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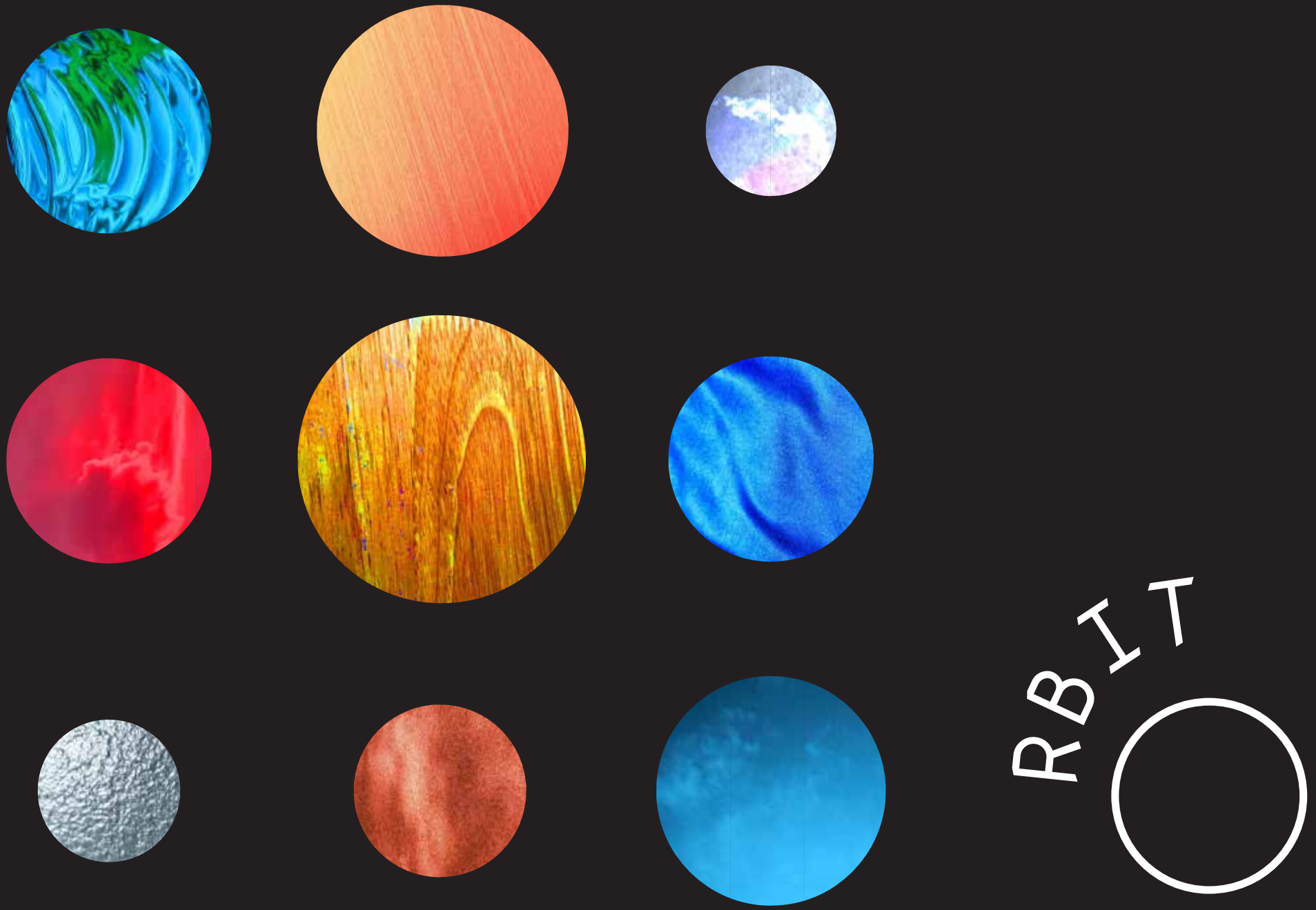

ORBIT

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#NASAMOONTUNES

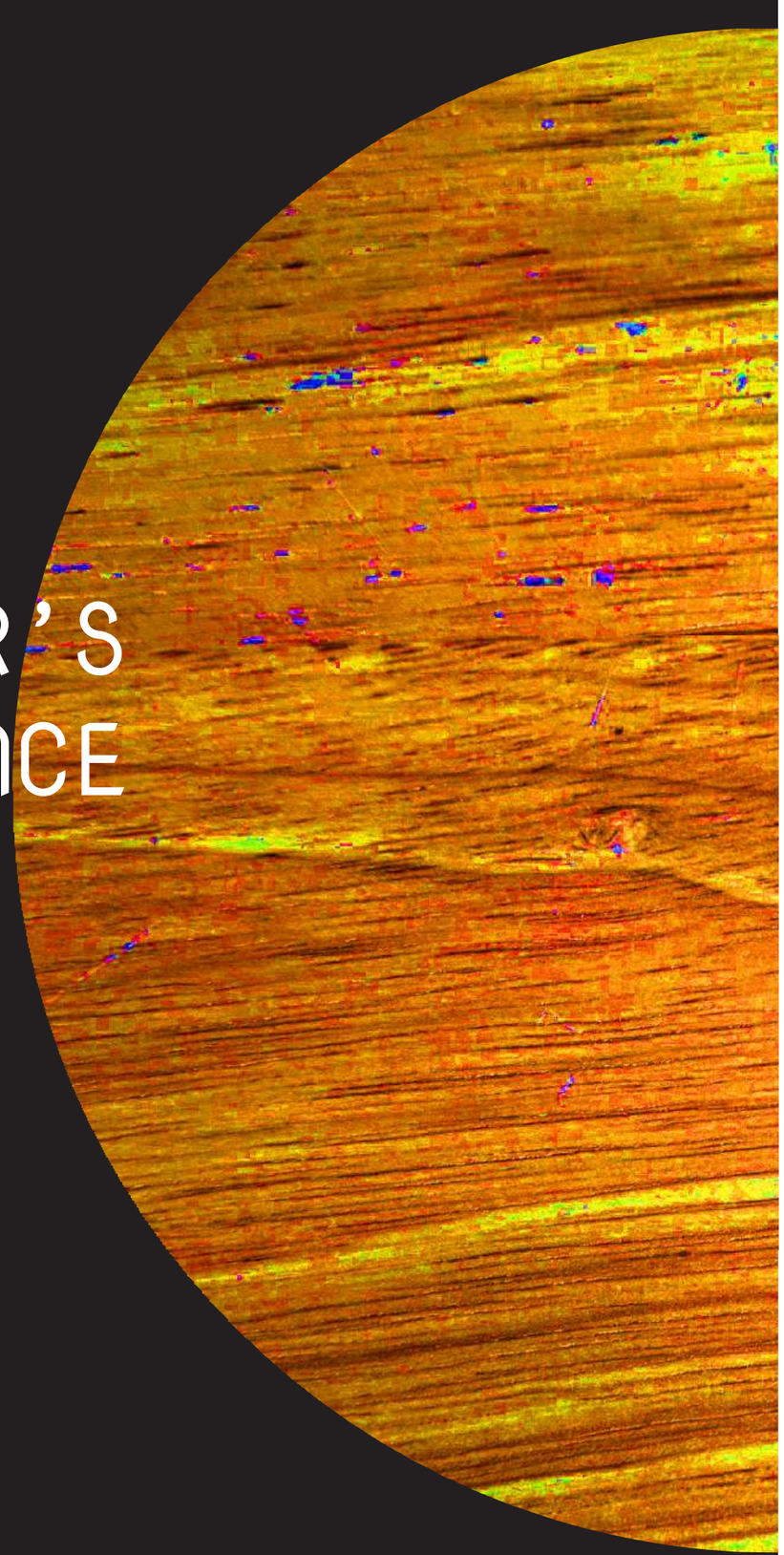
Sep 14, 2020
Noah Michelsohn

Music has been interwoven throughout spaceflight history, from pre-launch songs to shuttle wake-up calls to crewmembers playing instruments on the International Space Station. As we celebrate the 50th anniversary of Apollo 11, we're also preparing to go back to the Moon by 2024, which means astronauts will have a non-stop journey of approximately 3 days each way – the ultimate long-distance travel. Just like any road trip needs a soundtrack, so does a spaceflight! If you were making the journey, what favorite song would you be sure to include on your playlist? Let us add it to ours! Tell us on Twitter with the hashtag #NASAMoonTunes or submit via this form!

Submit your suggestion from June 3-June 28 -- the same time frame in which Apollo 11 astronauts were making final preparations for their mission 50 years ago. Liftoff of our playlist will be on July 13 and 14 and will air during a live show on NASA's Third Rock Radio, just a few days prior to the Apollo 11 launch anniversary!

See the first few hundred songs in the sidebar! To see the rest of the playlist, go to www.thirdrockradio.net/moon-tunes-2019/

David Bowie- Space Oddity • Frank Sinatra- Fly Me To The Moon • R.e.m.- Man On The Moon • A Flock Of Seagulls- Space Age Love Song • Train- Drops Of Jupiter • Mansionair- Astronaut (Something About Your Love) • The Police- Walking On The Moon • The Byrds- Eight Miles High • Foo Fighters- The Sky Is A Neighborhood • Ccr- Bad Moon Rising • The Killers- Spaceman • Elton John- Rocket Man • Billie Holiday- Blue Moon



JUPITER'S INFLUENCE

NASA'S MISSION JUNO

In other planetary systems, we see evidence that giant planets like Jupiter can migrate from where they originally formed, spiraling inward to an orbit closer to their stars. When these giants wander toward their stars, any small, rocky planets that stand in the way can be swallowed up or, due to the giants' strong gravity, flung out of the star system altogether.

But if Jupiter-like planets remain distant from their stars, they can serve as the gatekeepers to their planetary systems. They protect their fellow planets on inner orbits, allowing them to maintain nearly circular orbits that provide stable climates over extended periods of time. Long, elliptical orbits cause extreme climate shifts for an Earth-like planet, possibly preventing any sort of sustained life from evolving.

In our solar system, Jupiter can eat up any asteroid or comet that ventures near, earning the nickname "vacuum cleaner of the solar system." The asteroid belt in between the orbits of Mars and Jupiter is another example of the gas giant's influence. Its gravity likely prevented the asteroids from combining into a planet.

Jupiter can also radically alter the orbits of small bodies that stray close, hurling them on long orbits that take hundreds or even thousands of years for those bodies to return. We think this is how comets got the extreme orbits that carry them to the far-flung reaches of the solar system. They spend most of their time out there, forming a cometary collection called the Oort cloud, which may extend as far as halfway to the nearest star.

While Jupiter often protects Earth and the other inner planets by deflecting comets and asteroids, sometimes it sends objects on a collision course straight toward the inner planets. Earlier in the solar system's history, when there were more objects flying around, the increased amount of impacts would have brought to Earth water and other ingredients for life. Of course, other collisions would have been disastrous, such as the impact that likely led to the extinction of the dinosaurs 65 million years ago.

HOLST: THE PLANETS

March 26, 1972- Leonard Bernstein

My Dear Young Friends: On this program we're going to be playing around in outer space. And I mean playing — not only in the sense of playing notes on musical instruments, but also of playing as fun, as we play games, for the sheer enjoyment of it.

Now these days when we think of outer-space music, the first thing that pops into our minds is that well-known fanfare:
(LB sings next two notes)

But that is, of course, the opening of Zarathustra by Richard Strauss, which we learned about in such depth last season, and so we know it doesn't really have anything to do with outer space. Then there's what's sometimes called "spaced-out" music like certain rock music or pieces by Stockhausen, but they really have to do with the inner spaces of our minds.

But today we're going to hear a piece called The Planets by the British composer Gustav Holst — and this does have to do with outer space, because that's literally what it's about; The planets of our solar system. And the reason I call it music for fun is that it doesn't try to make any deep philosophical points, it doesn't tell any complicated story, it doesn't try to blow your mind with new musical techniques — it's just great first-class entertainment. In fact, when it was first played in Germany around 1920 some critics roasted it as being nothing but "Unterhaltungsmusik" — which means "entertainment music," Well, what's wrong with that? Especially if it's good; and If it turns out to blow your mind, which it might — so much the better.

It's a big piece; after all, there are an lot of planets to cover, and each planet has a whole piece of its own. And so, correspondingly, Holst uses a big orchestra, a very big one, in fact, as befits so large a subject as the solar system.

He's not satisfied with the 100-odd pieces of the normal big symphony orchestras; he calls for extra added instruments, not ordinarily used, like a bass oboe:

Now it may surprise you to learn that Holst's Planets are seven in number: that is, there are seven movements. How come seven, when every child knows that there are nine planets moving around the sun? Well, the answer is that, first of all, at the time Holst composed this work, over 50 years ago, the 9th planet, Pluto, had not yet been discovered, so there were only eight. And second of all, he left one out that we consider pretty important — namely, Earth. Which leaves us with seven planets: Mars, Venus, Mercury, Jupiter, Saturn, Uranus and Neptune.

But why did he leave out, of all things, our very own planet Earth? That's an interesting question. The answer, of course, is that Holst wasn't at all interested in astronomy, but in astrology. I'm sure you know the difference. Now we all know that in astronomy the sun is the center of our system, and we all revolve around it; but in astrology the Earth is the center, and everything else revolves around us, including the sun and the moon.

So out went Earth as a planet. It's not very scientific but Holst couldn't have cared less about the scientific side of the planets, he was drawn to the mystic side of things, and for him the planets were important as symbols, in relation to the zodiac, to horoscopes, to the ancient sort-of-science known as astrology. I suppose today he would be called a mysticism-freak. One of his pet hobbies was drawing up horoscopes for his friends, not so much to predict the future, as to try and get a fuller idea of their character and personality. And this is just what Holst did with his planets. He would pick on one aspect, or personality, of each planet, and write music about it.

Now it's not that easy to pick: one single aspect of any planet — astrologers have been arguing for centuries about the real meanings and influences of these strange wandering bodies. But for Holst it was easy; he just decided what each planet meant to him, and went to work.

So out came planet No. 1, Mars, which he subtitled, the Bringer of War. It presents an amazingly realistic picture of war: the racketing of machine guns.

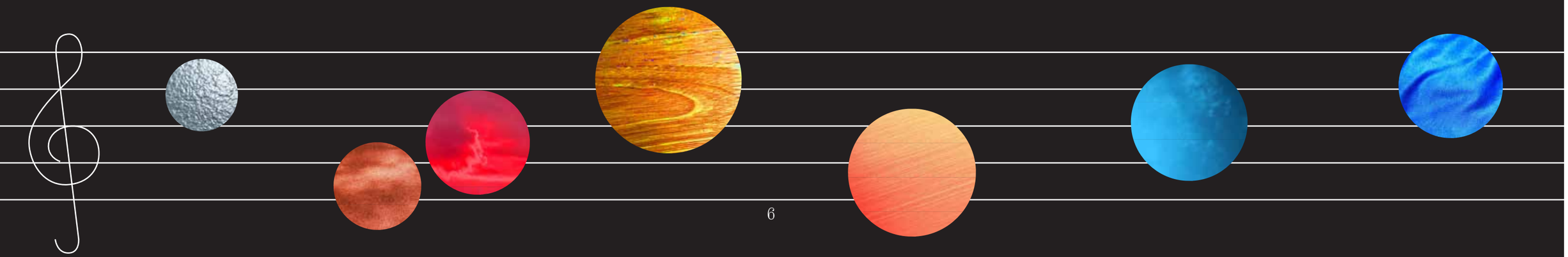
The grinding of monstrous tanks plus fanfares and marching and screaming, and all the rest. Here is that first planet Mars, the Bringer of War.

Now that may be an exciting piece to hear, but it's not exactly beautiful music; in fact you might even call It ugly music. But then, what is uglier than war? And this music is not so much an impression of the planet Mars — with its red glow, and its possibility of life — as it is an impression of Mars the god of war, after whom the planet was named. It's an inhuman piece, utterly mechanical, brutal and relentless. Just like war itself, inhuman, brutal, relentless and mindless. But just think a minute: if an artist sets out to depict something ugly, in notes or paints or words, and if he does it well, doesn't that make beautiful art? (Think of Breughel) of the ugliness in Picasso's Guernica, the unpleasant scenes in drawings by Goya, the distasteful subject matter in Dickens, and Dostoevsky. Aren't those all beautiful works? There's something for you to ponder over a hamburger some time.

But meanwhile, as an antidote, Holst brings us his second planet, Venus, the Bringer of Peace.
Now that's sort of a surprise; we usually think of Venus as the goddess of love; but astrologers have made her a symbol of peace by a simple equation: love equals harmony, and harmony equals peace. Easy.

So here is Venus, a very different story from Mars: This is music of humanity, of rich harmony and gentle movement. In short of peace.

We're going to play the next two planets together, without pause, because they're short, and somehow belong together. The first is Mercury, described by Holst as the Winged



Messenger. Which, of course, the Roman God Mercury was, swift as lightning, swift and small. And so is the music. Actually, the planet Mercury is the smallest of all and being the closest to the sun it has the shortest orbit; so naturally it has the shortest musical run as well. But that's astronomy again, which wasn't the name of Holst's game. What he cared about was that astrologers have always described Mercury as a quick tricky type, double-dealing, now-you-see-him-now-you-don't. And Holst makes this point by writing double-dealing music — for instance, by writing in 2 different keys at once. Here's one harp playing in Bb major: and the other harp in E major: And the whole orchestra follows suit. To make the two-faced point even stronger, Holst writes in 2 different rhythms at once: like here's a clarinet playing in 6/8 time: and against that the bassoons are playing in 3/4 time: And together they sound like this:

You see what I mean "by double-dealing? Mercury is a very elusive little creature.

One other little trick: since Mercury is the messenger of the gods, and astrologically in charge of messages and communications, Holst tells us this by inventing a little passage of what seems to be Morse Code: This is later repeated by the Glockenspiel:

I've always suspected some secret message in this music, but I've never been able to discover what it is. Maybe some Morse-code expert among you out there can decipher it.

Anyway, that's Mercury. And his companion is his exact opposite — Jupiter, the hugest planet of all, the master, the chief god. Holst calls him Jupiter, the Bringer of Jollity -- but that seems a very small attribute to assign to so great a planet. The astrologers say that Jupiter brings power, wealth, high position, fatherhood, ownership — everything big. Also jollity — I suppose because the Romans also called him by the name of Jove, from which we get our word jovial.

And to Holst, that was the most important of all — joviality, or jollity, and in the most British manner — the ho-ho jollity of Santa Claus, of John Bull, of roast-beef and Yorkshire pudding. This is the most famous of all Holst's planets, and even contains a lot of famous jovial tunes you'll recognize from TV commercials and stuff like that.

So now, here they are together, these total opposites, little Mercury and big Jupiter, the messenger and the master, the servant and the lord, the naughty little boy and Big Daddy.

Well, that leaves us with three remaining planets, and not enough time to play them all. The next in line Saturn, the Bringer of Old Age, seems like a good one to skip, since it's long and slow and draggy, and who wants to think about old age at this moment anyway? Besides, the astrologers tell us that Saturn is a nasty-planet, always making trouble for us mortals. So on to the next planet, Uranus, which Holst calls the Magician. And in his music he makes a delightful picture of a magician. This magician struts about, pulling off one surprise after another, and finally breaking into a triumphant march:

The magician has one final trick up his sleeve, where the music abruptly goes soft and way-out, and we suddenly are in outer space. I think you'll know it when we come to it. Here's Uranus, the Magician:

And now we have a surprise for you, and for Holst too, if he's listening somewhere out there in the Universe. Instead of playing his final planet, Neptune, which is also long and slow, the New York Philharmonic and I propose to supply the missing planet, Pluto. You remember I told you that Pluto had not yet been discovered when Holst wrote this work; but it was discovered in 1930, when Holst was still alive. So he had his chance to add Pluto to this work, but for reasons of his own didn't. So we're going to make up for this omission by supplying a little Pluto of our own.

As you know, Pluto is the furthest planet from the sun, and therefore the darkest and the most mysterious. Very little is known about it, except that it is very dark, and very slow-moving, with an endlessly long orbit. It is also the bane of the astrologers' existence, because suddenly there it was in 1930, upsetting all the calculations of centuries, and causing no end of confusion in the world of horoscopes.

With all this in mind, we shall now attempt to shed a little light on this dark planet by improvising a Pluto-piece. Let's call it in the manner of Holst, Pluto, the Unpredictable; but there any resemblance to Holst will end. This music will not be in Holst's style, nor in anybody's style for that matter, because we don't know what's going to come out. We have no pre-arranged signals, and we here on stage are going to be as surprised as you at the mysterious sounds we will be making. In other words, you are about to hear a piece nobody has ever heard, nor will ever hear again. It's a once-in-a-lifetime experience, a real spaced-out trip. And here it is: Pluto the Unpredictable.

Good Night Oppy, A Farewell To NASA's Mars Rover

Feb 16, 2019- Scott Simon

We probably should not project human traits onto machines. But if you spend a lot of time with a mechanism — talk to it, wait to hear from it and worry about it — even scientists begin to see personality in machinery.

When the Opportunity Mars Exploration Rover ended its mission this week, after more than 5,000 Martian days, NASA scientists mourned.

"This is a hard day," Opportunity's project manager, John Callas, told reporters. "Even though it's a machine and we're saying goodbye, it's still very hard and very poignant."

Opportunity — and its cousin rover Spirit — both landed on Mars in January 2004. They were supposed to carry on for just three months, scratching and scouring for less than a mile over the Martian landscape.

But Spirit roamed for almost 5 miles and lasted for six years. Oppy, as scientists began to call the Opportunity rover, rolled over Mars for 28 miles and stayed on the job for more than 14 years. It transmitted 217,594 images — including a selfie.

Spirit and Opportunity helped establish that there was once liquid water on Mars. This doesn't mean there will soon be beach resorts on the red planet, but it does confirm that some of the elements of life may have once existed there, on a world that now looks pretty dry, lifeless and cold.

It's a reminder not to judge too much by appearances. Planets, and people, have histories.

Oppy got stuck in a dune in 2005. But NASA scientists, working over a distance of millions of miles, were able to free their rover. Oppy also suffered from recurrent wheel and robotic arm problems for most of his — her — its — life, but it kept on rolling, searching, digging and sending back information.

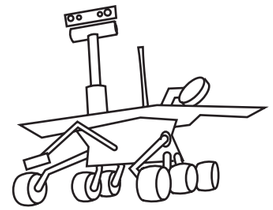
A dust storm enveloped much of Mars last June. Oppy foundered in a gully on the western rim of the Endeavour Crater; in a gully the scientists called Perseverance Valley. The storm robbed Oppy of the solar power to recharge its batteries.

NASA's scientists sent up more than 830 rescue commands. They beamed music to Oppy to try to awaken their Martian explorer: David Bowie's "Life on Mars?" Gloria Gaynor's "I Will Survive," "Here Comes the Sun," by — well, you know.

Oppy was too depleted to reply.

The rover did send a last image, of a dark world, cloaked in dust. Jacob Margolis, a science reporter for KPCC in Pasadena, made a poetic translation of the digital bursts, bytes, and squeaks Oppy sent out before going silent: "My battery is low and it's getting dark."

We might all hope for such a gentle end to a useful life.



Yes, Pluto Is A Planet Says NASA Scientist At The Site Of Its Discovery 91 Years Ago This Week

Feb 15, 2021 - Jamie Carter

Is Pluto a planet? It's been one of astronomy's most controversial questions since a meeting of the International Astronomical Union (IAU) in August 2006 voted to downgrade the then-ninth planet to mere "dwarf planet" status.

Not only is the IAU's definition of a planet 15 years ago roundly ignored by planetary scientists, but the IAU's use of a vote made science seem arbitrary and political, undermining trust in science itself.

So says Dr. Alan Stern, a planetary scientist who leads NASA's New Horizons mission that explored the Pluto system in 2015. He was speaking at the "I Heart Pluto Festival 2021," a virtual program of lectures and events staged by Lowell Observatory in Flagstaff, Arizona—the very sight of Pluto's discovery on February 18, 1930 by astronomer Clyde Tombaugh.

Stern's argument against the decision to relate Pluto to "dwarf planet" status boils down to this: it doesn't make scientific sense.

The IAU relegated Pluto after a flurry of new discoveries of small planets in the outer Solar System—notably Eris in 2005—so the IAU felt that it had to create a tighter, more exclusive definition of a planet:

It orbits the Sun.

It has enough mass (and therefore gravity) to be round.

It has "cleared the neighborhood" around its orbit.

Pluto doesn't get tick that last box because it's influenced by Neptune's gravity. It also shares its orbit with other objects in the Kuiper Belt.

So Pluto was re-classified as a "dwarf planet" to sit alongside Eris, Ceres, Haumea and Makemake.

Stern thinks that definition of a planet is poorly worded. "The IAU's definition was created by non-experts—astronomers—who study stars, galaxies and black holes," he said. "They botched it."

He thinks the IAU overacted because they were horrified by the idea that there could be hundreds of small planets beyond the orbit of Neptune in the Kuiper Belt. "The purpose of the IAU in creating this definition was to limit the number of planets in our Solar Systems so that school kids wouldn't have to memorize long lists of planets," he said. "Astronomers became afraid of astronomically large numbers."

That's a shame because one of the revolutions in planetary science in the last 40 years has been the discovery that the Kuiper Belt—that "third zone" in the Solar System beyond the orbit of Neptune—is busy with comets, planetesimals and small planets like Pluto. "They now outnumber the terrestrial and gas planets and are expected to number in the hundreds when surveys are complete," said Stern.

He also makes the point that the Solar System is littered with asteroids to the extent that no celestial body has "cleared the neighborhood" around its orbit.

It's why planetary researchers ignore the IAU's definition of a planet in favour of a geophysical definition that's completely agnostic to the total number of planets in the Solar System:

It has enough mass (and therefore gravity) to be round.

It has insufficient mass to undergo nuclear fusion in its interior.

That way, Stern says, Pluto easily qualifies as a planet—as do all "dwarf planets."

However, Stern also accused the IAU of harming science itself when it publicly voted to relegate Pluto in 2006. "Voting is a terrible mechanism of doing science," he said. "We don't vote on the theory of relativity. We don't vote on quantum mechanics. The image of the IAU taking a vote was the single most damaging pedagogical event in science in probably a century, because to many people it was easy to reach the conclusion that science is arbitrary or political, which it is not."

The argument about Pluto is about semantics. After all, where astronomers draw the line between planets, dwarf planets, planetoids and moons is essentially arbitrary and makes zero difference to reality. Even Stern's keynote—provocatively titled "Why Pluto is a Planet, The Embarrassment of the IAU, and Why They Had It Coming" is a callback to "How I Killed Pluto And Why It Had It Coming" book by Mike Brown, one of the discoverers of Eris.

Stern's argument is merely that science should be agnostic. "There are countless stars and there are countless planets—and who cares? It's just the data," he said. "We have to give up the old 20th century notion that we need to remember the names of all of them—this is big science and there is a lot of data. We as scientists are reductionists and we want to have classifications systems, but we don't require memorization—that's stamp-collecting."

"Voting is a terrible mechanism of doing science. We don't vote on the theory of relativity. We don't vote on quantum mechanics."

The Sad, Sad Story of Laika, the Space Dog, and Her One-Way Trip into Orbit

Alice George

April 11, 2018

With a pounding heart and rapid breath, Laika rode a rocket into Earth orbit, 2,000 miles above Moscow streets she knew. Overheated, cramped, frightened, and probably hungry, the space dog gave her life for her country, involuntarily fulfilling a canine suicide mission.

Sad as this tale is, the stray husky-spitz mix became a part of history as the first living creature to orbit the Earth. Over the decades, the petite pioneer has repeatedly found new life in popular culture long after her death and the fiery demise of her Soviet ship, Sputnik 2, which smashed into the Earth's atmosphere 60 years ago this month.

Soviet engineers planned Sputnik 2 hastily after Premier Nikita Khrushchev requested a flight to coincide with November 7, 1957, the 40th anniversary of Russia's Bolshevik Revolution. Using what they had learned from the unmanned and undogged Sputnik 1 and often working without blueprints, teams labored quickly to build a ship that included a pressurized compartment for a flying dog. Sputnik 1 had made history, becoming the first man-made object in Earth orbit October 4, 1957. Sputnik 2 would go into orbit with the final stage of the rocket attached, and engineers believed the ship's 1,120-pound payload, six times as heavy as Sputnik 1, could be kept within limits by feeding its passenger only once.

They expected Laika to die from oxygen deprivation—a painless death within 15 seconds—after seven days in space. Cathleen Lewis, the curator of international space programs and spacesuits at the Smithsonian's National Air and Space Museum doubts that a few ounces of food would have made a difference, and she recalls reports that a female physician broke protocol by feeding Laika before liftoff.

The Soviet canine recruiters began their quest with a herd of female stray dogs because females were smaller and apparently more docile. Initial tests determined obedience and passivity. Eventually, canine finalists lived in tiny pressurized capsules for days and then weeks at a time. The doctors also checked their reactions to changes in air pressure and to loud noises that would accompany liftoff. Testers fitted candidates with a sanitation device connected to the pelvic area. The dogs did not like the devices, and to avoid using them, some retained bodily waste, even after consuming laxatives. However, some adapted.

Eventually, the team chose the placid Kudryavka (Little Curly) as Sputnik 2's dog cosmonaut and Albina (White) as backup. Introduced to the public via radio, Kudryavka barked and later became known as Laika, "barker" in Russian. Rumors emerged that Albina had out-performed Laika, but because she had recently given birth to puppies and because she had apparently won the affections of her keepers, Albina did not face a fatal flight. Doctors performed surgery on both dogs, embedding medical devices in their bodies to monitor heart impulses, breathing rates, blood pressure and physical movement.

Soviet physicians chose Laika to die, but they were not entirely heartless. One of her keepers, Vladimir Yazdovsky, took 3-year-old Laika to his home shortly before the flight because "I wanted to do something nice for the dog," he later recalled.

Three days before the scheduled liftoff, Laika entered her constricted travel space that allowed for only a few inches of movement. Newly cleaned, armed with sensors, and fitted with a sanitation device, she wore a spacesuit with metal restraints built-in. On November 3 at 5:30 a.m., the ship lifted off with G-forces reaching five times normal gravity levels.

The noises and pressures of flight terrified Laika: Her heartbeat rocketed to triple the normal rate, and her breath

rate quadrupled. The National Air and Space Museum holds declassified printouts showing Laika's respiration during the flight. She reached orbit alive, circling the Earth in about 103 minutes. Unfortunately, loss of the heat shield made the temperature in the capsule rise unexpectedly, taking its toll on Laika. She died "soon after launch," Russian medical doctor and space dog trainer Oleg Gazenko revealed in 1993. "The temperature inside the spacecraft after the fourth orbit registered over 90 degrees," Lewis says. "There's really no expectation that she made it beyond an orbit or two after that." Without its passenger, Sputnik 2 continued to orbit for five months.

During and after the flight, the Soviet Union kept up the fiction that Laika survived for several days. "The official documents were falsified," Lewis says. Soviet broadcasts claimed that Laika was alive until November 12th. The New York Times even reported that she might be saved; however, Soviet communiqués made it clear after nine days that Laika had died.

While concerns about animal rights had not reached early 21st century levels, some protested the deliberate decision to let Laika die because the Soviet Union lacked

the technology to return her safely to Earth. In Great Britain, where opposition to hunting was growing, the Royal Society for the Prevention of Cruelty to Animals and the British Society for Happy Dogs opposed the launch. A pack of dog lovers attached protest signs to their pets and marched outside the United Nations in New York. "The more time passes, the more I'm sorry about it," said Gazenko more than 30 years later.

The humane use of animal testing spaceflight was essential to preparation for manned spaceflight, Lewis believes. "There were things that we could not determine by the limits of human experience in high altitude flight," Lewis says. Scientists "really didn't know how disorienting spaceflight would be on the humans or whether an astronaut or cosmonaut could continue to function rationally."

Alas, for Laika, even if everything had worked perfectly, and if she had been lucky enough to have plenty of food, water and oxygen, she would have died when the spaceship re-entered the atmosphere after 2,570 orbits. Ironically, a flight that promised Laika's certain death also offered proof that space was livable.

The story of Laika lives on today in websites, YouTube videos, poems and children's books, at least one of which provides a happy ending for the doomed dog. Laika's cultural impact has been spread across the years since her death. The Portland, Oregon, Art Museum is currently featuring an exhibition on the stop-motion animation studio LAIKA, which was named after the dog. The show "Animating Life" is on view through May 20, 2018. There is also a "vegan lifestyle and animal rights" periodical called LAIKA Magazine, published in the United States.

The 1985 Swedish film, My Life as a Dog, portrayed a young man's fears that Laika had starved. Several folk and rock singers around the globe have dedi`cated songs to her. An English indie-pop group took her name, and a Finnish band called itself Laika and the Cosmonauts. Novelists Victor Pelevin of Russia, Haruki Murakami of Japan, and Jeannette Winterson of Great Britain have featured Laika in books, as has British graphic novelist Nick Abadzis.

In 2015, Russia unveiled a new memorial statue of Laika atop a rocket at a Moscow military research facility, and when the nation honored fallen cosmonauts in 1997 with a statue at the Institute of Biomedical Problems in Star City, Moscow, Laika's image could be seen in one corner. During the Mars Exploration Rover Opportunity mission in March 2005, NASA unofficially named a spot within a Martian crater "Laika."

Space dog biographer Amy Nelson compares Laika to other animal celebrities like the Barnum and Bailey Circus's late 19th-century elephant Jumbo and champion thoroughbred racehorse Seabiscuit, who lifted American spirits during the Great Depression. She argues in Beastly Natures: Animals, Humans and the Study of History that the Soviet Union transformed Laika into "an enduring symbol of sacrifice and human achievement."

Soon after the flight, the Soviet mint created an enamel pin to celebrate "The First Passenger in Space." Soviet allies, such as Romania, Albania, Poland and North Korea, issued Laika stamps over the years between 1957 and 1987.

Laika was not the first space dog: Some had soared in the Soviet military's sub-orbital rocket tests of updated German V-2 rockets after World War II, and they had returned to Earth via parachuted craft—alive or dead. She also would not be the last dog to take flight. Others returned from orbit alive. After the successful 1960 joint flight of Strelka and Belka, Strelka later produced puppies, and Khrushchev gave one to President John F. Kennedy.

During the days before manned flight, the United States primarily looked to members of the ape family as test subjects. The reason for the Soviet choice of dogs over apes is unclear except perhaps that Ivan Pavlov's pioneering work on dog physiology in the late 19th and early 20th century may have provided a strong background for the use of canines, Lewis says. Also,

> stray dogs were plentiful in the streets of the Soviet Union- easy to find and unlikely to be missed.

According to Animals In Space by Colin Burgess and Chris Dubbs, the Soviet Union launched dogs into flight 71 times between 1951 and 1966, with 17 deaths. The Russian space program continues to use animals in space tests, but in every case except Laika's, there has been some hope that the animal would survive.