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TO SCHEDULE?

From : Rockefeller, Laurance S.

Topic : Encloses copy of, "Unidentified Flying Objects, the Best Available Evidence." for JHG review;enc draft of Let to POTUS; followup on pilot amnesty proj

Action: none

Division(s) Technology Director's

Assnd1 :

Copy1 : Dr. Gibbons

Assnd2 :

File : Tech/UFOs

Remarks :

3-1-96
JHG

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February 29, 1996

John H. Gibbons, Ph.D.
Assistant to the President for
Science and Technology
Old Executive Office Building, Room 424
17th and Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Jack,

I am pleased to send you the enclosed copy of a report entitled, "Unidentified Flying Objects, the Best Available Evidence."

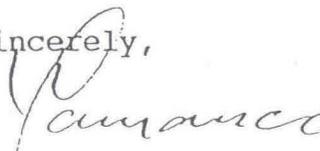
The public interest in UFOs and extraterrestrial intelligence obviously remains very high as evidenced by the recent cover story in Time Magazine, (which I also enclose) and the many television programs including one this week on public television's distinguished NOVA series. I sponsored this report because it seemed useful to bring together the most credible evidence about UFO sightings in the form of eyewitness reports, official statements, and scientific views.

While I do not necessarily agree with every finding and conclusion, I do believe that the evidence presented indicates that this subject merits serious scientific study. Toward that end, I hope that our government, other governments, and the United Nations will cooperate in making any information they may have available.

A new draft of our proposed letter to the President also is enclosed. As always, your reactions will be helpful. In particular, we hope you will be able to follow-up on the pilot amnesty project you suggested.

With warm regard, I am

Sincerely,



Laurance S. Rockefeller

DRAFT

Dear President Clinton,

Re: Lifting Secrecy on Information About
Extraterrestrial Intelligence

Mr. President, let me say why I believe the above subject is so important. For some time, I have been interested in the possibility of expanding man's spiritual and intellectual potential. We must fulfill more of our human potential if we are to cope with the increasingly difficult problems which now challenge our quality of life and our very survival. In my view, to achieve this greater potential it is essential to accelerate the recognition of a new paradigm of consciousness which recognizes the oneness of mind, body and spirit.

One possible evidence of a new paradigm of consciousness would be the discovery of the existence of extraterrestrial intelligence. Of course, we must continue to deal primarily with problems on our own planet. However, I have come to believe that the question of whether there is life elsewhere in the cosmos is of great significance. The implications for science, religion, and human potential are enormous. If life does exist elsewhere, we may learn much that will help us here.

Your initiative in bringing greater openness to government through the current review of the classification of government documents to eliminate unnecessary secrecy, offers a very significant opportunity to advance our knowledge of this question. This letter is to request that, as part of this reassessment, you personally and specifically direct a review of current government information policy concerning Extraterrestrial Intelligence (ETI), including Unidentified Flying Objects (UFO's). It is widely believed that various agencies of the federal government have substantial information concerning the existence or non-existence of UFOs, and that such information may have been unnecessarily withheld from the public as classified for reasons of national security. If this information does exist and if it were released, it would be received as evidence of a new spirit of partnership between government and its citizens.

The current classification review is a good step. However, Mr. President, from past experience there is reason to believe that if there is information being held by federal agencies about ETI and UFOs, it will not be released in a meaningful way without your personal initiative. This is to urge you to expand and accelerate the important movement towards openness you have initiated.

We suggest that you consider the following steps be taken now:

- Direct that information about ETI and UFOs be given priority in the current classification review.
- Appoint a coordinator for government information about ETI and UFOs to bring together information from all federal agencies involved, such as the Department of Defense, the Air Force, NASA, the CIA and the other parts of the intelligence community. Your Science Advisor, Jack Gibbons, might well be the right person for this role.
- Make it known through federal agencies, such as those named above, that credible witnesses having information about ETI or UFOs will be granted amnesty from relevant oaths or other government constraints.

These steps I respectfully suggest, would further not only the cause of scientific inquiry and knowledge, but also that of public confidence in government and international good will. The timing is particularly propitious because, as our first post-Cold War President, you have an opportunity to take this important step without many of the national security constraints that have limited government candor with the American people in the past.

As an interested and concerned citizen, I stand ready to assist in whatever I can do that you might find useful.

Sincerely,

Laurance S. Rockefeller

The Honorable William J. Clinton
The President
The White House
Washington, D.C. 20500

EXECUTIVE SUMMARY

UNIDENTIFIED FLYING OBJECTS

BRIEFING DOCUMENT

THE BEST AVAILABLE EVIDENCE

by

DON BERLINER

with

Marie Galbraith

Antonio Huneus

Presented by
CUFOS, FUFOR, MUFON
December 1995

Foreword

The Briefing Document was sponsored by Laurance S. Rockefeller, and written by Don Berliner with Marie Galbraith and Antonio Huneus. This Executive Summary was prepared by Richard Hall.

Information on UFO case histories and related documents was supplied by a number of sources including the officers of the Center for UFO Studies (CUFOS), the Fund for UFO Research (FUFOR), and the Mutual UFO Network (MUFON). These three organizations are each non-profit, tax-exempt corporations. They cooperate on joint projects under the umbrella name: UFO Research Coalition.

The full document contains illustrations, quotations, appendices, and extensive footnotes as documentation for statements in the text. Part 1 provides an overview, Part 2 reports case histories, and Part 3 contains quotations of statements by important people. The appendices provide background information, suggested readings, resource materials, and addresses and phone numbers for CUFOS, FUFOR, and MUFON. Supporting documentation is on file at FUFOR.

Part 1. OVERVIEW

Government Secrecy

Decisions between the people's right to know and the government's right to secrecy for national security reasons must be made by appropriate members of society. Many observers believe that use of government secrecy has been excessive for decades, especially since the end of the Cold War. Secrecy, like power, lends itself to abuse. Generally speaking, too many government employees can too easily restrict access to documents, and later attempts to have them declassified proceeds at a glacial pace. The Freedom of Information Act process is complicated and the paperwork load burdensome for many agencies. The process can also be used to withhold or delay release of information that might be politically awkward or embarrassing. For whatever reasons, important UFO information has been withheld.

Legitimate questions can be raised about the justification for withholding UFO information from the public, especially since the government *officially* downplays the existence of true UFOs and states that there is no threat to national security. But if UFOs are real, as the information in this report strongly suggests, the issue in this case is access to knowledge of potentially profound significance with regard to man's place in the universe, to human society, and to science. The advanced science being evidenced by UFOs needs to be acknowledged and opened up to the scientific community for full study. UFO sightings suggest an enormous gap between our science and that of someone else.

The Case For UFO Reality

Two basic questions have always been at the heart of the UFO mystery:

1. Are they real, or are they just honest mistakes?
2. If they are real, could they be ships from some other world?

Several types of evidence exist for the reality of UFOs as something far more than mistaken sightings of conventional objects or phenomena. They include:

Visual Evidence. Well-documented sightings of UFOs, including numerous reports from trained and experienced witnesses, have established the basic *credibility* of the case for UFO reality. Their *strangeness* (the extent to which they differ from routine sightings of such things as aircraft or meteors) is established by their structural features and abrupt high-speed maneuvers. Reports that are high in both *credibility* and *strangeness* form the heart of the UFO mystery.

Radar Evidence. Radar has repeatedly confirmed the presence of something unidentified which responds to radar much as an airplane does. Temperature inversions were once thought to be an explanation for many radar-UFO sightings, especially following the 1952 UFO sightings over Washington, D.C., but studies and events since then tend to rule out that possibility. Several radar/visual sightings are included in the following case histories.

Physical Evidence. Evidence at UFO landing sites has included imprints, residues, and damaged foliage. A landing case in 1964, investigated by U.S. Army Intelligence and the FBI, included imprints in a geometrical pattern suggestive of landing gear as well as scorched foliage. The witness, a police officer, was highly credible. No explanation could be found. Other well-documented physical evidence cases are included in the following case histories.

Government Statements. Investigations by the American government have produced ambiguous results, and often counter-to-fact explanations. At the same time, rarely publicized official statements have supported the position that UFOs are real and unexplained. Examples of such statements and background information on the U.S. Air Force UFO investigations are provided.

In summary, the combined evidence (visual, radar, and physical), backed up by official government documents, strongly suggests the presence in the Earth's atmosphere of apparently manufactured craft of unknown origin.

The Case For Extraterrestrial UFOs

Some UFO sightings that remain unexplained may be caused by an unknown natural phenomenon or secret man-made craft. Reasons for exploring the possibility of an extraterrestrial origin include the reported shapes, almost always simple geometrical forms: disc-shape, spherical, cylindrical, or triangular. Over the past 50 years, no human aircraft have had most of these configurations. Rockets and missiles have been cylindrical and some military aircraft are delta-wing, but their activities and flight characteristics are known. Even more striking is the performance of UFOs: their unprecedented speed, acceleration, maneuverability, and silence. UFOs have frequently hovered silently, accelerated rapidly in midair, and made abrupt changes of direction.

The UFO Cover-Up

Thousands of sightings describe novel, high-performance craft in our skies. Why is this officially denied? A possible solution to this mystery is that the official position is based on an elaborate cover-up. If so, what is being protected? The answers generally proposed focus on the issue of national security and the fear of the public reaction to an official disclosure of UFO reality and an extraterrestrial origin. Certain questions might be difficult to answer. However, many believe that science and technology issues lie at the heart of the secrecy. Whoever masters the science and technology would gain a huge advantage.

A policy of secrecy dates back to World War II when so-called "foo-fighters" were reported by combat pilots. The U.S. Eighth Air Force is said to have prepared a report about "foo-fighters" in 1945, but half a century later no one has seen a copy of it. The Swedish government began to release information in the 1990s about "ghost rockets" seen over Scandinavia in 1946. When "flying saucers" appeared over the U.S. in 1947, reports and analyses were kept secret. During the Air Force Project Blue Book study in later years, official policy prohibited comment on "unexplained" cases and case details were withheld from the public. Continuing government secrecy has been evident in the reaction to growing public and press interest in the apparent crash of a strange craft in New Mexico in 1947. Despite strong testimony to the contrary, the Air Force claims the debris found at the site was from a formerly classified research balloon project, Project Mogul. A recent GAO investigation disclosed that U.S. Air Force message traffic for the period had been *improperly destroyed*.

Summary of Quotations

Sample quotes from high-ranking military personnel, prominent scientists, and others are provided on:

- Reality of UFOs.
- Extraterrestrial origin of UFOs.
- Secrecy and National Security.
- Challenge for today's science.
- Effect of ridicule on potential witnesses.

More complete and additional quotations are in Part 3.

Part 2. CASE HISTORIES

UFOs, under one name or another, have been described and depicted throughout recorded history and from most countries of the world. [Renaissance painting reproduced.] Some prime examples follow.

1944-45: "Foo Fighters" Over Europe and Asia

The modern era of UFOs began in the mid-1940s with the appearance of "foo fighters" over both the European and Pacific Theaters of War. On August 10, 1944, a B-29 bomber on a mission over the Indian Ocean reported a brilliant red-orange spherical object that paced the aircraft about 500 yards [475 m.] off the starboard wing. The pilot reported:

"It seemed to throb or vibrate constantly....I went into evasive action, changing direction constantly, as much as 90 degrees and altitude of about 2,000 feet [600 m.]. It followed our every maneuver for about eight minutes....When it left, it made an abrupt 90 degree turn, accelerating rapidly, and disappeared into the overcast."

On December 22, 1944, over Hagenau, Germany, an American night fighter encountered two glowing orange objects that climbed rapidly toward them. The pilot stated:

"Upon reaching our altitude, they levelled off and stayed on my tail....After two minutes, they peeled off and turned away, flying under perfect control."

1946: "Ghost Rockets" Over Scandinavia

A wave of sightings began over Scandinavia on June 9, 1946, when a brilliant light streaked over Helsinki, Finland: possibly an unusually large meteor. The following night another object streaked overhead, turned and went back in the direction it had come from: definitely not a meteor. Hundreds of reports were made in July and August of "ghost rockets" over Sweden, including many describing tubular or "spindle-shaped" objects flying low and slowly with little or no sound. The Swedish government established a special commission to study the sightings. Similar reports came from Norway. A British Air Ministry Intelligence Report in September 1946 concluded:

"An analysis suggests the most notable characteristics of the projectiles to be: a) great speed; b) intense light frequently associated with missile; c) lack of sound; d) approximate horizontal flight....[If they] are of natural origin, they are unusual; sufficiently unusual to make possible the alternative explanation that at least some are missiles. If this is so, they must be of Russian origin."

An effort was made to explain the "ghost rockets" as Soviet tests of captured German rockets from a test site across the Baltic Sea. Later historical research established that this answer was not correct. When the Scandinavian sightings began to taper off in September 1946, similar sightings began in southern Europe and North Africa.

1947: First American Sighting Wave

A daylight sighting on June 24, 1947, of a chain of "nine peculiar looking aircraft" was made by a private pilot, Kenneth Arnold, over Washington State. The objects were moving rapidly on a steady course; every few seconds some of them would "dip or change their course slightly, just enough for the sun to strike them at an angle that reflected brightly at my plane....[They] swerved in and out of the high mountain peaks...." [Sketch by Arnold reproduced.] Other reports were made from the Pacific Northwest that day of discs banking and turning in formation. The sighting wave continued through the summer. Air Force studies soon afterwards concluded that:

- The objects were metallic.
- Shapes usually were circular or elliptical.
- They sometimes flew in formations of 3 to 9.
- The discs oscillated laterally while flying along.
- They were "something real and not visionary or fictitious."
- Some sightings may be caused by natural phenomena.
- The maneuverability and flight characteristics suggest controlled flight.

In January 1948 the U.S. Air Force established its first announced UFO investigation: Project Sign.

1952: Second American Sighting Wave

The Air Force carried on a routine military intelligence gathering effort for a few years; then the number of sightings suddenly began to increase. Early in 1952, reports began coming in from Air Force jet interceptor pilots sent aloft in response to radar or visual sightings. By late July, reports to Project Blue Book at Wright Field, Dayton, Ohio, were averaging 27 per day. On three consecutive weekends, from July 19 to August 3, there was intensive UFO activity over Washington, D.C. Luminous objects darting around the sky were seen from the ground, from control towers at Washington National Airport, Bolling AFB, and Andrews AFB. The objects invaded restricted areas over the White House, the Capitol Building, and the Pentagon. They were also tracked on radar from all three airfields, as the radar operators conferred by telephone to ensure that they were tracking the same objects. Airline pilots arriving at or departing from National Airport often were able to provide visual confirmation of the radar targets. [Radar chart reproduced.]

A major press conference was held in the Pentagon on July 29, 1952, led by Maj. Gen. John Samford, Chief of Air Force Intelligence. The sightings were attributed to "temperature inversions" which cause visual mirages. Later studies showed that the mirage theory was totally inadequate to explain the data. Early in 1953, the then five-year-old Central Intelligence Agency convened a secret panel of five prominent scientists whose interest focused on the potentially adverse effects of UFO sighting reports on the national intelligence gathering effort (such reports would 'clog the channels'), and recommended a debunking effort. The panel failed to address the question of what the reports were really describing.

1956: Radar/Visual Jet Chase Over England

On the night of August 13-14, radar operators at RAF Bentwaters and RAF Lakenheath in eastern England repeatedly tracked single and multiple unidentified objects which displayed high speed, as well as rapid changes of speed and direction. An RAF jet interceptor was launched to investigate. As the interceptor closed in on the target, he had a visual sighting and locked onto it with his airborne radar, but then lost it. Suddenly the unidentified "target" appeared behind the interceptor. Following is an excerpt from the official Air Force Intelligence Report on the incident:

"[Radar showed] that as the Venom [interceptor] passed the target on radar, the target began a tail chase of the friendly fighter. Radar requested pilot acknowledge this chase. Pilot acknowledged and stated he would try to circle and get behind the target. Pilot advised he was unable to 'shake' the target off his tail and requested assistance.... [He said it was the] 'clearest target I have ever seen on radar.'"

1957: Third American Sighting Wave

During the first week of November 1957, a sudden wave of sightings coincided with the launch of the dog-carrying Soviet satellite, Sputnik II. Hundreds of cases poured into the Air Force. The most striking feature was electromagnetic effect cases concentrated in and around Levelland, Texas. Glowing objects, usually blue-green and elliptical or oval, were observed repeatedly on or near highways. Headlights and engines of the witnesses' vehicles failed. The Air Force blamed the sightings on a severe electrical storm and witness excitability. A scientific study later determined that there had been no storm or source of excessive moisture in the area at all.

1958: Brazilian Navy Photographic Case

A Saturn-shaped UFO was photographed from a Brazilian Navy training ship conducting research for the International Geophysical Year, on February 21, 1958, near Trindade Island in the South Atlantic Ocean. Personnel on deck observed the UFO and watched as the professional

photographer took pictures of it. The film was immediately developed below deck in an improvised darkroom, and the UFO images were confirmed. At first the sequence of photographs was kept secret, but the pictures were later given to the press by the President of Brazil, Juscelino Kubitschek. Several high-ranking military officials vouched for their authenticity. Later tests by the Navy determined that the UFO had been flying at 900 to 1,000 km/hr [550 to 600 mph]. The negatives were analyzed by photographic experts and there were no signs of tampering. Indeed, the pictures confirmed what the witnesses had all seen. Despite all evidence to the contrary, U.S. Navy and Air Force agencies, who had obtained the photographs for analysis, promptly labelled them a hoax. [Photographs reproduced.]

1964: Landing Case at Socorro, New Mexico

Until the sighting on April 24, 1964 by Officer Lonnie Zamora, in Socorro, New Mexico, reports of UFO occupants remained controversial. In late afternoon, Zamora drove off the highway onto rough side roads to investigate a roaring sound and flame visible low in the sky that he thought was an explosion. He saw a shiny white object on the ground which he first thought was an overturned car. Standing near it were two small beings in white coveralls. Then he noticed that the object was egg-shaped, sitting on one end and resting on slender legs. As he got out to walk closer, he heard loud thumps like hammering or doors shutting hard, and the beings were no longer visible. Then the object began to roar and emit blue-orange flames from underneath. Fearing an explosion, he ducked behind his cruiser for protection. But the roaring stopped and everything became totally quiet. He looked up to see it hovering a few feet above the ground. The object then moved away slowly, gathering speed, and moved away over the distant horizon. Zamora was joined by a State Police sergeant, who knew him, and they examined the landing spot. Charred and singed foliage and four prominent "landing pad" imprints were clearly visible. Within hours, an Army investigator from White Sands Missile Range and an FBI agent were on the scene. Zamora described the object to them:

"It was smooth--no windows or doors. As the roar started, it was still on or near the ground. There was red lettering of some type. The insignia was about 2-1/2 feet (75 cm.) high and about 2 feet (60 cm.) wide. It was in the middle of the object. The object was...aluminum-white."

He sketched the object showing the red "insignia" as half a circle over an inverted V with a vertical line inside and a horizontal line below. [Sketch by Zamora reproduced.] An Air Force investigation followed, and Zamora was recognized to be "a serious police officer, a pillar of his church, and a man well-versed in recognizing airborne vehicles in his area."

1967: Physiological Case at Falcon Lake, Canada

A Close Encounter of the Second Kind (CE-II) physical evidence case occurred on May 20, 1967 in the Falcon Lake area of Manitoba, where the witness was prospecting. Steven

Michalak of Winnipeg encountered a disc-shaped UFO that landed near him. As he approached it, a door opened and voices were heard from within. He could not see inside due to brilliant lights. As he neared it, the door closed and a whining sound was heard. The object began rotating and finally raised off the ground. Just before it rose, he touched it with his left, gloved hand and the glove was burned immediately. Exhaust gases burned his cap and garments, and he sustained stomach and chest burns, as a result of which he was hospitalized for several days. Neither laboratory analyses of the clothing nor medical tests by the doctors were able to determine what caused the burns. Soil samples from the landing spot were found to be significantly radioactive. Michalak had seen a grid-like exhaust vent from which a blast of hot air struck his chest and set his clothing on fire. The burn marks on his chest and abdomen were in a geometrical pattern conforming to the exhaust grid. Soon after the encounter, he experienced nausea and a strong headache. Later he had weight loss, reduced blood lymphocyte count, swelling, and other symptoms. Physiological or medical effect cases are frequent occurrences. [Photograph of injuries and sketch by Michalak reproduced.]

1975: Strategic Air Command Bases UFO Alert

From late October through mid-November of 1975, high-security Air Force bases in the northern states experienced intrusions by "mystery helicopters" whose origin could not be determined. The Commander-in-Chief of the North American Aerospace Command (NORAD) issued a report of the events on November 11, 1975. Some excerpts:

"Reliable military personnel at Loring AFB, Maine, Wurtsmith AFB, Michigan, Malmstrom AFB, Montana, Minot AFB, North Dakota, and Canadian Forces Station Falconbridge, Ontario, Canada, have visually sighted suspicious objects....[At Malmstrom AFB] site personnel reported the object as low as 200 feet [60 m.] and said that as the interceptors approached, the lights went out. After the interceptors had passed, the lights came on again...the object increased to a high speed, raised in altitude and could not be discerned from the stars....Minot AFB on 10 Nov. reported that the site was buzzed by a bright object the size of a car at an altitude of 1,000 to 2,000 feet [300 to 600 m.]. There was no noise emitted by the vehicle."

On November 7 at Malmstrom AFB, Montana, a Sabotage Alert Team saw a brightly glowing orange disc that illuminated the Minuteman ICBM missile site. As jet interceptors approached, the UFO took off straight up, NORAD radar tracking it to an altitude of 38 miles (60 km.).

1976: Multiple Witness Case in the Canary Islands

A large luminous UFO was observed throughout the Spanish Canary Islands on the night of June 22, 1976, for 20 minutes. An investigation was launched by the Commanding General of the Canaries' Air Zone, and depositions taken from 14 witnesses. At least one color photograph was taken. [Photograph and Air Force sketches reproduced.] The case file was

declassified in 1994. A Spanish Navy ship made the first report, followed by citizen reports starting about three minutes later. The object alternately hovered and moved around, its brilliant light at times illuminating the terrain. The military investigator's report stated:

"Numerous witnesses belonging to different positions and cultural strata, saw it with similar characteristics....Therefore, the fact that a very strange and peculiar aerial phenomenon occurred on the night of 22 June is a true and proven fact, as incredible as its behavior and conditions may seem."

A physician and his taxi driver filed a report of a translucent sphere seen near the ground. His deposition states in part:

"It had an electric blue color but tenuous, without dazzling; it had a radius of about 30 m. [100 ft.], and in the lower third of the sphere you could see a platform of aluminum-like color as if made of metal, and three large consoles. At each side of the center there were two huge figures of 2.5 to 3 m. [8.5 to 10 ft.] tall [humanoid wearing some kind of head gear]...dressed entirely in red and facing each other in such a way that I always saw their profile...it rose slowly...suddenly it reached enormous speed like none I ever saw in an airplane [and] disappeared in the direction of Tenerife."

A few months later the Commanding General and his aides, while flying on an Air Force transport plane, encountered a similar phenomenon.

1976: UFO Dogfight Over Tehran

A thoroughly documented aircraft-UFO encounter occurred over Tehran, Iran, on the night of September 18/19, 1976. Two F-4 Phantom II jet fighters of the Imperial Iranian Air Force were scrambled to intercept a UFO that had been sighted flying over restricted airspace, but as the pilots closed in on the target their communications and weapons systems were suddenly jammed. During a second F-4 Phantom jet scramble, the UFO flashed various colored strobe lights alternately and its image on the radarscope was comparable to that of a Boeing 707 tanker aircraft. The pilot attempted to fire an AIM-9 missile at the object, but at that instant his weapons control panel and entire communications system also failed. The UFO emitted a missile-like object that descended, illuminating the ground, and apparently landed. The next day, investigators questioned citizens in the landing area who reported "a loud noise and a very bright light like lightning" at the time of the landing. A Defense Intelligence Agency report on the incidents concluded: "This case is a classic which meets all the criteria necessary for a valid study of the UFO phenomenon." Six points of justification were cited, including multiple independent witnesses, the credibility of many of the witnesses, the radar confirmations, the physical effects, and finally that: "An inordinate amount of maneuverability was displayed by the UFOs."

1980: UFO Incidents at Rendlesham Forest, England

Late in December 1980, UFOs were reported in the Rendlesham Forest, in Suffolk. Military personnel from nearby RAF Bentwaters and RAF Woodbridge, then NATO bases in England leased to the U.S. Air Force, had sightings over several days. A report filed by Deputy Base Commander, Lt. Col. Charles I. Halt, said that base security personnel saw unusual lights just outside the base early on December 27 and were given permission to investigate. Three patrolmen reported seeing a strange glowing object in the forest. It was triangular in shape and apparently metallic, about 2 to 3 meters (7 to 10 ft.) across the base and about 2 meters high, with various body lights. [Sketch by patrolman reproduced.] The forest was illuminated by its glow. As they approached to investigate, it maneuvered through the trees and disappeared. Animals at a nearby farm were agitated by it. The next day, three depressions were found in the ground where the object had been, and radioactivity was detected. A few nights later, luminous objects were seen flying overhead. In a report to the British Ministry of Defence, Col. Halt stated:

"The objects moved rapidly in sharp angular movements and displayed red, green and blue lights. The objects to the north appeared to be elliptical through an 8-12 power lens. They then turned to full circles....The object to the south was visible for two or three hours and beamed down a stream of light from time to time."

Col. Halt, who personally saw light beams emitted from the objects pointing to the weapons storage area at Woodbridge, said:

"We could very clearly see it....I noticed other beams of light coming down from the same object falling on different places on the base. My boss was standing in his front yard in Woodbridge and he could see the beams of lights falling down, and the people in the weapons storage area and other places on the base also reported the lights."

Other base personnel during this time period reported contact with a landed craft and humanoid beings in the woods, and various extraordinary phenomena. These reports are still being investigated.

1981: Physical Trace Case in Trans-en-Provence, France

On the afternoon of January 8, 1981, an object shaped like one saucer inverted on top of another landed on a farm near Trans-en-Provence in southeastern France. It left physical traces which were collected by the Gendarmerie. The case was investigated by the Groupe d'Etudes des Phénomènes Aérospatiaux Non-identifiés (GEPAN), a study group within the National Center for Space Studies, the French counterpart of NASA. The witness was Renato Nicolai, 55, who thought he was seeing a military experimental device. Following are excerpts from his statement to police:

"My attention was drawn to a small noise, a kind of little whistling. I turned around and I saw, in the air, a ship...descending toward the ground...[Then] I saw the ship standing on the ground. At that moment, the ship began to emit another whistling, a constant, consistent whistling. Then it took off and once it was at the height of the trees, it took off rapidly....I walked towards the [landing] spot and I noticed a circle about two meters [7 feet] in diameter. At certain spots on the curve of the circle there were tracks (or traces)."

Studies of the soil and biological samples, and control samples were conducted at major French laboratories and universities. They included physico-chemical analysis, electronic diffraction, mass spectrometry, and biochemical analysis. Some of the scientific findings were:

- A strong mechanical pressure was forced on the ground surface.
- Thermal heating of the soil was detected along with or soon after the impact.
- Chlorophyll pigment reduction was detected in young leaves.
- The chlorophyll transformation could be related to the action of an electrical energy field.
- Significant differences were determined between the impact site and more distant control samples.
- The environmental effects collectively suggest the occurrence of a significant event.

GEPAN has also documented three other UFO physical trace cases that occurred in 1979, 1982, and 1987, involving biological samples. Jean-Jacques Velasco, the primary GEPAN investigator, has since stated that the best hypothesis to explain the laboratory findings is powerful electromagnetic fields in the microwave frequency range. [Photograph of traces, diagram and charts from French space agency reproduced.]

1986: Jet Chase Over Brazil

UFOs were sighted visually by civilian and military pilots and tracked on ground and airborne radar in southeastern Brazil on the night of May 19, 1986. Two F-5E and three Mirage jet fighters were scrambled by the Brazilian Air Force to identify the objects. Among the witnesses were retired colonel and executive jet pilot Ozires Silva, president of the state-owned oil company Petrobras, and several fighter pilots. The luminous objects darted from point to point, made sharp turns, and sometimes operated in groups. The incidents were widely reported in the news media and openly discussed by Brazilian officials, who were outspoken about the strange nature of the encounters. Excerpts of their quoted statements follow.

Brig. Gen. Otavio Moreira Lima, Minister of Aeronautics: "Radar doesn't have optical illusions....It's fantastic. The signals on the radar were quite clear."

Maj. Ney Cerqueira, commander of Air Defense Operations Center: "We don't have technical operational conditions to explain it. The appearance and disappearance of these objects on the radar screens are unexplained."

A short message from the U.S. Defense Attaché Office in Rio de Janeiro to the Defense Intelligence Agency, from a self-styled skeptical reporting officer, said: "Three visual sightings and positive radar contact from three different types of radar systems, leads one to believe that something arrived over Brazil the night of 19 May."

1986: Japan Airlines 747 Case Over Alaska

On the night of November 17, 1986, a Japan Air Lines Boeing 747 freighter flight, commanded by Capt. Kenju Terauchi, was approaching Anchorage, Alaska, when two small unidentified lights and one huge lighted object were sighted visually and on radar for more than a half hour. Capt. Terauchi, a 29-year veteran flyer, said, "It was a very big one—two times bigger than an aircraft carrier." With permission of FAA air traffic controllers, he took evasive action as the objects maneuvered around his airplane. The objects moved quickly and stopped suddenly, once moving abruptly directly in front of the airplane. At one time, the light was so bright that it illuminated the cockpit. At a press conference on March 5, FAA spokesman Paul Steucke said: "As far as we know, the whole crew are people of integrity and did report what they saw accurately." [Sketches by Capt. Terauchi reproduced.]

1989: Multiple Witness Case at Russian Missile Base

UFO investigation in Russia and the former USSR has ranged from debunking them as "capitalist propaganda" to establishment of serious academic and military commissions. Information is now beginning to emerge about formerly classified sightings. A report from the KGB files describes a multiple witness sighting at an army missile base in the Astrakhan Region on the night of July 28, including depositions by seven military witnesses. The summary report stated:

"It was determined that the reported characteristics of the observed UFOs are: disc 4-5 m. [13-17 ft.] in diameter, with a half-sphere on top, which is lit brightly. It moved sometimes abruptly, but noiselessly, at times coming down and hovering over ground to an altitude of 20-60 m. [65-200 ft.]...the UFO did not let the [fighter interceptor] aircraft come near it, evading it."

One of the witnesses, Ensign Valery N. Voloshin, said:

"It hovered over the [rocket weapons] depot at a height of 20 meters [65 ft.]...[and] shone with a dim green light which looked like phosphorous. It was a disc, 4 or 5 m. [13-17 ft.] in diameter, with a semispherical top....A bright beam appeared from the

bottom of the disc, where the flash had been before, and made two or three circles, lighting the corner of one of the buildings...."

[Sketch by Voloshin reproduced.]

1989-90: Sighting Wave in Belgium

From October 1989 into 1990, hundreds of reports were made of dark triangular UFOs with bright body lights and often light beams. They were tracked by ground and airborne radar as Belgian Air Force F-16 jets chased them, and numerous photographs and videos were taken. [Photographs and computerized radar images reproduced.] Military leaders were open and candid about the unexplainable incidents. A radar/visual jet scramble occurred on the night of March 30-31, 1990. A report prepared by Major P. Lambrechts of the Belgian Air Force General Staff includes a detailed chronology of events. An excerpt follows:

"Each time the pilots were able to secure a [radar] lock on one of the targets for a few seconds, there resulted a drastic change in the behavior of the detected targets...[Once] their speed changed in a minimum of time from 150 to 970 knots [275 to 1,800 km./hr.] and from 9,000 to 5,000 feet [2,700 m. to 1,500 m.], returning then to 11,000 feet [3,300 m.] in order to change again to close to ground level."

The F-16 computerized radar tapes underwent a detailed technical analysis at the Air Force Electronic War Center, which suggested that some (but not all) of the radar targets may have been induced by weather conditions. Others tried to explain the sightings as due to electromagnetic interference. Maj. Gen. Wilfred De Brouwer (then Colonel and Chief of Operations) has recently stated:

"These were credible people and they told clearly what they saw....On at least one occasion there was a correlation between the radar contacts of one ground radar and one F-16 fighter. This weakens the theory that all radar contacts were caused by electromagnetic interference. If we add all the possibilities, the question is still open, so there is no final answer."

The sighting wave was documented by the Belgian Society for the Study of Space Phenomena (SOBEPS), whose report listed characteristics of the UFOs:

- Irregular displacement (zig-zag, instantaneous change of trajectory).
- Displacement following the contours of the terrain.
- Varying speeds.
- Hovering.
- Overflight of urban and industrial areas.
- Sound (faint humming to total silence).

1991-1994: Recent Cases

Impressive sightings have continued since the 1990 Belgian cases, with investigations still underway. They include:

1991: Paraguay. June 8 radar-visual sighting from two airplanes, with electromagnetic effects on instruments of a Cessna 210.

1992-1993: Mexico. Many sightings over Mexico City, including the International Airport on March 4-5, 1992, with radar confirmation.

1993: United Kingdom. Widespread sightings March 30-31, investigated by Ministry of Defence, including a huge diamond-shaped object slowly flying low overhead with a humming sound; RAF meteorologist report of UFO emitting light beam to ground.

1994: United States. Widespread sightings on the night of March 8 in southwestern Michigan; confirmation of anomalous targets on Weather Service radar.

Part 3. QUOTATIONS

[Significant quotes by prominent people provided. Following are excerpts.]

Military and Government Officials

United States.

Adm. Roscoe Hillenkoetter, first Director of the CIA (1947-50): "Unknown objects are operating under intelligent control....It is imperative that we learn where UFOs come from and what their purpose is...."

Gen. Nathan D. Twining, Chairman, Joint Chiefs of Staff (1957-1960): "The reported operating characteristics...lend belief to the possibility that some of the objects are controlled either manually, automatically, or remotely."

Harry S. Truman, at the time he was President: "I can assure you that flying saucers, given that they exist, are not constructed by any power on earth."

Argentina.

Capt. Engr. Omar R. Pagani, director of Navy investigation team, 1960: "The unidentified flying objects do exist. Their presence and intelligent displacement in the Argentine airspace has been proven."

Brazil.

Brig. Gen. João Adil Oliveira, Chief of AF General Staff Information Service, 1954: "Almost all the governments of the great powers are interested in it [UFOs], dealing with it in a serious and confidential manner, due to its military interest."

England.

Air Chief Marshal Lord Dowding, Chief of RAF Fighter Command in WWII, 1954: "I am convinced that these objects do exist and that they are not manufactured by any nation on earth."

Lord Hill-Norton, Admiral of the Fleet, Chief of Defence Staff (1971-73): "The evidence that there are objects...that cannot be accounted for either as man-made objects or as any physical force or effect known to our scientists seems to me to be overwhelming."

France.

Gen. Lionel M. Chassin, Commanding General of Air Forces, 1958: "We can...say categorically that mysterious objects have indeed appeared and continue to appear in the sky that surrounds us."

Spain.

Gen. Carlos Castro Cervero, Air Force (1976): "I [personally] believe that UFOs are spaceships or extraterrestrial craft....The nations of the world are currently working together [on UFO investigations]. There is an international exchange of data."

Astronauts

Gordon Cooper, Mercury and Gemini astronaut, Colonel, USAF (Ret.): "There are several of us who do believe in UFOs and who have had occasion to see a UFO on the ground, or from an airplane." (1978) "I do believe UFOs exist and that the truly unexplained ones are from some other technologically advanced civilization." (1980)

Maj. Gen. Pavel Popovich, pioneer Cosmonaut, Soviet Union: "The UFO sightings have become the constant component of human activity and require a serious global study."

Donald (Deke) Slayton, Mercury Seven astronaut, describing a 1951 sighting while flying in Minnesota: "[It was] gray and about three feet in diameter....It looked like a saucer, a disc. About that same time I realized that it was suddenly going away from me....then all of a sudden the damn thing just took off. It pulled a 45-degree climbing turn and accelerated and just flat disappeared."

Scientists

Dr. Richard F. Haines, psychologist, NASA-Ames: "We're not dealing with mental projections or hallucinations on the part of the witness but with a real physical phenomenon."

Dr. J. Allen Hynek, astronomer, Northwestern University, USAF consultant on UFOs: "The body of data point to an aspect or domain of the natural world not yet explored by science....[The solution to the UFO problem] will prove to be not merely the next small step in the march of science but a mighty and totally unexpected quantum jump."

Dr. Auguste Meessen, professor of physics, Catholic University, Louvain, Belgium: "There are too many independent witnesses to ignore reports....The simplest hypothesis is that the reports are caused by extraterrestrial visitors...."

Prof. Hermann Oberth, father of the space age: "It is my thesis that flying saucers are real and that they are space ships from another solar system."

Dr. Paul Santorini, Greek physicist and engineer: "[Referring to a secret international investigation of sightings in 1947 in which he participated] A world blanket of secrecy surrounded the UFO question because the authorities were unwilling to admit the existence of a force against which we had no possibility of defense."

Dr. Felix Y. Zigel, professor of mathematics and astronomy, Moscow Aviation Institute: "Unidentified flying objects are a very serious subject which we must study fully."

APPENDICES

- Characteristics of IFOs and UFOs
(A comparison of identifiable and unidentifiable objects.)
- Terminology of UFOs
- International Agreements and Resolutions
(History of and quotations from bilateral, regional, and global agreements.)
- Recommended Reading
- Resource Catalogs

Source materials and supporting documents are available at:

The Fund for UFO Research, P.O. Box 277, Mt. Rainier, MD 20712
Tel: (703) 684-6032

The other participating organizations are:

The Center for UFO Studies, 2457 West Peterson Ave., Chicago, IL 60659
Tel: (312) 271-3611

The Mutual UFO Network, 103 Oldtowne Rd., Seguin, TX 78155
Tel: (210) 379-9216

Interest grew and more investigators went to work, locating and interviewing additional witnesses. By the late 1980's, it had become the most thoroughly investigated and best authenticated of all reported UFO crashes. There would soon be four books and scores of papers and television programs devoted to this single episode.

In the early 1990's, the refusal of the Air Force even to comment publicly on the growing dispute, led to a formal request for information from Rep. Steven Schiff (R-NM), in whose district the crash had occurred. His inability to get a satisfactory answer from the Pentagon led him to request the General Accounting Office to conduct a search for official documents related to the 1947 event.

The first official statement by the Air Force in a quarter century came in September 1994. This report blamed the Roswell crash on a once-secret program to develop a constant-altitude balloon designed to carry scientific equipment to detect the first Soviet nuclear test.

Although this "Project Mogul" never worked, and thus never became operational, its test flights from Alamogordo, NM, involved large and unusual clusters of balloons with attached equipment. The Air Force claimed these were responsible for the "mysterious" debris and the accompanying secrecy.

In July 1995, the GAO reported to Rep. Schiff that it had been unable to find documents explaining what really happened in the desert in 1947. It concluded that a lot of documents from the Roswell Army Air Force base had been improperly destroyed, and that "the debate over what crashed at Roswell continues."

In September 1995, the Air Force released a 1,000-page report reinforcing its position that a Project Mogul balloon cluster was responsible for all the furor. It never quite said that a Mogul balloon rig had crashed on the sheep ranch, only that this was a possibility.

In fact, there is no evidence in *any* official report that such a balloon came anywhere near the sheep ranch, only that two such clusters were never found, and thus *might* have landed there. At the same time, the Air Force discounted the possibility that the debris could have been the result of the crash of a military airplane, the impact of a test rocket or missile, or any sort of nuclear accident.

With the GAO stating it had found no evidence for a Mogul balloon, and the Air Force eliminating most other possible explanations, a UFO remains a tantalizing possibility.

For further information, contact the UFO Research Coalition, c/o Fund for UFO Research, P.O. Box 277, Mt. Rainier, Md. 20712. Tel: (703) 684-6032.

CONGRESSIONAL HEARINGS ON UFOs

Only two formal hearings on UFOs have ever been held:

I. The House Armed Services Committee convened the first hearing in 1966 in response to widely publicized sightings and strong public and editorial criticism of the handling of the Air Force Project Blue Book UFO program. This effort was supported by the House Minority Leader, Gerald Ford (R-Mich.), whose home state was the focus of many sightings.

Only witnesses connected to the Air Force project testified. Thereupon, the Secretary of the Air Force announced the formation of an outside review of Project Blue Book and an independent study of current cases. This resulted in the University of Colorado "Scientific Study of UFOs" which became known as the Condon Committee project, after the name of its director.

**April 5, 1966. House Armed Services Committee (89th Congress, 2nd Session).
Committee Print No. 55. "Unidentified Flying Objects."**

Chairman: L. Mendel Rivers (D-S.C.)

Witnesses: Harold Brown, Secretary of the Air Force.

Dr. J. Allen Hynek, Scientific Consultant to the Air Force.

Maj. Hector Quintanilla, Jr., Chief, Project Blue Book

II. The House Science and Astronautics Committee convened a second hearing two years later, during the final stages of the Condon Committee project, to review the scientific evidence for UFOs. It took the form of a scientific symposium in which six scientists testified and six others submitted prepared papers.

**July 29, 1968. House Science and Astronautics Committee (90th Congress, 2nd Session).
Committee Print No. 7. "Symposium on Unidentified Flying Objects."**

Chairman: George P. Miller (D-Calif.)

Hearing Chairman: J. Edward Roush (D-Ind.)

Witnesses: Dr. J. Allen Hynek, Head, Dept. of Astronomy, Northwestern University

Dr. James E. McDonald, Senior Physicist,

Institute of Atmospheric Physics, University of Arizona

Dr. Carl Sagan, Dept. of Astronomy, Cornell University

Dr. Robert L. Hall, Head, Dept. of Sociology,

University of Illinois-Chicago

Dr. James A. Harder, Assoc. Professor, Civil Engineering,

University of California-Berkeley

Dr. Robert M. L. Baker, Jr., Professor, Dept. of Engineering,

University of California-Los Angeles

(Submitted statements from: Dr. Donald Menzel, Harvard College Observatory; Dr. R. Leo Sprinkle, Psychology, University of Wyoming; Dr. Garry C. Henderson, Senior Research Scientist, General Dynamics; Stanton T. Friedman, Nuclear Physicist, Westinghouse Astronuclear Laboratory; Dr. Roger N. Shepard, Psychology, Stanford University; and Dr. Frank B. Salisbury, Plant Sciences, Utah State University.)

Findings of the Condon Committee:

In 1969, the Condon Committee published its findings. The project director, physicist Dr. Edward U. Condon, concluded that there was no convincing scientific evidence for UFOs and therefore recommended the termination of Project Blue Book.

However, critics of the Condon Report pointed out that up to *30% of the cases investigated by the committee had remained unexplained!* According to the critics, such as Dr. J. Allen Hynek, Dr. Condon's conclusions were politically oriented rather than scientific (i.e., the Air Force wanted Blue Book terminated and needed a good reason).

Opinions of the Scientific Symposium:

Of the six scientists who testified in the Symposium, five were of the opinion that there was a valid scientific anomaly that should be further investigated. Only Dr. Sagan, while conceding that some cases remained unexplained, was more skeptical. In fact, Dr. McDonald's thoroughly prepared paper with case histories is considered a milestone in UFO research. McDonald concluded: "My own study of the UFO problem has convinced me that we must rapidly escalate serious scientific attention to this extraordinarily intriguing puzzle."

Dr. Baker, whose testimony highlighted the unexplained nature of UFO movie films he had analyzed, recommended: "[establishment of] an interdisciplinary, mobile task force or team of highly qualified scientists...on a long-term basis, well funded, and equipped to swing into action and investigate reports on anomalistic phenomena....We must get a positive scientific program off the ground...."

Unfortunately, to date no such officially funded and open investigation has been undertaken.

Note:

In 1976, Marcia Smith, a specialist in aerospace with the Congressional Research Service, prepared a comprehensive report on UFOs entitled "The UFO Enigma." It was revised and updated by George D. Havas in 1983 into a 143-page Report No. 83-205 SPR. It contains sections on types of encounters, witness credibility, pre-1947 accounts, history of Air Force UFO investigations, international perspectives, appendices with selected case summaries, etc. "The UFO Enigma" provides a well researched and unbiased overview of the phenomenon.

**AN EXAMPLE OF AN AIR FORCE DISINFORMATION TECHNIQUE
WHEN QUESTIONED BY CONGRESS REGARDING RESULTS OF
AIR FORCE INVESTIGATIONS RE UFOs:**

In a letter to Senator Patty Murray (D-Washington), August 25, 1993, the Air Force states:

"The Air force began investigating UFOs in 1948 under a program called Project Sign. Later, the program's name was changed to Project Grudge and, in 1953, it became known as Project Blue Book. On December 17, 1969, the Secretary of the Air Force announced the termination of Project Blue Book... As a result of these investigations, studies, and experience, the conclusions of Project Blue book were: 1) no UFO reported, investigated and evaluated by the Air Force has ever given any indication of threat to our national security..."(Bolding mine.)

Compare this with the statement of General Carroll Bolender, USAF, in 1969 when recommending the closing of Project Blue Book (unclassified, but 16 attachments "could not be found"):

"Moreover, reports of unidentified flying objects which could affect national security are made in accordance with JANAP 146 or Air Force Manual 55-11, and are not part of the Blue Book system... However, as already stated, reports of UFOs which could affect national security would continue to be handled through the standard Air Force procedures designed for this purpose."

COMMENT: The Air Force statement to Senator Murray is the truth, but certainly not the whole truth. Project Blue Book did **not** handle the important material which **would** affect national security. But since the public and Congress do not know this, the impression is left that the Air Force has never discovered anything of interest or importance among its many thousands of UFO reports. The Air Force chose **not to** reveal the real results of its **classified** UFO investigations, **nor to inform** Senator Murray or other legislators of its findings.

SUMMARY OF QUOTATIONS

UFOs: THE REALITY

General Nathan D. Twining, Chairman of the Joint Chiefs of Staff (1957-1960):

"The phenomena reported is something real and not visionary or fictitious... There are objects probably approximating the shape of a disc, of such appreciable size as to appear to be as large as a man-made aircraft... The reported operating characteristics such as extreme rates of climb, maneuverability (particularly in roll), and action which must be considered evasive when sighted or contacted by friendly aircraft and radar, lend belief to the possibility that some of the objects are controlled either manually, automatically, or remotely." (Letter to the Commanding General of the U.S. Army Air Forces, September 23, 1947.)

Brigadier General João Adil Oliveira, Chief of the Air Force General Staff Information Service, and Director of the first official military UFO inquiry in Brazil in the mid-50s:

*"It is impossible to deny any more the existence of flying saucers at the present time... The flying saucer is not a ghost from another dimension or a mysterious dragon. It is a fact confirmed by material evidence. There are thousands of documents, photos, and sighting reports demonstrating its existence." ("How to doubt?," *O Globo*, Rio de Janeiro, February 28, 1958.)*

General Lionel M. Chassin, Commanding General of the French Air Forces, and General Air Defense Coordinator, Allied Air Forces, Central Europe (NATO):

*"The number of thoughtful, intelligent, educated people in full possession of their faculties who have 'seen something' and described it grows every day... We can... say categorically that mysterious objects have indeed appeared and continue to appear in the sky that surrounds us... [they] unmistakably suggest a systematic aerial exploration and cannot be the result of chance. It indicates purposive and intelligent action." (Chassin, L., Foreward to the book by Michel Aime, *Flying Saucers and the Straight Line Mystery*, New York: Criterion Books, 1958.)*

Admiral Roscoe Hillenkoetter, first Director of the CIA (1947-1950):

*"Unknown objects are operating under intelligent control... It is imperative that we learn where UFOs come from and what their purpose is." (Maccabee, Bruce, "What The Admiral Knew: UFO, MJ-12 and R. Hillenkoetter," *International UFO Reporter*, Nov./Dec., 1986.)*

UFOs: EXTRATERRESTRIAL ORIGIN

Professor Hermann Oberth, German rocket expert considered one of the three fathers of the space age. In 1955, Dr. Werner von Braun invited him to the U.S. where he worked on rockets with the Army Ballistic Missile Agency and later NASA: ➔

*"It is my thesis that flying saucers are real and that they are space ships from another solar system. I think that they possibly are manned by intelligent observers who are members of a race that may have been investigating our earth for centuries." (Oberth H., "Flying Saucers Come From A Distant World," *The American Weekly*, October 24, 1954.)*

General Kanshi Ishikawa, Chief of Staff of Japan's Air Self-Defense Force; Commander of the 2nd Air Wing, Chitose Air Base (1967):

*"Much evidence tells us UFOs have been tracked by radar; so, UFOs are real and they may come from outer space... UFO photographs and various materials show scientifically that there are more advanced people piloting the saucers and motherships." (1967 interview published in *UFO News*, Vol. 6, No. 1, 1974.)*

Gordon Cooper, Astronaut (Mercury-Atlas 9, Gemini 5), Col. USAF (Ret):

"I believe that these extra-terrestrial vehicles and their crews are visiting this planet from other planets, which obviously are a little more technically advanced than we are here on earth. I feel that we need to have a top level, coordinated program to scientifically collect and analyze data from all over the earth concerning any type of encounter, and to determine how best to interface with these visitors in a friendly fashion." (Letter to Grenada's Ambassador to the United Nations, November 9, 1978.)

Major-General Pavel Popovich, pioneer Cosmonaut and "Hero of the Soviet Union," President of All-Union Ufology Association of the Commonwealth of Independent States:

*"Today it can be stated with a high degree of confidence that observed manifestations of UFOs are no longer confined to the modern picture of the world... The historical evidence of the phenomenon... allows us to hypothesize that ever since mankind has been co-existing with this extraordinary substance, it has manifested a high level of intelligence and technology. The UFO sightings have become the constant component of human activity and require a serious global study... The scientific study of the UFO phenomenon should take place in the midst of other sciences dealing with man and the world." (Popovich, P., *MUFON 1992 International Symposium Proceedings*.)*

UFOs: SECRECY AND NATIONAL SECURITY

Wilbert Smith, Senior radio engineer, Department of Transport, Director of Project Magnet, the first Canadian government UFO investigation in the 1950s:

"The matter is the most highly classified subject in the United States Government, rating higher even than the H-bomb. Flying saucers exist. Their modus operandi is unknown but a concentrated effort is being made by a small group headed by Doctor Vannevar Bush. The entire matter is considered by the United States authorities to be of tremendous significance." (Top Secret memorandum on "Geo-Magnetics," November 21, 1950.)

Dr. Paul Santorini, Greek physicist and engineer credited with developing the proximity fuse for the Hiroshima atomic bomb, two patents for the guidance system used in the U.S. Nike missiles, and a centrimetric radar system. In 1947, he investigated a series of UFO reports over Greece that were initially thought to be Soviet missiles:

"We soon established that they were not missiles... Foreign scientists flew to Greece for secret talks with me... A world blanket of secrecy surrounded the UFO question because the authorities were unwilling to admit the existence of a force against which we had no possibility of defense." (Fowler, R., UFOs: Interplanetary Visitors, 1974.)

Senator Barry M. Goldwater, Sr., (R-Arizona), Republican presidential candidate, 1964:

"The subject of UFOs is one that has interested me for some long time. About ten or twelve years ago, I made an effort to find out what was in the building at Wright Patterson Air Force Base where the information is stored that has been collected by the Air Force, and I was understandably denied the request. It is still classified above Top Secret." (Good, T., Above Top Secret, Quill William Morrow, 1988; Frontispiece, letter to Shlomo Arnon, March 28, 1975.)

Representative Steven H. Schiff, (R-New Mexico), in response to inquiries in 1993 concerning a possible cover-up of the crash of an alleged UFO outside Roswell, NM in 1947, requested information from the Department of Defense:

"It's difficult for me to understand, even if there was a legitimate security concern in 1947, that it would be a present security concern these many years later. Frankly I am baffled by the lack of responsiveness on the part of the Defense Dept. on this one issue, I simply can't explain it." (Remarks on CBS radio's The Gil Gross Show, February 1994.)

UFOs: CHALLENGE FOR TODAY'S SCIENCE

Dr. J. Allen Hynek, Chairman of the Department of Astronomy at Northwestern University and scientific consultant to the U.S. Air Force investigations of UFOs from 1948 until 1969 (Projects Sign, Grudge and Blue Book):

*"There exists a phenomenon... that is worthy of systematic rigorous study... The body of data point to an aspect or domain of the natural world not yet explored by science... When the long awaited solution to the UFO problem comes, I believe that it will prove to be not merely the next small step in the march of science but a mighty and totally unexpected quantum jump." (Hynek, J. Allen, *The UFO Experience: A Scientific Inquiry*, Chicago: Regnery Co., 1972.)*

Dr. Felix Y. Zigel, Professor of mathematics and astronomy at the Moscow Aviation Institute, father of Russian Ufology:

*"The important thing now is for us to discard any preconceived notions about UFOs and to organize on a global scale a calm, sensation-free and strictly scientific study of this strange phenomenon. The subject and aims of the investigation are so serious that they justify all efforts. It goes without saying that international cooperation is vital." (Zigel, F., "Unidentified Flying Objects," *Soviet Life*, No. 2 (137), February 1968.)*

M. Robert Galley, French Minister of Defense (1974):

*"I believe that the attitude of spirit that we must adopt vis-a-vis this phenomena is an open one, that is to say that it doesn't consist in denying a priori, as our ancestors of previous centuries did deny many things that seem nowadays perfectly elementary." (Bourret, Jean-Claude, *La nouvelle vague des soucoups volantes*, Paris: editions france-empire, 1975.)*

Dr. Peter A. Sturrock, Professor of Space Science and Astrophysics and Deputy Director of the Center for Space Sciences and Astrophysics at Stanford University:

*"The definitive resolution of the UFO enigma will not come about unless and until the problem is subjected to open and extensive scientific study by the normal procedures of established science. This requires a change in attitude primarily on the part of scientists and administrators in universities." (Sturrock, Peter A., *Report on a Survey of the American Astronomical Society concerning the UFO Phenomenon*, Stanford University Report SUIPR 68IR, 1977.)*

UFOs: THE EFFECT OF RIDICULE

Admiral Roscoe Hillenkoetter (see above):

"It is time for the truth to be brought out in open Congressional hearings. Behind the scenes high ranking Air Force officers are soberly concerned about the UFOs. But through official secrecy and ridicule, many citizens are led to believe the unknown flying objects are nonsense." (Statement in a NICAP news release, February 27, 1960.)

Dr. Frank B. Salisbury, Professor of Plant Physiology at Utah State University:

"I must admit that any favorable mention of the flying saucers by a scientist amounts to extreme heresy and places the one making the statement in danger of excommunication by the scientific theocracy. Nevertheless, in recent years I have investigated the story of the unidentified flying object (UFO), and I am no longer able to dismiss the idea lightly." (Paper on "Exobiology" presented at the First Annual Rocky Mountain Bioengineering Symposium, May 1964. Quoted in Fuller, John G., Incident at Exeter, Putnam, 1966.)

Representative Jerry L. Pettis, (R-California), stated in 1968 during the House Committee on Science and Astronautics UFO hearings:

"Having spent a great deal of my life in the air, as a pilot... I know that many pilots... have seen phenomena that they could not explain. These men, most of whom have talked to me, have been very reticent to talk about this publicly, because of the ridicule that they were afraid would be heaped upon them... However, there is a phenomena here that isn't explained." (U.S. House of Representatives, Ninetieth Congress, July 1968.)

Dr. Peter A. Sturrock (see above):

"In their public statements (but not necessarily in their private statements), scientists express a generally negative attitude towards the UFO problem, and it is interesting to try to understand this attitude. Most scientists have never had the occasion to confront evidence concerning the UFO phenomenon. To a scientist, the main source of hard information (other than his own experiments' observations) is provided by the scientific journals. With rare exceptions, scientific journals do not publish reports of UFO observations. The decision not to publish is made by the editor acting on the advice of reviewers. This process is self-reinforcing: the apparent lack of data confirms the view that there is nothing to the UFO phenomenon, and this view works against the presentation of relevant data." (Sturrock, Peter A., Journal of Scientific Exploration, Vol. 1, No. 1, 1987.)

**Dole Drops,
Clinton Rises**

IS ANYBODY OUT THERE?

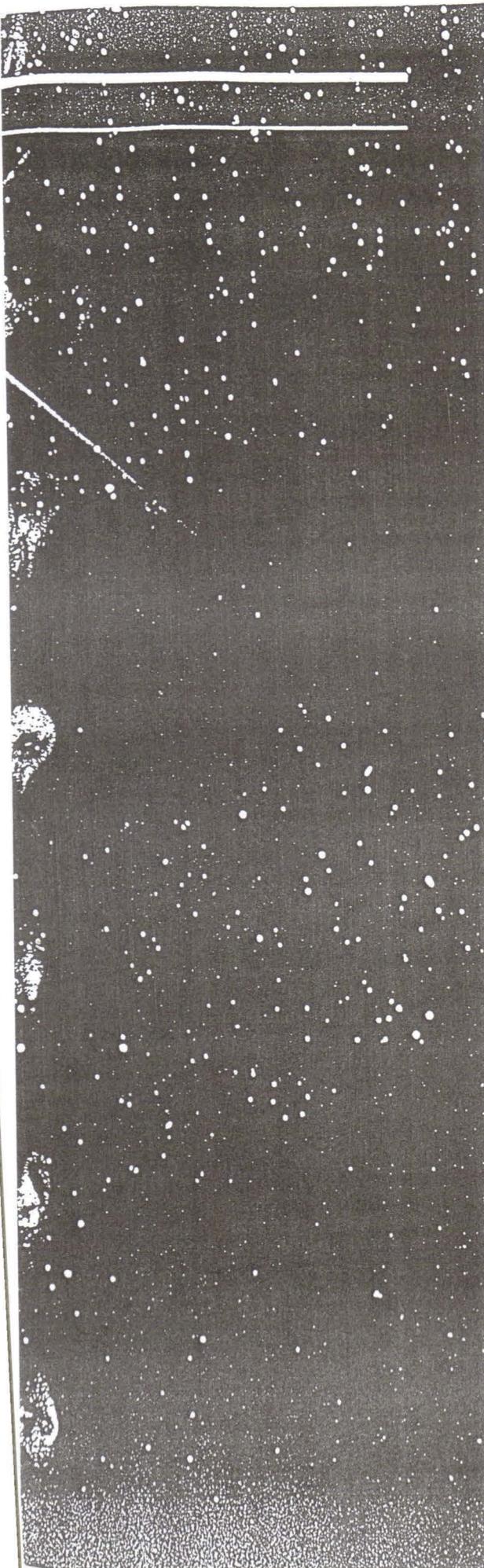
How the discovery of two planets
brings us closer to solving the
most profound mystery in the cosmos.

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S P A C E

**IS
THERE
LIFE
IN
OUTER
SPACE?**





The objective scientist and the tabloid mystic collaborate in our fascination with extraterrestrial life

By LANCE MORROW

WRITING HIS *NATURAL HISTORY* IN THE FIRST CENTURY A.D., Pliny the Elder reported that when water rises into the atmosphere to form rain clouds, it sucks up with it shoals of fish and sometimes quantities of stones. Fish and stones hover above us in the sky. Elsewhere, Pliny offered an item about a woman who gave birth to an elephant. He was, occasionally, a supermarket-tabloid sort of Roman.

A Pliny pattern persists. The scientific side of the observer's mind demands objective evidence, as the great naturalist usually did; but the brain's mythopoeic, magic-thinking side is lured to marvels—to alchemy, to spells, to bat people on the moon or aliens on other planets. Can these matters be addressed with a whole mind? Can the two instincts of the brain—Einstein and Elvis-sighting—be made to fit together like compatible spoons?

Extraterrestrials? The physicist Enrico Fermi rejected the possibility. "Where are they?" he demanded. They would have shown up by now.

But science today is offering an elaborately conditioned answer about where extraterrestrial life might possibly be. Two American astronomers have found a planet or two outside our solar system whereon conditions exist (liquid water the temperature of hot tea, for example) that may be hospitable to life.

Why are human beings fascinated by alien life? The primary answer (human curiosity in the face of mystery) is obvious enough. "All men by nature desire knowledge," Aristotle said.

Speculation titillates the mind but usually ends by subtly demeaning the human place in the cosmic scheme. The Earth that the ancients took to be the center of the drama becomes ever more marginal, a receding speck. Astronomers' searches tend to assume that the aliens would be superior to earthlings, perhaps evolved beyond Earth's ability to comprehend them.

The Earth constricts. We imagine ourselves to be prisoners in solitary confinement, tapping crude coded messages on the dungeon wall and hoping for an answering tap—without which we stare at the queasy possibility that we are truly, absolutely alone. Such an abyss 1) may be infinitely more depressing than the assumption of human inferiority or 2) may argue, conversely, for the divine uniqueness and therefore preciousness of the human enterprise. An agnostic will split the difference and think of Voltaire: "Remember your dignity as a man."

The fascination with extraterrestrials may reflect an exhaustion of the secrets and novelties of Earth and of earthly behavior, which, on the whole, we have come to think, is nothing to write home about. We know one another too well. Perhaps a master system of intergalactic ethics dictates that no planet may have contact with another until it has subdued its own self-destructive violence. Maybe the Earth is under a sort of quarantine.

If that should prove to be true, the actual encounter with alien life might mark a higher stage in earthly progress, a liberation. Then theology, history, astronomy—all the strands of human thought and striving—would converge in a fusing shock of understanding that would also be a planetary self-transcendence.

Until then, however, it will go on raining mackerel and speckled trout and stones upon the human mind. ■

BIRTH OF A PLANET: A desire to know, to connect, to transcend

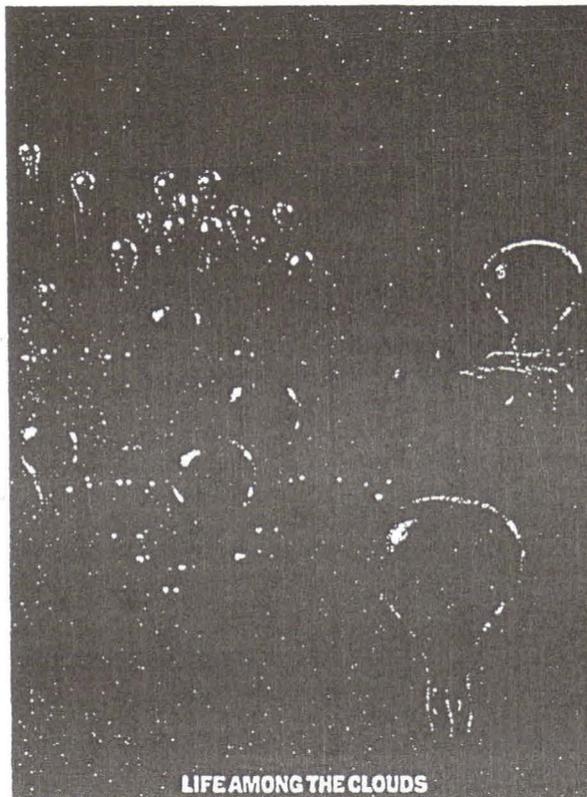
Astronomers have detected water-bearing planets around nearby stars. Now they're focused on a deeper mystery: Where are the friendly, Earthlike worlds?

By MICHAEL D. LEMONICK

IT'S HARD TO IMAGINE TWO more undesirable pieces of extraterrestrial real estate. The first, a planet orbiting a star known as 47 Ursae Majoris, 200 trillion miles from Earth in the Big Dipper, is about twice the size of Jupiter. Like our own largest planet, it probably consists mostly of such noxious gases as hydrogen sulfide, ammonia and methane. Fierce jet streams blow unceasingly at hundreds of miles per hour, sometimes spiraling into mammoth hurricanes that last for centuries and are big enough to swallow the Earth. And if this harsh world has any solid surface at all, it's buried under an atmosphere thousands of miles deep, crushed by pressures a thousandfold greater than those at the bottom of the deepest terrestrial sea. A second planet, circling the star 70 Virginis, in the constellation Virgo, is probably even less inviting: because it has more than six times the mass of Jupiter, weather conditions there could be even more extreme.

Yet inhospitable as both these worlds seem, their discovery, announced two weeks ago by San Francisco State University astronomers Geoffrey Marcy and Paul Butler, has thrown an almost wholly speculative area of study solidly into the realm of tangible fact. Despite years of searching with the most powerful telescopes, despite decades of listening for the faint crackle of radio signals from distant civilizations, despite endless theorizing about how life might or might not arise, nobody had ever found concrete evidence to suggest that our planet, our civilization, our life-forms were anything but unique in the cosmos.

Now, suddenly, everything has changed. Not only do these still unnamed planets triple the number of worlds known to orbit stars like the sun—the only other example having been found just four months ago—but they have an even more profound significance. Both of them are temperate enough to allow water to exist in liquid form. And whatever else is necessary for life as we know it, say biologists, liquid water is an absolute prerequisite.



LIFE AMONG THE CLOUDS

The worlds found by Marcy and Butler, left, are probably habitable only high in their atmospheres, where water can exist in liquid form. But nature is infinitely creative: above, an artist's rendering of creatures that might evolve on such planets

It isn't that life necessarily exists on either of the new planets. The question is impossible to settle with today's technology, and if organisms do inhabit these distant worlds they would be a bizarre sort of life, proceeding from birth to death, generation after generation, without ever touching solid ground.

Even if the new planets are sterile, though, their very existence is a powerful piece of astronomical news. If our solar system is any indication, giant, unpleasant planets are likely to be accompanied by small, friendly ones. Giant planets also tend to be attended by giant moons, small worlds in their own right, and these too could be hospitable to life. Perhaps most important, the discovery of planets around three relatively nearby sunlike stars implies that the Milky Way, 100 billion stars strong, must be bursting with other worlds. Unless the chances are literally 100 billion to one against the emergence of life—and recent advances in biology suggest that the

chances are considerably better—there is life out there, somewhere.

If so, it may not be long before we find out. Energized by the latest discoveries, astronomers are racing back to their telescopes for more observations and to their computers to analyze years' worth of data still sitting in their disk drives. Everyone wants to be the next to find a distant world. The scientists are eagerly awaiting the results from the Infrared Space Observatory (ISO), a newly orbiting European satellite that can detect the faint heat from distant planets. They're looking forward to the 1997 installation of a new infrared camera on the Hubble Space Telescope, which could take a picture of at least one of the newly discovered worlds.

Most promising of all, they're buoyed by a newly unveiled NASA initiative, known as the Origins project, that will build a generation of space telescopes to search for new worlds. Says NASA administrator Daniel Goldin: "We are restructuring the agency to focus on our customer, the American people." And the public excitement about this field, he says, "is beyond belief."

It shouldn't be. Man's fascination with other worlds is as old as Western civilization. Galileo's discovery that they actually existed—that at least some of the pinpoints of light that wandered throughout the night sky had mountains and moons—set off a centuries-long quest to discover new planets. The first great success came in 1781, when William Herschel found Uranus. Then came the discovery of Neptune by Johann Galle in 1846. Eventually, the notion of otherworldly life made the transition out of the pages of philosophy and fiction: in 1894, the wealthy astronomer Percival Lowell built his own observatory in Arizona to try to detect the life he believed existed on Mars. He never found it, but in 1930 Clyde Tombaugh, then an assistant at Lowell Observatory and now a professor emeritus at New Mexico State University, found Pluto. It was the last planet that would be discovered until the 1990s.

Not that astronomers ever stopped looking—at first, within the solar system, for the mysterious Planet X (now considered very unlikely to exist), and then, as

DAVID HARDY—SP/PHOTO RESEARCHERS

powerful instruments like the 200-in. Hale telescope came online, around other stars as well. But picking out a planet against the glare of a star is like trying to spot a 100-watt light bulb next to a 100-billion-watt searchlight. Astronomers find it much easier to look for the subtle influence a planet might have on its parent star.

An orbiting world's gravity should, for example, tug faintly on the star that is its sun, pulling it first this way, then that. If the plane of the planet's orbit is such that a star is being pulled first toward and then away from the Earth, the motion will cause light waves coming from the star to be squeezed together, then stretched apart—making the light look first a little bit bluer than it really is, then a little bit redder, then bluer again, and so on. These subtle color changes—examples of the so-called Doppler shift—can be precisely measured, and the magnitude of the wobble pinned down, with a device called a spectrometer.

While some astronomers searched for planets, others tried to detect intelligent alien life directly. In 1960, astronomer Frank Drake started Project Ozma, an attempt to look seriously for radio signals

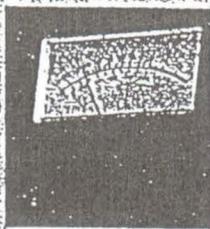
from alien civilizations. It was the first in what became a series of experiments in SETI, the Search for Extra-Terrestrial Intelligence. Several are still going on, but so far without success.

The race to discover planets around sunlike stars proved similarly fruitless until about 18 months ago. At the time, Marcy and Butler were sure they had the inside track on finding them. The telescope they use, at Lick Observatory in the mountains above California's Silicon Valley, has an excellent view of the heavens. It also has one of the world's finest spectrometers. After a major refurbishment in November 1994, the device was even better. In principle, says Marcy, "we could detect not just Jupiters but Saturns."

In principle, maybe, but in practice there are dozens of factors that can confuse matters. For example, stars, including the sun, pulse rhythmically with waves generated deep in their interi-

ors, making the surface bulge toward the Earth just as the whole star were wobbling. Stars also have huge blotches—sunspots in essence—that change the mix of colors as they rotate into and out of view. And spectrometers are subject to all sorts of problems that come from changes in temperature and electronic glitches. Thus, Marcy and Butler had to run their observations through a sophisticated computer program they'd written to sort useful information from useless information—a piece of software so complex and so demanding of computer time that their colleagues kidded that it would never work.

LISTENING FOR ALIENS



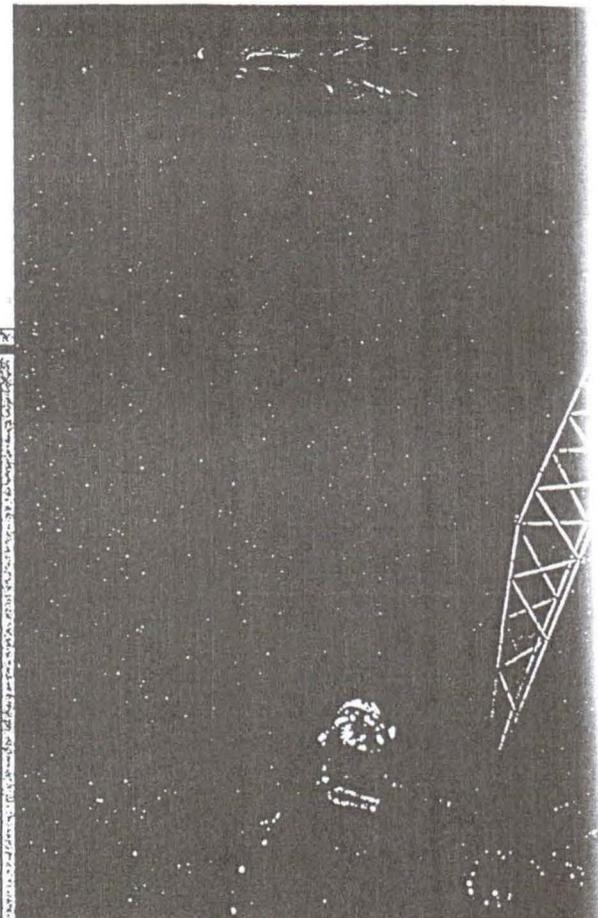
Sounds from space make gauges flutter

IF E.T. IS OUT THERE TRYING TO GET IN touch with us, his message may well be received first in a quiet rural setting 30 miles northwest of Boston. There, atop a hill overlooking a snow-covered apple orchard and the frozen remnants of a pumpkin patch, a dish-shaped antenna 84 ft. across faces skyward, attuned to the murmurings of the cosmos.

That antenna is a Harvard-Smithsonian radio telescope, the Broddingnagian ear of the newly dedicated project BETA, the latest and most ambitious effort yet in the Search for Extra-Terrestrial Intelligence (SETI). The search has been doggedly conducted over 30 decades by small bands of devoted scientists around the world. It's a quest not only for life beyond the Earth but for life intelligent and capable enough to transmit meaningful radio signals across vast stretches of empty space.

Inside BETA's one-story control room, a workstation displays patterns of green and red spikes; lights blink on a bank of small computers; and needles flutter on glowing dials. From a stereo amplifier comes a static-filled hiss, the audio version of radio waves piped directly from the antenna above. The display amuses graduate student Darren Leigh, hard at work debugging a BETA computer program. "We do a few things here for the tourists," he explains. "Camera crews love this stuff."

Indeed, most of that light and sound show is superfluous because BETA is, with good reason, an almost entirely automated experiment. Otherwise, as BETA director and Harvard physicist



Collect calls: Ready to receive extraterrestrial signals

Paul Horowitz puts it, "what do you do when something comes in the middle of the night and there's no one here to listen?" Each day, as the Earth turns, the BETA (for Billion-character Extra-Terrestrial Assay) telescope sweeps a circular swath through the heavens, elevated at a slightly different fixed angle from the horizon with each successive turn. During each circuit it captures radio waves reaching Earth at frequencies between 1400 and 1720 megahertz—a broad but relatively quiet region of the radio spectrum. "In the 1960s we were looking in a few niches and hoping the extraterrestrials had put their feet there," says astronomer Frank Drake, who launched the

They were wrong. As it happened, Butler was in the middle of rewriting the software last October to accommodate the spectrometer's newly heightened sensitivity when a disconcerting flood of E-mail started pouring in. Michel Mayor and Didier Queloz, of the Geneva Observatory in Switzerland, had just detected a planet circling the star 51 Pegasi, lying 45 light-years away in the constellation Pegasus. Says Queloz: "We first thought that our instrument was faulty, but repeated verifications and computations finally convinced us that we had bagged a planet."

More than one astronomical discovery has disappeared on a closer look, though, so

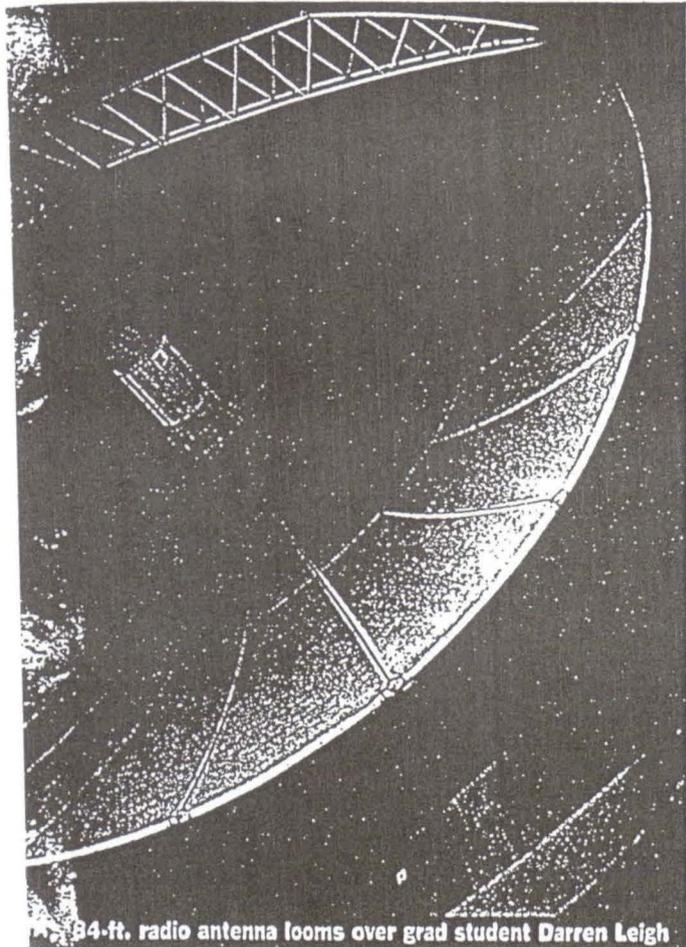
Marcy and Butler headed for the telescope, determined either to debunk or verify the Swiss team's claims. Sure enough, says Marcy, after four nights at Lick and many hours of computer time, "everything they'd said about the planet was confirmed." (Butler and Marcy did, however, show that hints the Swiss team had found a second planet around the same star were mistaken.)

The object turned out to be peculiar. It's half as massive as Jupiter, but orbiting closer to 51 Pegasi than Mercury is to the sun. That means its surface temperature is 1300°C, hotter than a blast furnace. Still, it is a planet. "I was a little schizophrenic about it," says Marcy. "On the one hand, we had been scooped. But I also felt euphoric that humanity had entered a new era in which new worlds were going to be subject to exploration."

Marcy didn't rest on his euphoria. He and Butler went into high gear, determined

to be at least the second team to find planets around a sunlike star. They begged telescope time from their colleagues and borrowed more than \$100,000 worth of computer equipment to crunch gigabytes' worth of data from observations stretching back over eight years. "We knew," says Butler, "that we could get scooped again and again by the Swiss team."

After two months, they had analyzed 60 of the 120 stars in their survey. On the morning of Dec. 30, Butler went to the office to check on the computer's progress. "When I saw the data come up, I was completely blown away," he says. It was the telltale signature of the object orbiting around 70 Virginis. Recalls Butler: "It knocked me off the chair." His colleagues at the American Astronomical Society's winter meeting in San Antonio, Texas, where Marcy and Butler announced their findings two weeks ago, were no less excited. "What we are seeing," said Robert Brown, an astronomer with the Space Telescope Science Institute, after Marcy sat down, "is the culmination of intellectual history that began with Copernicus 500 years ago."



34-ft. radio antenna looms over grad student Darren Leigh

SETI project in 1960. They didn't. Now we are doing it right. Every two seconds, BETA captures enough data to fill a CD-ROM, which adds up to roughly 22 million megabytes of data per day—an overwhelming volume far beyond human capacity to comprehend and evaluate. For that reason, the incoming radio waves are digitized and read into a custom-made, homegrown supercomputer, designed and assembled by Horowitz and his students, that sorts through the input and discards cosmic radio "noise."

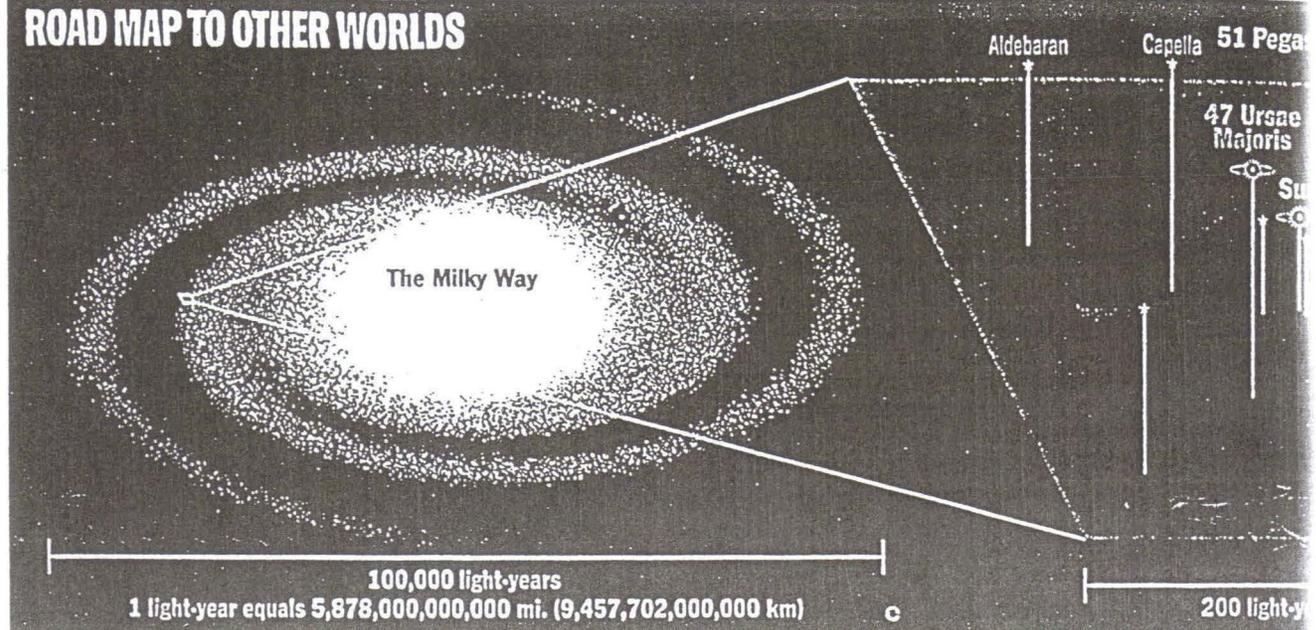
Should BETA spot a signal that seems to meet the programmed criteria for artificiality, the radio telescope would

abandon its fixed position and automatically leapfrog farther west so that the same sector of sky would pass before it again. If the suspect signal should then reappear in the same location, Leigh says, alarms won't go off, but the computer will send his e-mail. And unlike earlier SETI programs, which sometimes signaled "hits" that after much excitement and analysis turned out to be beeps from prosaic Earthbound orbiting electronic sources, BETA methodically compares signals from space to signals from the horizon, so it can better differentiate between Earth's transmissions and our own.

Since 1993, when NASA's own ambitious SETI program was eliminated by Congress, the search has been carried out largely by two groups: the privately financed SETI Institute in Mountain View, California, headed by Frank Drake, and the Planetary Society, which is supported through donations from members and other space enthusiasts. After a conversation with Carl Sagan, head of the Society, Steven Spielberg kicked in \$100,000 to build one of physicist Horowitz's earlier projects. BETA has also received grants from the Josack Kruger Foundation and generous contributions of silicon chips and processors from such companies as Micron Technologies and Intel. Essentially, says Leigh, the computers were free. We just had to build them. We had an army of undergrads soldering everything by hand.

Horowitz shares that kind of dedication to SETI, convinced that E.T. is there for the finding. "I have no doubts," he says, "that intelligent life in the universe. Guaranteed. Intelligent life in our galaxy. So overwhelmingly likely that I'd give you almost any odds you'd like." Still, Horowitz is realistic. The hard part is the last step, which is intelligent life in the galaxy transmitting radio waves to us at a wavelength that we're expecting and at a power level such that we can detect them. That, he concedes, is a lot of ifs. *By Leon Jaroff. Reported by David Bjorkle/Harvard*

ROAD MAP TO OTHER WORLDS



It is also a beginning of sorts. Faced with the existence of these planets, astronomers must now revise their theories to fit the new facts. To begin with, theorists have to scramble to explain how the 51. Pegasi planet could have formed and survived intact so close to its parent star. The planet around 70 Virginis is also problematic: its orbit is egg-shaped rather than circular, which suggests to some astronomers that it formed more like a star than like a planet. Indeed, many experts think it is technically a brown dwarf—a star that never got big enough to ignite—rather than a planet. Only the third object matches what astronomers expected. Says Brown cautiously: “I can’t say for certain that it is a planet. But so far, it looks like a planet, it walks like a planet, it quacks like one.”

What the data may be saying is simply that the dividing line between stars and planets may be less distinct than astronomers had believed. “Everything found so far poses challenging questions for planetary formation theory,” says astronomer Robert Stefanik, of the Harvard-Smithsonian Center for Astrophysics. That was underscored last week when, after weeks of government shutdown, results were released from a NASA experiment much closer to home. The probe’s plunge from the Galileo spacecraft into Jupiter’s atmosphere showed that the planet has higher winds, less lightning, less water, helium and neon, and—at the point of impact at least—fewer clouds than the experts had been expecting.

More surprises are almost certain to follow if astronomers find more and more planets circling other stars. But while finding new planets of any sort is terrifically

exciting, says Alan Boss, an astronomer at the Carnegie Institution of Washington, “the Holy Grail is to find an extrasolar planet that is capable of supporting life.”

THAT IS EXACTLY WHAT DANIEL Goldin has challenged NASA to do in the Origins program: locate and even photograph Earthlike planets outside our solar system. The initiative is headed by Edward Weiler, an agency veteran who also serves as chief scientist for the Hubble telescope. “That’s a pretty lofty goal,” says Weiler of Goldin’s challenge. “You’re talking about objects that are millions to billions of times fainter than the stars around which they’re revolving.” The only way to do it, he and other astronomers agree, would be to use a space telescope with a mirror as wide as a football field is long.

Such a gigantic scope is utterly beyond current technology, and beyond anything engineers can imagine for the next century as well. But astronomers know they can simulate a huge telescope by orbiting several smaller ones, widely separated, and combining their light electronically. This multimirror device is known as an interferometer, because rather than gathering light directly, it measures interference patterns created when light waves from several mirrors overlap each other.

Unlike traditional NASA projects, which tend to be expensive and complex, this one is relatively modest. “We really don’t want to start out building the Battlestar Galactica,” says Weiler. Instead he will start with a demonstration model by the turn of the

century, a device consisting of four to mirrors a foot or two across. Even at that size, the interim interferometer should be able to spot objects the size of Neptune around nearby stars.

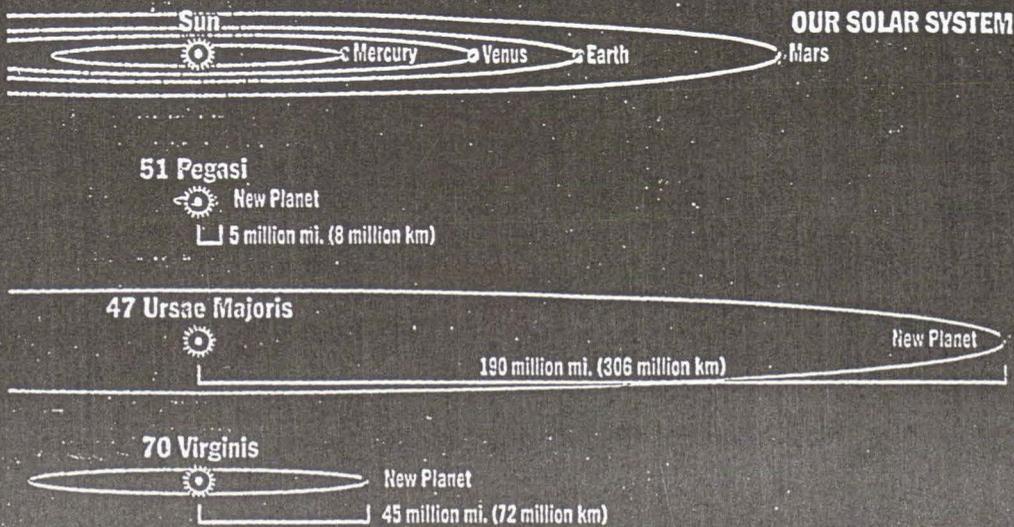
Finally, by about 2010, NASA hopes to launch what it calls the Planet Finder: an interferometer with five 3-ft.-to-6-ft. mirrors spread over 300 ft., orbiting out by Jupiter where the solar-system dust begins to clear out. The Planet Finder should allow scientists to identify Earthlike planets, which should show up as pale blue dots in images beamed back to ground controllers, and analyze their atmosphere for signatures of life like ozone, oxygen or carbon dioxide.

That is not ambitious enough for Goldin, though. He wants engineers to create a device so powerful that it could take pictures of Earthlike planets in such detail that we might see clouds, continents and oceans. “That’s mighty tough,” cautions Weiler, careful to say Goldin’s vision is impossible. “It sounds way out, but when Kennedy said, ‘We’re going to be on the Moon in nine years,’ a lot of people thought that was way out. On the other hand,” he adds wistfully, “they got \$25 billion.”

Origins will receive nothing close to that. Goldin expects his scientists and engineers to do it for several hundred million dollars, drawing from existing programs and saving money by technological innovations as yet unspecified. And if his ambitious goals are not met, will he consider Origins a failure? “No!” Goldin faintly shouts. “I’m trying to say, let’s expand our minds and let’s see if we can answer some basic questions. It may be there’s not a terrestrial-size planet out there.”

Locations of the newly discovered worlds in relation to the Sun and other nearby stars

How the new solar systems compare with the old



One point in his favor: by keeping the budget low, proceeding in small steps and refusing to make firm promises about what the program will produce, Goldin may be improving his chances of keeping Congress on his side. Boss, for one, thinks Origins will endure even after Goldin is gone. "The momentum is building," he says. "The scientific imperative is there."

Despite Goldin's caution about assuming the existence of Earthlike planets, few astronomers doubt they are out there. If other solar systems do contain Earthlike worlds, says NASA exobiologist Michael Meyer, at least some should fall into the "habitable zone"—the region, governed by a planet's distance from its star, where water is liquid rather than solid or gaseous. "The good news," he says, "is that if our solar system is typical, there's a 50% chance that a planet will be in the right zone."

That is crucial, observes David Des Marais, a NASA biogeochemist. Liquid water is an ideal medium in which carbon-based organic chemicals can dissolve and react with one another in myriad ways. Why carbon, necessarily? Because, says Des Marais, "it is such a versatile chemical. It makes so many different and complex compounds. And it's the fourth most abundant element in the universe." Carbon compounds literally litter the cosmos, drifting through interstellar space in giant molecular clouds and making up a significant percentage, by mass, of comets and asteroids. Some scientists are convinced that the basic building blocks of life fell to Earth from space and that the same could easily happen anywhere.

Whether life would inevitably arise

from those building blocks is still an open question. With only one example, it is impossible to say whether life on Earth was a fluke or a foregone conclusion. But most biologists cautiously lean toward the latter. Life on this planet emerged surprisingly quickly—as early as a few hundred million years after Earth formed. At the time, the planet was intensely volcanic, with the occasional leftover asteroid screaming in every few million years—yet primitive life forms persisted and flourished.

Until a few years ago, biologists were at a loss to understand how life could have arisen under such conditions. But laboratory experiments have convinced them that self-replicating molecules are relatively easy to assemble. And the discovery of hot-water volcanic vents deep in the ocean, surrounded by rich ecosystems of exotic life, implies that a hot, young, volcanic planet might in fact be an ideal incubator.

That suggests, though it does not prove, that biology will take hold if it possibly can, even under hostile conditions. In fact, biologists have not quite given up on our own solar system yet. They think Mars may have had a brief fling with one-cell life that could have left fossil evidence behind. Some even hold out the hope that microorganisms are still surviving somewhere under the Martian surface. Attention is also turning to Europa, one of Jupiter's moons; its icy white surface could conceal oceans of liquid water, and perhaps some sorts of living organism. Both possibilities are likely targets of future NASA investigation.

Alien life of any sort would make biologists ecstatic, of course, but it is the prospect of intelligent life that fires most

people's imagination. "That final step from life to intelligent life is probably the longest shot of all," observes Des Marais. Even so, the small band of astronomers devoted to the search for broadcasts from high-tech extraterrestrials is encouraged: their 35-year quest has always rested on the assumption that planets exist outside Earth's solar system, and the fact that they have been proved right makes the search seem considerably less quixotic.

The astronomers who are looking for planets, meanwhile, are sounding downright cocky. Butler says that he and Marcy are "close, real close" to finishing the analysis of their remaining 60 stars and that they would not be surprised to find two or more additional planets popping out of the data—perhaps in a matter of weeks. The pair will soon be heading for the Keck Telescope in Hawaii, the world's largest, to continue the search with even more powerful equipment. Mayor and Queloz, meanwhile, are back at their telescope in Europe. At the same time, dozens of other groups, using instruments ranging from the high-flying Hubble to relatively small scopes, are stepping up their activities. Predicts Marcy: "We are going to find, between us and the Swiss, 10 more planets in the next two years." Concurs Butler: "Very shortly, there could be more planets known outside the solar system than inside." Whether or not they are right, the human race has already moved closer to answering the most enduring question about its true place in the cosmos.

—Reported by Hannah Bloch/
Washington and Sybester Monroe/San Francisco,
with other bureaus

THE HARMONY OF THE SPHERES

If we discover extraterrestrial life, our world will never seem quite the same

By PAUL DAVIES

THE DISCOVERY OF LIFE BEYOND EARTH WOULD TRANSFORM not only our science but also our religions, our belief systems and our entire world view. For in a sense, the search for extraterrestrial life is really a search for ourselves—who we are and what our place is in the grand sweep of the cosmos.

Contrary to popular belief, speculation that we are not alone in the universe is as old as philosophy itself. The essential steps in the reasoning were based on the atomic theory of the ancient Greek philosopher Democritus. First, the laws of nature are universal. Second, there is nothing special or privileged about Earth. Finally, if something is possible, nature tends to make it happen.

Philosophy is one thing, filling in the physical details is another. Although astronomers increasingly suspect that bio-friendly planets may be abundant in the universe, the chemical steps leading to life remain largely mysterious.

Traditionally, biologists believed that life is a freak—the result of a zillion-to-one accidental concatenation of molecules. It follows that the likelihood of its happening again elsewhere in the cosmos is infinitesimal. This viewpoint derives from the second law of thermodynamics, which predicts that the universe is dying—slowly and inexorably degenerating toward a state of total chaos. Life bucks this trend only because it is a statistical fluke.

Similar reasoning applies to evolution. According to the orthodox view, Darwinian selection is utterly blind. Any impression that the transition from microbes to man represents progress is pure chauvinism on our part. The path of evolution is merely a random walk through the realm of possibilities.

If this is right, there can be no directionality, no innate drive forward; in particular, no push toward consciousness and intelligence. Should Earth be struck by an asteroid, destroying all higher life-forms, intelligent beings, still less humanoids, would almost certainly not arise next time around.

There is, however, a contrary view—one that is gaining strength and directly challenges orthodox biology. It is that complexity can emerge spontaneously through a process of self-organization. If matter and energy have an inbuilt tendency to amplify and channel organized complexity, the odds against the formation of life and the subsequent evolution of intelligence could be drastically shortened.

The relevance of self-organization to biology remains hotly debated. It suggests, however, that although the universe as a whole

may be dying, an opposite, progressive trend may also exist as a fundamental property of nature. The emergence of extraterrestrially intelligent life, is a key test for these rival paradigms.

These issues cut right across traditional religious dogmas. People cling to the belief that the origin of life required a unique divine act. But if life on Earth is not unique, the case for a miracle origin would be undermined. The discovery of even a simple

able bacterium on Mars, if it could be shown to have arisen independently from Earth life, would support the view that life emerges naturally.

Historically, the Roman Catholic Church regarded any discussion of the origin of life as heresy. Speculating about life on other inhabited worlds was one of the charges against philosopher Giordano Bruno, who was burned at the stake in 1600. The belief that mankind has a special relationship with God is central to all monotheistic religions. The discovery of the existence of alien beings, especially if they were further advanced than humans intellectually and spiritually, would disrupt this cozy view.

Christianity faces a peculiar dilemma in relation to the Incarnation. This event unique in the universe is central to the official doctrine, which insists, or did God create life on alien flesh too? Is Christ the Savior of humans alone, or of all intelligent beings in the galaxy and beyond?

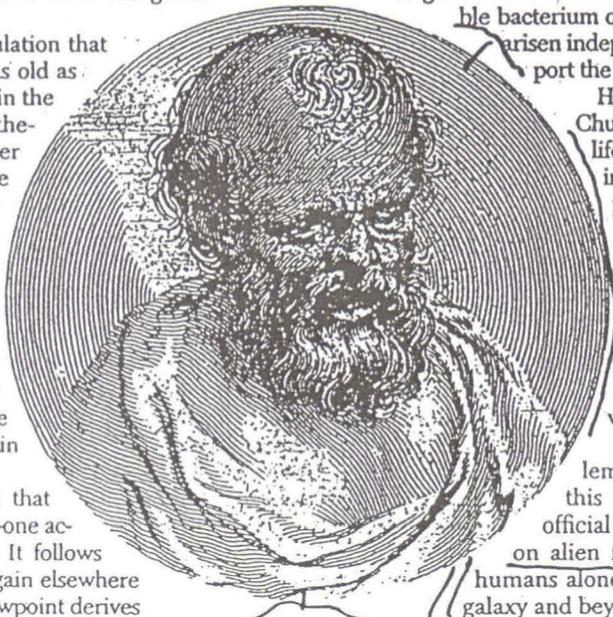
Weighed against these threatening facts is the uplifting picture of the universe that the existence of life and consciousness implies. A cosmos that starts out in a sterile Big Bang and gradually progresses through complex chemistry to life, intelligence and culture—and sentient beings who look back and reflect on the meaning of it all—is profoundly inspiring. The fact that this advance can take place entirely naturally, without divine intervention, adds to the wonder.

Bertrand Russell argued that a universe under a death sentence from the second law of thermodynamics rendered human life ultimately futile. Our achievements, all our struggles, “all the noon-brightness of human genius,” as he put it, would be the final analysis, count for nothing if the very cosmos

itself is doomed.

Russell's despairing tone is frequently echoed by contemporary thinkers. Thus the French Nobel-prizewinning biologist Jacques Monod writes, “Man at last knows that he is alone in an unfeeling immensity of the universe, out of which he has emerged only by chance.”

But what if, in spite of the second law of thermodynamics, there can be systematic progress alongside decay? For those who hope for a deeper meaning or purpose beneath physical existence, the presence of extraterrestrial life-forms would provide a spectacular boost, implying that we live in a universe that is in some sense getting better and better rather than worse and worse.



DEMOCRITUS

Contrary to popular belief, speculation that we are not alone in the universe is as old as philosophy itself

Paul Davies is a professor of natural history at the University of Adelaide, Australia, and the author of more than 20 books, including: The Mind of God (Simon & Schuster, 1992) and, most recently, Are We Alone? (Basic Books, 1995).