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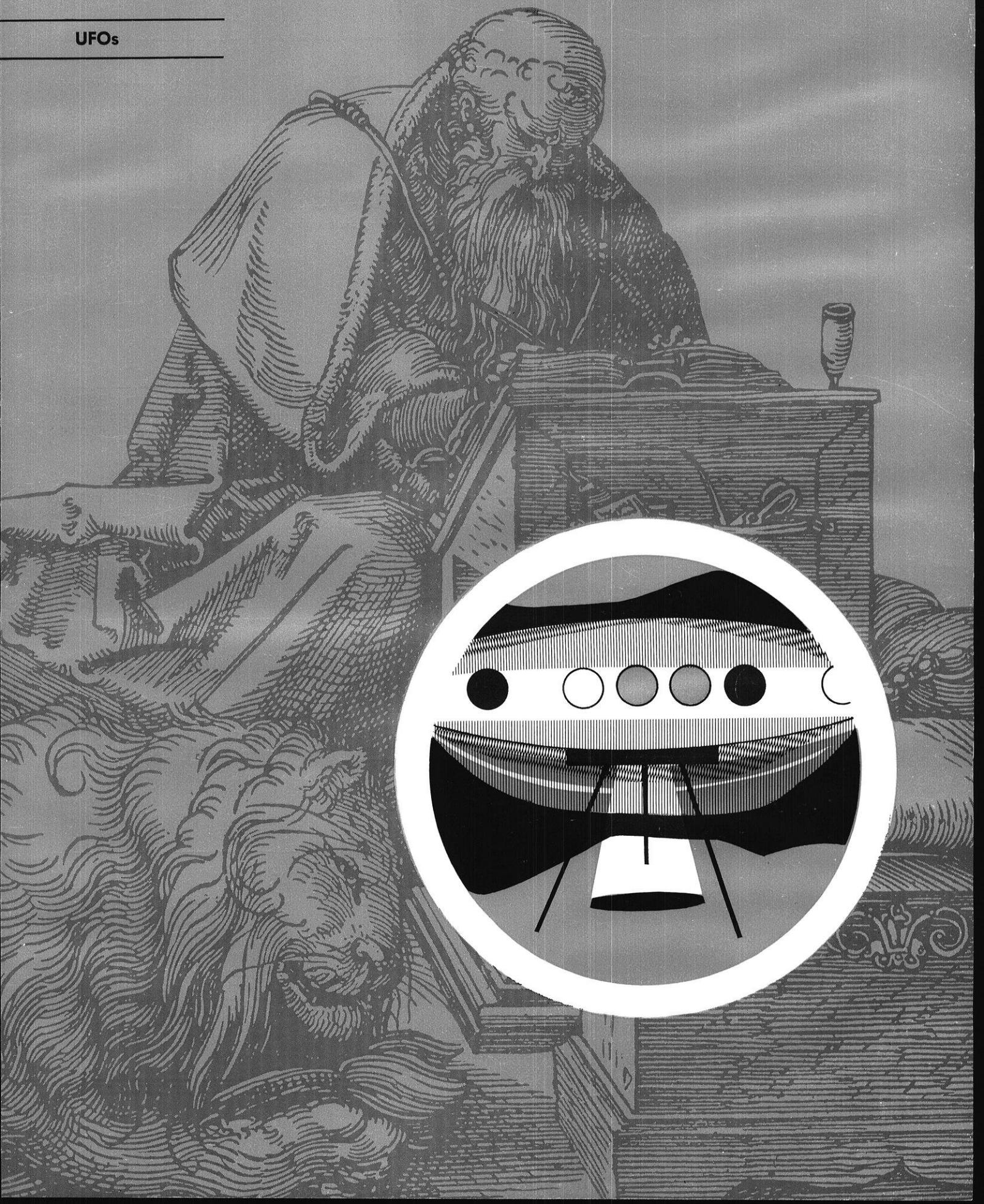
VOL. 72, NO. 7 MEMBER ECMA 35 CENTS APRIL 1968

wisconsin engineer

UFOs



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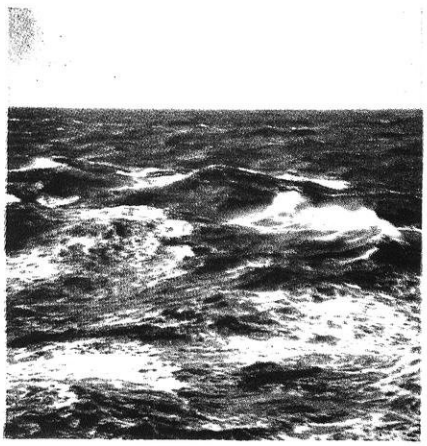

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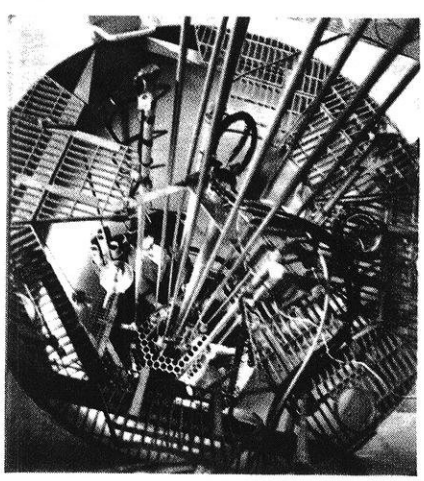

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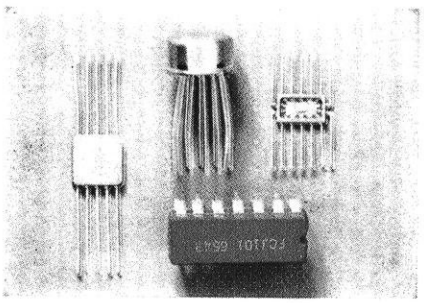

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wisconsin engineer

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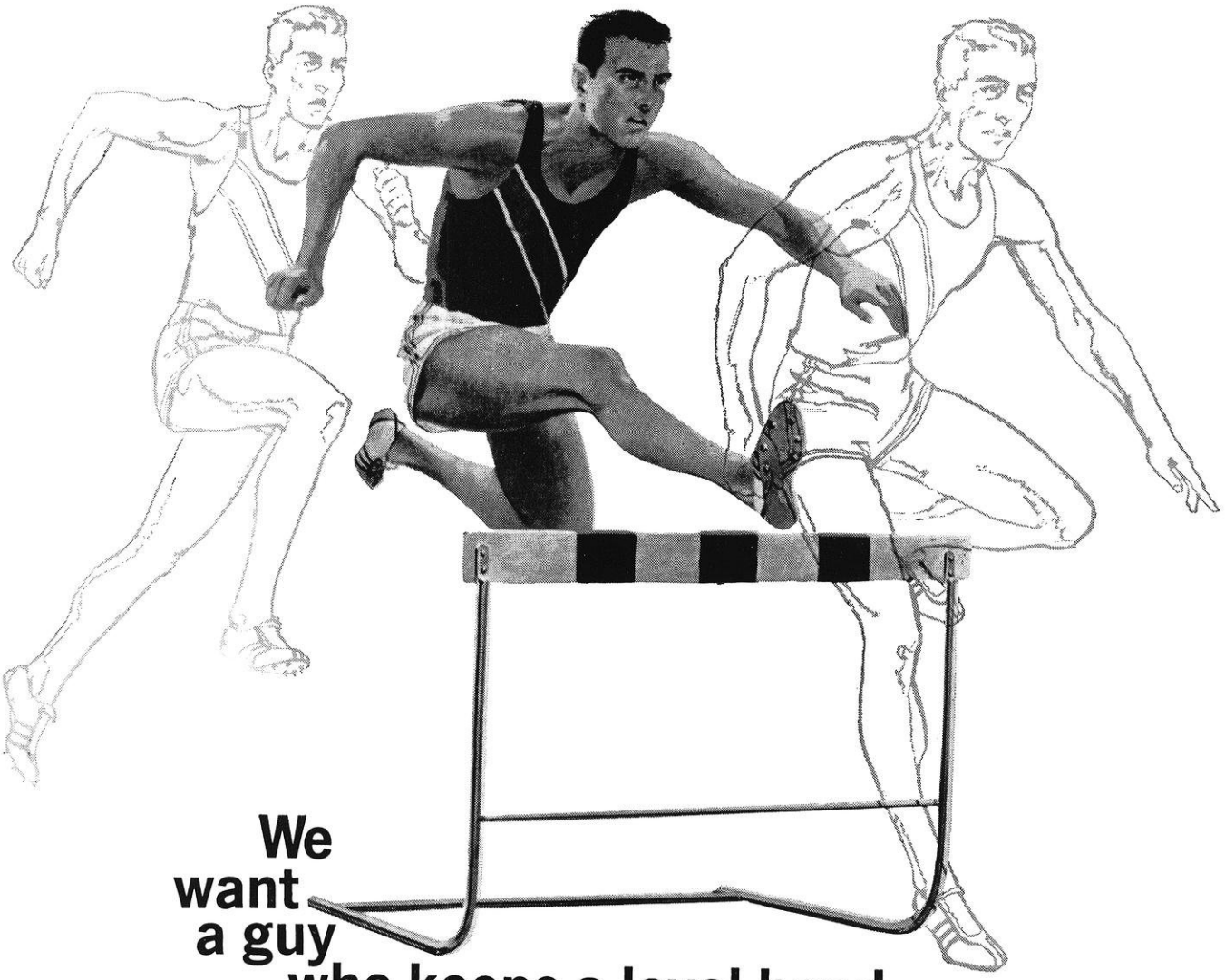

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EDITORIAL

DO NOT PASS GO, DO . . .

Fill out the card, please . . .

It has been a long two years of hard work, making the *Wisconsin Engineer* into a magazine we can be proud of. Our circulation has increased from 150 to 2000. Costs have gone way up, but our advertising revenue has kept us ahead most of the time, and we are able to print more in each magazine. Yet there is something lacking, something we can do very little about without your help. What should be *in* the Engineer?

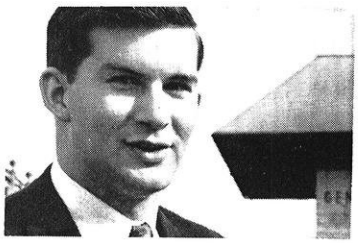
Without this communication, this magazine cannot continue to grow. Next year the new staff needs help, to know what you think should be in print, what you want to read.

Do you want to see articles on campus problems such as engineering library hours, or improving the T.A. system? Should we print more politically controversial matter—get involved in campus politics? Do you like the joke page, the Girl-of-the-Month, the Feedback column? Should we get on the bandwagon for the placement office? Should we run critiques on teachers or courses? Tell you about research in your departments and in others? Do you want to know about jobs and salaries, or about the alumni?

These are just a few of the many article ideas we've come up with—but no real answers. Please help us by filling out the enclosed card and either mailing it to us, or leaving it in our campus boxes or mail-box.

Mary E. Ingeman
editor

Paul Feldman, BSAE University of Maryland '68, wanted to be sure he was making the best choice for his career, not just getting a job. He had some pretty pertinent questions when he talked to Bill Raynor at our plant in Evendale. Here are three of the more basic ones:



PAUL: "Do you have a real job for me or would I just be filling a space?"

BILL: "You've just seen the type of engineering work that was responsible for the awarding of the Heavy Military Transport (C-5A) and the Super Sonic Transport contracts within the last 24 months. With projects like that going on, you can bet your efforts will be valuable. We have too much planned for the future not to need every bit of professional thinking you can give right from the beginning—especially with your store of new knowledge. Your contribution could be a deciding factor in one of our future engine proposals."

PAUL: "If I join your Engineering Program, what are the chances for advancement?"

BILL: "They're great. While on the Engineering Program, your salary benefits, pay reviews and status will be exactly the same as though you were directly assigned to a specific area. The whole point of the Program is to give you exposure to three different R&D areas so that you can make your decision on what area of engineering you want to work in. But you move up just as fast. It's talent, not years that is important. Your contribution to the business determines when you'll move up in responsibility and authority."

PAUL: "Do you reimburse engineers for higher education?"

BILL: "The General Electric Tuition Refund Plan allows you to continue your education at one of the fine schools in the Cincinnati area, like the University of Cincinnati, Xavier University or Miami (of Ohio) University. You could take an advanced engineering curriculum or a program leading to a MBA degree. Your tuition is reimbursed after you have successfully completed each individual course."

Paul Feldman wanted to know...we told him

Paul's questions and Bill's answers resulted in Paul joining the General Electric Evendale Engineering Program. If you have, or are about to get a BS/MS in Mechanical or Aero Engineering and have some good questions, why don't you talk to Bill Raynor. You can call him collect at (513) 243-6484. If that's not convenient, write Mr. Wm. Raynor, Entrance Programs, Sect. 867, Aircraft Engine Group, General Electric Company, Cincinnati, Ohio 45215. An equal opportunity employer, M/F.

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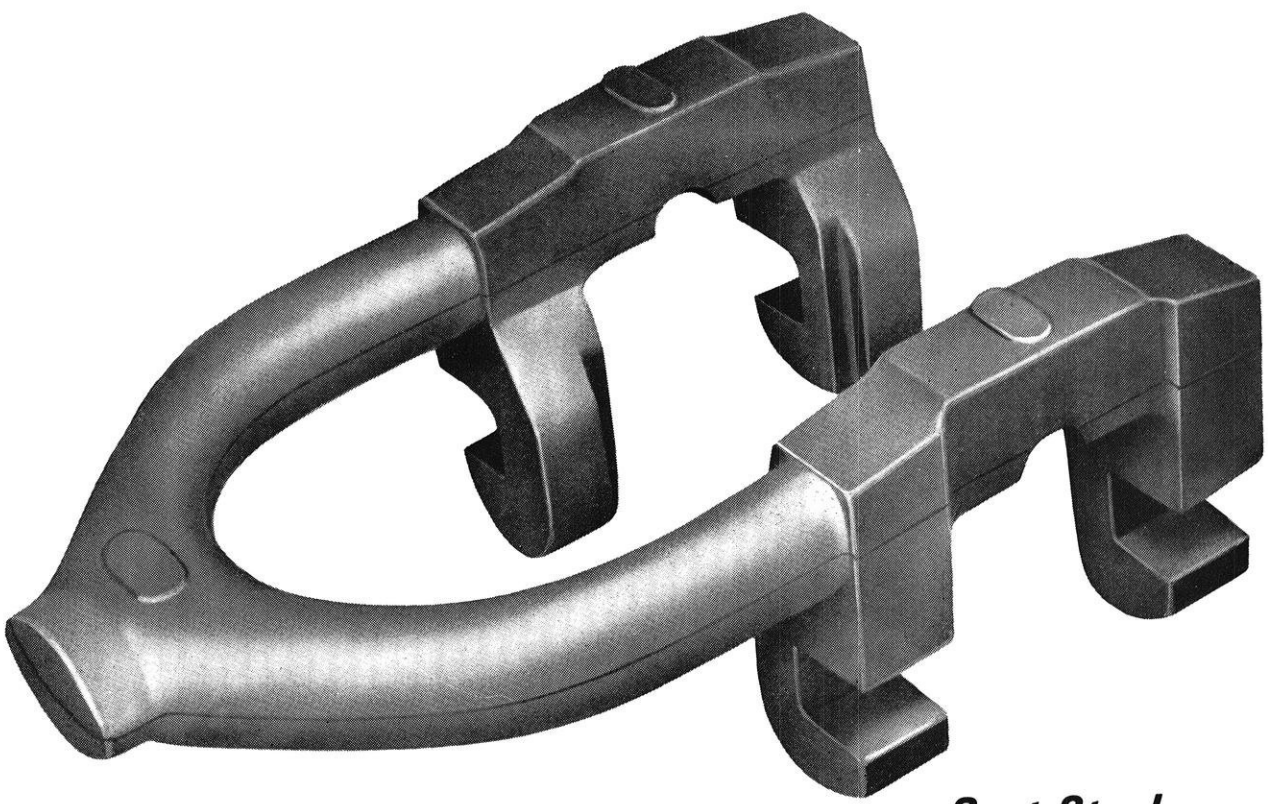
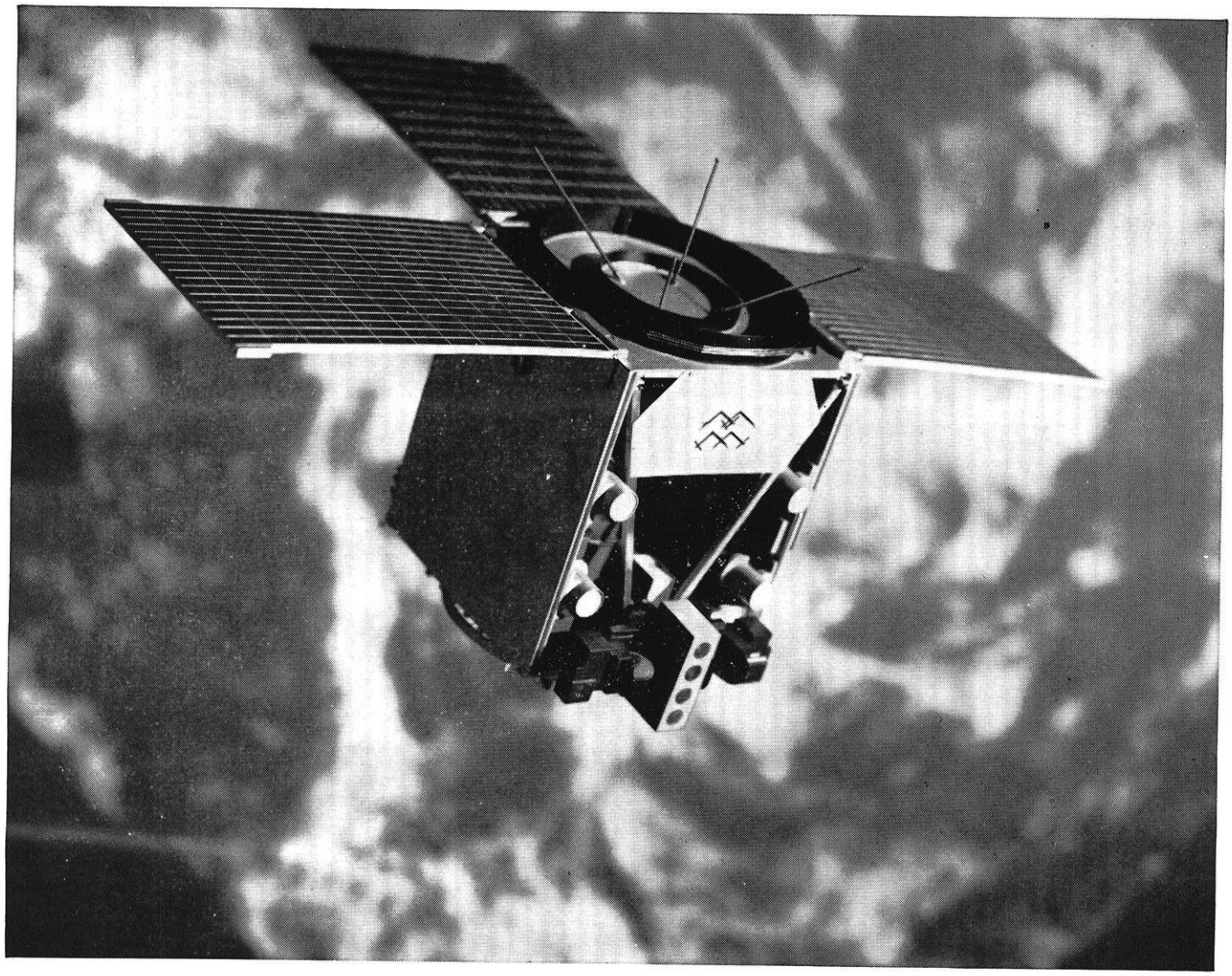


Cast-Steel for Engineering Flexibility



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UFOs: MY VIEWPOINT

by Mike Luttig
Wisconsin Engineer Staff

The average man on the street knows what UFO's are, all you have to do is ask him. Everyone likes to speculate on this way-out subject. The serious investigator, however, must try to reach a solution based on insufficient and misused information, and work with the fear of being put away for finding anything out of the ordinary.

Reports of UFO sightings are scattered all through history. For example, in 1878, Mr. John Martin, a farmer from Dension, Texas, stated that while hunting, he saw a dark object high in the sky. This object increased in size as it approached him, and he was able to make out the shape of a large "saucer" at a great height. The object turned and was soon out of sight.

In 1896, residents of California were visited by a cigar-shaped vehicle with blinding lights. Many people saw this object; one of these, Don Martin, viewed the thing through a 60-power telescope.

Several theories have been proposed concerning UFO's. They do not explain them, but do shed light on the question of the phenomenon. For instance, there are repeated references in ancient literature of strange beings, often called gods and "angels" that have appeared among men. Cave drawings have been found, dating to 45,000 B.C., which depict people with large trunks and cylindrical objects in the air on which similar creatures are standing.

There are Roman records telling of "shields flying through the sky" and of two moons ruling the night sky. There have been reports from Egypt, though most of them occur in the Middle and Near East.

It is worth looking in the Bible for further evidence. Many writers, especially Ezekiel, talk about flying machines and "angels" which came and associated with men. In Ezekiel, chapter one, verses 4 and 5, he wrote, "And I looked, and, behold a whirlwind came out of the north, a great cloud, and a fire infolding itself, and a brightness was about it, and out of the midst thereof as the colour of amber, out of the midst of the fire. Also out of the midst thereof came the likeness of four living creatures. And this was their appearance: they had the likeness of a man."

Despite these sightings, many people still say nonsense to the possibility that there is life on other planets, much less advanced enough to visit our planet.

For the sake of an argument, let us assume that there is life on other planets. Although we have no scientific evidence to support such a statement, it would be foolish to say that our experiments are all conclusive. We have not even explored our own planets completely, much less the rest of the universe. It is very plausible then for there to be life on hundreds or even thousands of planets. There is also the strong possibility for one or more of these planets to have a civilization advanced enough to send some of their people exploring for other life. Our own civilization after all, is young, yet we are on the threshold of sending men to the moon. We would be very vain to think that we are the only life in existence.

If there is other life, they would probably try to find and communicate with other life, just as we are trying to do. Possibly they already have been in contact. For example, a number of people have legends that their ancestors came from Venus — some North American Indians, the Mayans, the "Long Ears" of Easter Island, and the Hindus of India. These people come from different parts of the earth, yet they all have the same legend!

Isn't it possible that thousands of years ago, the earth and Venus were in contact? There may have been intermarriage, resulting in races. During experimentation, perhaps an accident occured, and most of the civilization was wiped out. Possibly some escaped, and are now trying to get in touch again. Maybe some of our own people left too, and their families are trying to come back! This may sound way out, but so did the airplane 100 years ago!

Why have the number of sightings increased since 1947? Very possibly these other beings concerned about our discovery and harnessing of atomic power. We are now capable of not only wiping out our own planet, but also of taking a couple of other planets with us! They might be interested in making sure that we don't try such a thing.

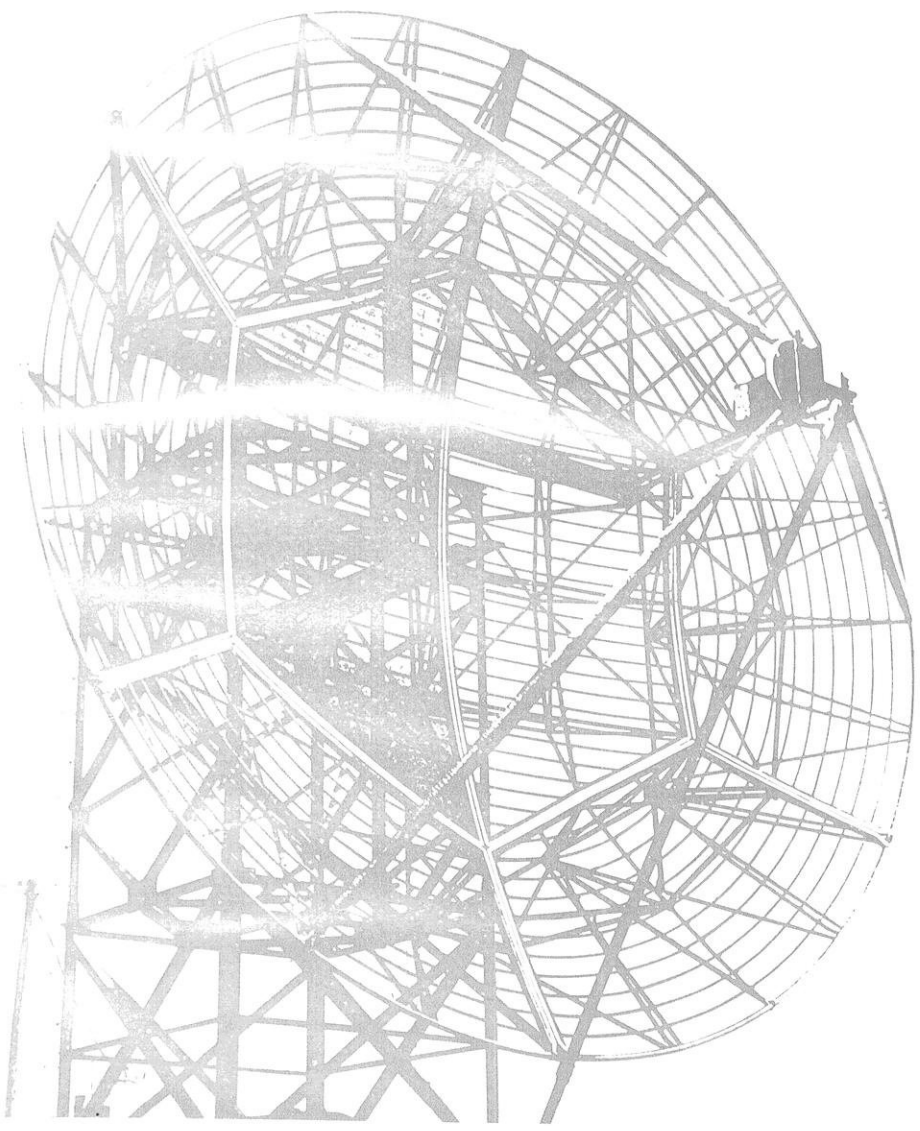
A lot of people wonder why, if there are such people hovering around, they don't just land and try to communicate. Who can say that they haven't? More than one person has stories of being taken aboard space ships and being examined by humanoids. Yet these people are either hushed up or locked up.

The time has come for us to seriously investigate. Whoever or whatever is hovering around up there probably won't go away. It is to our advantage to find the answer. It would be nice if one of them would land in the front of the White House, get out, and walk into the office of the President. But would we still get the facts?

UFOs

Fact Or Fantasy?

by Mike Davy
CiE '69



THOUSANDS of reports of "flying saucers," "unidentified flying objects," or "UFOs," have appeared in print during the past 20 years. Although most of the things reported have later been explained as unusual but normal phenomena, some people continue to regard them as mysterious, and thus help keep alive the belief that these "saucers" are actually spaceships from other planets. The phrase "unidentified flying objects," abbreviated as UFO, is used to indicate an air-borne phenomenon that fails to identify itself to, or to be identified by, trained witnesses on the ground or in the air who are using visual or radar methods of observation. The term UFO is misleading because it seems to imply that the unknown is a solid material object when many of them are not. The more dramatic phrase "flying saucer" is similarly misleading because not all of the unknowns are shaped like a saucer and not all are flying. Since no one has devised a more accurate brief term, "UFO" and "flying saucer" have remained in common use.

Most flying-saucer reports have come from reliable citizens who have seen something extraordinary that they don't understand. Air Force investigators and scientists have been able to account for almost all reported unknowns as the failure to identify some natural phenomena. Some reports were deliberate hoaxes or the product of delusion.

This report introduces the reader to some of the natural occurrences that have been wrongly interpreted as "space ships." These are analyzed in three sections:

1. Air-Borne UFOs
2. Stars and Planets
3. Phantoms on Radar

A concluding section explains the role of the Air Force and some civilian groups in their studies of aerial phenomena.

AIR-BORNE UFOs: BALLOONS TO BUBBLES

The year 1952 was a big year for experimental balloons — and UFO sighting. Radiosondes, weather balloons in clusters, 100-foot skyhooks, pibals (pilot balloons sent up to show the direction and speed of the wind) were released all over the continent. These spheres of gas vary in size from a few inches to 200 feet in diameter.

Someone on the ground or even in a plane, watching an object some 20,000 to 100,000 feet above him, finds it impossible to make an accurate estimate of its true height, diameter, or speed. The particular angle of vision can make the object look like anything but a balloon. Temperature inversions can produce a double image of a balloon so it looks like a linked pair. Balloons released in pairs or clusters may seem to be traveling in formation under intelligent control. They may give a radar return that indicates a solid object since they often carry heavy instrument loads.

When balloons develop a leak, they may drop some distance at high speed and then level off, as though under intelligent control. They may burst and suddenly vanish at the extreme cold of high altitudes above the air lanes where varying wind streams may move them at great velocities, slow them so they seem to hover and be almost stationary, abruptly change the direction of motion so that they reverse course, dive toward the earth, or ascend rapidly.

Burst balloons have caused many saucer reports, but the invasion of Farmington, New Mexico, on March 17, 1950, was one of the more dramatic. About 10:15 a.m. the "saucers" appeared in numbers estimated from 500 into the thousands. For more than an hour the gleaming objects soared above the town, moving at incredible speeds, darting in and out among one another in what one writer has called "the greatest exhibition of magnetic flight that has ever happened in this universe."

The explanation is not quite so dramatic. A Skyhook balloon had been sent up from White Sands, New Mexico, that morning. Near Farmington, the cold atmosphere at 60,-

000 feet had caused the balloon to become brittle and burst into hundreds of small pieces of plastic. These very light pieces, shining in sunlight, had floated over the town and then blown away.

Weather balloons are not the only air-borne objects mistaken for spaceships: jets and their contrails have both been reported. Perspective can make spaceships out of things as small as seeds, spider webs, scraps of paper, or toy balloons.

The malfunction of a sewage-disposal plant in Pennsylvania in 1954 caused one of the more spectacular UFO reports. An excess of detergent, piled high by wind, suddenly launched thousands of bubbles. This giant bubble bath rose high in the air and drifted for miles, causing many reports of UFOs. But balloons and bubbles cannot be blamed for all reports; the stars and planets above us have produced more than their share.

STARS AND PLANETS

The distorting atmosphere of the earth can, under certain conditions, change the image of a star or planet considerably. When light enters the atmosphere, the rays are refracted so that the image is moved upward with respect to its true position (Figure 2). The greater the density of the air, the greater displacement of the image.

But a star's light is not bent uniformly. Light rays of different wave lengths bend at different angles. The density and temperature of the air also affect the rays so that in traveling from the thin upper atmosphere to the denser air near the earth, the colors shift constantly and the star seems to twinkle.

These changes are most noticeable when a star is low on the horizon and its light must travel through miles of the dense atmosphere before it reaches the observer. It may seem to be extraordinarily large and brilliant, showing a red glow at the bottom and bright blue at the top. A witness would see the object apparently in motion, hovering, and flashing red and green lights. He could interpret it as a strange craft, the red as glow from the exhaust, and the blue as an illumination system.

Under certain conditions, a temperature inversion can be created where a warm layer of air is contained between two colder ones (Figure 3). Light passing through such an inversion is bent in a peculiar way so that the image is displaced far more than normally. If there are several layers of alternate hot and cold air, a star or planet may seem to move erratically, have an odd shape, and undergo fantastic color changes.

Each day the planets move to a new position among the constellations. The planet Venus has been chased at least once by police officers in a patrol car, has caused the sending up of jet interceptors, and has been named in many UFO reports. This planet, the brightest and closest to earth, has a diameter of 10 seconds when it is farthest from the earth and a diameter of 64 seconds when closest. Viewed quickly through rapidly moving clouds, it may seem to be a fast moving flying saucer, but a closer examination will prove it to be making very slow progress.

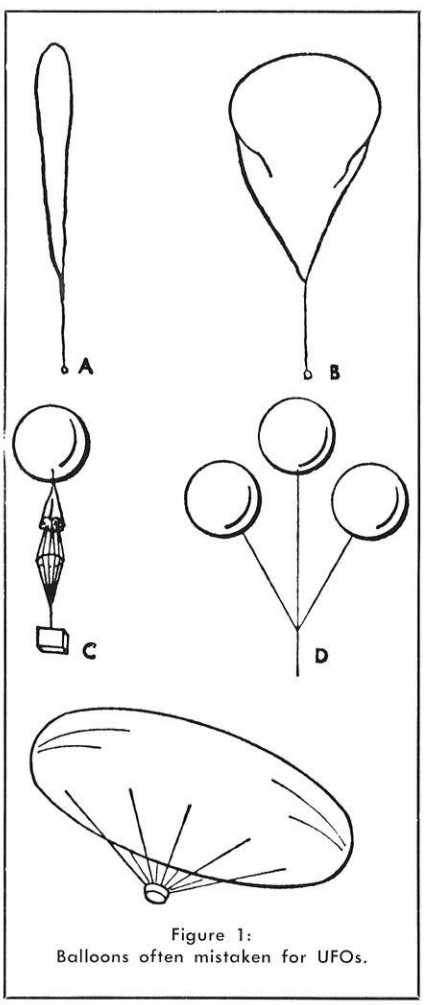


Figure 1:
Balloons often mistaken for UFOs.

Jupiter has also been blamed for some UFO reports. An ex-army man, a trained observer with a good knowledge of physics and optics reported this experience:

"On January 30, 1954, my buddy and I had been fox hunting in southwestern Indiana. We hunted until well after sundown and headed for the car. As we heard it, a jet plane thundered through the darkening sky, from north to south. Happening to glance skyward as I moved around the car, I let out a yell. There it was, no mistaking it. A flying saucer blazing in the sky. A real illuminated spaceship. Only it wasn't moving, just hanging in the sky. Football-shaped, about as long as the apparent diameter of the full moon, it showed red, yellow, and bluish green. It seemed to be pulsating with a quivering, twinkling light. We watched it for about five minutes, trying to figure out what we were seeing. Then the spaceship became smaller and smaller, reducing in size without moving, until it suddenly contracted into a planet — Jupiter.

"Suddenly we realized we were looking directly through the path of the plane at the planet and our best guess was that the atmospheric turbulence and temperature change caused by the passage of the jet was to blame for the strange observation we had witnessed."

One sighting that probably would have become a classic had the Air Force investigators not kept it a secret occurred at Presque Isle Air Force Base in northern Maine on October 10, 1952, at 10:00 p.m. A group of weather observers had noticed a bright orange object hovering low on the eastern horizon. They set up a theodolite to measure its altitude and bearing and asked observers at Limestone Air Force Base to do the same. Calculations based on the altitudes and bearings reported gave almost unbelievable results. In plotting the data, it was

shown that the UFO hovered 100 miles above the earth and more than 50 miles off the Maine coast, was of tremendous size and was moving at high speed. But the measurements reported from Presque Isle pointed directly to Jupiter, and if a constant correction was applied to the bearings from Limestone they also agreed with Jupiter's position. The Limestone observers had made a mistake in determining true north and had thus obtained a wrong bearing for the unknown.

Those who firmly believe in the existence of flying saucers often refer to the supposed confirmation of alien spacecraft by radar reports. But there is actually no radar evidence to support this.

PHANTOMS ON RADAR

Radar only reports, it does not interpret. The scope shows only spots of light on the flat surface of its screen. A pointer continually sweeps around the dial at a speed that keeps pace with the rotation of the radar antenna as it scans the sky by sending out radio pulses. When the pulses encounter a solid object, they bounce off and return to the set and show as spots of light on the radarscope. The operator must interpret these spots and try to identify them as familiar objects.

Radio waves travel at the velocity of light, 186,000 miles per second. Successive pulses go out at intervals of approximately one one-thousandth of a second, so that each pulse is followed by another 186 miles behind it. If the operator gets a return from an object apparently 25 miles away, he must consider the possibility of a secondary echo which could make the object 25 plus any even multiple of 186 miles away.

Usually this doesn't cause any problems because the curvature of the earth and the distance factor combine to reduce secondary returns to a minimum, but the temperature inversion discussed previously can have an unusual effect on radar. Since inversion layers move and shimmer, radio waves bouncing off of them may pick up one ground object on one sweep and a different object the next. An inexperienced operator might conclude that both echos came from a single object which had moved miles in a fraction of a minute. Many reports of radar flying saucers have been caused by this and similar mistakes in identity.

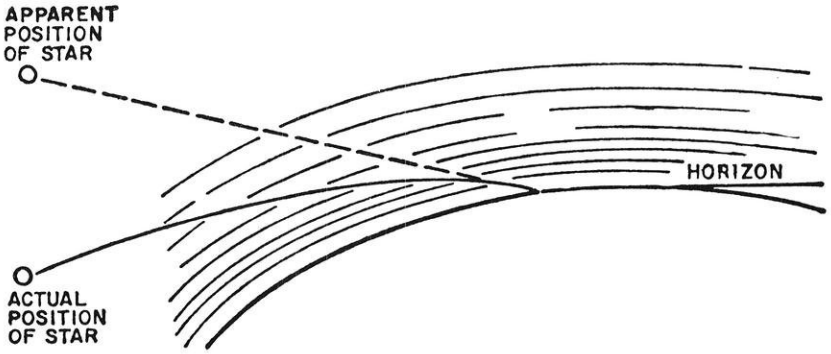


Figure 2: Air density variation "moves" image.

Quite a variety of things have been interpreted as interplanetary craft. A mirage in which the peaks of mountains appear to float above the mountain chain may seem to be flying disks. Orographic clouds can stand more or less motionless and assume dramatic shapes. "Grindstone" clouds may be shaped like thick solid disks either singularly or in stacks. Meteors have often been mistaken as UFOs. Even owls that glow after coming into contact with a common fungus, armillari mellea, can convince an unsuspecting observer to believe in flying saucers.

An important fact to remember concerning UFO reports is that an accurate estimate of speed, size or distance cannot be made unless one of these unknowns can be determined. I won't attempt to explain what the object is, but the picture in the November 3, 1966, issue of *Life* includes a caption which makes unwarranted assumptions. Mr. Pfeiffer's estimates of "70 feet in diameter," "1,500 feet above the restaurant," and "speed away at 200 miles per hour" have no justification unless he has an accurate guess for one of the values. That the object went below the trees on the far side of the lagoon indicates that it was at least that far away, but there is no way of knowing if it was farther.

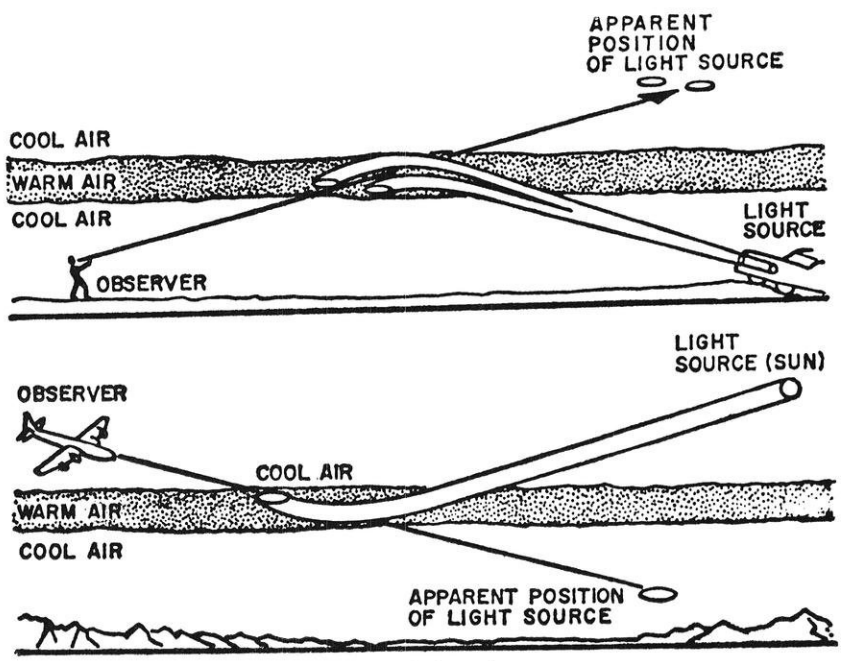


Figure 3: Inversion.

The noise reported could have very easily come from another source.

INVESTIGATORS: AIR FORCE AND CIVILIAN

The Aerial Phenomena Group of the Aerospace Technical Intelligence Center based at Wright-Patterson Air Force Base, Dayton, Ohio, is the chief investigation agency of the Air Force. This agency, usually referred to as ATIC, has the responsibility of investigating all official reports of unidentified objects in our skies. Some civilian enthusiasts, who reject the normal explanation, argue that the failure of the Air Force to admit flying saucers cruise in our skies proves that its investigators are incompetent or dishonest, and that they are involved in a conspiracy to keep the truth from the American public.

The official study of UFOs is empowered to investigate only the reports given directly to a military official. Considering their years of experience, ATIC can often identify the unknown after a brief study of the report. If not, they attempt to determine if enough facts are available for an explanation and if an unknown may be of interest to Intelligence officers. When all the facts are collected, an analysis usually shows that the unknown fits a particular class of sighting. Then the information can be turned over to a specialist in the type of phenomenon involved for a complete identification. Expert help is available from these sources:

1. Official consultant to the Air Force, Dr. J. Allen Hynek, Director of the Dearborn University and Professor of Astronomy at Northwestern University.

2. Members of the Air Force with special scientific and technical training who are assigned to study UFO reports.

3. A panel of military and civilian experts in all fields of science.

4. The scientific and technical laboratories of all branches of the Air Force and other government agencies.

5. The meteorological records of the United States Weather Bureau and the United States Coast Guard.

6. Commercial laboratories under contract to carry out special work. With these unquestionable resources available, the Air Force can have each unknown studied by an expert if necessary.

In recent years, ATIC has received fewer than 600 reports a year and solved 98%. Flying saucer believers tend to ignore the 98% and focus attention on the 2%. These remaining cases report similar observations and probably have one of the same causes, but they cannot be proved because some essential fact is missing.

The Aerial Phenomena Research Organization and the National Investigations Committee on Aerial Phenomena (NICAP) are the two most dedicated organizations concerned with UFO analysis.

Explained in their own words:

NICAP is a non-profit, fact-finding organization incorporated in the District of Columbia in 1956. Policies are set by the Board of Governors — prominent scientists. educators and other leading citizens — and are carried out by the executive staff. Our purpose is to investigate all aspects of UFOs, to weed out worthless information, and to publicize reliable data. Our major goal is scientific investigation of UFOs to determine their full significance. Because of official secrecy, we will continue to seek open Congressional hearings to make all the facts public.

NICAP was formed because the official U. S. Air Force investigation was bogged down in secrecy, denials and ridiculing of observers; the subject had become distorted by publicity given to wild and unbelievable tales of trips to other planets and personal visits from spacemen. A responsible private agency was needed to search for the truth somewhere between these extremes.

The Aerial Phenomena Research Organization is a world-wide, non-profit private group which concentrates the efforts and talents of its membership on the documentation, investigation and analysis of reports of unconventional aerial objects (UAO). The group uses the designation UAO for incidents which cannot be explained in a mundane manner, and applies the term unidentified flying objects (UFO) to those incidents for which there is insufficient evidence to classify.

APRO was conceived by the Lorenzens (Mrs. Lorenzen serves as Secretary and Editor of the A.P.R.O. Bulletin, a bi-monthly periodical) in January 1952 and is the oldest UFO research organization in existence. Emphasis is on quality of investigations and reports.

APRO is committed to the premise that the UFO phenomena, whether it consists of physical fact or rumor, is important enough to warrant an objective investigation.

Such an investigation deals with facts as much as possible. The prime fact on which our program is based is that UFO reports exist. Secondary facts in the form of patterns and correlations that have emerged from a study of these reports are as follows:

(1) A consistent reporting of specific types of craft; namely, the disc, the sphere or elongated sphere, and the flying fuselage. Also small versions of the above whose reported behavior suggests remote control.

(2) Considerable religious activity centering around reports of revelations by individuals who claim contact with tall, handsome space visitors. These reports contain the usual material associated with religious revelation throughout recorded history and seem to be based more on internal need that on external fact. They seem to offer little that is useful to solving the question of the existence of physical UFOs.

(3) Quite aside from the type of report in (2) above, there is a consistent reporting of small-statured bipeds who usually seem to be occupied with the collection of botanical and geological specimens or the observation of human reaction. These reports are associated with hovering or landed craft and in some cases reasonable residuals of such maneuvers are left behind.

Possibly to prove that it is not hiding anything, the Air Force announced early in November, 1966, that it had granted Colorado University $300,000 to investigate unidentified flying objects.

GLACIER STUDY: CLUES FROM THE PAST

By Art Reimer

CiE '68

THE SCIENCE of glacier study has direct significance for the people of the world. Understanding glacial trends and predicting changes in them is important in preserving the established patterns of civilization. It is predicted, for instance, that a 65-to-165-foot increase in sea level will occur if the Greenland and Antarctic ice sheets melt. This would, understandably, have a tremendous impact on the seacoasts of the world and the nations that govern them.

This article explains the present status of glaciation in the world and gives some of the evidence that geologists have gathered for predicting future trends. The history of the known ice ages is also included with specific references made to the role of those ice ages in creating the present land features of North America.

There have been many periods in the history of the world when glacial sheets have formed, expanded, and then retreated over major parts of the continents. This complete cycle of advance and retreat constitutes an ice age. The past ice ages have occupied relatively short periods between longer spans of moderate climate. In their short periods, however, they have produced important changes in the land structure and in the animal life of the world.

EARLY PERIODS

The earliest glacial periods that geologists have discovered are from 1 to ½ billion years ago. These are so ancient that very little evidence of their existence remains. Subsequent weathering has destroyed most of their old till sheets and morain areas so that today there are only isolated deposits to study. Because of this, information on the severity and geographic limits of early glaciation are not well known and have only been outlined by geologists.

Carboniferous - Permian

Following the relatively uneventful period of the Silurian-Devonian times, the end of the Paleozoic Era was marked by the largest known glacial period. It occurred 250 million years ago, and because it spans the Carboniferous and Permian Periods, it is called the Permo-Carboniferous Ice Age. The glaciation during this period was so severe that all of the continents except Europe and North America had continental-size ice sheets. The glaciers reached into the temperate zones and even into the tropics, but the polar regions were not glaciated.

The most important results of this frigid period were the transformations that occurred in the flora and fauna of the world. Small reptiles and mammals were the major forms of life that survived. Later these reptiles evolved into the dinosaurs that dominated the world during the Mesozoic Era, while the mammals became the form of life that dominates the world today. In the sea, the low water temperature killed most of the primitive ganoid fishes, which were then replaced by the ancestors of the modern bony fish and the marine reptiles.

The spore bearing plants that once dominated the land were replaced by the conifers and cycads which

later formed the Mesozoic forests of the dinosaurs. Thus, the Permo-Carboniferous Period was extremely important to the advancement of the evolution of life forms on earth.

RECENT PERIODS

The next era begins the "modern" portion of glacial history. This is the transition from the Mesozoic to the era which we are still in today, the Cenozoic. Because of its relative recentness on the geologic time scale, much more is known about the Cenozoic than any other time period. North America has been affected by the ice ages of this period more than has any other continent, so the Cenozoic will be explained here as it relates to North America.

Cenozoic

The Cenozoic consists of two glacial periods separated by two periods of mild climate. The first glacial period was the Eocene. During this time, the world underwent a slight cooling of the climate. This did not produce extensive glaciation, but it greatly affected animal life. The dinosaurs, the flying reptiles, and the last of the ganoid fishes were killed. These animals had thrived during the relatively mild climate of the Mesozoic, but were unable to adapt to the lowering of temperature that occurred in this period.

The animals that did survive were the ancestors of the present inhabitants of the earth — the mammals and the birds. These creatures, although they had been dominated by the giant reptiles, had been able to adjust to the cooler climate. Man would have been millions of years behind his present stage of development if the world had not been freed from domination by the reptiles.

Miocene - Pliocene

The following periods of the Cenozoic, the Miocene and the Pliocene had no ice ages, and the climates remained mild throughout them. The mammals that survived the cooling of the Eocene multiplied in species and in number, causing this period to be referred to as the "Age of Mammals." During this time, animals, such as the horse, the rhinoceros, the saber-toothed tiger, and the hairy mammoth roamed throughout North America. With the mild climate, they suffered no prolonged tests of survival.This was interrupted about a million and a half years ago by the advent of the second greatest ice age, the Pleistocene.

Pleistocene

The Pleistocene began 1½ million years ago, when the climate of the Pliocene began to cool. At this time in North America, there were no Great Lakes, Hudson Bay, or Gulf of St. Lawrence, and the Arctic Islands were a part of the continent. The topography was similar to its present form, with the Cordillera mountain chain in the West, the Appalachian chain in the East, and a flat prairie region separating them. The Pleistocene began with North America in this state, when the climate cooled off and the glaciers began to form.

Cordillera Ice Sheet

The glacial activity began in the Cordillera Mountain Range. The higher altitudes of this region have a cooler average temperature than in other places. With sufficient snowfall present, a single glacial field developed from the joining of hundreds of mountain glaciers. The ice sheet was confined by the mountain valleys of the region and was forced to flow along them. It was blocked completely on the northeastern and southwestern sides by the Rocky Mountains and the coastal ranges. The ice flow, therefore, extended south toward Washington and Montana, and northwest into the Yukon Valley. It did not penetrate far into the present boundaries of the United States.

The ice sheet was 1,200 miles long and 400 miles wide and covered 400,000 square miles. Although it was a mile thick in many places and climbed 8,000 feet up the mountain sides, it did very little to alter the land, except at the glacier margins. The valleys that it flowed through were so deep that the ice on the bottom of the glacier was stagnant, while only the top layers of the ice moved. Thus, no scouring action was done on the valley walls and bottom, and it did not have a great affect on the present topography of the area. The evidence which remains of this glaciation is found mainly where the mountain tops penetrated the glacial field at the height of seven or eight thousand feet. It did not extend to central Alaska or to the main part of the Yukon region, because these cold regions did not receive enough snowfall.

Keewatin Ice Sheet

The next ice sheet to form, the Keewatin, was directly to the east of the Cordillera Sheet. It started to the west of Hudson Bay and extended in all directions. This was not a mountain glacier moved by gravity, as was the Cordillera; this was a continental ice sheet which moved by its own weight forcing the ice out from under it. At its full extent, this ice sheet was 10,000 feet thick, and covered 1½ million square miles. The western boundary of the Keewatin sheet was the Rocky Mounatins, and it extended south to Nebraska. Its eastern boundary was the last of the three ice sheets, the Labrador Ice Sheet.

Labrador Ice Sheet

The Labrador Ice Sheet, which developed after the Keewatin, was also a continental ice sheet. It had its center in northern Quebec, and it spread over the Hudson Bay region to the Atlantic Ocean in the East. In the West, it overlapped the Keewatin Ice Sheet west of Lake Superior, and it extended as far south as the present city of Cincinnati. Its area was 3½ million square miles, making it the largest of the three sheets. Together, the three ice sheets covered over five million square miles of the North American continent.

The glaciation outlined above did not blanket the area in one advance. It occurred in four successive advances and retreats. In each glacial period, the Cordillera Sheet matured and made its advance first. As it was retreating, the Keewatin Sheet formed. The advance of the Keewatin Sheet was followed by the development of the Labrador Sheet. Thus, the Cordillera Sheet was the first to appear; and the Labrador

Sheet was the last to retreat. The time between the development of the sheets is not known, but the pattern of glaciation from West to East has been definitely established.

One complete advance and retreat of the ice is a glacial period. There were four of these periods in the Pleistocene, separated from each other by long periods of non-glacial climates.

YEARS AGO	PERIOD
0	**Main Wisconsin**
	Interglacial
115,000	**Early Wisconsin**
340,000	Sangamonian Interglacial
420,000	**Illinoian Glacial**
1,060,000	Yarmouth Interglacial
1,205,000	**Kansan Glacial**
1,375,000	Aftonian Interglacial
1,500,000	**Nebraskan Glacial**

The reader should be cautioned in accepting the accuracy of these dates, for there is a wide difference of opinion among geologists concerning them. The beginning of the Nebraskan Glacial Period, for example, is placed at 250,000 years ago by some geologists, rather than 1½ million years. The dates given in the listing have received the greatest support and can only be considered to reflect the majority opinion.

These four major advances and retreats have created much of the topography that is present today in this area. The time since the final retreat of the last Wisconsin ice has been relatively so short that the land can be considered to be unchanged from the way the glaciers left it.

Great Lakes

The largest and most important features that the glaciers created in North America were the Great Lakes. Today, they exist 1,000 miles from the ocean and have beds which go several hundred feet below sea level and yet, before the last glacial period, they were river-drained lands. Lake Superior's basin was formed in Keweenawan Time when underlying rock formations collapsed and formed a synclinal depression in the surface. The other four lakes were originally the drained valleys of old rivers. Lakes Erie and Ontario were created by the uplift of their downstream portions. Lakes Michigan and Huron were formed by the deposition of glacial debris across their river valleys.

The old river channels in Lakes Erie and Ontario have been located although they are presently buried under hundreds of feet of glacial deposits. The lakes, since they were not formed as a result of being a natural drainage basin, do not drain a large land area. Only twenty miles north of Lake Superior, for example, the land drains into Hudson Bay rather than into Lake Superior. The Great Lakes sustain themselves mainly by the precipitation that falls upon their surface.

The present lakes are much different from those that had developed as the glaciers advanced and retreated. Lake Michigan had a high level of 640 feet above sea level during Lake Chicago IV, and a low level of 230 feet during Lake Algonquin I. This great change in elevation was due to the opening and closing of the different drainage systems shown as the land rose with the removal of its ice load. The present level of Lake Michigan is 580 feet above sea level. This high level is attributed to the fact that the land has risen to such an extent that only the St. Lawrence outlet is now open.

Lake Agassiz

An even greater body of water than the Great Lakes was the glacial Lake Agassiz. It covered the central part of Canada and the north-central United States; it included an area larger than all of the Great Lakes combined. Its boundaries changed with the direction of the receding ice. Although it existed for thousands of years, being altered with each succeeding glaciation of the Pleistocene, its drainage basin has not supported it with enough water to sustain it. All that remains of Lake Agassiz today is the much smaller Lake Winnipeg.

Western Lands

During this period, the western states were very different from what they are today. Although they were not covered by the ice, the water from the melted glaciers turned the dry mountain valleys into lush green areas. Grass and trees grew there and lakes proliferated. Lake Bonneville alone, which is the present day Great Salt Lake, had an area of 20,000 square miles and was 1,000 feet deep. When the glaciers were present, these western lakes thrived; but in interglacial times, they either dried up or were reduced to the salty pools which exist today.

Pleistocene Animals

The animals of the Pleistocene did not change radically from those which existed before this period. There was some change, but it was in number of species rather than in variety of species. The mammals, having thrived during the Mesozoic Period, survived the more rigorous climate of the Nebraskan, the Kansan, and the Illinoian Glacial Periods. However, for some unknown reason, the most outstanding of the North American mammals were killed during the Sangamonian Interglacial Period or during the Wisconsin Glacial Period. These include the giant sloth, the eight foot beaver, the wooly mammoth, the horse, the rhinoceros, and the saber-toothed tiger. Why the Wisconsin glaciation killed them, while the others did not, is not known.

One possible explanation is that these animals could not adjust to the warmer climate of the Sangamonian after having become genetically adapted to colder climates. The rhinoceros, for instance, had grown a coat of hair. Whatever happened, the record of their passing remains only in the bones left around the countryside.

(continued on next page)

This, then, is the story of events during the Pleistocene. As David B. Ericson has said:

"The relatively short span of the Pleistocene brought greater changes to the face of the earth than any that had occurred during the previous seventy million years . . ."

The significance of this statement will become more apparent if the Pleistocene has not ended, as has often been suggested. There is substantial evidence that this is actually the case.

After the last ice retreated, the climate of the world continued to warm up. By 4000 B.C. the climate was warmer than it is today at the same latitudes. All of the mountain glaciers in the Alps and in the Rocky Mountains melted completely, and their valleys were inhabited by man. About 4000 B.C., however, another cooling period began, and these mountain regions were again glaciated. The glaciers continued to grow until 150 years ago, but from that time to the present, they have been receding. It is not known whether this is a long range or just a cyclical variation.

Present Ice Sheets

There are three important ice sheets in the world to study. One of the major ice fields is in Greenland. Here, there is an active continental ice sheet that shows no signs of expiring. West of Greenland, on Baffin Island, there is a large ice sheet that is in a stagnant state. In Antarctica, the last and most important glaciated area, the ice sheet appears to be on the wane. More ice is lost to the Antarctic Ocean every year than is replaced by annual snowfall.

From this evidence, the continental glaciers of the world seem to be diminishing. By projecting the west to east pattern of glaciation across Baffin Island and Greenland, it can be predicted that these two islands will also be freed from their glaciers.

Conversely, the glaciated areas mentioned above contain six million square miles of ice. This represents ten percent of the dry land surface on the earth and is more ice than existed during any of the previous interglacial periods. There is, in fact, one third of the total ice coverage in the Pleistocene still present in the world. The ending of the Pleistocene Ice Age will not have come until these major ice sheets melt.

Predicting such an event cannot be justified from the information available. Geologists' records of glaciation span too short a time period to include detailed information of previous glacial periods. The characteristics of a dying ice age, therefore, have never been recorded—so the signs of the Pleistocene ending, cannot be recognized. It will depend upon observation over a span of thousands of years to determine whether the climate is warming or whether it is cooling. Only then, will the significance of the present fluctuations be known.

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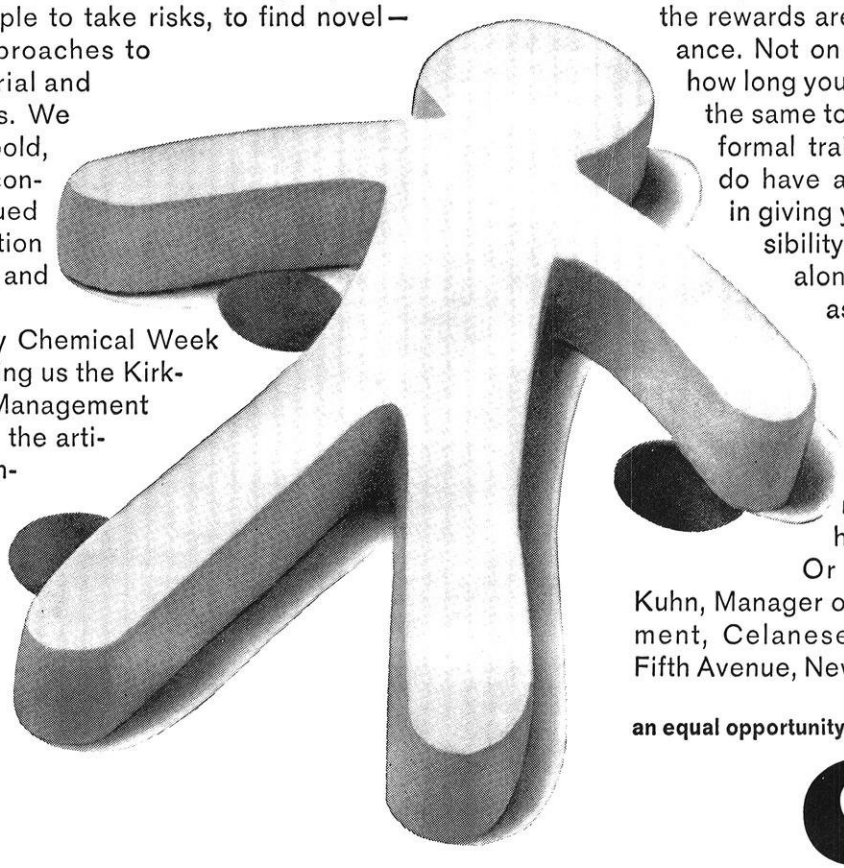

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THE NEW FACULTY PENTHOUSE:
If it were mid-1969, and if you were to climb to the top of the three story Engineering Building and then jump up 60 ft. (!) this is what you would see while glancing toward the ME Building. The conception promises a handsome new Engineering research building for the University of Wisconsin, Madison.

THE NEW RESEARCH ENGINEERING BUILDING

or a tale of many stories

A Preview By
Dick Wagner
Wisconsin Engineer
Staff

What's up on the University of Wisconsin engineering campus? Nothing yet, but what soon will be is a new 14-story staff and graduate engineering research building. When completed in mid-1969, the building, located at the heart of the engineering campus, will house several hundred research and administrative people, in addition to the many research programs.

This particular building plan was the result of a demand for flexible research space. The need was recognized by the Engineering Experiment Station whose purpose is "promotion of engineering and industrial interests of the state by scientific study of related problems . . . " From the early 1960's, the planned physical size of the building grew, of course, along with the number of graduate students on campus and the demand for research.

Some of the first programs to be conducted in the new edifice include: internal combustion engines, air pollution, nuclear engineering, plasma gas dynamics, university-wide instrumentation system center, computing and data processing, materials research, and solar energy (there will be solar cells located on the roof). The types of research programs conducted will vary with time.

There will be no classroom space, as such. The basement and the first floor of the building will be connected to the Mechanical Engineering building. This space and the present Automotive Lab will be occupied by the Nuclear Engineering Department.

Now located in the Princeton House, the University's Instrumentation System Center will be moved to take up five complete stories in the new building, in conjunction with the Engineering Instrumentation program.

Responsibility for the planning involved was consigned to a building committee headed by Professor Phil Myers (ME). The structure, architecturally in line with the "going tall" policy of the University, will cost $5.7 million. Sources of funds were the State Building Fund ($3.5 million); the Office of Education—"Title II Funds" ($1.0 million); and the National Science Foundation ($1.2 million).

wisconsin's finest

Beth Duescher

The month of April brings the lovely smile of Beth Duescher, an Alpha Chi Omega sophomore majoring in medical technology (have you ever considered Bio-Engineering?).

Watching "Herby" the bear at the Vilas Tiergarten. Beth would like to live in Germany some day.

Beth liked this spring at the Arboretum because she loves to be near water. She is waiting patiently for summer when she can enjoy her favorite sports: swimming and water skiing.

photos by Norm Frater and Bruce Pease

"The excitement in engineering doesn't all happen in a development lab."

"I found that out when I started selling computers.

"Obviously, they're expensive. Nobody's going to buy one unless I can show him why it'll be worth the investment. (This is Bob Shearman, Mechanical Engineer, an IBM Medical Representative in Marketing.)

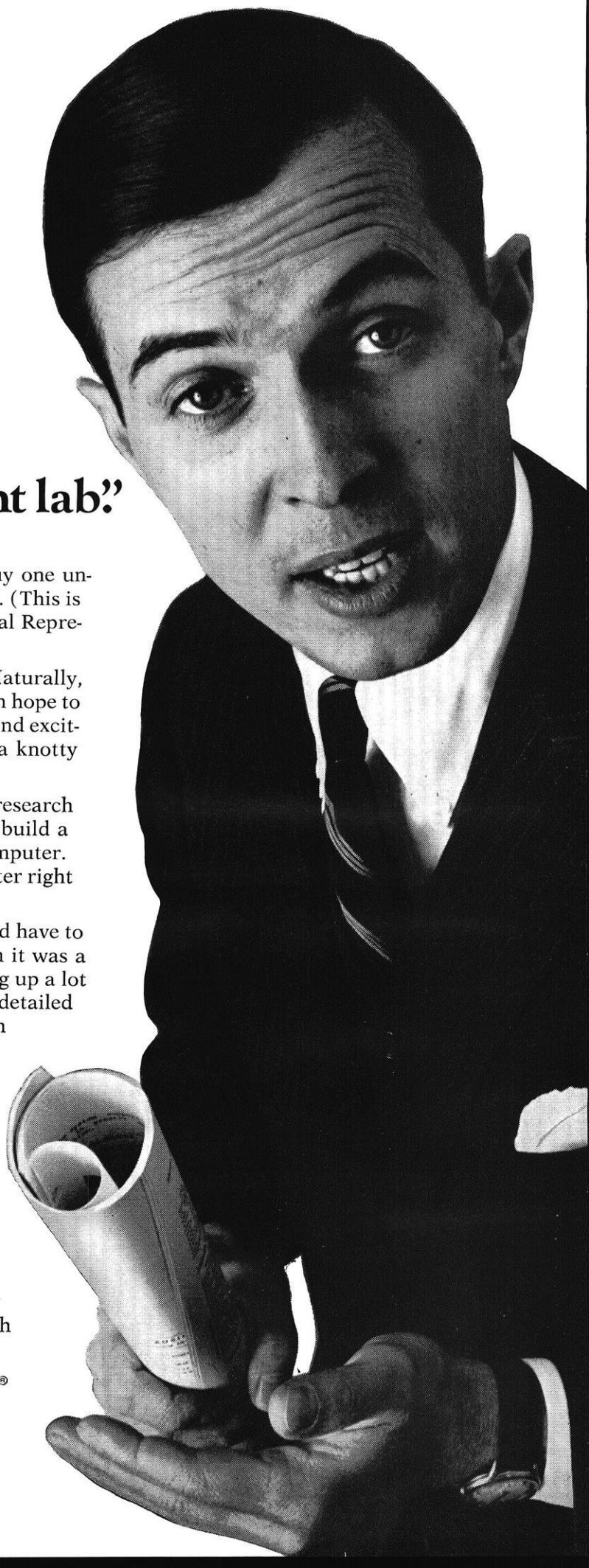
"My customers happen to be doctors and scientists. Naturally, I have to find out what their problems are before I can hope to build a case for installing a computer. That's what I find exciting. This whole process of helping somebody solve a knotty problem.

"For example, one of my installations is at a cancer research institute. A problem came up when they decided to build a radio therapy suite about a block away from the computer. The doctors wanted to communicate with the computer right from a patient's bedside.

"The general solution was easy enough. We knew we'd have to use some sort of remote terminal. But from then on it was a process of exploration. I asked a lot of questions, dug up a lot of facts, and generally helped the customer arrive at a detailed definition of his problem. Then I worked closely with IBM and the customer until we had the right terminals installed and functioning.

"In a job like this, you use your engineering background all the time. Whether you're defining a problem or showing the customer how our equipment can help solve it."

Bob's comments cover only a small part of what IBM offers an engineering student who likes to work with people. For more facts, visit your campus placement office. Or send an outline of your career interests and educational background to Irv Pfeiffer, IBM Corporation, Department E, 100 South Wacker Drive, Chicago, Illinois 60606. We're an equal opportunity employer. IBM®



PICTORIAL

wisconsin's album

Weird Harold strikes again.

HUMOR

FILEABLES

In former times, people who committed adultery were stoned; today, it's often the other way around.

* * *

Once upon a time there was a Roman named Herman, who had a hobby of collecting berries. Herman liked to pick them, eat them, just everything about berries. One day while Herman was out picking berries he stumbled onto this bush that had the neatest berry he had ever seen. It was just great; it had the finest texture and the best shape of any berry he had ever seen. Herman picked it and waited for nightfall to come so he could sneak it home, lest someone should mug him for his berry. Well, Herman got the berry home, but somehow word of Herman's neat berry had sneaked out. Everyone was saying "Say, have you seen Herman's berry?" And everyone from miles around came to praise Herman's berry. Caesar was getting jealous of the fact that Herman's berry was getting more attention than him.

One night while Herman and his wife were watching TV they heard a loud knock at the door. Herman answered the door and was confronted with two armed guards. Herman said, "Oh, have you come to praise my berry?"

"No, Herman, we have come to seize your berry not to praise it."

* * *

ME: "My brother is working with 5,000 men under him."

ChE: "Where?"

ME: "Mowing lawns in a cemetery."

When the sultan entered his harem unexpectedly, his wives let out a terrified sheik.

* * *

Girls are like pianos. When they're not upright, they're grand.

* * *

A housewife went to the grocery store and got some eggs and catsup, then she stopped in the neighborhood bar where she dropped her groceries and made the biggest mess you ever saw. A drunk looked down, patted her on the shoulder and said, "That's all right lady, don't cry . . . it wouldn't have lived nohow, the eyes are too far apart."

* * *

Historians have done an extensive study of this country's past Presidents and they have discovered some surprising things about the Presidency. With Roosevelt, they found that the Presidency could be a lifetime job. Truman showed them that anybody could be President. Eisenhower demonstrated that we didn't really need a President. Kennedy proved that it was a dangerous job. And now, Johnson is demonstrating that it is dangerous to have one.

* * *

"I've changed my mind."

"Thank Heaven! Does it work any better now?"

* * *

He: "Ya' know something honey? I'm going to call you jello because you're so easy to make."

She: "That's alright dear. I'll call you oatmeal because you're done in three minutes."

Bad trip: acid indigestion.

* * *

Patient (shortly after returning from the operating room): "Why are all the blinds drawn, Doctor?"

Doctor: "There's a big fire across the street, and I didn't want you to wake up and think the operation was a failure."

* * *

The closest our civilization has got to perpetual motion is street repairing.

* * *

Paying alimony is like having a TV set on after you've fallen asleep.

* * *

What do Eskimos get from rubbing noses?

Sniff-less.

* * *

Many engineers think a good time is going places and undoing things.

* * *

Hear about the new deodorant called Vanish? It makes you disappear and everybody wonders where the odor is coming from.

* * *

Q: Who put the last 15 bullets in Mussolini's head?

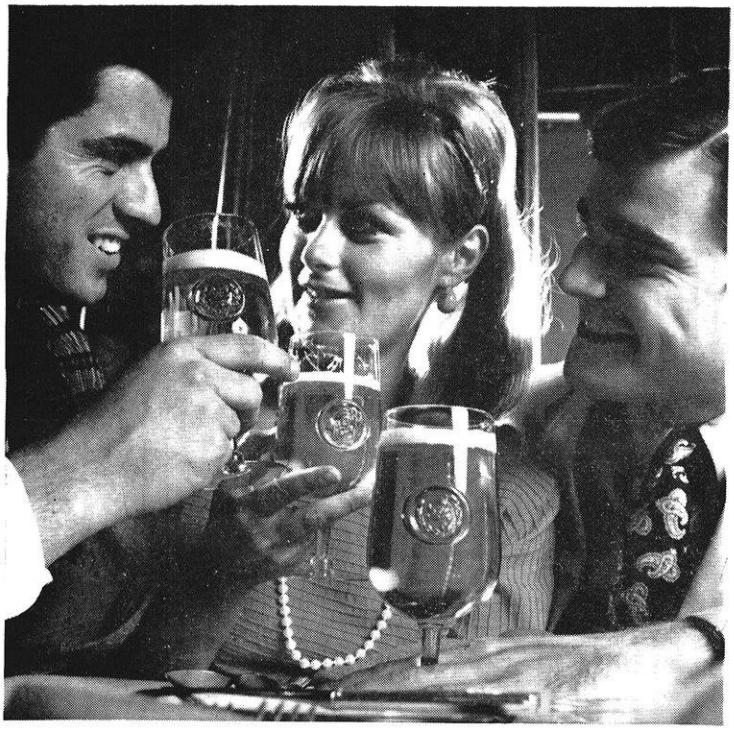
A: 273 Italian sharpshooters.

* * *

CONSCIENCE is defined as the thing that hurts when everything else feels great.

* * *

A snowflake in an avalanche never feels responsible.



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Now, that's a pretty funny thing for a civilian firm to say. A boss? Right out of college? The first day?

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The Air Force moves pretty fast.

Think it over. A man's career can sometimes move pretty slow.

United States Air Force

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Dan Johnson has a flair for making things.

Just ask a certain family in Marrakeck, Morocco.

A solar cooker he helped develop is now making life a little easier for them—in an area where electricity is practically unheard of.

The project was part of Dan's work with VITA (Volunteers for International Technical Assistance) which he helped found.

Dan's ideas have not always been so practical. Like the candlepowered boat he built at age 10.

But when Dan graduated as an electrical engineer from Cornell in 1955, it wasn't the future of candlepowered boats that brought him to General Electric. It was the variety of opportunity. He saw opportunities in more than 130 "small businesses" that make up General Electric. Together they make more than 200,000 different products.

At GE, Dan is working on the design for a remote control system for gas turbine powerplants. Some day it may enable his Moroccan friends to scrap their solar cooker.

Like Dan Johnson, you'll find opportunities at General Electric in R&D, design, production and technical marketing that match your qualifications and interests. Talk to our man when he visits your campus. Or write for career information to: General Electric Company, Room 801Z, 570 Lexington Avenue, New York, N. Y. 10022

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