The World on a Record

The two Voyager spacecraft will head for the stars bearing a message of the earth, its life and its civilizations

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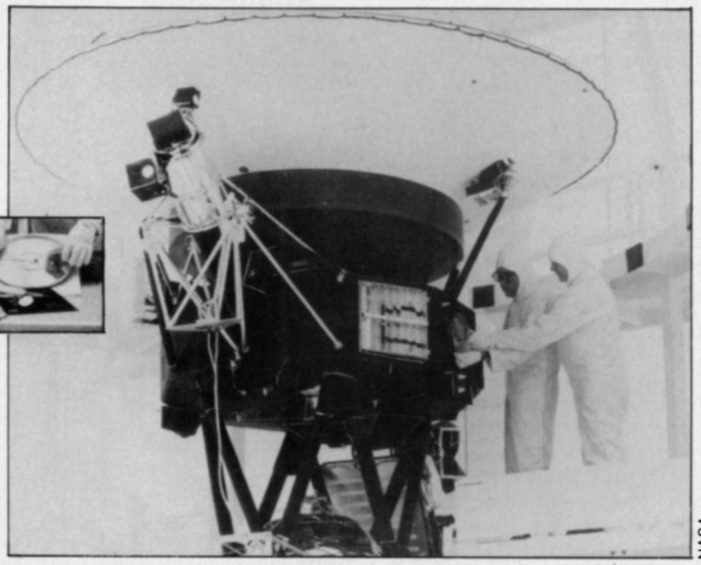

NASA

The Voyager 2 spacecraft becomes a mail truck as technicians deposit an audio-visual recording (inset) bound for possible recipients far outside the solar system. An identical message rides with Voyager 1.

Describe the world. Not just that multicolored ball in the spacecraft photos, but the *world*—its place in space, its diverse biota, its wide-ranging cultures with their lifestyles, arts and technologies—everything, or at least enough to get the idea across. And do it on one long-playing record.

Oh, there's one stipulation: Assume not only that your audience doesn't speak your language, but that it has never even heard of the earth or the rest of the solar system. An audience that lives, say, on a planet orbiting another star, light-years away from anything you would recognize as home.

This fascinating challenge was taken up this year by a group of friends and associates with just such an extraterrestrial audience in mind. Their inducement was the chance to have their message actually delivered, or at least tossed into space like a message in a bottle in a cosmic ocean.

The means of delivery was also the impetus for devising the message: the two Voyager spacecraft, bound for encounters with Jupiter and Saturn and their many moons, with the possibility that one of the probes will press on to Uranus and perhaps even to Neptune (SN: 1/1/77, p. 10). Beyond their planetary objectives, however, the Voyagers will become only the third and fourth manmade vehicles ever to leave the solar system, the third and fourth chances against huge—but not infinite—odds to say "hello" to the members of a truly unearthly civilization. The pathfinders were the Pioneer 10 and 11 spacecraft, which also visited Jupiter (Pioneer 11 will pass close to Saturn in 1979), and which carry small metal plaques portraying man, woman and the position of the earth in space.

The new message is far more elaborate. When Voyager project manager John Casani asked Cornell astronomer Carl Sagan to chair a committee that would consider some sort of message for the Voyager probes, Sagan's first idea was just "a souped-up Pioneer plaque." Indeed, the mere presence of the spacecraft should be very significant to any civilization advanced enough to detect it. But the committee members, perhaps imagining what their own reactions would be if confronted with a crewless alien probe, opted for a message with a considerably higher "information density."

The chosen medium was essentially a phonograph record, a 12-inch copper disk to be played at $16^2/_3$ revolutions per minute using a ceramic cartridge and stylus sent along in the spacecraft for the purpose. Pictorial instructions on the lid of the disk's aluminum container show how the cartridge is to be used, with other notations indicating the proper playing speed and the playing time of each side. The group believes that the sealed container and the benign space environment should enable the disk to survive a journey of more than a billion years.

But how do you describe an entire world? The disk is a mixed-media affair, its grooves containing information that a technologically inclined civilization could readily reconstruct into both sounds and pictures. But which sounds, and which pictures? Technical suggestions from Frank Drake, another Cornell astronomer who has spent many years considering interstellar communications, enabled the number of pictures on the disk to be raised from 6 to 116, but that didn't make the choosing any easier.

The picture sequence as adopted begins with a "calibration circle," designed to show extraterrestrial viewers the proper height-to-width ratio of the images that follow. Many people contributed suggestions—the original committee grew considerably during the process—including Toronto artist Jon Lomberg, who prepared a number of diagrams such as DNA structure and continental drift for the project. The sequence flows from a view of the solar system down through the planets to the earth, then to the most basic levels of biology and up through human beings, other animals and plants. It then moves through the diversity of cultures and the ways in which they live, work and play, finally wending through technology to space flight and ending with sunset—and a violin.

One conspicuous lack is that of nude human beings, which might have been informative to an alien species wondering about the creatures that built the spacecraft. A nude man and woman appear on the Pioneer plaques, but the National Aeronautics and Space Administration got a little protest mail about that ("using the taxpayers' money to send smut into space") and vetoed the idea for Voyager. The included representation of human sex organs is a drawing from a biology textbook.

Following the picture sequence is a message from President Carter, a list of the congressional leaders and committee members who enabled Voyager to be funded, and a message from United Nations Secretary General Kurt Waldheim. The list and both messages are also presented visually; it is not until the next section that the record produces its first sound.

It is a greeting, spoken in Sumerian, perhaps the oldest known language in the world. There are greetings in 55 languages on the disk, including the 25 most widely spoken ones and ending, in English, with a little voice saying, "Hello from the children of planet earth."

Next comes an "essay in sound," compiled from many sources and organized primarily by writer Ann Druyan, who also served as "creative director" for the project. Like the pictures, the

sounds flow in a progression, moving from the recorded "greeting call" of a whale to the natural sounds of the earth, its animals and signs of human beings. There is fire, then tools, then domestication of animals, manual labor, the coming of machines and on to the roar of a Saturn 5 rocket taking off. Then, almost as a coda, there is a kiss, a baby's voice and the sounds of medical instruments indicating that life continues to be reborn.

The record ends with music, which posed the hardest choices of all. It has been proposed in the past that the intricate music of Bach might be appropriate as a message to distant civilizations, suggesting artistic sophistication amid technological development. The Voyager message-makers, however, wanted to present the diversity of a world—and spent 10 weeks deciding how to do it. Their choice runs from Bach to the blues, an Indian raga and a Navajo chant, often juxtaposed to suggest an underlying unity by aligning similar instruments or moods from different traditions.

About 30 organizations contributed to the overall project, says Sagan, as did many individuals. Timothy Ferris of Rolling Stone produced the record, and Columbia Records manufactured it as a public service. But after all the effort, will anyone ever receive the message?

Certainly not for tens or hundreds of millennia. Michael R. Helton of Jet Propulsion Laboratory ran a computer analysis of where the Voyagers will go after they leave the solar system. Voyager 1 will pass Pluto's orbit late in 1987 and head toward the constellation Ophiuchus. Voyager 2, assuming that it goes to Uranus but not to Neptune (a reasonable bet, since a close look at Uranus's newly discovered rings would prohibit the Neptune visit), will leave the system in mid-1989 on the way to Capricornus. In about 40,000 years, both craft should pass within 1 to 2 light-years of a fourth-magnitude star (AC +79 3888)—not exactly grabbing distance. Voyager 2 should pass a similar distance to another star (AC −24 2833-183) 110,000 years later, and about 375,000 years after that, Voyager 1 will pass perhaps 1.5 light-years from DM +21 652 in Taurus.

None of those encounters are close ones, and tiny errors could make large differences in the trajectories anyway. But the numbers are all so vast as to make such calculations nearly irrelevant. The record's mentors, however, feel that the possibility of actual reception is only one reason for sending the message. Another is simply to get earthlings thinking about the chance that there are beings even capable of receiving it. And then there is the significance of looking at one's whole home planet through a few representative details.

Try it. Make your own list. Or imagine: If you, as an alien, got this message, what would you think? □

PICTURES (in sequence)

calibration circle
solar location map
mathematical definitions
physical unit definitions
solar sys. parameters (2)
the sun
solar spectrum
Mercury
Mars
Jupiter
Earth
Egypt, Red Sea, Sinai Pen., Nile (from orbit)
chemical definitions
DNA structure
DNA structure magnified
cells and cell division
anatomy (8)
human sex organs (drawing)
conception diagram
conception photo
fertilized ovum
fetus diagram
fetus
diag. of male and female birth
nursing mother
father and daughter (Malasia)
group of children
diagram of family ages
family portrait
continental drift diagram
structure of earth
Heron Island (Australia)
seashore
Snake River, Grand Tetons
sand dunes
Monument Valley
leaf
fallen leaves
sequoia
snowflake
tree with daffodils
flying insect, flowers
vertebrate evolution diag.
seashell (Xancidae)
dolphins
school of fish
tree toad
crocodile
eagle
S. African waterhold
Jane Goodall, chimps
sketch of bushmen
bushmen hunters
Guatemalan man
Balinese dancer
Andean girls
Thai craftsman
elephant
Turkish man with beard and glasses
old man with dog and flowers
mountain climber
Cathy Rigby
Olympic sprinters
schoolroom
children with globe
cotton harvest
grape picker
supermarket
diver with fish
fishing boat, nets
cooking fish
Chinese dinner
licking, eating, drinking
Great Wall of China
African house construction
Amish construction scene
African house
New England house
modern house (Cloudcroft)
house interior with artist and fire
Taj Mahal
English city (Oxford)
Boston
UN building (day)
UN building (night)
Sydney Opera House
artisan with drill
factory interior
museum
X-ray of hand
woman with microscope
Pakistan street scene
India rush-hour traffic
modern highway (Ithaca)
Golden Gate Bridge
train
airplane in flight
airport (Toronto)
Antarctic expedition
radio telescope (Westerbork)
radio telescope (Arecibo)
book page (Newton's *System of the World*)
astronaut in space
Titan Centaur launch
sunset with birds
string quartet
violin with score

GREETINGS IN MANY TONGUES (alphabetically)

Akkadian
Amoy (Min dial.)
Arabic
Aramaic
Armenian
Bengali
Burmese
Cantonese
Czech
Dutch
English
French
German
Greek
Gujorati (India)
Hebrew
Hindi
Hittite
Hungarian
Ila (Zambia)
Indonesian
Italian
Japanese
Kannada (India)
Kechua (Peru)
Korean
Latin
Luganda (Uganda)
Mandarin
Marathi (India)
Nepali
Nguni (SE Africa)
Nyanja (Malawi)
Oriya (India)
Persian
Polish
Portuguese
Punjabi
Rajasthani
Roumanian
Russian
Serbian
Sinhalese (Sri Lanka)
Sotho (Lesotho)
Spanish
Sumerian
Swedish
Telugu (India)
Thai
Turkish
Ukranian
Urdu
Vietnamese
Welsh
Wu (Shanghai dial.)

SOUNDS OF EARTH (in sequence)

whales
planets (audio analog of orbital velocity)
volcanoes
mud pots
rain
surf
cricket, frogs
birds
hyena
elephant
chimpanzee
wild dog
footsteps and heartbeats
laughter
fire
tools
dogs (domestic)
herding sheep
blacksmith shop
sawing
tractor
riveter
Morse code
ships
horse and cart
horse and carriage
train whistle
tractor
truck
auto gears
Saturn 5 rocket liftoff
kiss
baby
life signs: EEG, EKG
pulsar

MUSIC (in sequence)

Bach: Brandenberg Concerto #2, 1st m.
Java: court gamelan—"Kinds of Flowers"
Senegal: percussion
Zaire: Pygmy girls' initiation song
Australia: horn and totem song
Mexico: mariachi—"El Cascabel"
Chuck Berry: "Johnny B. Goode"
New Guinea: men's house
Japan: shakuhachi (flute)—"Depicting the Cranes in Their Nest"
Bach: Partita #3 for violin
Mozart: "Queen of the Night" (from "The Magic Flute")
Georgia (USSR): folk chorus—"Chakrulo"
Peru: pan pipes
Louis Armstrong: "Melancholy Blues"
Azerbaijan: two flutes
Stravinsky: "Rite of Spring," conclusion
Bach: Prelude and Fugue #1 in C Major
Beethoven: Symphony #5, 1st m.
Bulgaria: shepherdess song—"Izlel Delyo hajdutin"
Navajo: night chant
English 15th cent.: "The Fairie Round"
Melanesia: pan pipes
Peru: woman's wedding song
China: ch'in (zither)—"Flowing Streams"
India: raga—"Jaat Kahan Ho"
Blind Willie Johnson: "Dark Was the Night"
Beethoven: String Quartet #13, "Cavatina"