to do a first unmanned test flight in 2017, meaning that ESA will have to deliver the first service module in 2016. This is a tight deadline, but the people behind ATV have gotten used to delivering a new spacecraft in under 20 months. Image and text credit: ESA.

Collier's 1952-54

Man Will Conquer Space Soon! (1952-54)

DOUGLAS YAZELL, EDITOR, WITH MELVIN SCHUETZ

The Horizons Collier's Team

Douglas Yazell, Editor
Scott Lowther, Aerospace Projects Review (APR)
Dr. Albert A. Jackson IV
Ron Miller, Black Cat Studios
Melvin Schuetz, bonestell.com
Frederick Ira Ordway III
John Sisson, Dreams of Space
Arthur M. Dula
Shirazi Jaleel-Khan

Quite a few more people make these articles possible, including the Horizons team listed on page 2. Thanks to all involved!

On July 26, 2013, Melvin Schuetz wrote, "… A year ago, in July 2012, I donated an original Chesley Bonestell painting of Mars (circa 1955) to the National Air and Space Museum. They are currently running an exhibition called High Art: A Decade of Collecting, which, 'showcases fifty works of art that the museum has acquired since 2003, all inspired by space exploration and flight.'" Schuetz provided

(Continued on page 5)

	"Man Will Conquer Space Soon!" in 8 Issues of the Weekly Magazine Collier's 1952-54	Cover Image	Page Count
1	March 22, 1952: Man Will Conquer Space Soon! What are we Waiting For? pp. 22-23, The Editors Crossing the Last Frontier, pp. 24-29, 72, 74, Dr. Wernher von Braun A Station in Space, pp. 30-31, Willy Ley The Heavens Open, pp. 32-33, Dr. Fred L. Whipple This Side of Infinity, pg. 34, Dr. Joseph Kaplan Can We Survive In Space? Pp. 35, 65-67, Dr. Heinz Haber Who Owns the Universe? Pp. 36, 70-71, Oscar Schachter Space Quiz Around the Editor's Desk, pp. 38-39	Yes	25
2	October 18, 1952: Man on the Moon Man on the Moon, p. 51, The Editors The Journey, pp. 52-58, 60, Dr. Wernher von Braun Inside the Moon Ship, pg. 56, Willy Ley	Yes	11
3	October 25, 1952: More About Man on the Moon The Exploration, pp. 38-40, 44-48, Dr. Fred Whipple & Dr. Wernher von Braun Inside the Lunar Base, pg. 46, Willy Ley	No	10
4	February 28, 1953: World's First Space Suit Man's Survival in Space, 10 Contributors & 3 Artists, edited by Cornelius Ryan pp. 40-41 Picking the Men, pp. 42-48	Yes	10
5	March 7, 1953: More About (Continuing) Man's Survival in Space Testing the Men, pp. 56-63	No	8
6	March 14, 1953: How Man Will Meet Emergency in Space Travel Concluding Man's Survival in Space: Emergency! pp. 38-44	Yes	9
7	June 27, 1953: The Baby Space Station: First Step in the Conquest of Space Baby Space Station, pp. 33-35, 40, Dr. Wernher von Braun with Cornelius Ryan	Yes	6
8	April 30, 1954: Can We Get to Mars? / Is There Life on Mars? Is There Life on Mars? pg. 21, Dr. Fred L. Whipple Can We Get to Mars? pp. 22-29, Dr. Wernher von Braun with Cornelius Ryan	Yes	10

This issue

Above: Man Will Conquer Space Soon!, a series of articles from 1952 to 1954, from the weekly magazine Collier's.
Source for most of the table: Wikipedia, Man Will Conquer Space Soon!, an article first written by John Sisson.

(Continued from page 4)

a link to a related Smithsonian Magazine article.

"The Bonestell painting I donated is part of this new exhibition. But there is more. To quote the Curator of Aeronautics, Dr. Tom Crouch: 'In addition to your painting, we included two Bonestell pencil sketches, one of his notion of an Earth satellite, and the other of the space station. He annotated both drawings and sent them to von Braun, who added his comments and returned them to Bonestell. They are unique historical documents.'

"I suspected, and have since confirmed, that the two pencil sketches are original drawings that Bonestell produced when working on the Collier's series! Sadly, I will not be able to attend the exhibition myself, but I am hoping to get photographs of the two sketches displayed with the painting."

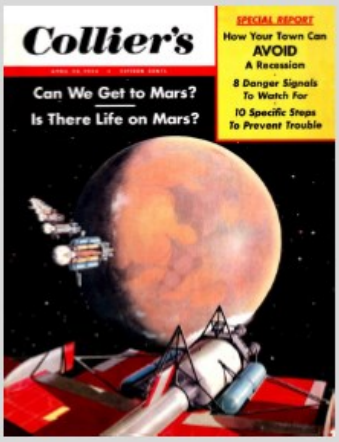
I asked if the donation was temporary. On August 10, 2013, Schuetz wrote, "The donation is permanent. Mrs. Bonestell left it to me in her will. She died in late 1998 and after the estate was settled in early 1999 I was sent the painting. It was a big surprise! I had been corresponding with her for almost ten years before that and had sent her a pre-publication manuscript copy of my Bonestell bibliography (which was published in mid-1999), but it was not revealed to me about the painting until the day it arrived. Chesley had originally gifted it to Hulda, who then gifted it to me. As a result, after having it for over a dozen years, I thought that it needed to find a 'home for posterity' as it were. I

(Continued on page 6)

Collier's 1952-54

Issue 3 of 8:
The cover image
is not related to
Man Will Conquer
Space Soon!

Issue 5 of 8:
The cover image
is not related to
Man Will Conquer
Space Soon!



Above: Image credits: Scott Lowther, with help from other Horizons Collier's team members.

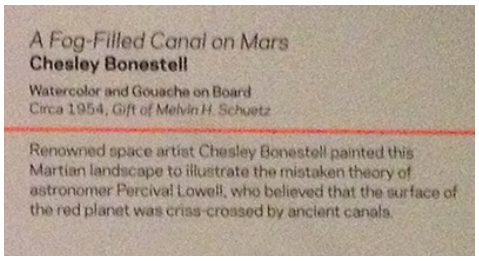
Collier's 1952-1954

(Continued from page 5)

offered the painting to the Smithsonian National Air and Space Museum (NASM). Their acquisitions committee voted unanimously to accept it into their collection."

(Continued on page 7)

Below: A Fog-Filled Canal on Mars, **Chesley Bonestell**, Watercolor and Gouache on Board, Circa 1954, *Gift of Melvin H. Schuetz*
Renowned space artist Chesley Bonestell painted this Martian landscape to illustrate the mistaken theory of astronomer Percival Lowell, who believed that the surface of the red planet was criss-crossed by ancient canals.



Above: From "High Art: A Decade of Collecting," which presents 50 works acquired by the Smithsonian's National Air and Space Museum from 2003 to 2013. The exhibition is open through December 1, 2013.

Collier's 1952-1954

(Continued from page 6)

Also on August 10, 2013, Schuetz mentioned this link to an article about that art display. The article appears on a George Washington University website magazine called George Washington Today.

This issue of Horizons presents (starting on the second page following this one) the Baby Space Station, the seventh of eight installments in the Collier's series. That fits perfectly with the two Bonestell sketches shown on this page. Our thanks go to Melvin Schuetz and all who worked on this museum display.

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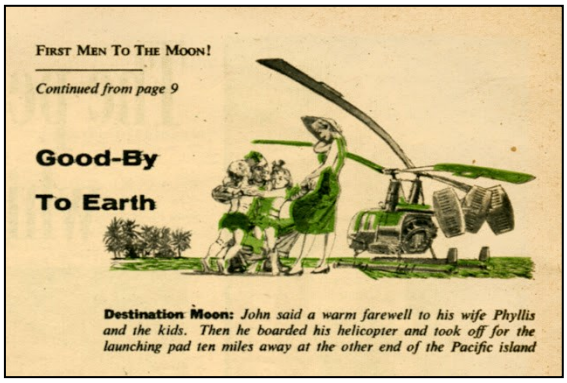
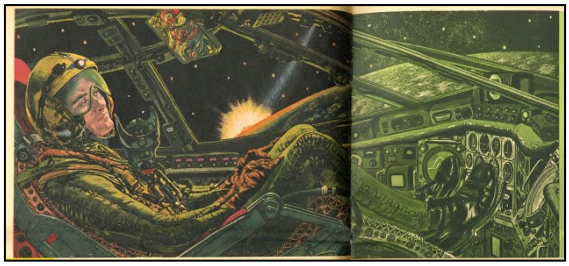
Below: Space Station, Chesley Bonestell.

Below: SHEET NO. 1, Chesley Bonestell. [Wernher von Braun added comments.]

Above: From "High Art: A Decade of Collecting," which presents 50 works acquired by the Smithsonian's National Air and Space Museum from 2003 to 2013. The exhibition is open through December 1, 2013.

Collier's 1952-54





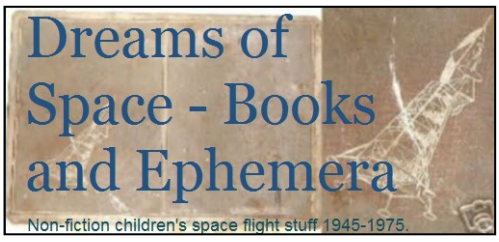
Right: More Wernher von Braun writing and Fred Freeman art from the Dreams of Space blog by John Sisson.

"…This Week Magazine [a newspaper insert] for October 5, 1958, featured the serialization of Wernher von Braun's book…

"First Men to the Moon, Holt, Rinehart and Winston, New York (1958). This book was a fictional story of an expedition to the Moon. Written at a popular level it humanized the possibilities of how human might explore the Moon. Unfortunately I currently have only part 1 of the serialization. Imagine a story like this coming with your Sunday paper and a child picking it up after their parents were done with it."

Below: "Walt Disney's Mickey Mouse Club Magazine for Summer 1956 featured an article based on the Walk Disney's 'Man in Space' and 'Man and The Moon' television shows. I am fascinated how Disney and von Braun worked together to prepare 'propaganda' films to forward the idea of manned space flight.

"(See http://history.msfc.nasa.gov/vonbraun/disney_article.html)" These quotes are from John Sisson's blog Dreams of Space and were obtained on Saturday, October 5, 2013. The link was not working due to the shutdown of the federal government of the USA."



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Collier's

JUNE 27, 1953 • FIFTEEN CENTS

Are You Afraid of LAWYERS?

I Worked for Three Presidents

A White House Diary on F.D.R.—TRUMAN—IKE

A DOZEN LAUGHS WITH BASEBALL UMPIRES

THE BABY SPACE STATION

First Step in the Conquest of Space

Large Format
Vellum Cyanotypes AVAILABLE
Such as these
for the German A-4 V-2
http://up-ship.com/blog/?p=20413

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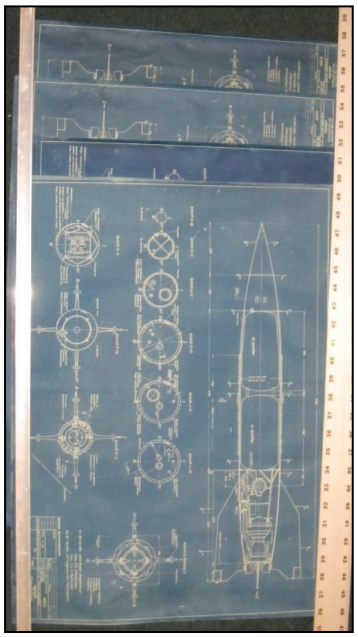
June 27, 1953

ARTICLES

FICTION

The Cover

Its curved mirrors reflecting the starlit blackness of space, man's first artificial satellite sweeps over the East Coast of the United States—Boston, New York and Philadelphia are all visible—busily sending scientific reports to the experts waiting below. Altitude: 200 miles; speed: 17,200 mph; duration of flight: 60 days. Those are the bare statistics; the exciting story starts on page 33.



Large Format
Vellum Cyanotypes AVAILABLE
Such as these
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BABY SPACE STATION

By Dr. WERNHER von BRAUN with CORNELIUS RYAN

Chief, Guided Missiles Development Division, Redstone Arsenal, Huntsville, Alabama

An unmanned rocket, whizzing around the earth 200 miles high, pouring vital facts back to ground stations . . . Scientists now know that's the first step in the conquest of space

WE ARE at the threshold today of our first bold venture into space. Scientists and engineers working toward man's exploration of the great new frontier know now that they are going to send aloft a robot laboratory as the first step—a baby space station which for 60 days will circle the earth at an altitude of 200 miles and a speed of 17,200 miles an hour, serving as scout for the human pioneers to follow.

We rocket engineers have learned a lot about space by shooting off the high-flying rockets now in existence—so much that right now we know how to build the rocket ships and the big space station we need to put man into space and keep him there comfortably. We know how to train space crews and how to protect them from the hazards which exist above our atmosphere. All that has been reported in previous issues of Collier's.

But the rockets which have gathered our data have stayed in space for only a few minutes at a time. The baby satellite will give us 60 days; we'll learn more in those two months than in 10 years of firing the present instrument rockets.

We can begin work on the new space vehicle immediately. The baby satellite will look like a 30-foot ice-cream cone, topped by a cross of curved mirrors which draw power from the sun. Its tapered casing will contain a complicated maze of measuring instruments, pressure gauges, thermometers, microphones and Geiger counters, all hooked up to a network of radio, radar and television transmitters which will keep watchers on earth informed about what's going on inside it.

Speeding 30 times faster than today's best jets, the little satellite will make one circuit around the earth every 91 minutes—nearly 16 round trips a day. At dawn and dusk it will be visible to the naked eye as a bright, unwinking star, reflecting the sun's rays and traveling from horizon to horizon in about seven minutes. Ninety-one mirutes later, it completes the circuit—but if you look for it in the same place, it won't be there: it travels in a fixed orbit, while the earth, rotating on its own axis, moves under it. An hour and a half from the time you first sighted the speeding robot, it will pass over the earth hundreds of miles to the west. The cone will never be visible in the dark of night because it will be in the shadow of the earth.

If you live in Philadelphia, one morning you may see the satellite overhead just before sunup, moving on a southeasterly course. Ninety-one minutes later, as dawn breaks over Wichita, Kansas, people there will see it, and after another hour and a half it will be visible over Los Angeles—again, just before the break of dawn.

That evening, Philadelphians—and the people of Wichita and Los Angeles—will see the speeding satellite again, this time traveling in a northeasterly direction. The following morning, it will

CHESLEY BONESTELL

Ready for launching. Rocket is divided nto three sections (separated by red bands), each with its own set of motors. Lower two wil be cast off when their power is spent. Only the topmost cone—equipped with TV cameras, other instruments—will get to 200-mile orbit

Monkeys in the trail-blazing satellite will prepare the way for the men who follow

be in sight again over the same cities, at about the same time, a little farther to the west. After about ten days, it will no longer appear over those three cities, but will be visible over other areas. Thus, from any one site, it will be seen on successive occasions for about 20 days before disappearing below the western horizon. In another month or so, it will show up again in the east.

And while you're gazing at the little satellite, it will be peering steadily back, through a television camera in its pointed nose. The camera will give official viewers in stations scattered around the globe the first real panoramic picture of our world —a breath-taking view of the land masses, oceans and cities as seen from 200 miles up. More than likely, commercial TV stations will pick up the broadcasts and relay them to your home.

Three more cameras, located inside the cone, will transmit equally exciting pictures: the first sustained view of life in space.

Three rhesus monkeys—rhesus, because that species is small and highly intelligent—will live aboard the satellite in air-conditioned comfort, feeding from automatic food dispensers. Every move they make will be watched, through television, by the observers on earth.

As fast as the robot's recording instruments gather information, it will be flashed to the ground by the same method used now in rocket-flight experiments. The method is called telemetering, and it works this way: as many as 50 reporting devices are hooked to a single transmitter which sends out a jumble of tonal waves. A receiver on earth picks up the tangled signals, and a decoding machine unscrambles the tones and prints the information automatically on long strips of paper, as a series of spidery wavelike lines. Each line represents the findings of a particular instrument—cabin temperature, air pressure and so on. Together, they'll provide a complete story of the happenings inside and outside the baby space station.

What kind of scientific data do we hope to get? Confirmation of all space research to date and, most important, new information on weightlessness, cosmic radiation and meteoric dust.

At a high enough speed and a certain altitude, an object will travel in an orbit around the earth. It—and everything in it—will be weightless. Space scientists and engineers know that man can adjust to weightlessness, because pilots have simulated the condition briefly by flying a jet plane in a roller-coaster arc. But will sustained weightlessness raise problems we haven't foreseen? We must find out —and the monkeys on the satellite will tell us.

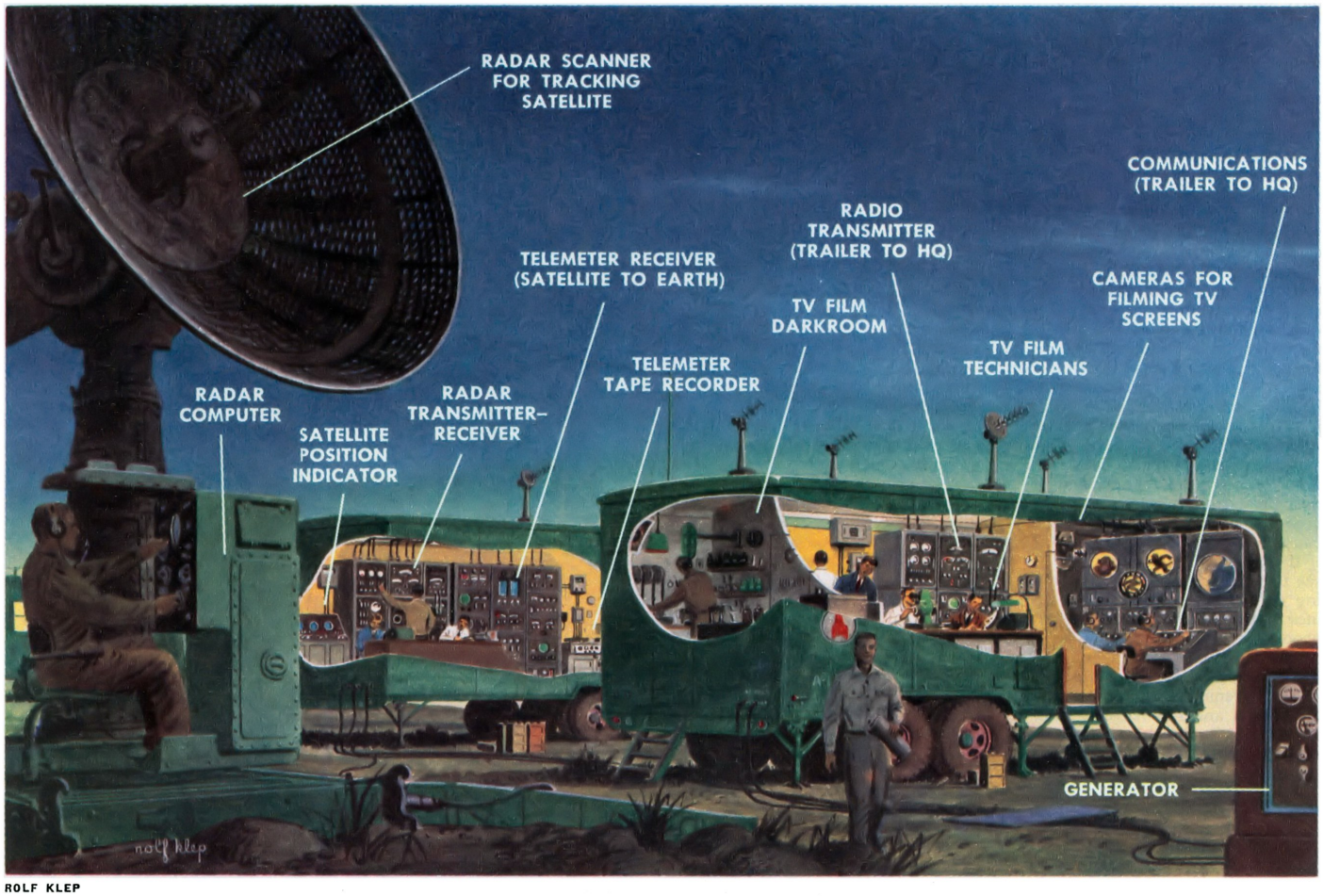
The monkeys will live in two chambers of the animal compartment. In the smaller section, one of the creatures will lie strapped to a seat throughout the two-month test. His hands and head will be free, so he can feed himself, but his body will be bound and covered with a jacket to keep him from freeing himself or from tampering with the measuring instruments taped painlessly to his body. The delicate recording devices will provide vital information—body temperature, breathing cycle, pulse rate, heartbeat, blood pressure and so forth.

The other two monkeys, separated from their pinioned companion so they won't turn him loose, will move about freely in the larger section. During the flight from earth, these two monkeys will be strapped to shock-absorbing rubber couches, under a mild anesthetic to spare them the discomfort of the acceleration pressure. By the time the anesthetic wears off, the robot will have settled in its circular path about the earth, and a simple timing device will release the two monkeys. Suddenly they'll float weightless, inside the cabin.

What will they do? Succumb to fright? Perhaps cower in a corner for two months and slowly starve to death? I don't think so. Chances are they'll adjust quickly to their new condition. We'll make it easier for them to get around by providing leather handholds along the walls, like subway straps, and by stringing a rope across the chamber.

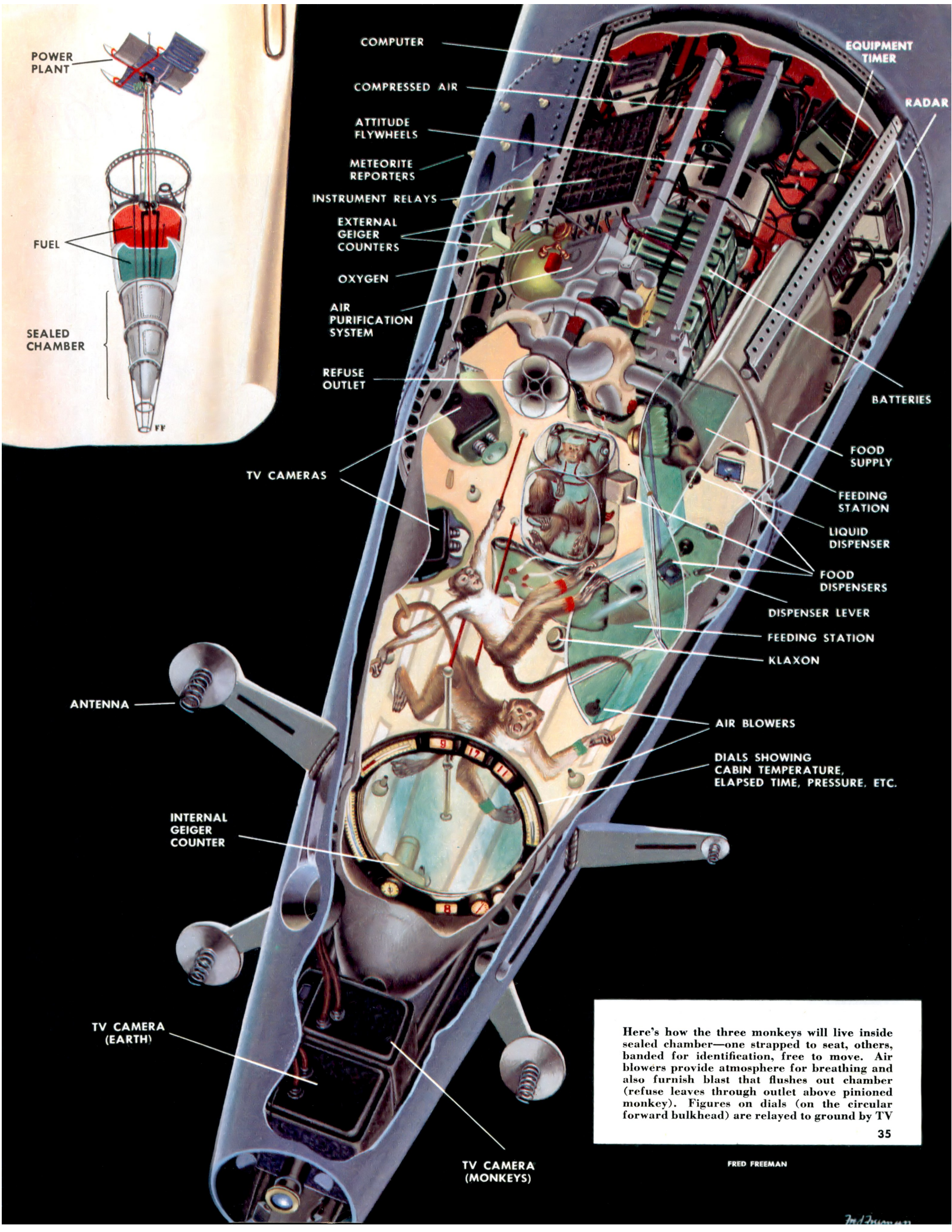
There's another problem for the three animals: to survive the 60 days they must eat and drink.

They'll prepare to cope with that problem on the ground. For months before they take off, the two unbound monkeys will live in a replica of the compartment they'll occupy in space, learning to operate food and liquid dispensers. In space, each of the two free animals will have his own feeding station. At specific intervals a klaxon horn will sound; the monkeys will respond by rushing to the feeding stations as they've been trained to do. Their movement will break an electric-eye beam, and clear plastic doors will snap shut behind them, sealing them off from their living quarters. Then, while they're eating, an air blower will flush out the living compartment—both for sanitary reasons



ROLF KLEP

One of the 20 field stations, scattered around the world, which will track the satellite and receive the reports it transmits by telemeter and TV. Information gathered here will be sent immediately to headquarters in the U.S.

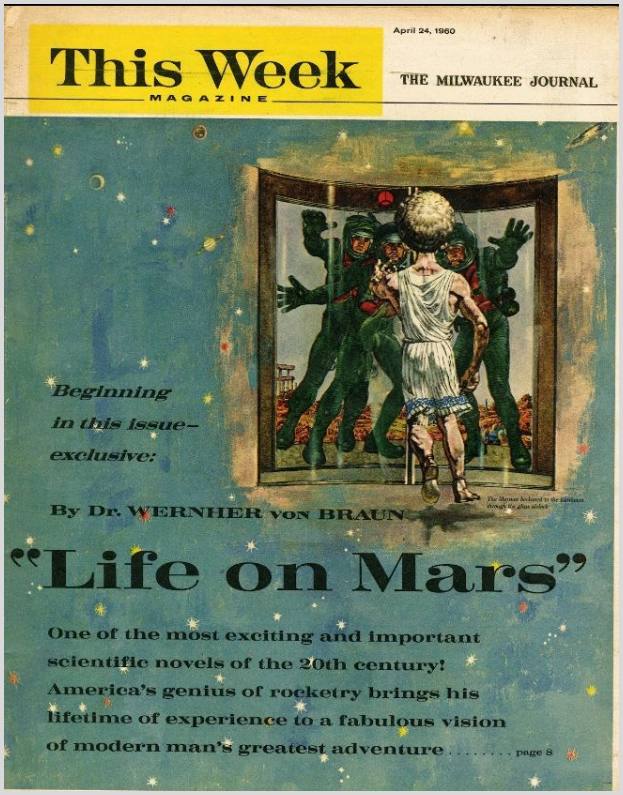


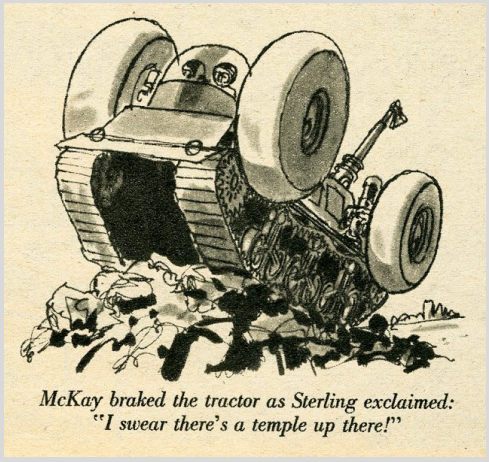
Here's how the three monkeys will live inside sealed chamber—one strapped to seat, others, banded for identification, free to move. Air blowers provide atmosphere for breathing and also furnish blast that flushes out chamber (refuse leaves through outlet above pinioned monkey). Figures on dials (on the circular forward bulkhead) are relayed to ground by TV

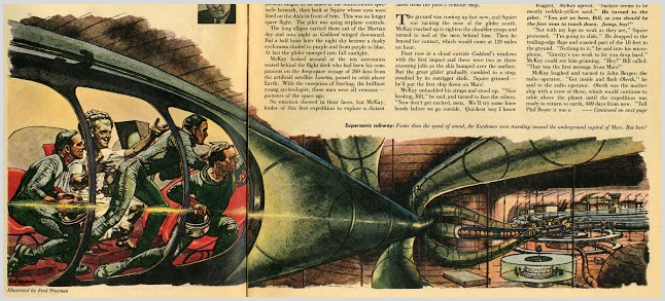
FRED FREEMAN

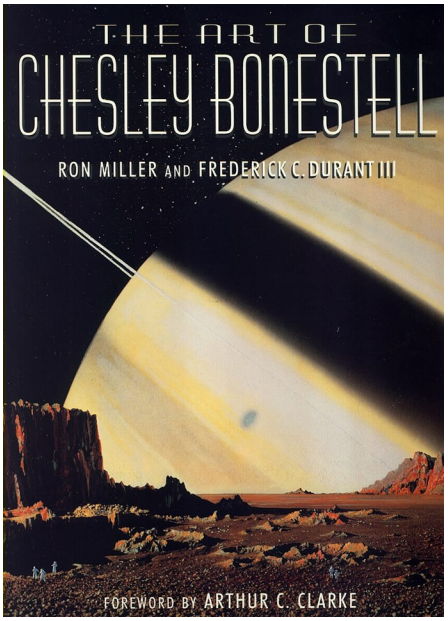
Dreams of Space
Books & Ephemera

Non-Fiction Children's Books about Space Flight from 1945 to 1975
http://dreamsofspace.blogspot.com/









Award winner Ron Miller & Black Cat Studios

Ron Miller, winner of the 2002 Hugo Award (World Science Fiction Society) for Best Related Work: The Art of Chesley Bonestell

The Chesley Bonestell Archives of Melvin H. Schuetz

A Chesley Bonestell Space Art Chronology

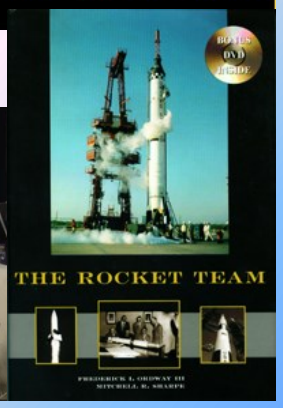
Melvin H. Schuetz

www.bonestell.com

A former satellite controller in the U.S. Air Force and private industry, Melvin H. Schuetz has researched and collected publications from around the world containing Bonestell's art for more than four decades. His book, A Chesley Bonestell Space Art Chronology, is a unique reference bibliography containing detailed listings of over 750 publications which have included examples of Bonestell's space art.

Space scientist and well-known author of visionary books on spaceflight. Ordway was in charge of space systems information at the Marshall Space Flight Center from 1960 to 1963 and before that performed a similar function for the Army Ballistic Missile Agency. For many years he was a professor at the University of Alabama's School of Graduate Studies and Research. However, his greatest contribution has been to the popularization of space travel through dozens of books that he has authored or coauthored. He was also technical consultant to the film 2001: A Space Odyssey and owns a large collection of original paintings depicting astronautical themes. Ordway was educated at Harvard and completed several years of graduate study at the University of Paris and other universities in Europe.

www.cgpublishing.com



Frederick Ira Ordway III

Co-Author with Mitchell R. Sharpe of The Rocket Team

Dreams of Space, Books & Ephemera

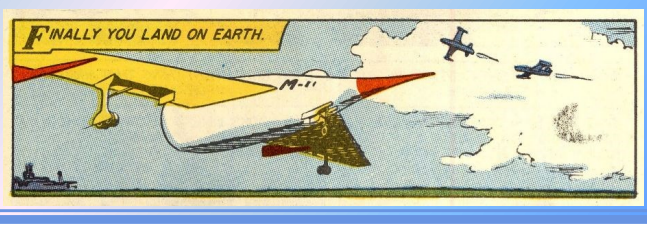
Non-Fiction Children's Books about Space Flight from 1945 to 1975

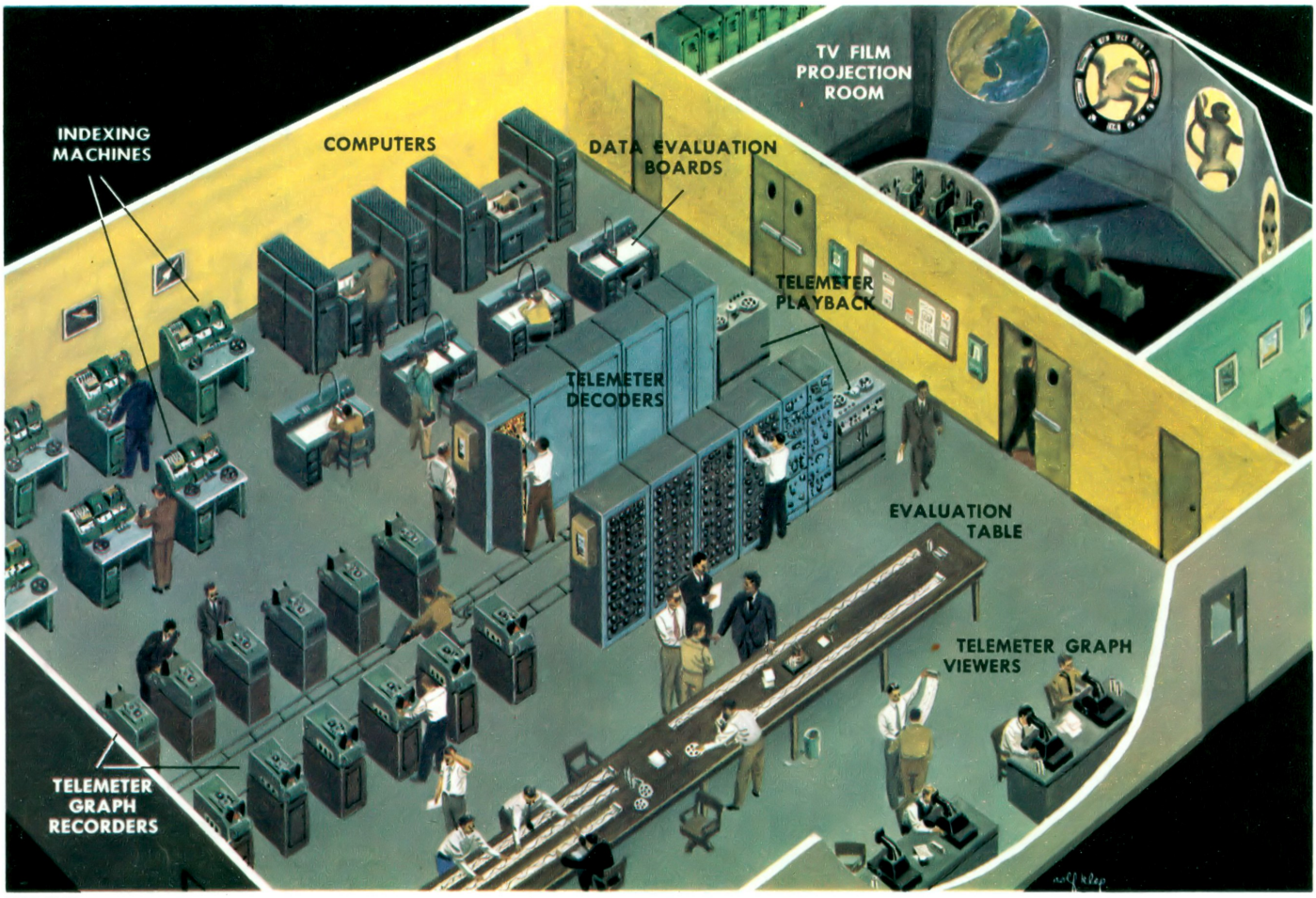
http://dreamsofspace.blogspot.com/

Classics Illustrated were comic books intended to educate as well as entertain. They often were fictional "classic" books in comic book form such as Moby Dick. They also had a special series called "The World around Us." These were non-fiction comic books about topics of interest.

Classics Illustrated. Illustrated by Gerald McCann, Sam Glanzman and John Tartaglione. The Illustrated Story of Space (80 pages), 26 cm, softcover.

Contains illustrated stories on training for space, the first rocket to the Moon, the history and use of the rocket, the launch of Vanguard 1 and the construction of a space station. "The World Around Us" (#5) January 1959.





ROLF KLEP

Main headquarters, where data transmitted by satellite—and relayed by field stations—will be decoded, interpreted and indexed for study

and to keep weightless refuse from blocking the television lenses. The plastic doors will spring open again when the housecleaning is finished.

The monkeys will drink by sucking plastic bottles. Liquid left free, without gravity to keep it in place, would hang in globules. To get solid food, each of the monkeys—again responding to their training—will press a lever on a dispenser much like a candy or cigarette machine. The lever will open a door, enabling the animals to reach in for their food. They'll get about half a pound of food a day—a biscuit made of wheat, soybean meal and bone meal, enriched with vitamins. The immobilized monkey will have the same food; his dispensers will be within easy reach.

For the two free monkeys, it will be a somewhat complicated life. The way they react to their ground training under the new conditions posed by lack of gravity will provide invaluable information on how weightlessness will affect them.

While the monkeys are providing physiologists with information on weightlessness, physicists will be learning more about cosmic rays, invisible high-speed atomic particles which act like deep-penetrating X rays and were once feared as the major hazard of space flight. Theoretically, in large enough doses cosmic rays could conceivably cause deep burns, damage the eyes, produce malignant growths and even upset the normal hereditary processes. They don't do much damage to us on earth because the atmosphere dissipates their full strength, but before much was known about the rays people worried about the dangers they might pose to man in space. From recent experiments scientists now know that the risk was mostly exaggerated—that even *beyond* the atmosphere a human can tolerate the rays for long periods without ill effects. Still, the best figures available have been obtained by high-altitude instrument rocket flights which were too brief to be conclusive. These spot checks must be augmented by a prolonged study, and the baby space station will make that possible.

The concentration of cosmic rays over the earth varies, being greatest over the north and south magnetic poles. The baby space station will follow a circular path that will carry it close to both poles within every hour and a half, so it can determine if cosmic-ray concentration varies that high up.

Geiger counters inside and outside the robot will measure the number of cosmic particle hits. The telemetering apparatus will signal the information to the ground—and for the first time physicists will have an accurate indication of the cosmic-ray concentration in space, above all parts of the globe.

Besides cosmic rays, the baby satellite will be hit by high-speed space bullets—tiny meteors, most of them smaller than a grain of sand, whizzing through space faster than 1,000 miles a minute.

When men enter space, they'll be protected against these pellets. Their rockets, the big space station, even their space suits, will have an outer skin called a meteor bumper, which will shatter the lightning-fast missiles on impact. But how many grainlike meteors must the bumpers absorb every 24 hours? That's what we space researchers want to know. So dime-sized microphones will be scattered over the robot's outer skin to record the number and location of the impacts as they occur.

In the process of unmasking the secrets of space, the baby satellite also will unravel a few riddles of our own earth.

For example, there are numerous islands whose precise position in the oceans has never been accurately established because there is no nearby land to use as a reference point. Some of them—one is Bouvet Island, lying south of the Cape of Good Hope—have been the subject of international disputes which could be quickly settled by fixing the islands' positions. By tracking the baby space station as it passes over these islands, we'll accurately pinpoint their locations for the first time.

The satellite will be even more important to meteorologists. The men who study the weather would like to know how much of the earth is covered with cloud in any given period. The robot's television camera will give them a clue—a start toward sketching in a comprehensive picture of the world's weather. Moreover, by studying the *pattern* of cloud movement, particularly over oceans, they may learn how to predict weather fronts with precision months in advance. Most of the weather research must await construction of a man-carrying space station, but the baby satellite will show what's needed.

To collect this information, of course, we must first establish the little robot in its 200-mile orbit. All the knowledge needed for its construction and operation is already available to experts in the fields of rocketry, television and telemetering.

Before take-off, the satellite vehicle will resemble one of today's high-altitude rockets, except that it will be about three times as big—150 feet tall, and 30 feet wide at the base. After take-off it will become progressively smaller, because it actually will consist of three rockets—or stages—one atop another, two of which will be cast away after delivering their full thrust. The vehicle will take off vertically and then tilt into a shallow path nearly parallel to the earth. Its course will be over water at first, so the first two stages won't fall on anyone after they're dropped, a few minutes after take-off.

When the third stage of the vehicle reaches an altitude of 60 miles and a speed of 17,700 miles an hour, the final bank of motors will shut off auto-

In one move we'll crack the secrets of cosmic rays, meteor bullets—even lost isles

matically. The conical nose section will coast unpowered to the 200-mile orbit, which it will reach at a speed of 17,100 miles an hour, 44 minutes later. The entire flight will take 48½ minutes.

After the satellite reaches its orbit, the automatic pilot will switch on the motors once again to boost the velocity to 17,200 miles an hour—the speed required to balance the earth's gravity at that altitude. Now the rocket becomes a satellite; it needs no more power but will travel steadily around the earth like a small moon for 60 days, until the slight air drag present at the 200-mile altitude slows it enough to drop.

Once the satellite enters its orbit, gyroscopically controlled flywheels cartwheel the nose until it points toward the earth. At the same time, five little antennas spring out from the cone's sides and a small explosive charge blasts off the nose cap which has guarded the TV lens during the ascent.

Finally, the satellite's power plant—a system of mirrors which catch the sun's rays and turn solar heat into electrical energy—rises into place at the broad end of the cone. A battery-operated electric timer starts a hydraulic pump, which pushes out a telescopic rod. At the end of the rod are the three curved mirrors. When the rod is fully extended, the mirrors unfold, side by side, and from the ends of the central mirror two extensions slip out. Mercury-filled pipes run along the five polished plates; the heated mercury will operate generators providing 12 kilowatts of power. Batteries will take over the power functions while the satellite is passing through the shadow of the earth.

With the power plant in operation, the baby space station buckles down to its 60-day assignment as man's first listening post in space.

At strategic points over the earth's surface, 20 or more receiving stations, most of them set up in big trailers, will track the robot by radar as it passes overhead, and record the television and telemetering broadcasts on tape and film. Because the satellite's radio waves travel in a straight line, the trailers can pick up broadcasts for just a few minutes at a time—only while the robot remains in sight as it zooms from horizon to horizon.

As the satellite passes out of range, the recorded data will be sent to a central station in the United States—some of it transmitted by radio, the rest shipped by plane. There, the information will be evaluated and integrated from day to day.

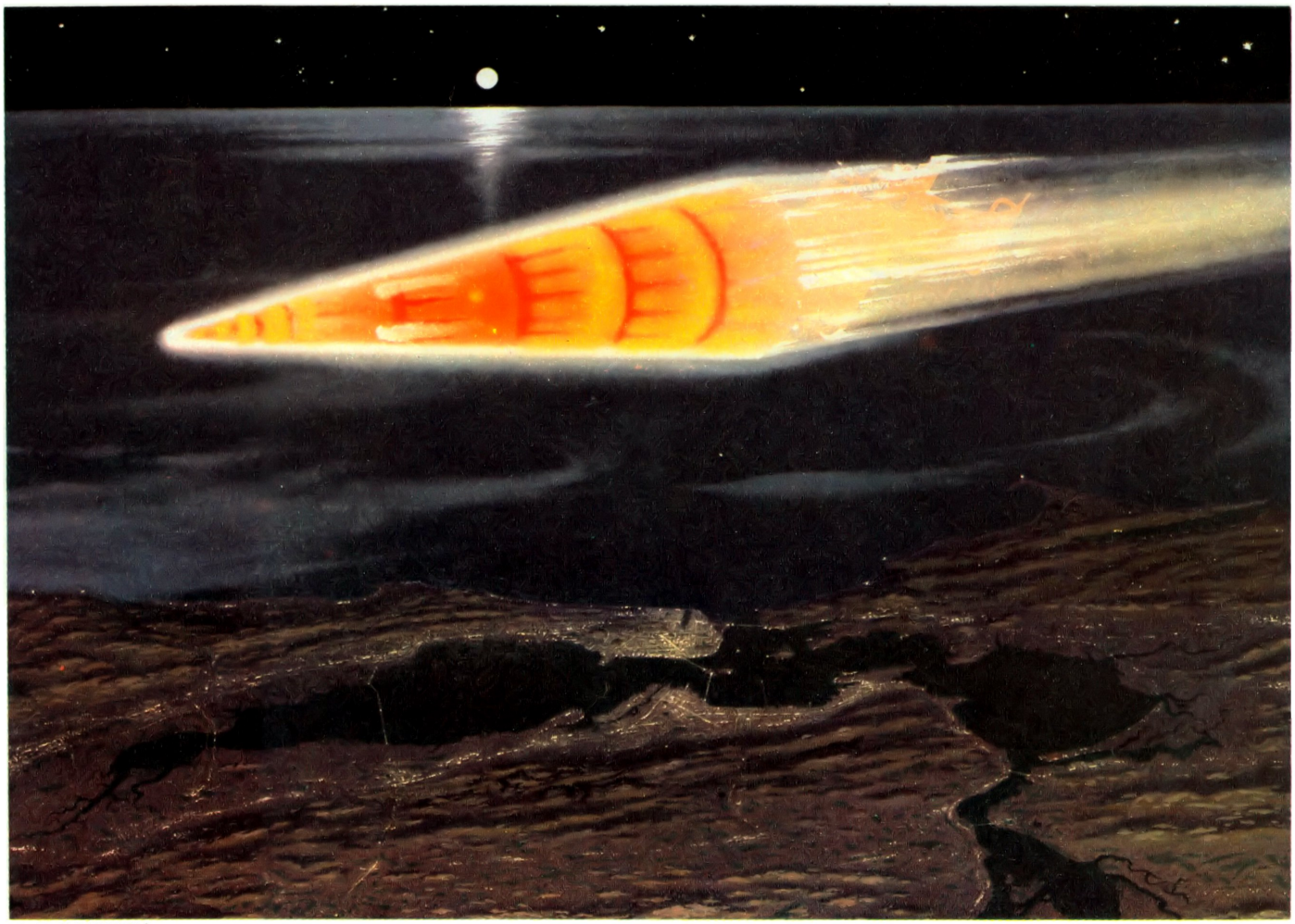
The monitoring posts will be set up inside the Arctic and Antarctic Circles and at points near the equator. In the polar areas, stations could be at Alaska, southern Greenland and Iceland; and in the south, Shetland Islands, Campbell Island and South Georgia Island. In the Pacific, possible sites are Baker Island, Christmas Island, Hawaii and the Galapagos Islands. The remaining monitors may be located in Puerto Rico, Bermuda, St. Helena, Liberia, South-West Africa, Ethiopia, Maldive Islands, the Malay Peninsula, the Philippines, northern Australia and New Zealand.

These points, all in friendly territory, would form a chain around the earth, catching the satellite's broadcasts at least once a day.

The monitor stations will be fairly costly, but they'll come in handy again later, when man is ready to launch the first crew-operated rocket ships for development of a big-manned space station, 1,075 miles from the earth.

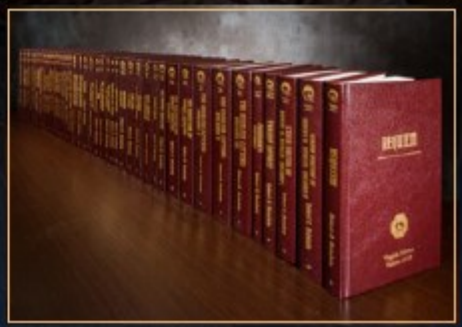
The cost of the baby satellite project will be absorbed into the four-billion-dollar 10-year program to establish the bigger satellite. We scientists can have the baby rocket within five to seven years if we begin work now. Five years later, we could have the manned space station.

One of the monitoring posts will view the last moments of the baby space station. As the weeks pass, the satellite, dragging against the thin air, will drop lower and lower in its orbit. When it descends into fairly dense air, its skin will be heated by friction, causing the temperature to rise within the animal compartments. At last, a thermostat will set off an electric relay which triggers a capsule containing a quick-acting lethal gas. The monkeys will die instantly and painlessly. Soon afterward, the telemetering equipment will go silent, as the rush of air rips away the solar mirrors which provide power, and the baby space station will begin to glow cherry red. Then suddenly the satellite will disappear in a long white streak of brilliant light—marking the spectacular finish of man's first step in the conquest of space. ▲▲▲



CHESLEY BONESTELL

Baby space station's last moments. With San Francisco Bay in background, satellite plunges into atmosphere in fiery windup to 60-day flight



Exerpt from "Ray Guns and Rocketships"
first published in 1952

It was suggested that I comment on the writing of science fiction for children. I am not sure just how to do this as I am not sure that I have written any sciene fiction for children. It is true that I have a group of books which are catalogued as being intended for "boys of ten and older"—but I have found that this list is read by adults as well as by boys (and girls!) and that my books intended for adults are read by my younger readers as well as by adults. Science fiction is quite ambivalent in this respect. A book so juvenile that it will insult the intelligence of adults is quite likely to insult the intelligence of the kids.

When I was a child myself I used to get quite annoyed at authors who "wrote down." When I was first asked to do a book intended for kids I swore a solemn oath that I would never "write down"—it is better by far that a child should fail to grasp some portion of a story than it is to patronize him. So I believe and my experience seems to bear me out. In my own work I make just two minor distinctions between copy intended nominally for adults and copy intended nominally for not-yet-adults. In the boys' list I place a little less emphasis on boy-meets-girl and a little more emphasis on unadulterated science—but these are matters of slight emphasis only. On the first point I am obeying a taboo set up by adults, it being my own recollection that kids get interested in boy-meets-girl at a very tender age. On my second point it is my recollection and my more recent observation that kids are more interested in "how" and "why" than their parents usually are. The kids really want to know how the spaceship operates; the adults frequently don't care—so I try to give the kids enough detail in matters technological to satisfy them without giving so much that it will bore an adult. In any case a science fiction story should be a story first of all; it is not intended to replace science text books.

But most especially in writing for kids the science in it should be valid. When they spot an error they are not likely to forgive it.

In many ways science fiction belongs to the kids. They know that "it hasn't happened yet"—but they believe that it will happen. They expect to grow up to build space ships, to pilot them. They still believe in change and they are undismayed by the wonderful and terrifying future we have in front of us. If an adult enjoys science fiction, it is almost a guarantee that he has managed to carry over a youthful point of view, a mind not yet calcified, a belief in change and the future. It is for the youngster and for this adult who still has something of youth about him that we write.

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Exerpt from "All You Zombies"

First published in The Magazine of Fantasy and Science Fiction (March 1959)

2217 TIME ZONE V (EST) 7 Nov 1970 NYC—"Pop's Place": I was polishing a brandy snifter when the Unmarried Mother came in. I noted the time—10.17 p.m. zone five or eastern time November 7th, 1970. Temporal agents always notice time & date; we must.

The Unmarried Mother was a man twenty-five years old, no taller than I am, immature features and a touchy temper. I didn't like his looks—I never had—but he was a lad I was here to recruit, he was my boy. I gave him my best barkeep's smile.

Maybe I'm too critical. He wasn't swish; his nickname came from what he always said when some nosy type asked him his line: "I'm an unmarried mother." If he felt less than murderous he would add: "—at four cents a word. I write confession stories."

If he felt nasty, he would wait for somebody to make something of it. He had a lethal style of in-fighting, like a female cop—one reason I wanted him. Not the only one.

He had a load on and his face showed that he despised people more than usual. Silently I poured a double shot of Old Underwear and left the bottle. He drank, poured another.

I wiped the bar top. "How's the 'Unmarried Mother' racket?"

His fingers tightened on the glass and he seemed about to throw it at me; I felt for the sap under the bar. In temporal manipulation you try to figure everything, but there are so many factors that you never take needless risks.

Continued on page 4.

The Virginia Edition

The Virginia Edition represents authoritative texts for all of Robert Heinlein's published fiction and nonfiction, newly typeset, whenever possible from the editions put in final form by Heinlein's own hand. In other cases, the definitive texts are represented by editions restored to their intended state, in publications overseen directly by Virginia Heinlein after her husband's passing. Mrs. Heinlein's role in perpetuating her husband's work and legacy was at all times crucial, both during and after the writing. It is truly fitting that her name be remembered in close connection with his.

Robert Heinlein and Virginia Gerstenfeld late fall 1947. Permission by Robert A. and Virginia Heinlein Prize Trust.

3

I saw him relax that tiny amount they teach you to watch for in the Bureau's training school. "Sorry," I said. "Just asking, 'How's business?' Make it 'How's the weather?' "
He looked sour. "Business is okay. I write 'em, they print 'em, I eat."
I poured myself one, leaned toward him. "Matter of fact," I said, "you write a nice stick—I've sampled a few. You have an amazingly sure touch with the woman's angle."
It was a slip I had to risk; he never admitted what pen-names he used. But he was boiled enough to pick up only the last. " 'Woman's angle!' " he repeated with a snort. "Yeah, I know the woman's angle. I should."
"So?" I said doubtfully. "Sisters?"
"No. You wouldn't believe me if I told you."
"Now, now," I answered mildly, "bartenders and psychiatrists learn that nothing is stranger than the truth. Why, son, if you heard the stories I do-well, you'd make yourself rich. Incredible."
"You don't know what 'incredible' means!"
"So? Nothing astonishes me. I've always heard worse."
He snorted again. "Want to bet the rest of the bottle?"
"I'll bet a full bottle." I placed one on the bar.
"Well—" I signaled my other bartender to handle the trade. We were at the far end, a single-stool space that I kept private by loading the bar top by it with jars of pickled eggs and other clutter. A few were at the other end watching the fights and somebody was playing the juke box—private as a bed where we were. "Okay," he began, "to start with, I'm a bastard."

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Above: A NASA camera accidentally captured an airborne frog as the agency's LADEE moon mission blasts off from Wallops Flight Facility in Virginia. Image credit: NASA Wallops Flight Facility/Chris Perry. Image source: National Geographic.

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