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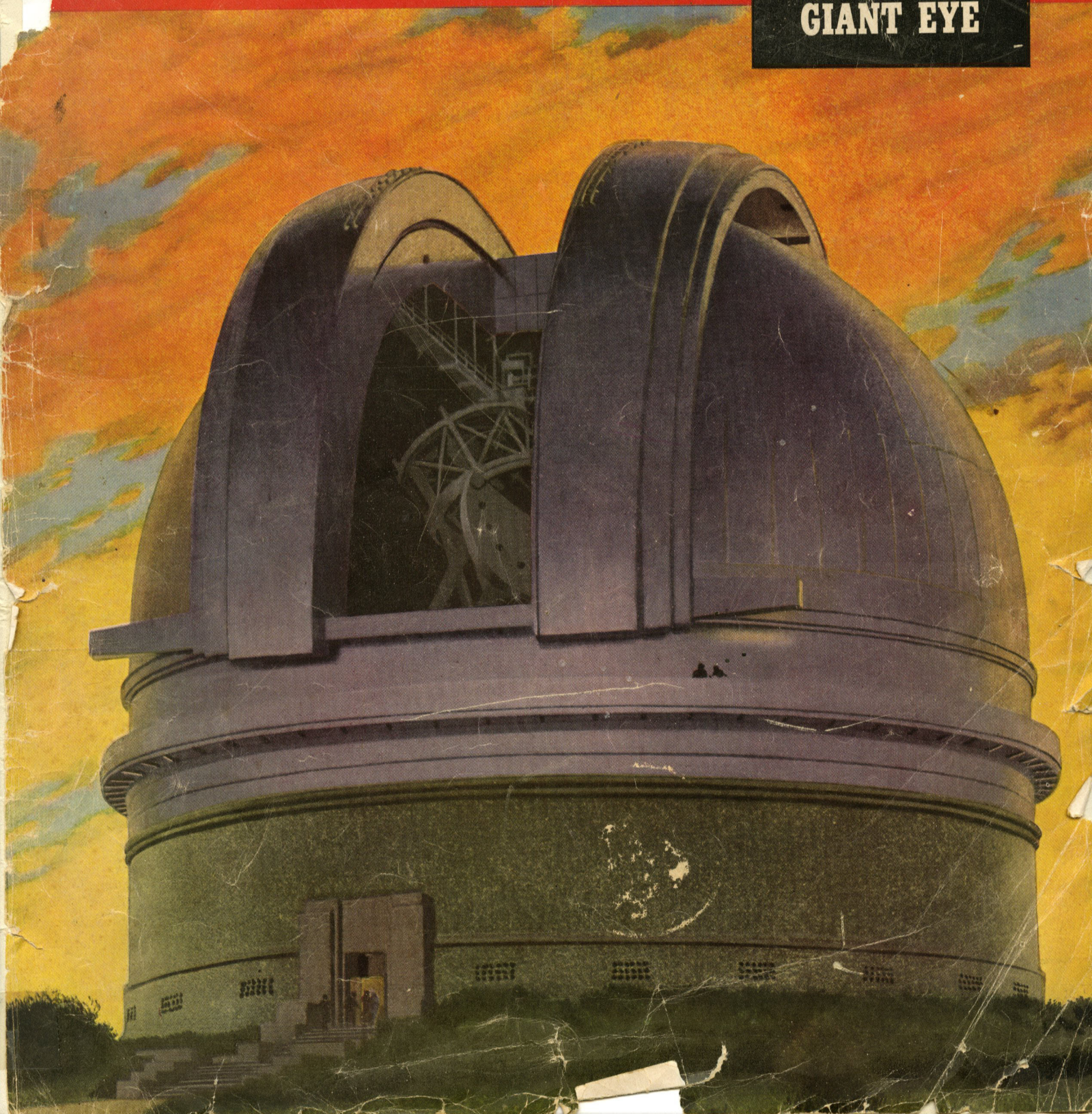
EXCLUSIVE!
First Photos Through PALOMAR'S GIANT EYE



COLLIER'S EXCLUSIVE

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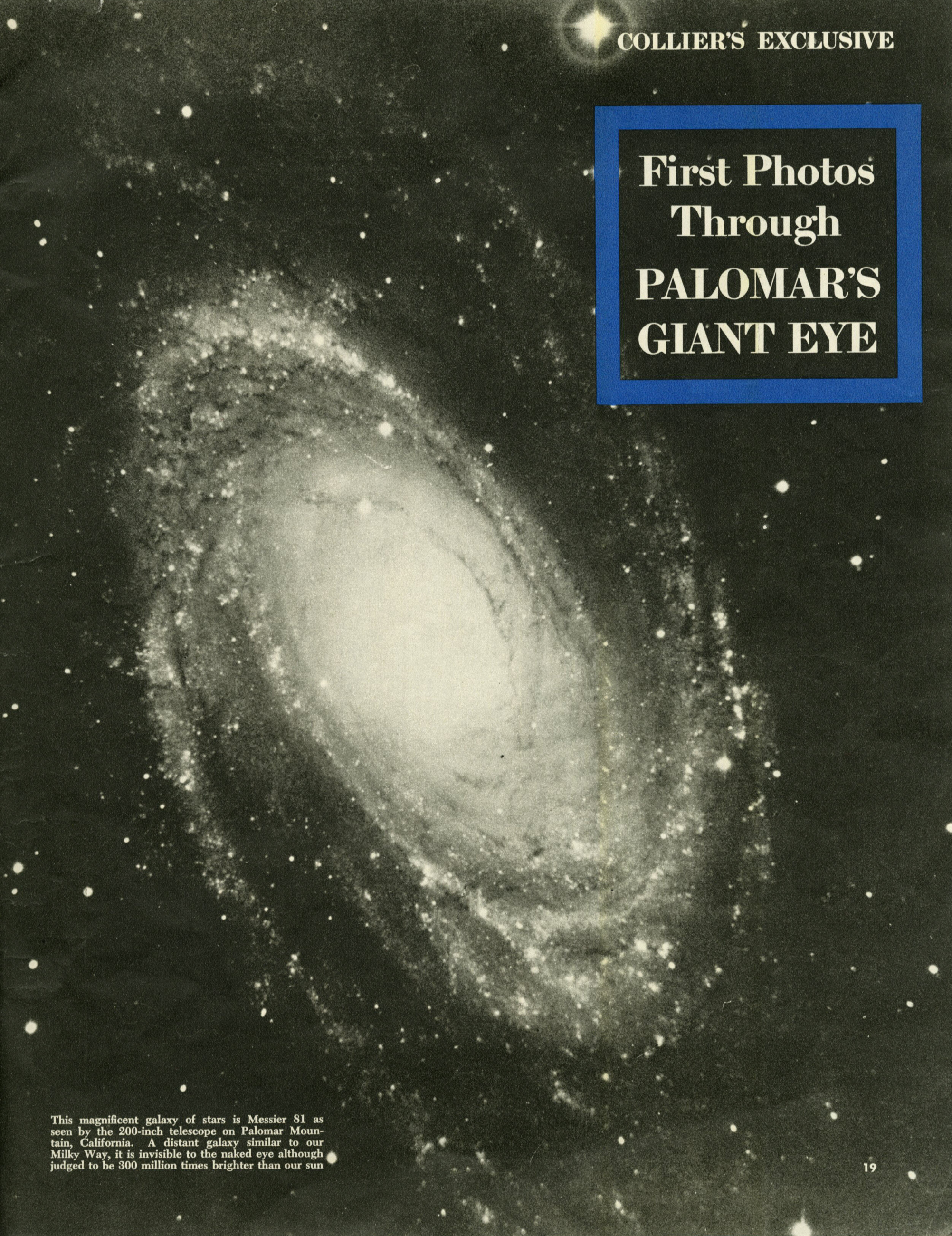


This magnificent galaxy of stars is Messier 81 as seen by the 200-inch telescope on Palomar Mountain, California. A distant galaxy similar to our Milky Way, it is invisible to the naked eye although judged to be 300 million times brighter than our sun

Behold, the Universe!

By DAVID O. WOODBURY

Author of
The Glass Giant of Palomar

This is the first picture ever taken by the 200-inch telescope. The light from the gas cloud in the center started earthward about 1500 B.C.

ON THESE pages you see what no one has ever seen before—the oldest and most remote star worlds ever photographed by man. These are the first official pictures to be taken by the world's largest stargazer, the long-awaited 200-inch Hale telescope on Palomar Mountain in California. The light that made the pictures started on its journey back in the dawn of our world, when primitive life was just beginning to stir on earth.

The giant telescope's steel and glass anatomy, refined in every detail to the limit of human ingenuity, is finished. Its 500 tons of precision mechanisms are ready at last to open up the secrets of outer space, to catch the incredibly weak signals of light that may give us a real understanding of creation.

This is an exciting time to be alive: yesterday, the coming of atomic energy; today, the first message from continents of stars so frighteningly far away that they may actually be at the ends of space. In preliminary tests this new telescope has recorded galaxies of light six thousand billion billion miles from our tiny planet home.

This first tremendous achievement puts us on the threshold of a magnificent new era of astronomy. With this instrument we may discover answers to mysteries that have tantalized humanity for centuries. We may learn how big the universe is and what it is made of. We may find out, from just such photographs as these, how this universe of ours began, and when, and what it did through the awesome span of aeons that have since passed by. We

In front of the 200-inch giant telescope, on which they have worked since its beginning in 1928, are, left to right: Bruce Rule, project engineer, Dr. Edwin P. Hubble, world authority on the outer universe, and Byron Hill, resident engineer

TED CROMER

This picture was made by the 100-inch telescope on Mount Wilson in California. The faintest images are tremendous galaxies of stars as much as 500 million light-years away. The circle of light in the upper right-hand corner was made by a near-by star

The same area of sky, when photographed by the 200-inch telescope, shows three or four times as many galaxies, some as distant as a thousand million light-years away (arrow). The near-by star is sixteen times too faint for the human eye to see

may even dare to predict what it will do next, and how it may finally end.

The promise of such vast new information should humble the most arrogant. For, although only astronomers can make these tremendous voyages into space, all of us may gain new spiritual dimensions from what they find.

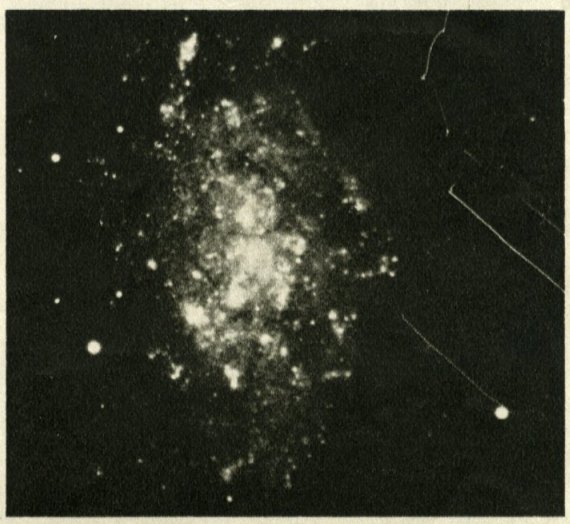
Every human being in all the ages has looked at the stars to marvel, and has taken comfort in their permanence. Their patterns in the sky have reassured us and inspired us. We did not understand them and we do not know them yet. But the growing certainty that there is order and plan out there, no matter how far we go, is a tremendous aid to human faith.

The 200-inch telescope itself, for all its tremendous possibilities, is no awesome new mechanical Gargantua. It is simply a fine precision star-camera with a million times the power of the human eye, representing an achievement that has demanded the best years of the lives of many men. Unheard-of obstacles, difficulties and disappointments have been surmounted, undreamed-of problems of construction have been solved, to make this mighty instrument possible.

Like the smallest box camera, the 200-inch makes its records upon film, not upon the eye. If you looked through the telescope you would see far less than a photographic plate would record. The pictures published here were taken upon film not much bigger than a post card, exposed for as long as an hour in the dark and quiet of a mountaintop. A first look at the developed negative would have told you little. It is only when these small, ordinary-seeming plates are greatly enlarged that the magnificent pictures of flaming outer worlds spring from pin-point images too small to notice.

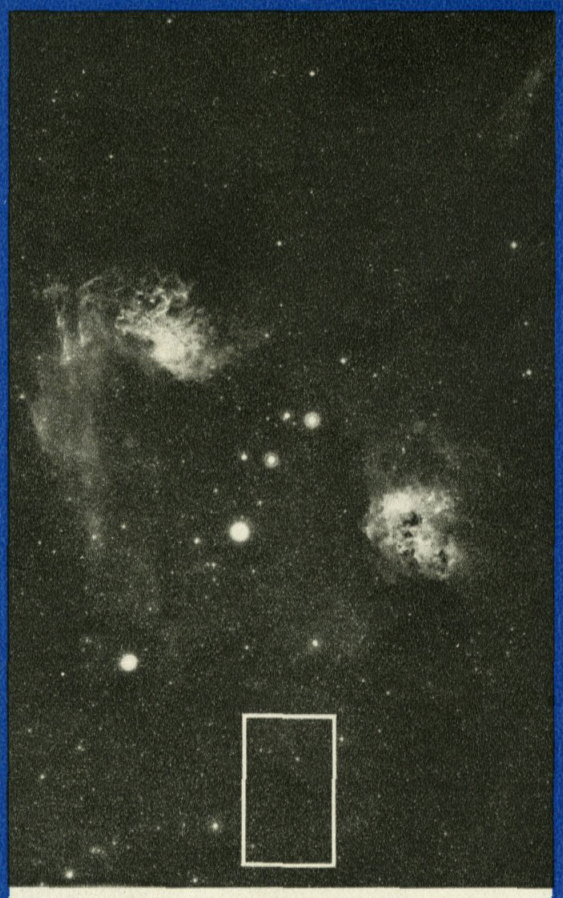
The Palomar giant is the culmination of the devoted labor of scientists working for centuries all over the world. It would never have been built without the faith and inspiration of the late Dr. George Ellery Hale, who was one of America's greatest seekers after knowledge in the sky. Back in 1890, Hale began to dream of a series of gigantic reflecting telescopes with which to plumb the depths of space. If he could find men to pay for them, he thought, and experts to build them, he might solve some of the riddles of the universe.

First, Hale built the 40-inch refractor at the Yerkes Observatory in Wisconsin—a wonder of the world in 1896. But it was not big enough. Fighting for new support, and moving to California, Hale inspired the 60-inch reflector on Mount Wilson, and eventually the 100-inch. So great a giant

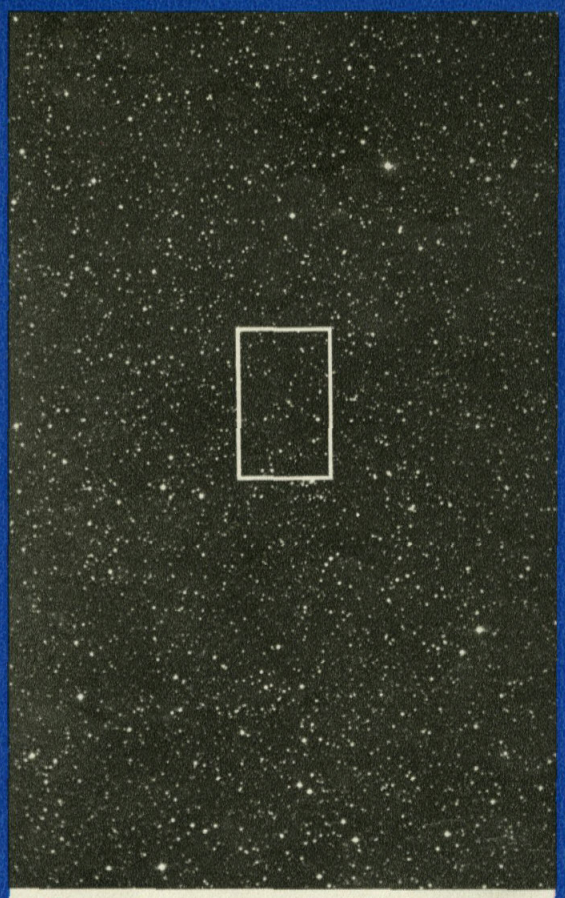


This shadowy star world is two and one-half million light-years or fourteen and one-half million trillion miles away. One light-year is nearly six trillion miles, the distance light travels in one year at a speed of about 186,000 miles per second. White streaks (right) were not made by stars but by scratches on the Hale telescope negative

THE SCHMIDT CAMERA DISCOVERS A GALAXY



1 Until now, dust clouds in the Milky Way have obscured what lies beyond. The Schmidt camera, scout for the 200-inch, however, has found a rift in the clouds



2 A section in picture No. 1 (outlined in white) was picked for closer study. It was enlarged (above) and another area (in oblong) picked for more enlargement

3 A window in the black heavens has been found! Through it can be seen a galaxy (red arrow) as vast as our Milky Way, which is 150,000 light-years across

was the latter that it promised to solve every riddle of creation. No sooner was it in operation, however, than it began to ask more questions than it could answer. Like a ship with too little fuel, it carried its passengers part way out, and left them there.

Then Hale proposed his daring plan for a telescope twice as big, ten times as costly, perhaps too complicated to build at all. In 1928 the gigantic project was begun. Ten years later Hale died, too soon to reap the full satisfaction of seeing the results of his dream. But the pictures published here prove beyond a doubt that his vision will be fully realized.

George Hale was an explorer of space, with all the courage and imagination of a Marco Polo or a Columbus. With his great telescopes he bequeathed to the astronomers of the future a new method of exploration—new ships in which to rocket to the outfields of space, with the speed of light, in search of the unknown. Like Hale, these men are pioneers, eager to set sail on uncharted seas.

It is to be a strange unearthly kind of exploration, like nothing you will find in history. There is no struggle, no suffering, no physical danger. There is no celebration, no waving of hands on the pier, no departure into remote wildernesses, no return. It is like this:

An astronomer and his assistant—quite natural, everyday men—make a simple trip to the top of a not-very-high mountain in a car. They enter the vast darkened observatory in the evening, pondering the clearness of the sky, chatting about the special problems for the night. Once inside, they separate to their posts: one man to the observation station high up in the throat of the gigantic machine, the other to the control buttons of an organ-like console on the main floor. Each knows his job in the team play they are to make.

The skylight fades. Within the dome a few heavily shaded lamps spill pools of yellow on the floor. Up into the crisp, dim air the mighty silhouette of the giant reaches, utterly quiet, waiting.

Bundled in his wool-lined parachute suit, the observer adjusts himself on his stool in the small steel capsule suspended within the telescope. A light blinks, a word is spoken over the intercom, and the voyage has begun.

Smoothly the telescope glides into position, locking into step with the swing of the earth. The gentle thunder of the moving dome rumbles briefly and is still. Into the field of view of a small eyepiece beneath the observer's gaze slips a guide star, cast up by the huge mirror below. Deftly the observer manipulates controls that center the cross hairs of the eyepiece. Then he pushes his photographic plateholder into position and pulls out the slide. Light too faint to be seen begins to soak imperceptibly into the emulsion.

Then, a beautifully timed vibrating wire takes over the task of controlling the great machine as it follows its target across the sky.

For an hour or more there is no perceptible motion, no sound but the thin faint hum of the driving motors that keep the telescope dead on its objective. Then, the exposure carried to the limit skylight will allow, the plate is removed and a telephoned word to the night assistant sends the giant to another objective in the heavens, and a new shot begins.

Stargazing Is Only the Start

So it goes all night, until dawn or until the scheduled work is done. The observer, stiff now from hours in his cramped little cage, is brought down by the long arm of the curving elevator platform. Quickly he retires to his darkroom and develops his plates, puts them in the drying rack and goes "home." Across the mountaintop he finds a warm and comfortable bed at the beautifully appointed "monastery," and gets his day's sleep.

For a week, perhaps, these carefully planned schedules move on. Through the dark of the moon, the astronomer spends night after night in the telescope's arms. Mornings he sleeps. At noon he breakfasts with his friends and chats about the deer that wander over the reservation, then strolls back to his workroom in the base of the observatory for a few hours' computation. Then, back for a nap and dinner at five thirty, and a discussion of the fine points of the new night's run. Finally, the job is done, and he goes home to his wife and children in Pasadena. A small box of glass plates, whose cryptic dots may contain a new secret of the universe, rides beside him.

Then comes the real excitement—the thrill of

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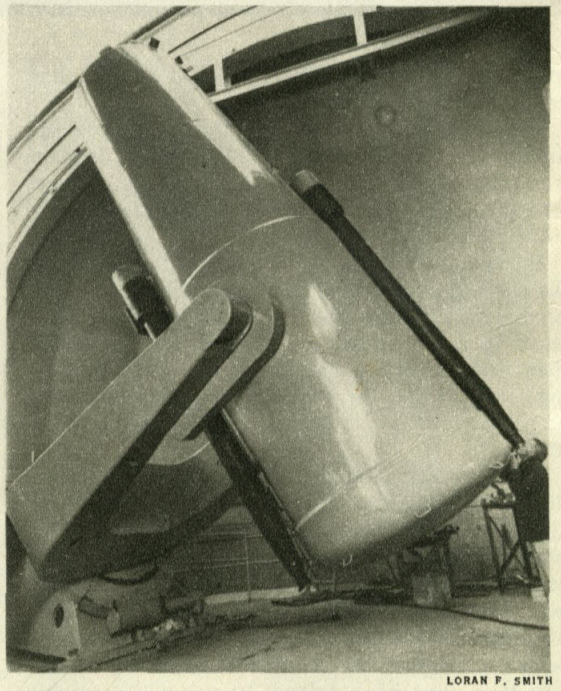
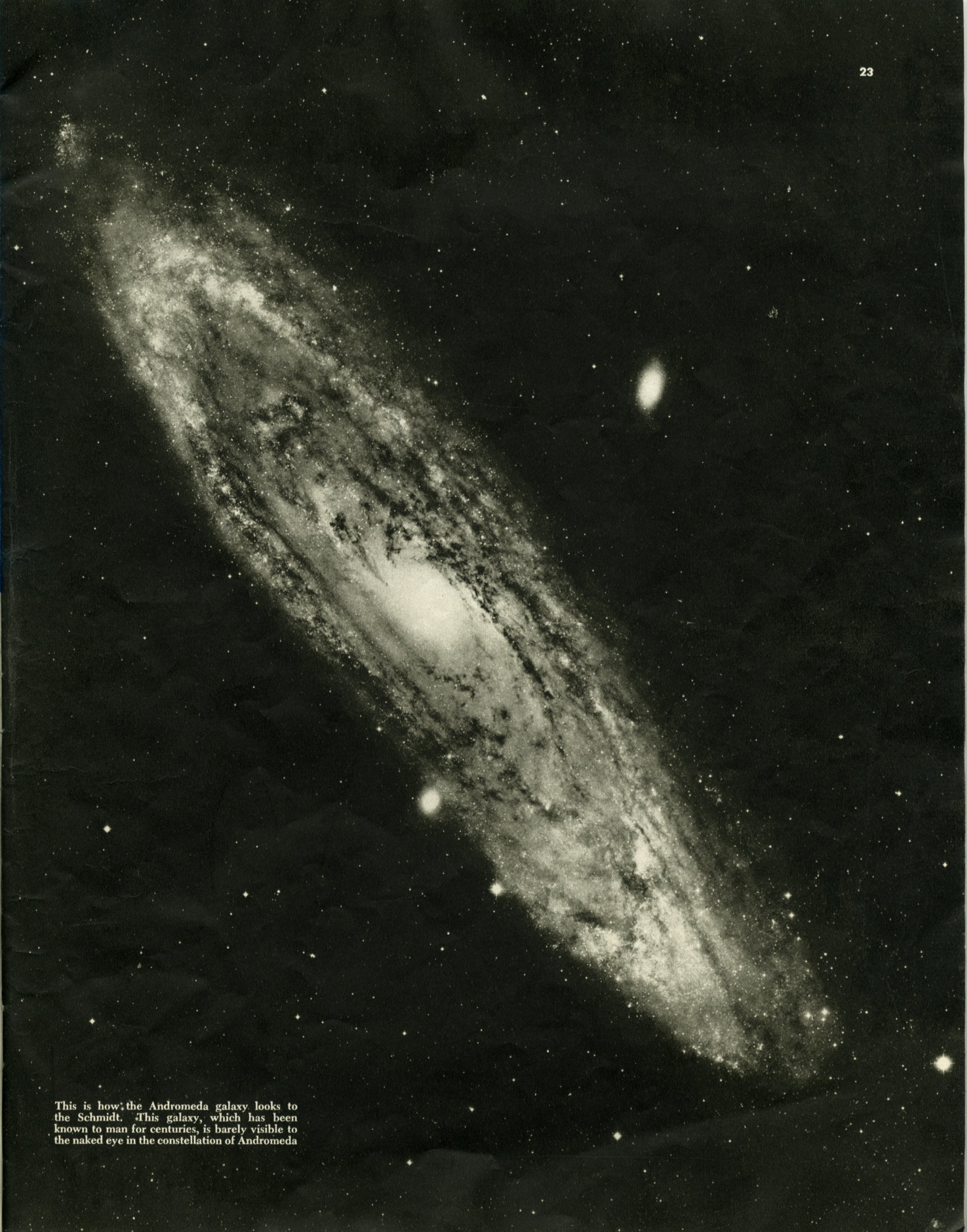
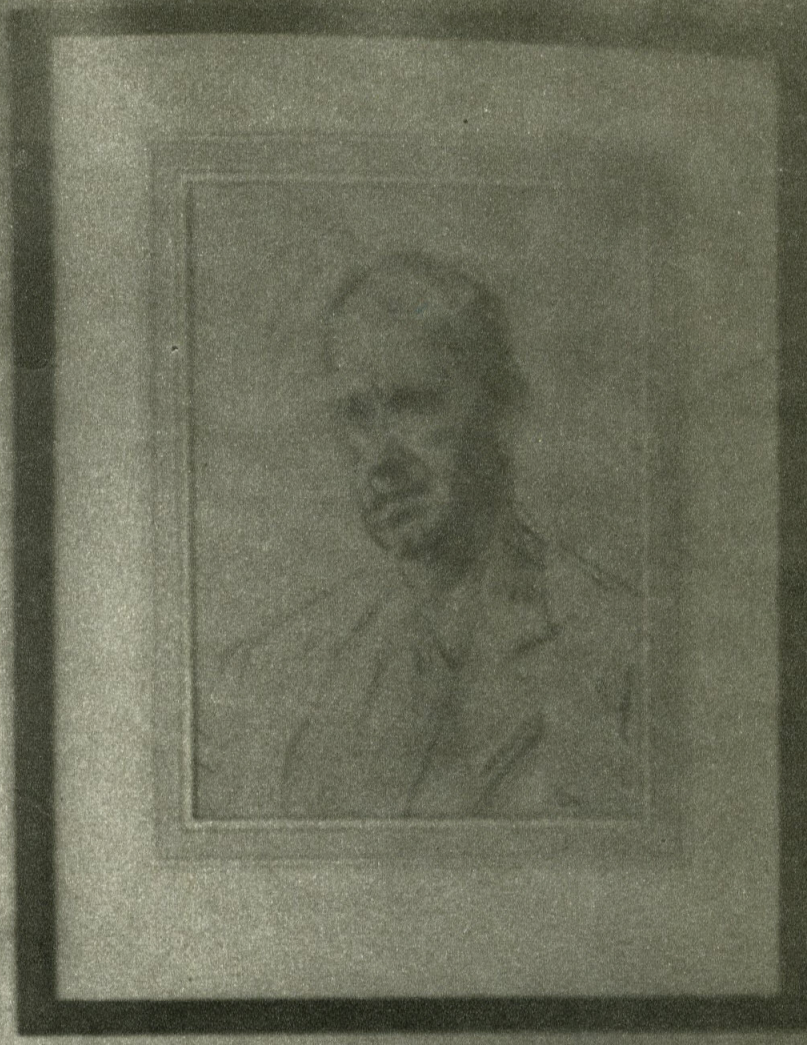


LORAN F. SMITH

Built like a cannon, the 48-inch Schmidt camera **has tremendous scope and great speed. The ten-inch telescopes on its sides are used as guides**



This is how the Andromeda galaxy looks to the Schmidt. This galaxy, which has been known to man for centuries, is barely visible to the naked eye in the constellation of Andromeda



The Men of Palomar

By JOHN KORD LAGEMANN

THERE'S nothing like a visit to the top of Palomar Mountain to make you fall in love all over again with life on this wobbly planet. It will take you farther out of the world than your imagination ever traveled before. And it will bring you closer than you've ever felt toward your fellow man.

"Like we were all shipwrecked here together in an ocean of space," an Iowa manual training instructor described the sensation to me as we looked at the 200-inch telescope from the visitors' gallery. It turned out he was an ex-Seabee whose transport had been torpedoed off Guadalcanal early in the war. The vision he got here at Palomar of the earth's place in the universe reminded him of the life raft he hung on to in the Pacific. "It doesn't feel much bigger, either."

Shortly after, I quoted the Iowa tourist to Dr. Edwin P. Hubble, dean of American astronomers and the one man most responsible for giving us our new vision of an expanding universe which the great 200-inch Hale telescope was built to explore.

"I've felt pretty much the same way myself," said Hubble, pressing down a fresh pipeload of tobacco with his thumb, "as if the only hope for mankind lay in the kind of human solidarity we'd have if we faced an actual invasion from Mars."

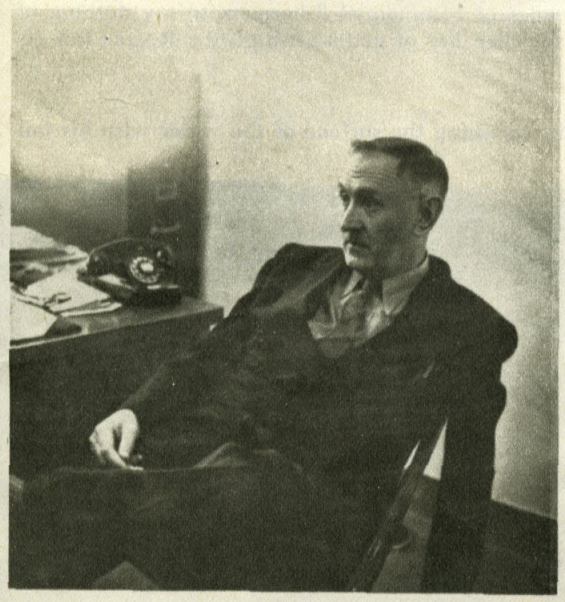
Dr. Ira S. Bowen, director of the Mount Wilson and Palomar observatories, put it another way: "Nobody can grasp the tremendous space now open to us for study without feeling a great deal less responsible for the behavior of the universe and a great deal more responsible for his own behavior."

You feel very close to the blue sky as you roam about this broad, green California mountaintop. It is moated on all sides with broad valleys, across which the rest of the range melts into a lilac

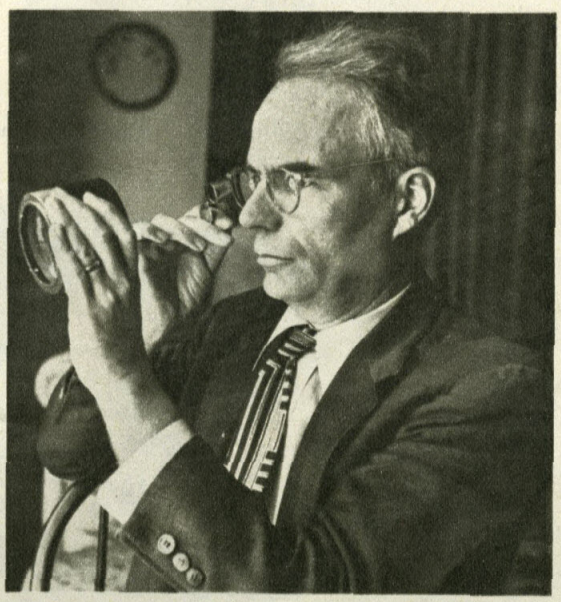
(CONTINUED ON PAGE 64)

In the library of the Mount Wilson and Palomar offices in Pasadena, four world-renowned astronomers examine the first pictures taken by the 200-inch telescope. They are, left to right, Dr. Paul Merrill, spectroscopist; Sir Harold Spencer Jones, Astronomer Royal of England; Dr. Hubble, and Dr. Rudolph Minkowski, astronomer. The portrait is of Dr. George Ellery Hale, for whom the new telescope is named

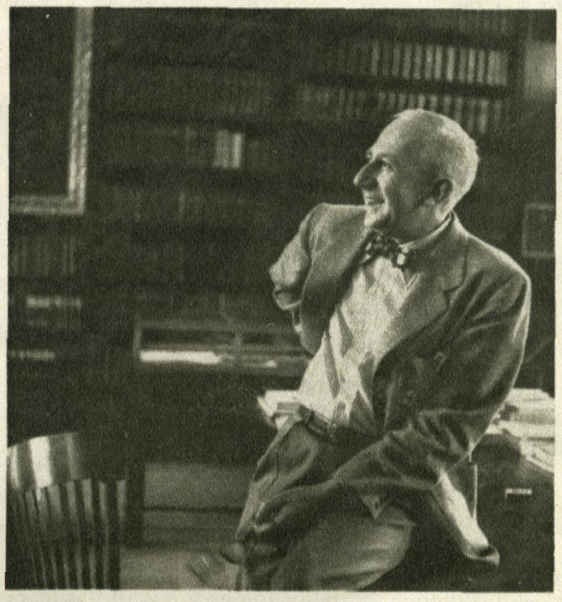
Dr. Edwin P. Hubble (left), one of the world's leading astronomers, opened up new realms of space that the 200-inch telescope is exploring. Portrait is of Sir Arthur Eddington, the physicist



Dr. Fritz Zwicky, astrophysicist, rocket expert and mountain climber, who foresaw our release of atomic energy on earth through his systematic observations of exploding stars, or supernovae



Dr. Ira S. Bowen is director of the Mount Wilson and Palomar observatories. His brilliance in astrophysics and optics was a vital factor in the positive success of the new 200-inch telescope



Dr. Walter Baade, a specialist in measuring the distance of stars by their relative brilliance, is now discovering new facts about our Milky Way from a study of Andromeda, its nearest neighbor

PHOTOGRAPHS FOR COLLIER'S BY TED CRONER

THE MEN OF PALOMAR

Continued from page 25

horizon. The "monastery" where the astronomers live during their monthly visits here is hidden in a grove of ancient oaks; most of the other buildings —bungalows for the permanent staff, powerhouse and machine shop—are screened off by pines and cedar. On the highest rocky promontories, the great white dome of the 200-inch and the lesser domes of the 18-inch and 48-inch Schmidt telescopes shine out like stepping-off places into infinity.

In this atmosphere, tourists who have been worrying about vacation budgets and whether they left a note for the milkman suddenly stand face to face with the universe and find themselves asking: "Is there a purpose behind all this or is it just an accident?" The sight of jet planes and bombers flashing overhead adds still another question: "How long will we last?"

As scientists, the astronomers are not concerned with such questions. But privately as human beings you'll find they are far more deeply disturbed than the rest of us. Their job is to find out what the universe is—not what we want it to be. Nobody knows better than they the insignificance of this planet in the material universe.

"We live in constant awareness of the almost unlimited capacity of technology to destroy the world —or cure its ills," says Hubble. "But science can't make the decision."

"Are you the keeper here?" a tourist asked one of the astronomers on his way to the dome.

"No, ma'am," the man of science told her politely, "I'm just one of the inmates."

Astronomers Like Their Leisure

The popular picture of astronomers as monkish scholars spending their lives in mountaintop seclusion is one that both amazes and amuses the scientists. Like motion picture directors, the time they actually spend filming the picture is little compared with the days of advance preparation in offices and laboratories.

Use of the telescopes, particularly the new 200-inch, is rigidly scheduled among the dozen staff scientists who also have to share them with visiting observers. A staff member considers himself lucky if he gets to spend more than a few days out of every month in the observatories.

In good weather, it's a mad rush to squeeze in all the work he can during the precious hours of clear nights. Even during the day, preparations for the following night leave him little time for sleep or relaxation.

In overcast weather, when the "seeing" is bad, it's a different story. Then the "monastery" bedrooms, with their blackout window curtains and soundproof walls, are ideal for catching up on lost sleep. There's also a pleasant little lounge where the scientists like to catch up on their reading—not so much technical literature either, but detective thrillers and popular magazines. Among the latter are a variety of pulp magazines—to which one of the prominent scientists up here contributes "amazing" science yarns in his spare time. Once in a while there's a very unscientific game of bridge or penny ante. Nobody plays chess.

At both Palomar and Mount Wilson, the astronomers dress like hunters on a camping trip—lumberjack shirts, rough tweed or leather jackets, corduroy or gray flannel pants and heavy hiking boots. Most of them are smokers and all but one or two of these prefer pipes, because they're easier to smoke during work in the telescopes.

Byron Hill, the engineer in charge of Palomar's construction and maintenance, swears that even in the pitch-black observatories he can tell who's using the scopes by the aroma of pipe tobacco drifting down from the observer's platform.

When it snows, Fritz Zwicky, an expert mountaineer with Alpine records in his native Switzerland, is completely in his element, skiing to and from the observatory. Some of the others use snowshoes.

The astronomers' fondness for the outdoor life

Dr. Hubble holds Nikolaus Copernicus, named for the famed Polish astronomer

came in handy in picking the site for the big 200-inch. Palomar was only one of the half-dozen rugged mountain peaks up which teams of Caltech and Mount Wilson scientists had to lug their heavy equipment for testing atmospheric conditions.

On Palomar, then a wild and trackless cattle range, the first test team boarded at the Beaches' ranch house a few miles from the peak. After an all-night vigil, the leader, Milton Humason, was hiking back with his assistant when they were stopped by an irate rancher driving a flat-bottomed Model-T truck.

"So you're the cockeyed stargazers been scarin' my steers," he greeted them, and without any ceremony ordered them to hang on to the truck bed while he drove them back to the ranch house. There was nothing to hang on to and every time the truck hit a bump it tossed the astronomers into the air like flapjacks. "Here's them crazy boarders of yours," he told Mrs. Beach. "After this, keep 'em locked into the house." He turned to the scientists, "Every time you scare a bunch of them steers I lose a hundred pounds of beef. You fellas was costin' me money."

That was astronomy's introduction to Palomar Mountain.

Bringing astronomy to the mountain and building roads up its sides haven't made the climb much less rugged. This winter, drifts often blocked the road. Hubble, driving up for the long session that resulted in the historic photographs on these pages, had to walk up the last half mile carrying a huge duffel bag on his shoulder. "Heavy reading," he groaned, when Bruce Rule, the telescope's design engineer, relieved him of the weight. The bag was packed with a fresh supply of detective novels.

To relieve tension or tedium during long vigils within the telescope, the radio tucked away near the 100-inch control board at Mount Wilson has been a godsend. As soon as Palomar's 200-inch swings into a routine schedule, the astronomers here will also work to music—at least they will if the night assistants have anything to say about it.

Most of the astronomers like symphony concerts, but these are few and far between, particularly after midnight. It is usually a disk jockey program that fills the dome. Most astronomers here know every number on the Hit Parade. You'll also find them up to the minute on sports news.

World Events Seem Trivial

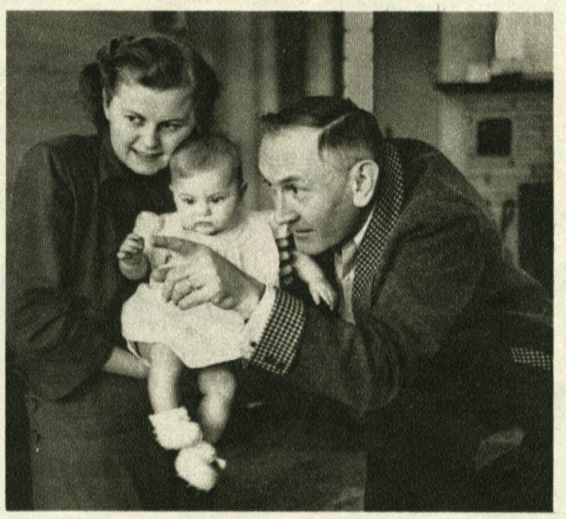
To a man who is looking at the image of a star whose light left the outer reaches of space several hundred million years ago, the up-to-the-minute world news is apt to sound a little different than it does in your living room. One night last winter a radio voice announced with considerable agitation that scientists of Russia and the United States were engaged in a race to see which country would dominate not merely the world but the whole universe. "I hope," the astronomer called down to the night assistant, "he'll remember to let us know how it turned out."

Last winter, the Palomar astronomers were surprised to learn from letters pouring in from all over the country that the "first discovery" made on the 200-inch telescope was a large, square object hur-

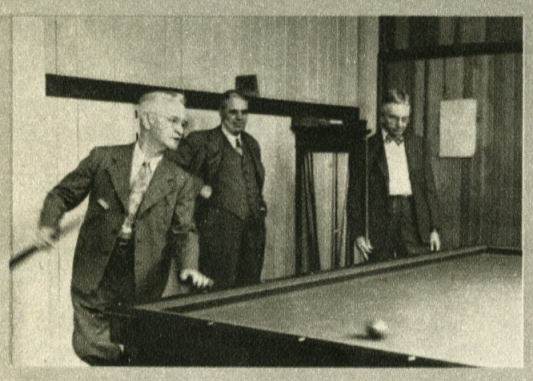
Byron Hill, resident engineer, plays with his dog Flag in front of his home on top of Palomar Mountain

The favorite diversion of Ira Bowen is climbing the mountains in back of his home near Pasadena

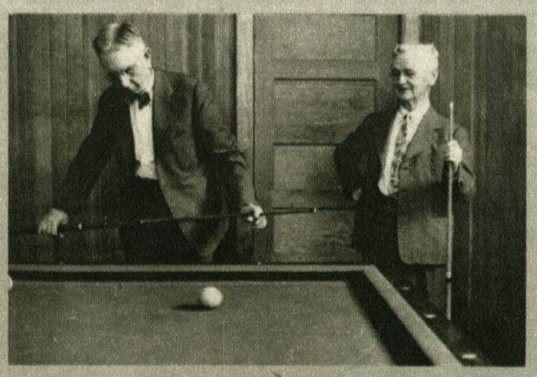
Dr. Milton Humason is the hero of a success story. He rose from Mount Wilson janitor to astronomer



Fritz Zwicky sits for a family portrait in his Pasadena home with his wife and baby daughter



Dr. Humason watches a ritual that takes place every Saturday morning in the laboratory at Pasadena: a fast billiard game between Dr. Frank Ross (white hair) and Dr. John Anderson



Rudolph Minkowski amuses his father-in-law, wife and Dr. Baade (standing) with impromptu music

tling through space—and aimed straight at the earth. Caltech and Mount Wilson scientists, adept at tracking down elusive nebulae, very quietly and methodically tracked this rumor to one of Los Angeles' radio churches.

An evangelist there admitted he'd used the square object hurtling through space to dramatize his sermon. "The astronomers don't know what it means," he had told his listeners. "That's why they're keeping it secret."

Rumors Perturb Scientists

Crank letters pouring into Caltech and Mount Wilson every day show that dozens of fantastic rumors are still in circulation. The astronomers find them depressing evidence of the tragic gap between the world of science and the everyday world in which scientists, too, must live.

As human beings, the astronomers vary as widely in temperament, background and outlook as a similar number of, say, writers, artists or doctors. With few exceptions they are "family men" and most of the older ones are proud grandfathers. Most of them depend on their salaries, averaging between $5,000 and $8,000 a year, and own their own modest bungalows where they putter around their back yards, polish their cars and take the family to an occasional movie.

Some like to watch the races at near-by Santa Anita, where they may line up at the $2 window on a pure hunch. Others enjoy a week-end drive to Palm Springs, where they can soak up sunlight around the pool of a moderate-priced motel. But these are fairly rare events.

"For most of us, astronomy is recreation enough," says Bowen. Besides fishing Bowen likes to experiment with new types of cameras and telescopes in his home workshop. The living room of his home has a huge window overlooking the mountains and after dinner he and Mrs. Bowen sometimes entertain their guests by turning on a floodlight and watching the opossum, raccoon, fox and deer which come to feed on scraps laid just outside the window.

Dr. John Anderson, who directed optical work on the 200-inch mirror, still enjoys an hour's solitary drive through the California countryside before a seven-o'clock breakfast. He also makes up ingenious and highly complicated mathematical riddles to spring on his friends. But as a billiard enthusiast, Dr. Anderson meets his equal in Dr. Frank E. Ross, designer of auxiliary lenses for use with the new telescope.

As relaxing as the astronomers find popular music, light fiction and bridge, they really enjoy nothing more than talking shop, telling guests and visitors what they hope to find and trying to help them grasp the unconceivable tremendousness of their field of study.

What is behind the scientist's interest in the stars? "Sheer curiosity," says Hubble. "It's the basis of all science." The astronomer wants to know more about the structure, content and behavior of the universe. All he has to work with are the faintest scraps of very old light.

The information he squeezes out of starlight affects our daily lives in many ways. A few hundred years ago, we thought the universe revolved around our little earth. It took us a long time to get used to the fact that we actually revolve around the sun—itself just one of countless trillions of stars in space. But the greatest change in our outlook came only 25 years ago. All the stars you can see with your naked eye, and countless others visible only through telescopes, are part of a giant pin wheel of stars called the Milky Way. Beyond this star-swarm, which we had thought of as *the* universe, Hubble established countless other similar "universes."

The man principally responsible for giving us this world-shaking vision of new universes was Edwin P. Hubble, a young astronomer from Marshfield, Missouri. After a brilliant record at the University of Chicago, Hubble went to Oxford University as a Rhodes scholar, studied law there and returned to practice law in Louisville, Kentucky. He quit almost immediately to volunteer in World War I and command a battalion in France. After the war he went back to his first love, astronomy, as a research fellow at Mount Wilson Observatory.

His teammate in the research that revealed new universes beyond our own was Milton L. Humason, a young man who started at the bottom—as janitor in the Mount Wilson Observatory. A California banker's son, he quit school at the age of fourteen, finally got a job driving pack mules which carried supplies up the steep mountain trail to the site of Mount Wilson's 100-inch telescope. That led to his first contact with astronomy, as night assistant. Later he became a staff astronomer and secretary of the Mount Wilson and Palomar observatories. "I decided that the only way to stay awake all night was to get interested in what was going on," says Humason. "So I did."

Through Mount Wilson's 100-inch telescope, the most distant of the newly discovered "island universes" appeared only as microscopic blurs. With only this to go on, Hubble and Humason tackled the seemingly impossible job of charting the newly revealed structure of the universe. What they found out was the most startling scientific news of our generation. Instead of floating serenely in space, these island universes appeared to be moving away from one another at tremendous speeds. The farther they receded from one another, the faster they seemed to move. Was the universe actually blowing up?

Hubble and his colleagues pushed Mount Wilson's big 100-inch telescope to the limit of its light-gathering power—the distance light travels in 500 million years. It wasn't enough. Here was the real inspiration of the movement for a larger instrument. The 200-inch at Mount Palomar will reach one billion light-years into space. Will it reveal the answer? Hubble, clenching his pipe between his teeth, will say only, "Maybe—maybe not."

"That's all very well," says the tough-minded layman, "but of what use is all this study of something so far away that you can't even see it?" Part of the answer came during the war when we discovered that the astronomers were, in the words of one general, "handy guys to have around."

A Valuable War Effort

Hubble, as chief of ballistics at the Aberdeen Proving Ground and director of supersonic wind tunnel research, guided the development of scores of new weapons, and was awarded the Medal for Credit. At Caltech, the astronomers concentrated on rocket research and conceived, designed and manufactured over a million rockets.

Zwicky, active both at Caltech and at the Aerojet Engineering Corporation in near-by Azusa, developed some of the first and the latest of our jet engines. Dr. Max Mason spearheaded the anti-submarine detection research which helped us win the Battle of the Atlantic. Bowen not only took part in rocket research, but vastly increased the efficiency of our aerial reconnaissance and the accuracy of our bombing by developing new types of cameras.

Specializing in aerial photography, Mount Wilson's and Caltech's scientific and engineering staffs turned out most of the new designs and manufactured most of the instruments. Even now, many of the astronomers at both Cal-

tech and Mount Wilson are working on highly classified research for the Army, Navy and Air force.

After Palomar, what next? You hear some talk of developing new telescopes on electronic principles. But the thing most astronomers want is to carry on their stargazing outside the earth's atmosphere, which now filters out most of the radiations from the universe. Already they are carrying out limited observations in rockets, one of which recently approached the limit of atmosphere at 250 miles.

Zwicky is working on rockets to reach a height of 1,000 kilometers or 621.3 miles. "This shouldn't involve too many difficulties," he tells you. Later, test bodies could be ejected from such rockets at the height of their climb and soar out into space while the parent rocket dropped back to earth. The 250-mile record was set by just such a team of rockets, a V-2 and a Wac Corporal. "I hope," says Zwicky, "that the collisions of the test bodies can be observed and a method of direct experimentation with these bodies can be established."

The next step, which scientists here think we may take within the next 25 years, is to send up rocket satellites to revolve around the earth on a regular orbit and carry test instruments which will relay their findings back to earth by radio. Scientists here see no reason why, within 50 years, we should not be able to establish "observation platforms" out in space or on the moon or the planets.

"Would you like to go to the moon," I asked one of the scientists.

"Why not?" he said. "The seeing would be marvelous."

Out in interstellar space, the astronomer has found a great experimental laboratory which can't be duplicated on earth. Back in the last century, the discovery of helium on the sun led to its extraction in Texas. Helium was the first noninflammable gas for airships.

Atomic fusion was first broached by astronomers to explain how the sun and other stars could produce far more energy than could be accounted for by chemical combustion.

Large-scale atomic fusion is now observable in supernovae, the stars that suddenly and unpredictably flare up to 100 million times the sun's brilliance, then gradually fade to their normal brilliance or die out altogether.

Till Zwicky, using the new Schmidt telescopes at Palomar, carried out a special program to spot such stars and watch them explode, only a dozen or so had ever been witnessed by mankind. One of these probably inspired the story of the star of Bethlehem. Two thousand years later, Zwicky's second supernova inspired a different story. "It meant," says Zwicky, "that we could prove in a simple way with certainty that nuclear chain reactions existed in the universe and that we could set them off here."

That was on August 26, 1937—seven years before the first atomic bomb was exploded in the New Mexico desert. Atomic research has come far since then.

"Today no fundamental principle stands in the way of realizing nuclear fusion on a large scale," says Zwicky. "The danger exists that the whole earth might be exploded by experiments not carefully handled." As a safeguard, he proposes that scientists begin to think of "how to stabilize the earth against this eventuality." This, he admits, will be difficult—"but not nearly so difficult as changing human nature."

Would Make Planets Livable

Once large-scale nuclear fusion has been realized—and the earth stabilized—then what? "There will no doubt follow plans for making the planetary bodies habitable by changing them intrinsically and by changing their positions relative to the sun," says Zwicky. Sound fantastic? "These thoughts," Zwicky tells you, "are today perhaps nearer to scientific analysis and mastery than were Jules Verne's dreams in his time."

How does Zwicky feel about the danger of the world's blowing up? "I would say it represented very sloppy experimental procedure," he tells you.

That's how he feels as a scientist. As a human being, you discover he feels no different than you do. At home he's a doting father who spends hours playing with his six-month-old daughter Margrit. At feeding time, he likes to take over from his pretty Swiss wife and talk baby talk to little "Margritli" as he holds the bottle. Just as important to Zwicky as any scientific issue is the question of bubbling. Zwicky maintains that babies might be just as well off without it. His wife does not share this view. The baby is always bubbled.

At Mount Wilson one night the stillness of the dome was shattered by a bloodcurdling scream and a great commotion somewhere below. The observer quickly covered his plates and turned on the lights. The cook's cat had fallen asleep on the ledge and the celestial motion of a galaxy several million light-years in space had sent the dome wheel grinding over the tip of his tail.

Coming down from the serenity of Palomar into a world living in dread of atomic war, you're apt to feel a good deal like the cook's cat.

"He went in as Fire Chief on Boys' Governing Day, declared the school a fire trap and had it closed for alterations"

COLLIER'S HANK KETCHAM