# Future human relations

How will we play, relate, socialise?

# 01 Idea: Art from the Earth


Plot. John Garrity is a structural engineer living in Atlanta, Georgia, with his estranged wife, Allison, and their diabetic son, Nathan. He returns home to watch the near-earth passing of a recently-discovered interstellar comet named Clarke, with his family and neighbours.

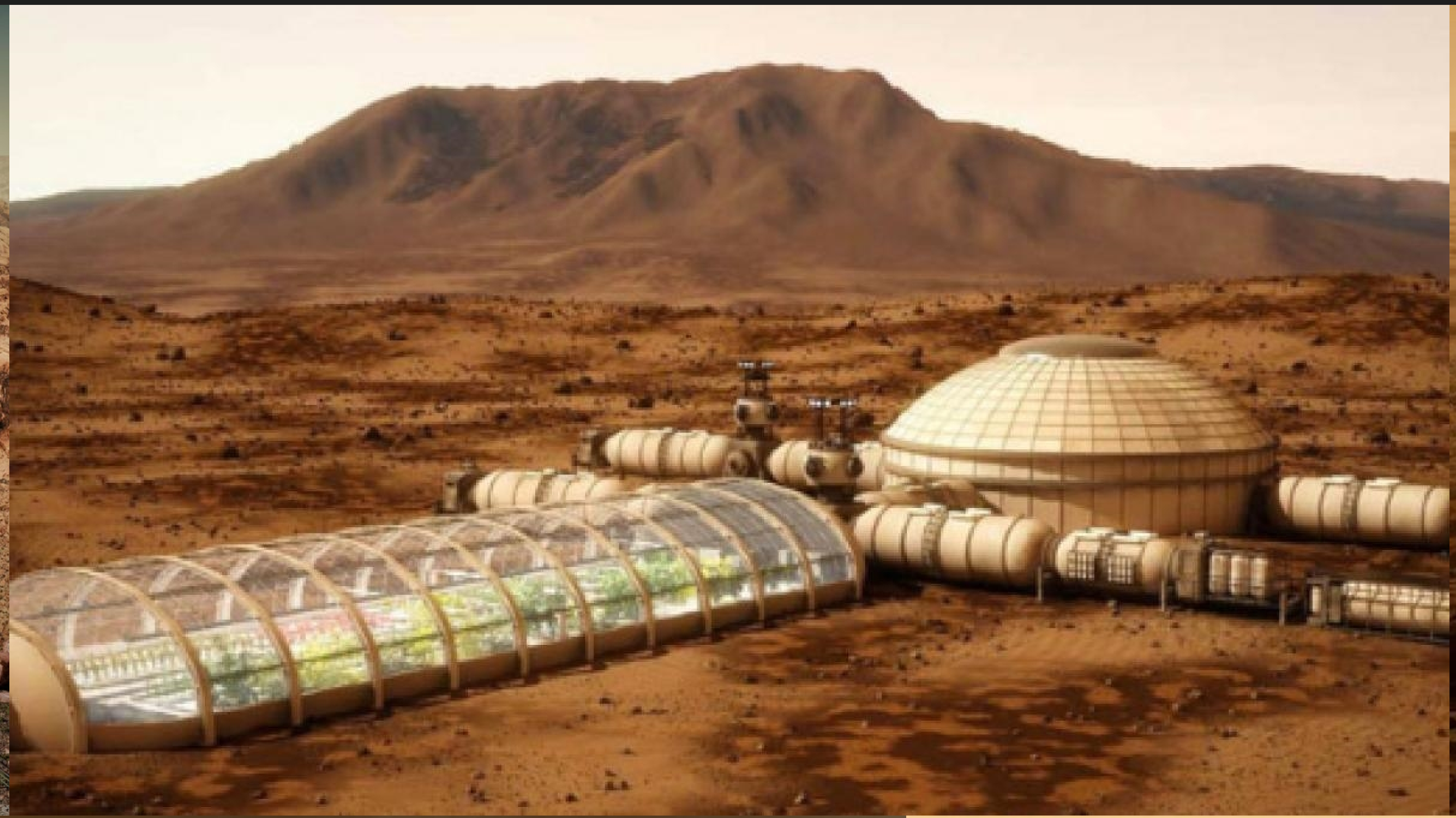
# Apocalyptic and post-apocalyptic fictions

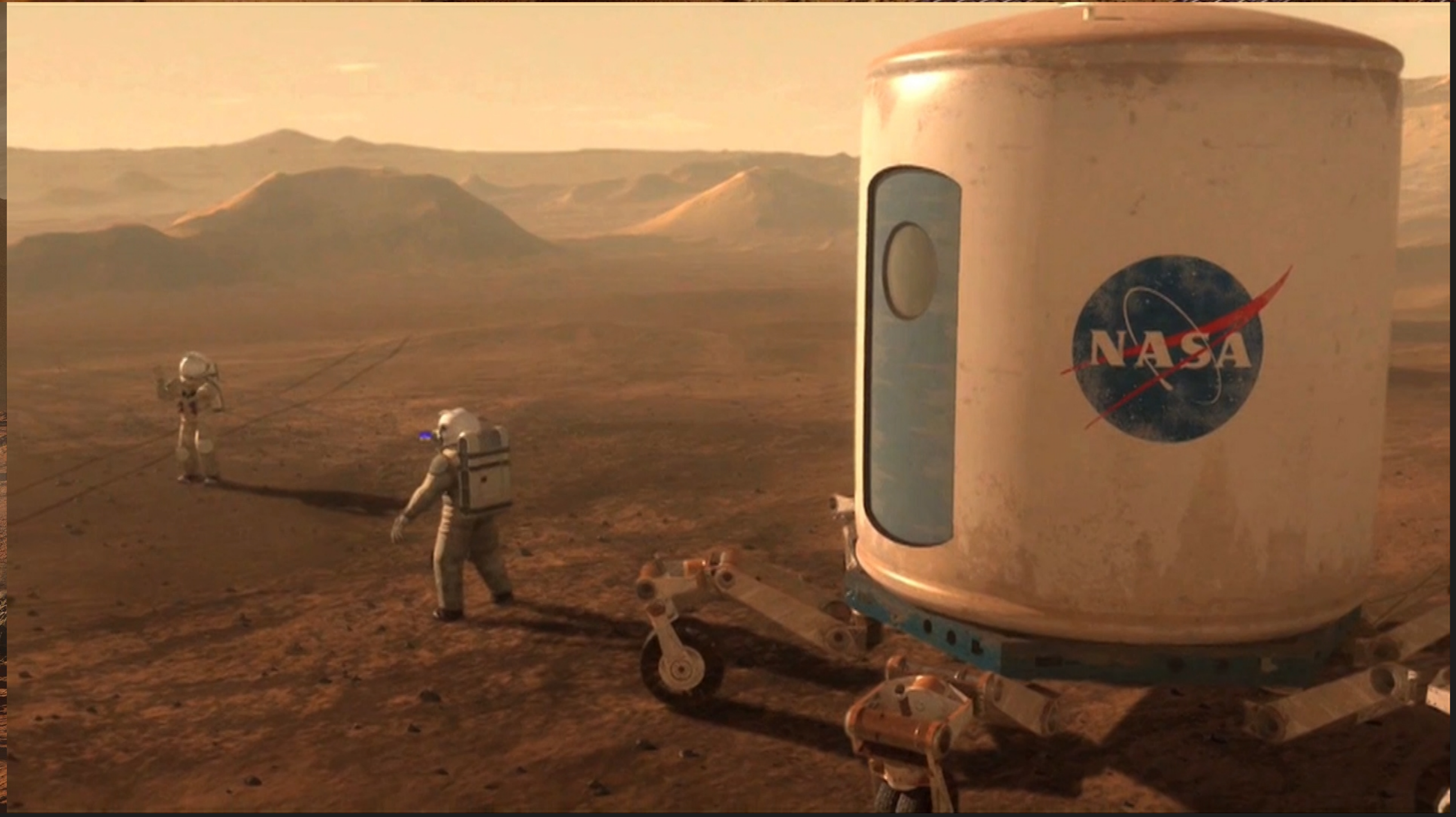
In most of the Apocalyptic and post-apocalyptic fiction that I have seen, there are two divided groups of people. One who is selected to be saved and the other group is the one who has no chance to be picked up, for reasonable and justifiable reasons.

At the time of crisis, the authorities need to select specific people with specific skills, the skills that would be MOST beneficial for the group.

Not all of us can be saved.
If not all of us can make it, who gets selected?

# Mars

## Art on Mars in 2084

Is there any artist living on Mars?
If no. Where do they live?
Do they still practice art?
If yes. What is their source of income?
How do musicians play?
Do they still live on earth?
How do painters paint?
Who is their audience?

– and the greatest innovation in music over the next ten years will be to digitally recreate the intimacy, interconnectedness and social currency that made music the driving force of popular culture over the last half-century."

**Eric Sheinkop**

*CEO, Music Dealers LLC* "Every day, more technology emerges that allows music fans to be closer and better connected to the artists they love -- sometimes before music even leaves the studio. The gap between the fans and the artists will continue to shrink, resulting in a more personal relationship to the music."

**Joe Belliotti**

*Director, Global Ent. Marketing, Coca-Cola* "Music is a common language that brings people together.

Democratisation of access to music will allow people to create personal and purposeful connections. A brand's role will be to enable these connections through scale and reach, and to create real-world interactions and experiences."

**DJ Keebz**

*will.i.am's 'tech wizard' and DJ tech collaborator* "Cookie-cutter DJs using identical controllers and playlists will need to upgrade their craft, or become irrelevant. Electronic dance music will re-examine and return to its roots as the original music hack. Pro DJs will incorporate interactive technologies, and use it in unpredictable ways."

TOPICS SCIENCE MUSIC CULTURE MAGAZINE AUGUST 2013 ISSUE

MORE FROM WIRED UK

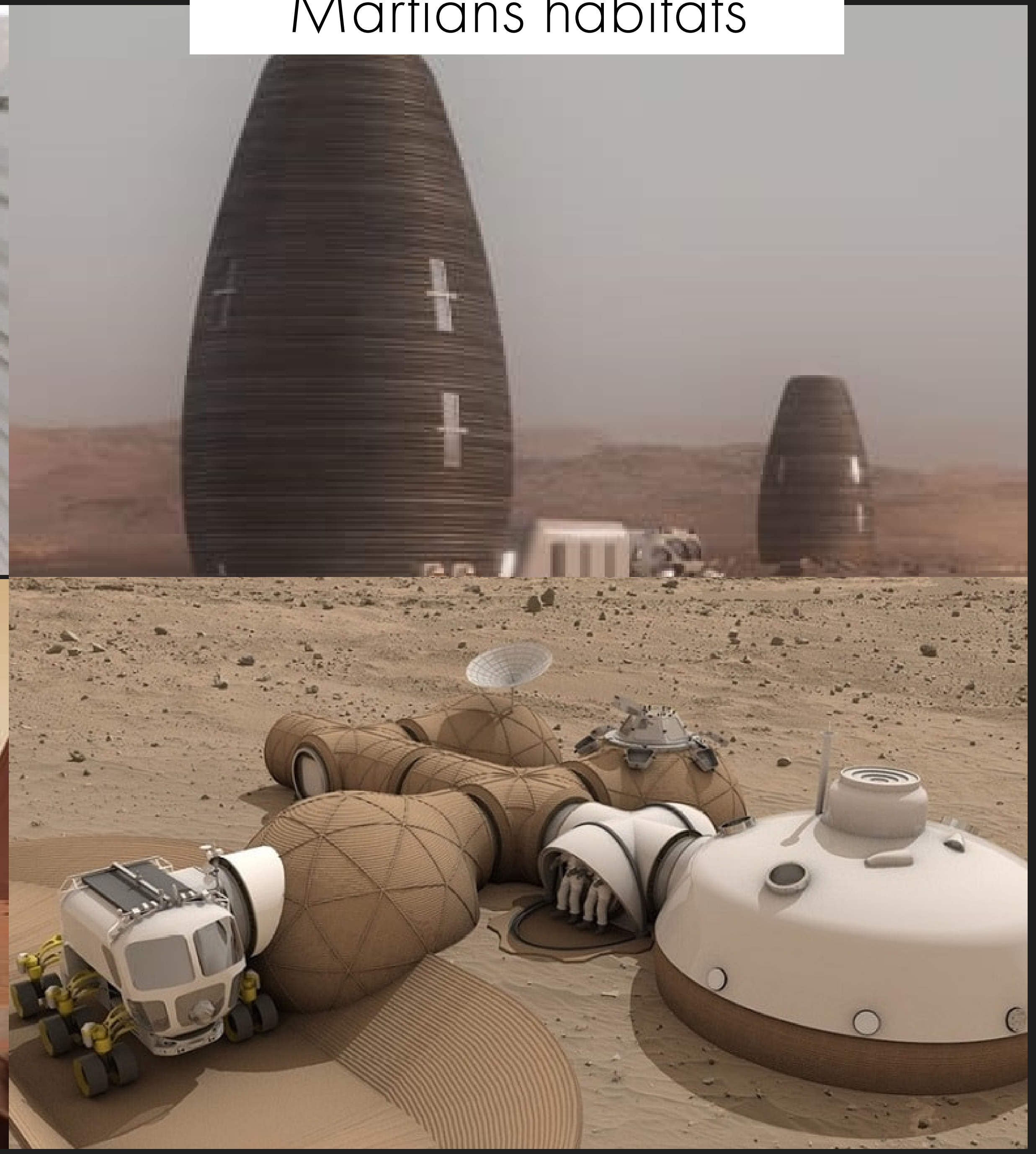
# 01 Idea: Art from the Earth

- This is the year 2084 and human lives on Mars.
- Earth is still habitable.
- The people who live on Mars are highly skilled, scientists, engineers, and programmers.
- The people who live on Earth are mostly artists.
- Artists are producing art for Martians.
- Artists use homemade technology and new technical devices to produce art. Also, they need to create art mixing different mediums. (A mixture of visuals and sound)

Individuals on Mars can sit inside the cell to watch the performance


Concert halls on Mars

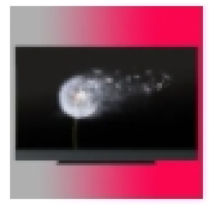
Martians habitats



WIRED SCIENCE 12.08.2013 12:01 PM

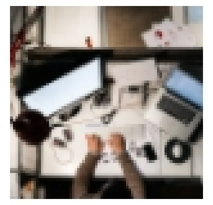
# The big question: 'What is the future of music?'

## Most Popular



Sky Glass is Not a Good Television

BY SIMON LUCAS



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Your Essential Guide to the Best Tequilas

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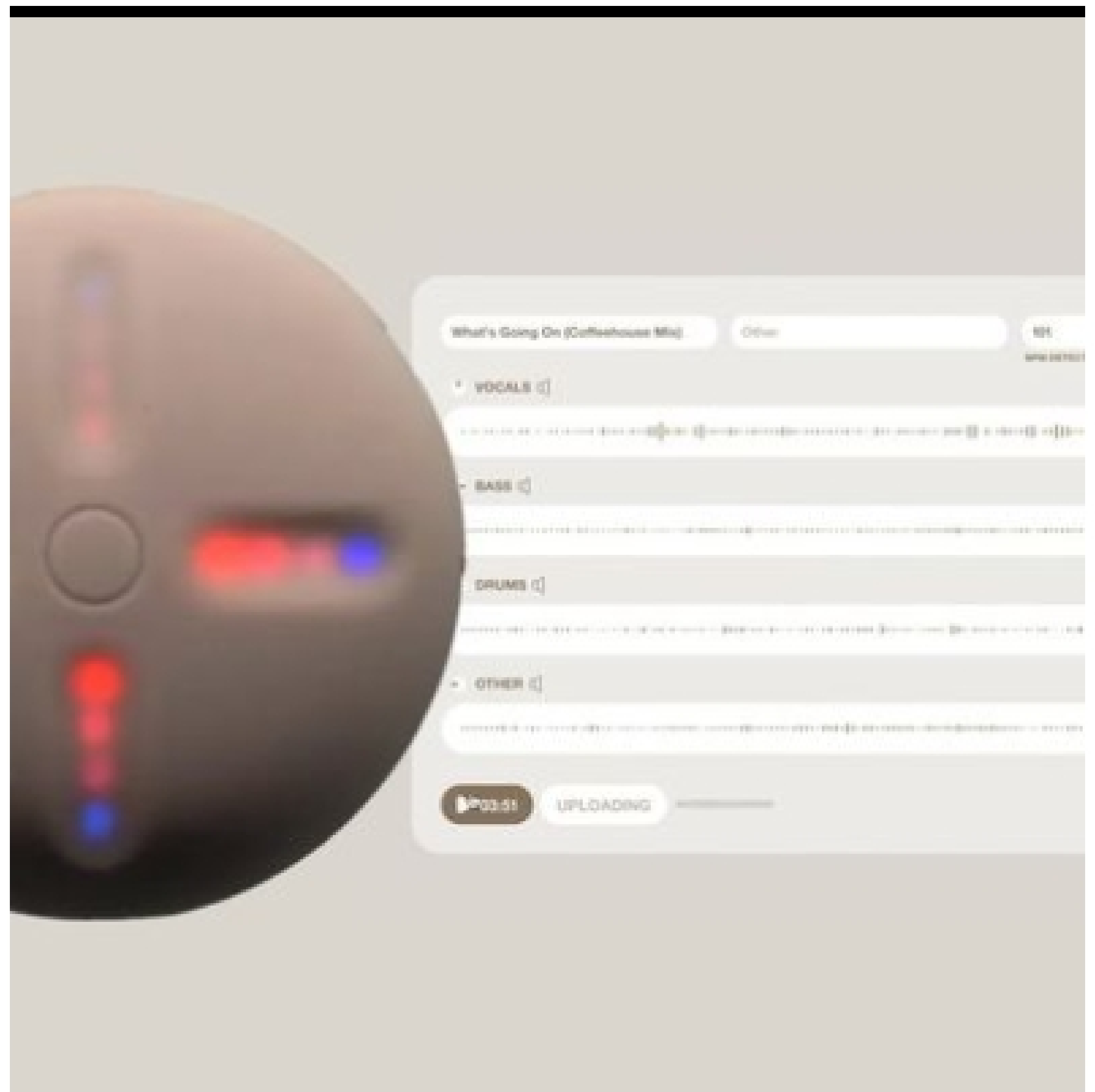
All the Good Early Black Friday Deals You Can Get Right Now

BY WIRED

## Kanye West's music gadget lets you customise his songs

Donda Stem Player, US



Donda Stem Player, US

US and UK – With a growing number of consumers expressing interest in creative ventures, the **musician** has unveiled a gadget that allows people to customise any song. The **Donda Stem Player**, developed by electronics company **Kano**, includes four touch-sensitive light bars that allow users to control the device and alter the output of sounds. Though it, users can adjust elements like vocals, drums and bass levels, as well as isolating elements and adding effects.

By allowing people to have an open-source control of songs in this way, the gadget taps into a growing interest in **decentralised music communities** – a mindset that is especially prevalent among Generation Z. Such a tool also dismantles associations with celebrity culture by expanding the realm of music creations to a broader audience.

Considering the wider implications, Kanye West's decision to reach people in this way also reflects ongoing innovation relating to **digital fandom**.

### Strategic opportunity

applications,...

15

**WHAT'S NEXT FOR SUSTAINABILITY? COLLECTIVE ACTION:**

As global heating reaches boiling point, Andres Colmenares, co-director of...

STEM PLAYER
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ADD TO CART
INFO
T&C
FAQ
UPLOAD
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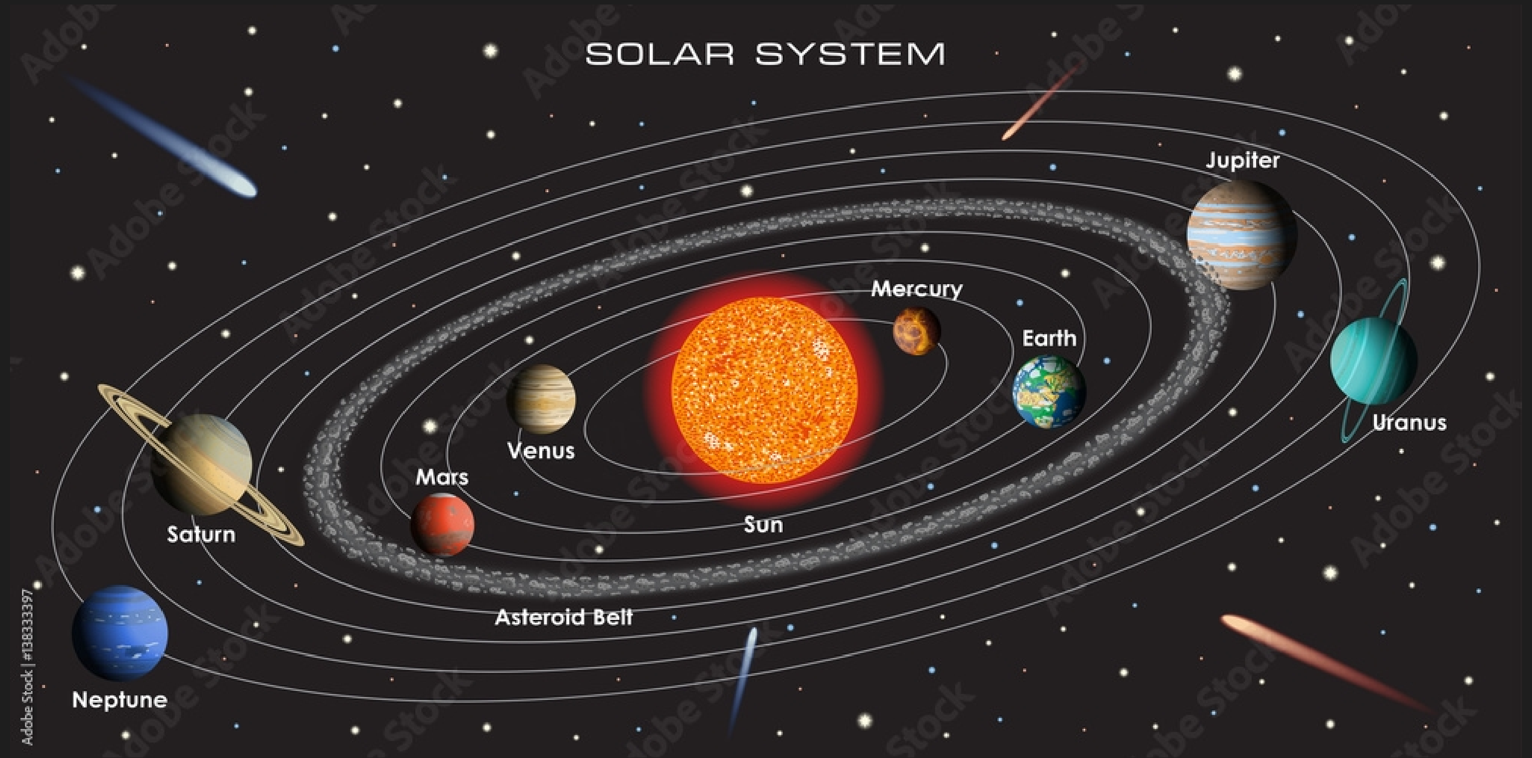
# 02 Idea: Interplanetary communication device




# The colours of the planets in our solar systems

The planets of the solar system are varied in their appearance. Mercury is slate grey while Venus is pearly white, Earth a vibrant blue, and Mars a dusky red. Even the gas giants are different, Neptune and Uranus an opaque blue, while Jupiter and Saturn are mostly beige with brilliant red-brown belts.

https://astronomy.com/news/2021/10/colors-of-the-solar-system

# If you were able to talk on another planet, how would you sound?

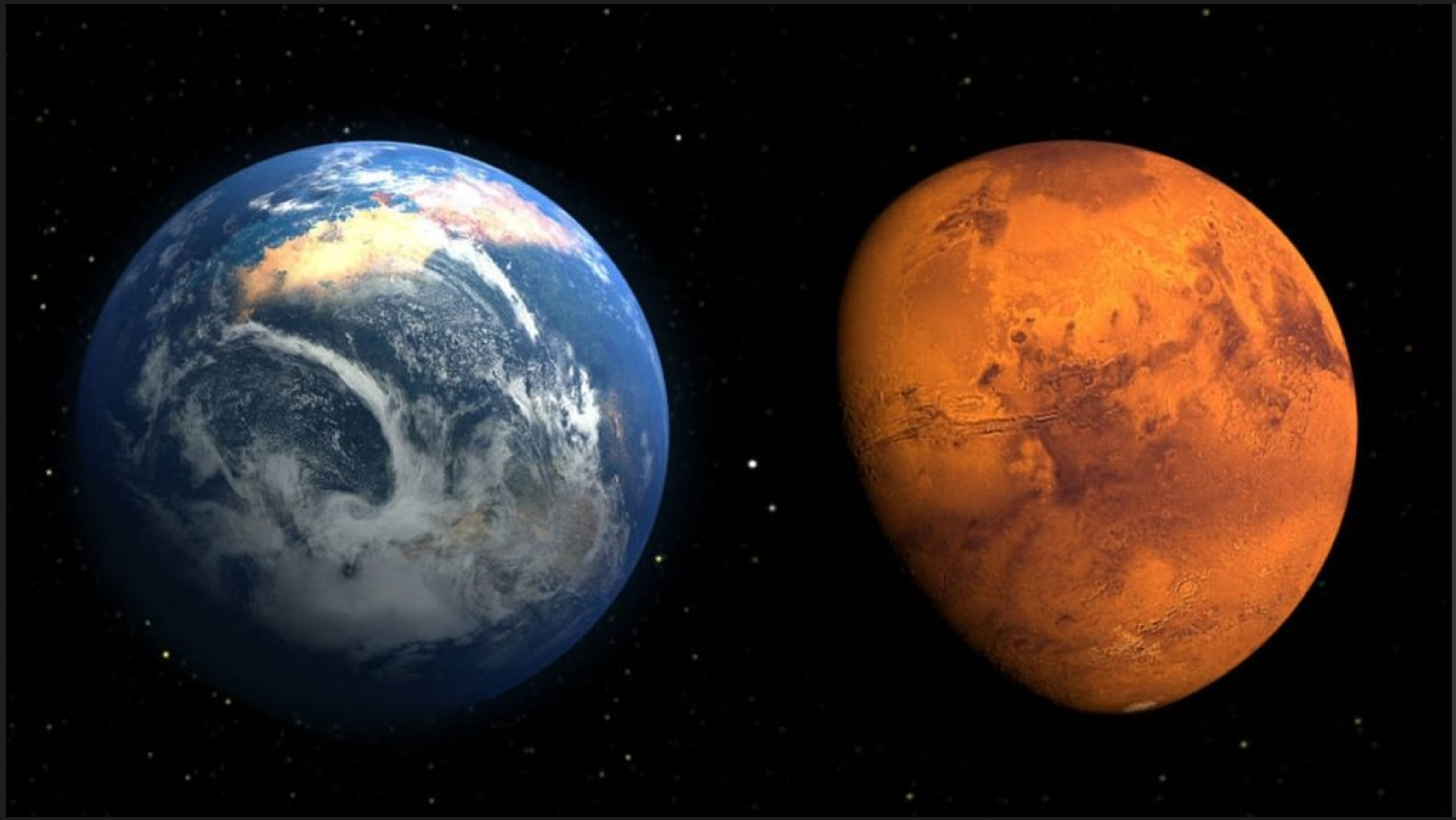
most planets in our solar system are surrounded by an atmosphere – an envelope of gases that are held close to the surface of the planet by gravity, allowing sound waves safe and efficient passage.

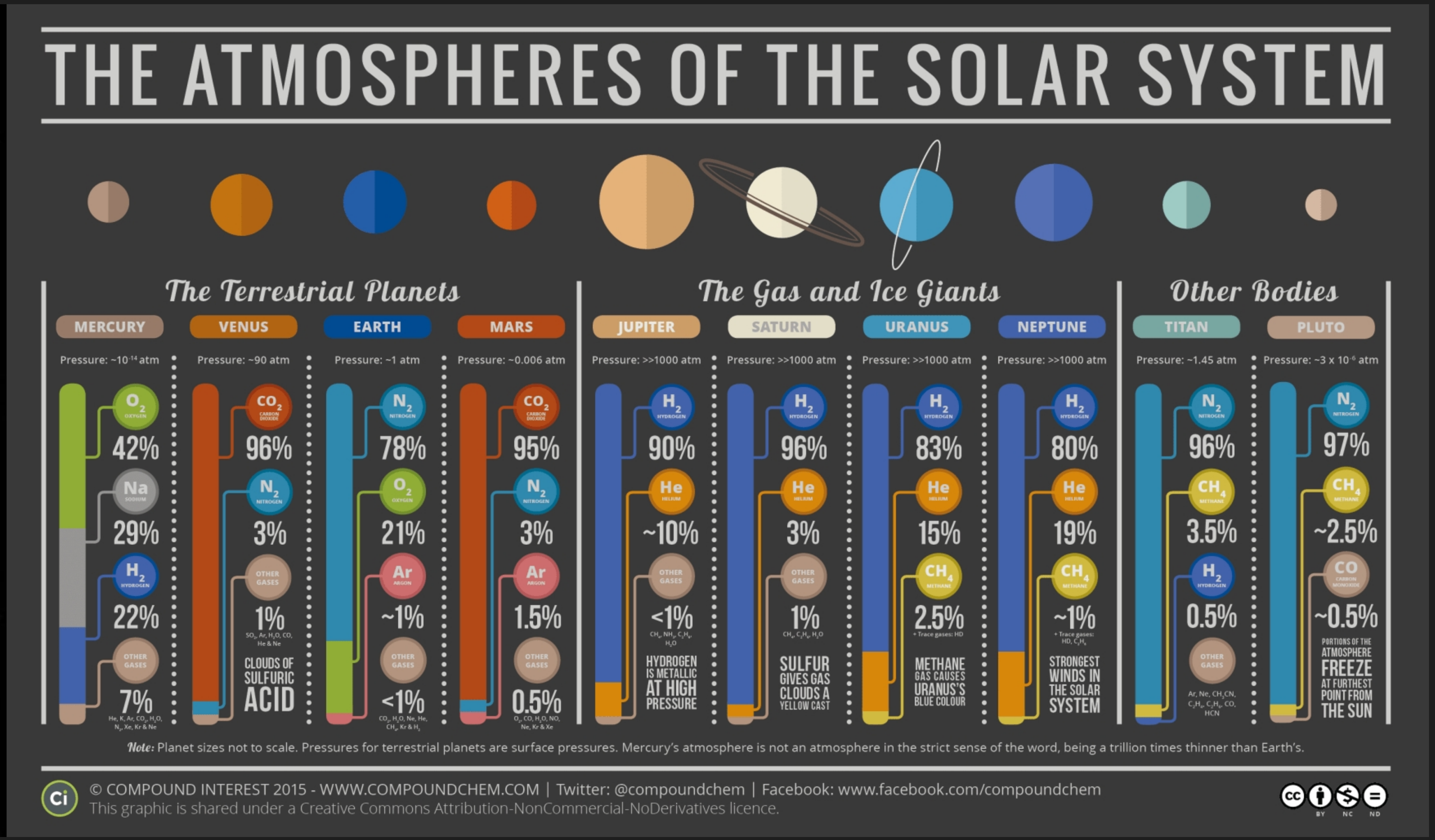
Although we have yet to record sound on the surface of another planet, we can make fairly confident predictions of what your voice would sound like by comparing what we know about atmospheric science and the differences between the environment here on Earth and other planets.

https://sitn.hms.harvard.edu/flash/2018/talk-another-planet-sound/

# 02 Idea: Interplanetary communication device

- This is the year 2084 and human lives on Different planets.
- People need to communicate from different planets (Video call or voice call).
- The colours and voice are different on every planet.
- People need to have an application to adjust their voice and look, for a better interplanetary communication experience.





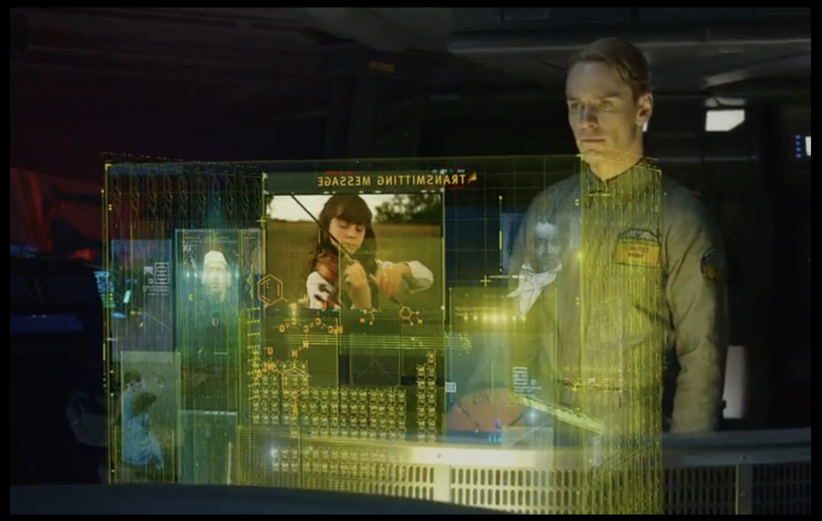
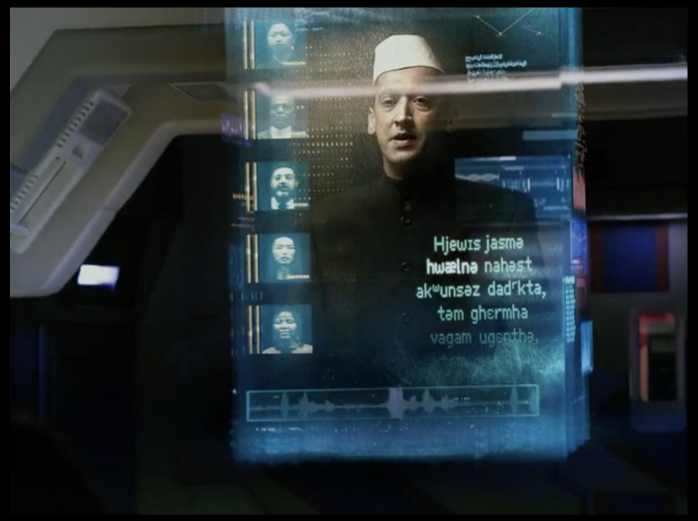

https://www.compoundchem.com/2014/07/25/planetatmospheres/

# 03 Idea: Booking a live performance

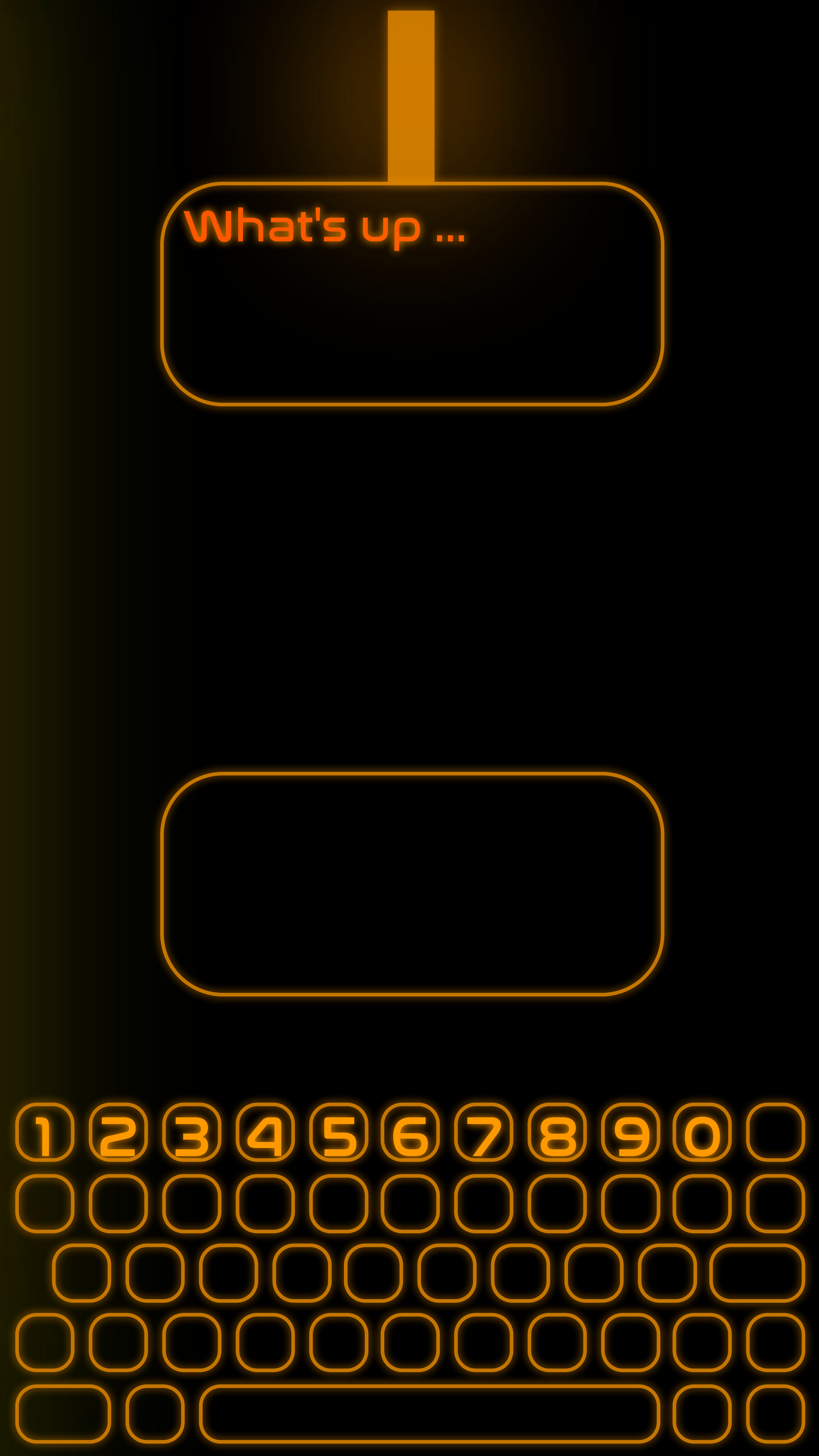
# 02 Idea: Booking a live performance

- This is the year 2084 and people are socially isolated, living in their own cubes.
- They can order a live art performance through an app.
- The artist receives a notification and he starts performing.

Some movies to look at:
- Ender's Game
- Ready Player One
- Ad Astra






In these two screens, I have tried to create a futuristic-looking app for communication

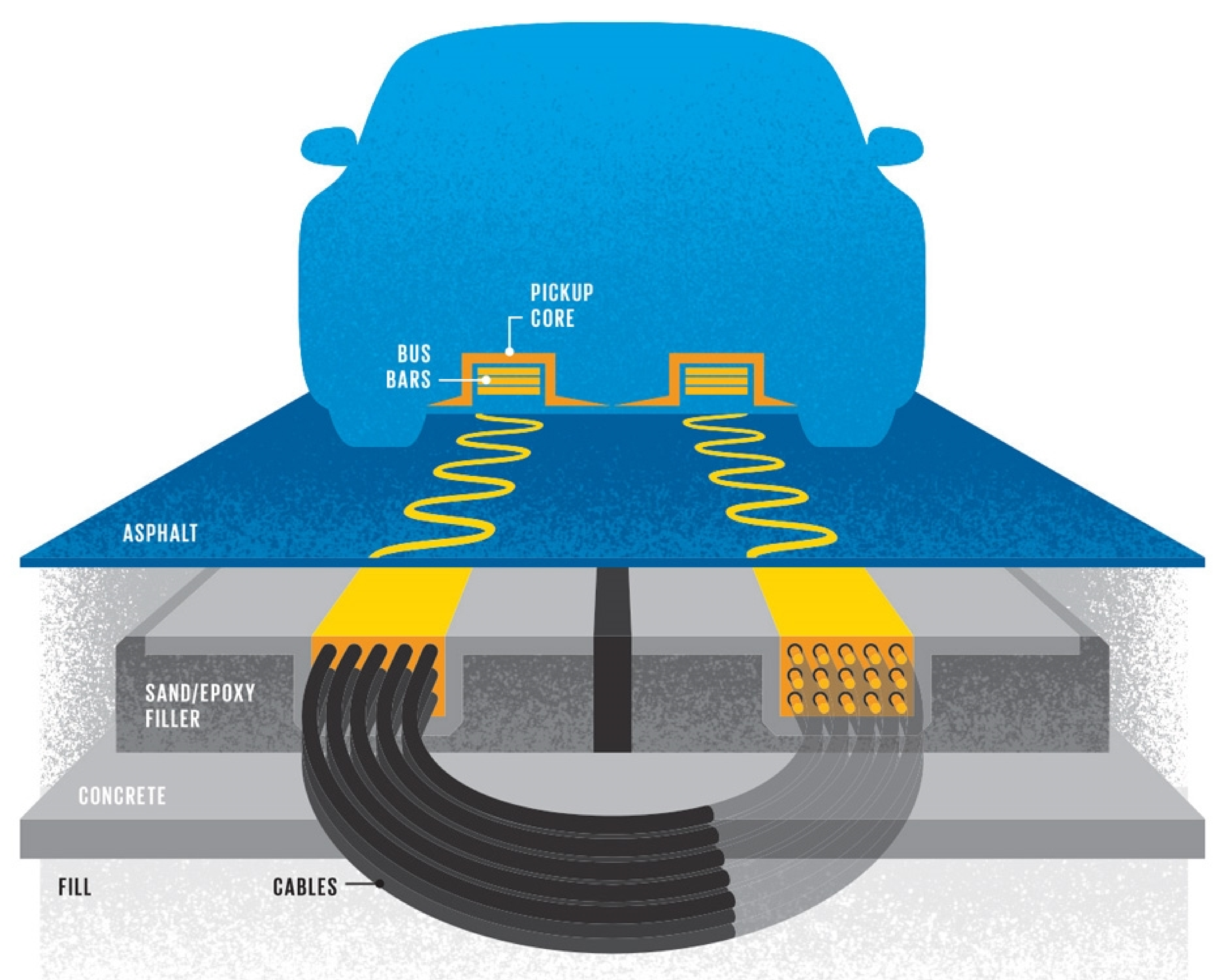
# 04 Idea: Musical Instrument Designed for Zero Gravity


TELEMETRON
ORCHESTRA
HOME
CONTACT
The Telemetron Orchestra
A UNIQUE COLLECTION OF MUSICAL INSTRUMENTS THAT
TAKE ADVANTAGE OF THE POETICS OF ZERO GRAVITY

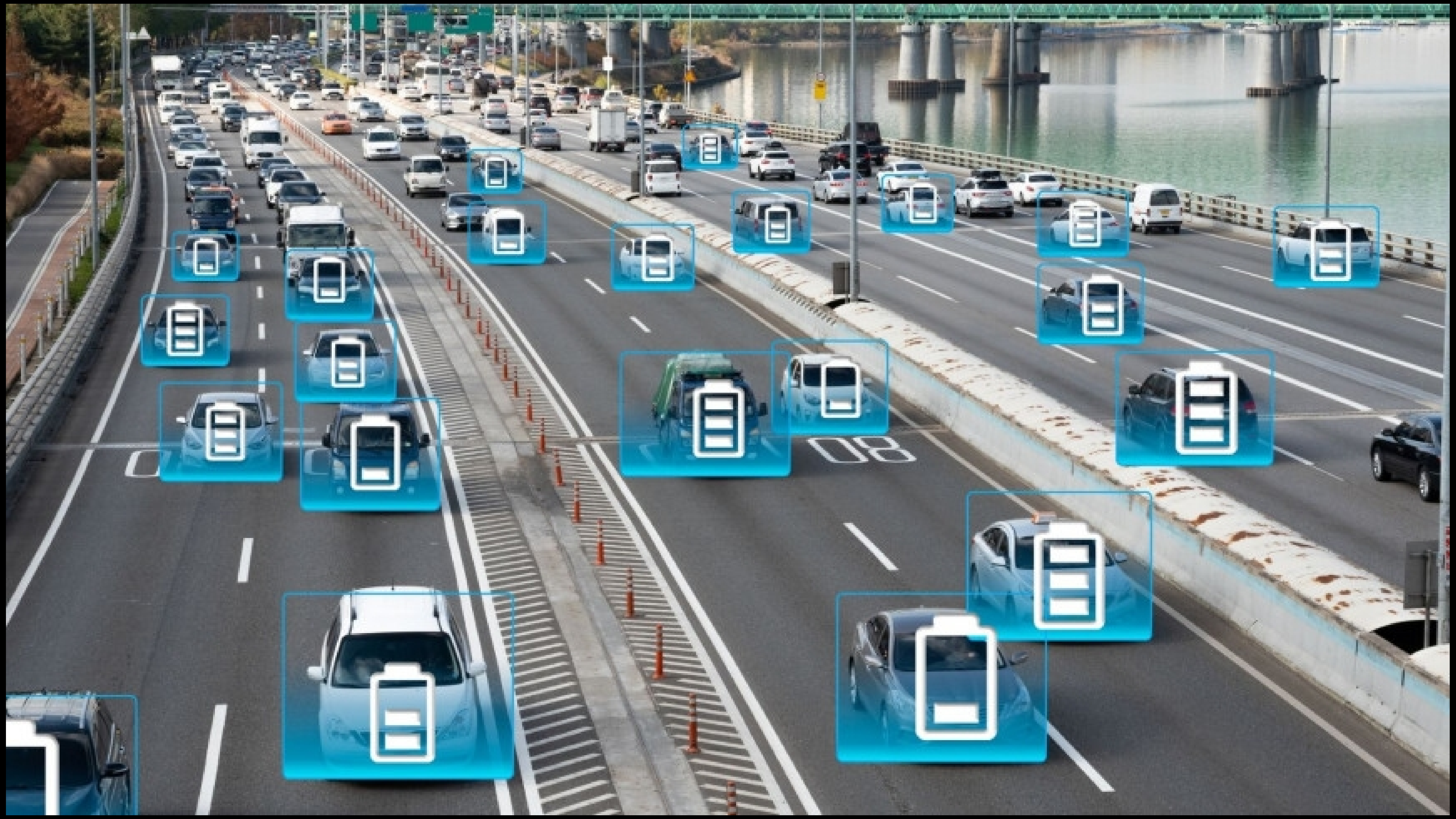
# Future energy

How will we power our existence?

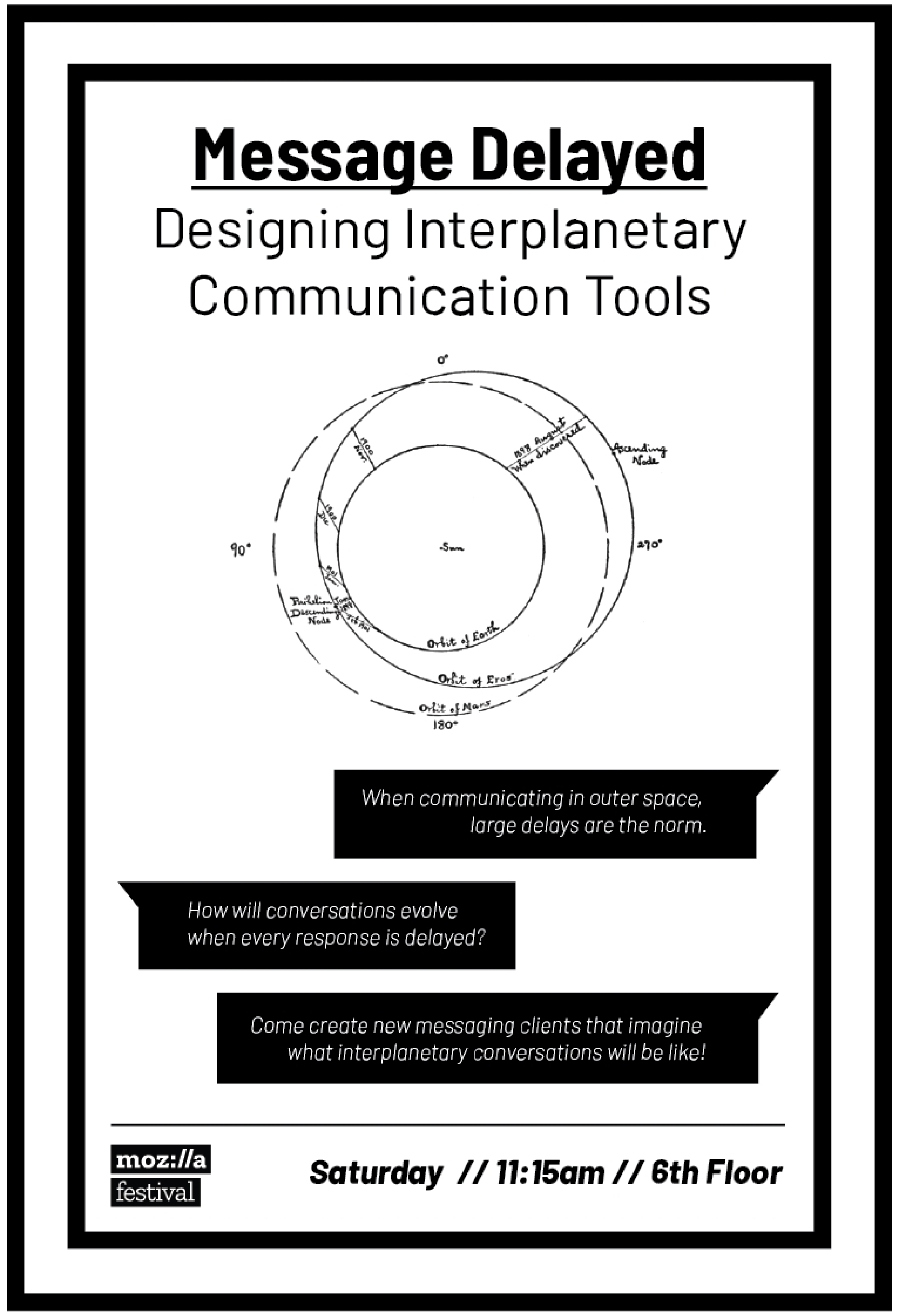
# 05 Idea: Wireless charging stations


PICKUP
CORE
BUS
BARS
ASPHALT
SAND/EPOXY
FILLER
CONCRETE
FILL
CABLES


Electric
re-charging
lane



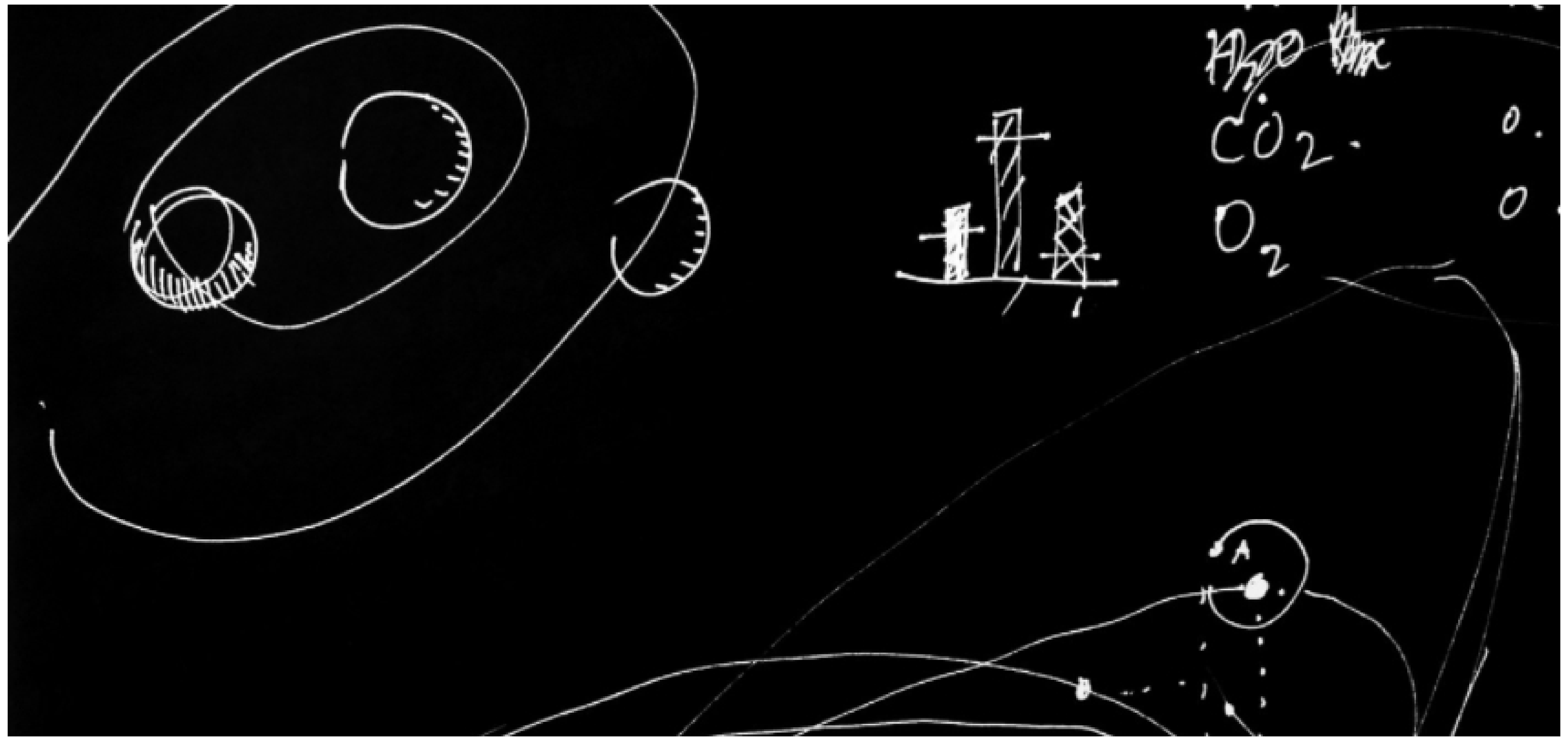
# Interplanetary Communication Manual




# How To Design Interplanetary Apps

Sands Fish Dec 8, 2018 · 7 min read

What does the internet look like when we're scattered across the solar system?



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# Research

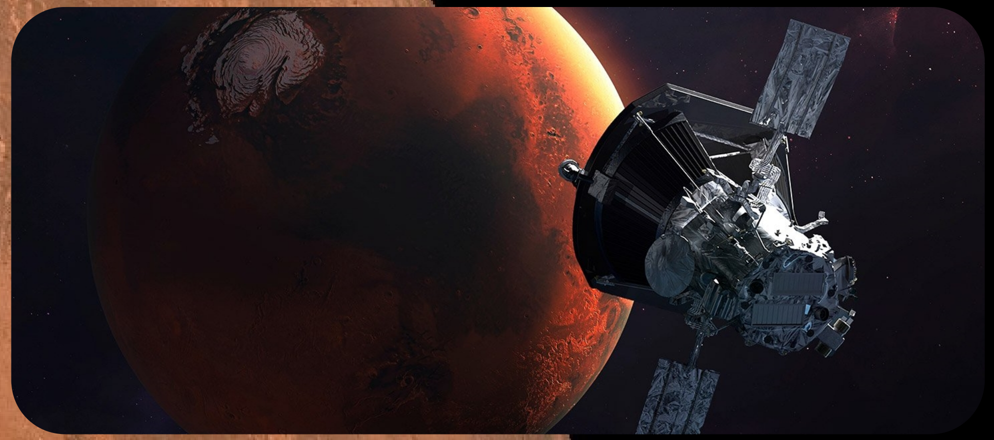
# DATA

## 1. HOW THE INTERNET WORKS ON MARS.

Here on Mars, we've gotten used to pulling out a smartphone and being able to talk, text or send and receive photographs and video from virtually anywhere on the planet's surface. Moreover, we're increasingly dependent upon tapping into the vast, burgeoning amount of information on the Internet to guide us, whether we're trying to do scientific research or find the quickest route to an appointment.

But the sort of instantaneous access and bandwidth to which we're accustomed doesn't exist in space. The enormous distances of space, for one, create huge lag times for electronic communications, and the signals have to make it from our planet's surface back to Earth through a gauntlet of space radiation that degrades their clarity. To make it even harder, the planets themselves are continuously in motion, and they can get into positions where their mass - or that of the sun - can block a signal.

We as Mars colonists, whose distance from Earth varies between 35 million and 140 million miles (56 and 226 million kilometres), those hindrances to communication could be a daunting problem. If you try to talk or send a text to mission control back on Earth using old technology, there's a lag time of between three and 21 minutes. That could make conversation pretty difficult. And imagine that you spot something incredible, and want to show it to them. You might be able to laboriously transmit a still photo but forget about streaming a live video image from the Martian surface. And with outdated technology, - the one we had on Earth - robotic rovers on Mars have only been able to achieve a data transmission rate of only about 256 kilobits per second. Running cloud apps or perusing Google's high-resolution maps of Mars for directions would be pretty much out of the question.
The difficulties would be mind-bogglingly magnified if you ventured past Pluto, and dared to try reaching an Earth-like planet in a neighbouring solar system.



### Create an Interplanetary Network of Communications Satellites / a global communications network of orbital satellites

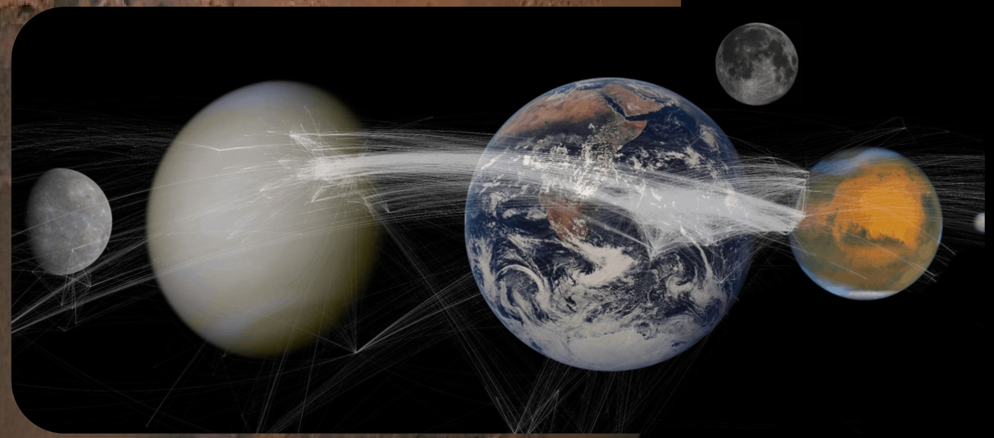
Our satellite network that stretches almost the entire 3.7 billion-mile (6 billion-kilometre) length of the solar system from Mercury to Pluto, make it possible to make a phone call or send a text or e-mail practically anywhere in our solar system and beyond. This is an interplanetary version of Clarke's global communications network back in 1945.
We have set up a long-distance digital transmission in space, via radio waves and laser waves.
The three most advanced satellites have been put in polar orbit around the sun, and others in either geosynchronous or polar orbits around the various planets. The satellites are linked into a network that could pick up radio messages from manned spaceships or robotic probes, and then relay them up or down the line from one planet or another until they reached other planets.

### Switching from Radio Signals to Lasers

Using radio waves limits the speed of data transmission. Because of the relative frequencies in which radio waves operate, they're limited in how much data they can handle. In contrast, the concentrated energy of a laser light, which has a shorter frequency, can handle a lot more data. Additionally, because lasers don't spread out as much as radio transmissions, they require less power to transmit data. NASA has set up Deep Space Optical Communications, which is utilizing lasers instead of radio transmitters and receivers. That has increased the amount of data being transmitted by 10 to 100 times what state-of-the-art radio rigs can do, our interplanetary Internet roughly as fast as a typical broadband connection on Earth.
Laser data transmission makes it possible to send high-definition, live video from Mars.

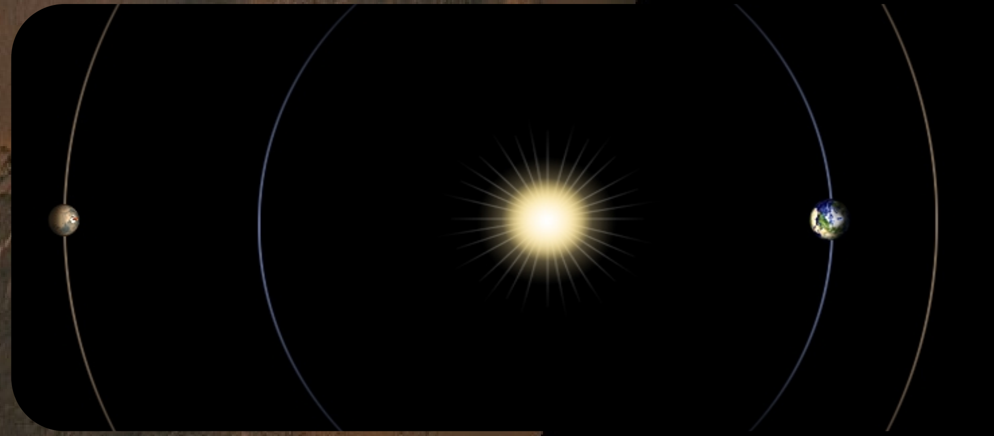
### Patching Probes and Rovers into an Interplanetary Communications Network

Every space object communicates with each other rather than just with Earth-based stations.
Back in 202 whenever we have sent spacecraft and satellites into space, they've usually communicated directly with Earth-based stations and utilized software and equipment that have been specially designed for that particular mission (and often discarded afterwards).
Scientists and engineers equipped every craft or object that was launched into space - from space stations, orbital telescopes, probes in orbit around Mars or other planets, and even robotic rovers that explored alien landscapes - so that they all are communicating with one another and serve as nodes of a sprawling interplanetary network.
In addition to relaying information, such an interplanetary network tie into the Internet on Earth, so that scientists can connect with orbital satellites or rovers and check out what they are seeing.
The network that NASA has built is the one over which scientists work out startling details of Martian geology, oceanic conditions under the ice of Jupiter's frigid moon Europa, or the turbulent cloud cover of Venus, It is the way a homesick space explorer sends an e-mail back home.



### An Internet That Works in Space

The Internet's basic design is not space-friendly - that's why scientists have developed a modified version that uses a new sort of protocol.
The Internet protocol that we use on Earth relies upon breaking up everything we transmit - whether we're talking about text, voice or streaming video - into little pieces of data, which is then reassembled at the other end so someone else can look at or listen to it. That's a pretty good way to do things, as long as all that information moves along at high speed with few delays or lost packets of data, which isn't that tough to do on Earth.
Once you get into space - where the distances are enormous, celestial objects sometimes get in the way, and there's a lot of electromagnetic radiation all over the place to mess with the signal - delays and interruptions of the data flow are inevitable. That's why scientists have developed a modified version of the Internet, which uses a new sort of protocol called disruption-tolerant networking (DTN).
Unlike the protocol used on Earth, DTN doesn't assume a continuous end-to-end connection will exist, and it hangs onto data packets that it can't immediately send until the connection is re-established.
To explain how that works, NASA uses a basketball analogy, in which a player just holds onto the ball patiently until another player is open under the basket, rather than panicking and tossing up a wild shot or throwing the ball away. In 2008, NASA ran its first test of DTN, using it to transmit dozens of images from a spacecraft located about 20 million miles (32.187 million kilometres) from Earth.

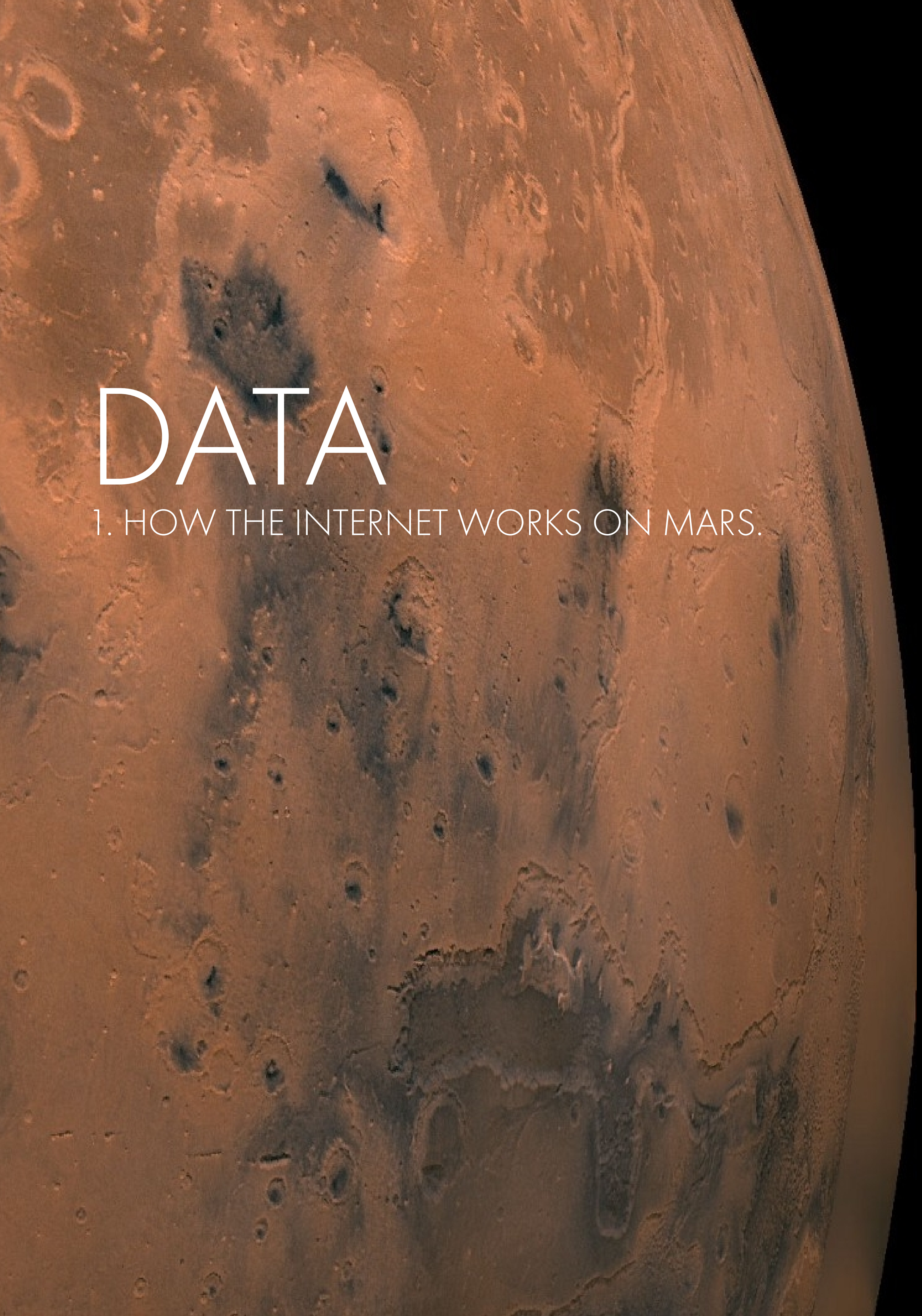


### Building Satellites and Relay Stations for Other Planets

Satellite floating in space, with Mars in foreground and Earth in background.
One of the big challenges in communicating with a Mars base is that Mars is in motion. Sometimes, a base might be turned away from the Earth, and every so often - approximately once every 780 Earth days - Mars and the Earth have the sun directly between them. That alignment called conjunction, potentially could degrade and even block communication for weeks at a time, which would be a pretty lonely, scary prospect for all of us as Martian colonists.
Satellites normally orbit planets in Keplerian orbits, named after the 17th-century astronomer Johannes Kepler, who wrote the mathematical equations that describe how satellites move. But the European and British scientists have set up a pair of communications satellites around Mars in something called a non-Keplerian orbit, which means that instead of moving in a circular or elliptical path around Mars, they are off to the side a bit so that the planet Mars is not at the centre. To stay in that position, however, the satellites have to counteract the effects of gravity, which is pulling them toward Mars.
To keep them in place, the scientists have equipped them with electric ion propulsion engines, powered by solar-generated electricity and using tiny amounts of xenon gas as a propellant. That enables the satellites to relay radio signals continuously, even during periods when Mars and Earth are in conjunction.

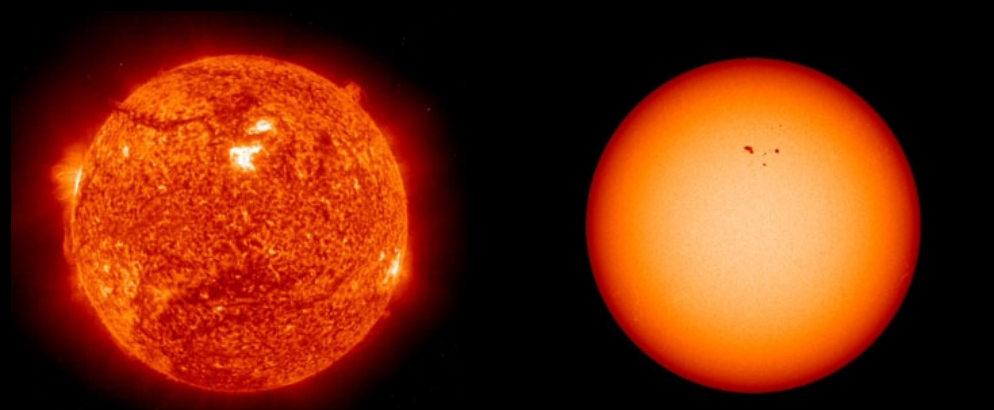
### Leave a Bread-Crumb Trail of Relays

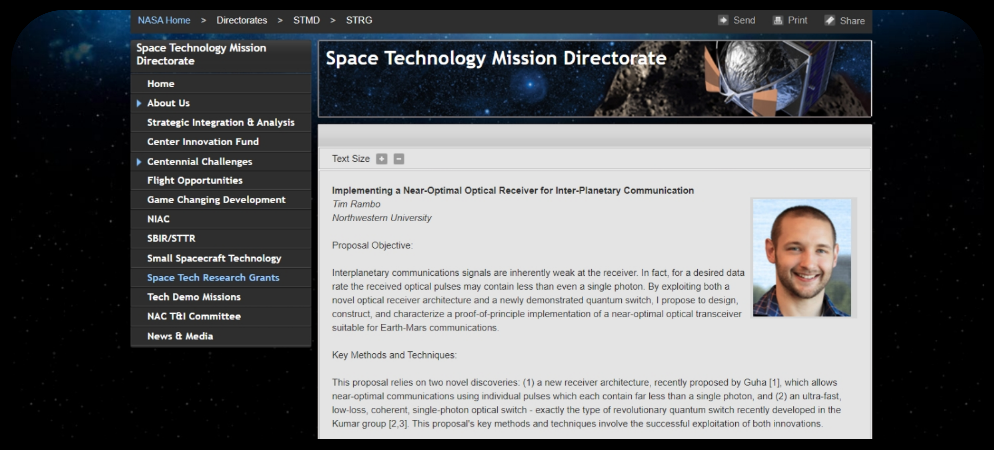
There is a chain of relays between the star-ship and Earth.
Interplanetary communication, of course, isn't necessarily just about our solar system. Since astronomers discovered the first planet orbiting a star similar to the sun in 1995, scientists have discovered scores of other exoplanets, as worlds outside our solar system are called. In October 2012, they even discovered a planet roughly the size of Earth orbiting the star Alpha Centauri B, which is in the closest neighbour system of stars, about 2.35 trillion miles (3.78 trillion kilometres) away.
Icarus is a giant star-ship that essentially is a moving, self-contained miniature version of Earth, capable of sustaining successive generations of astronauts who are venturing across interstellar space to reach other habitable planets and possibly even make contact with extraterrestrial civilizations.
Icarus is still communicating with us as it got further and further into the unknown. Along the way, the massive ship periodically jettisons empty fuel canisters equipped with signal relay equipment, forming a chain that is passing back messages from the spacecraft to Earth, Mars and Moon. With this chain of relays between Icarus and us, each 'hop' of the signal is a much shorter distance than the whole distance of several light-years, so we have been able to reduce the transmitter power requirement and the antenna size on Icarus. We also have increased the data rate that can be sent over the link.



# DATA

## 1. HOW THE INTERNET WORKS ON MARS.







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Particle physics

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Ian Sample, science correspondent

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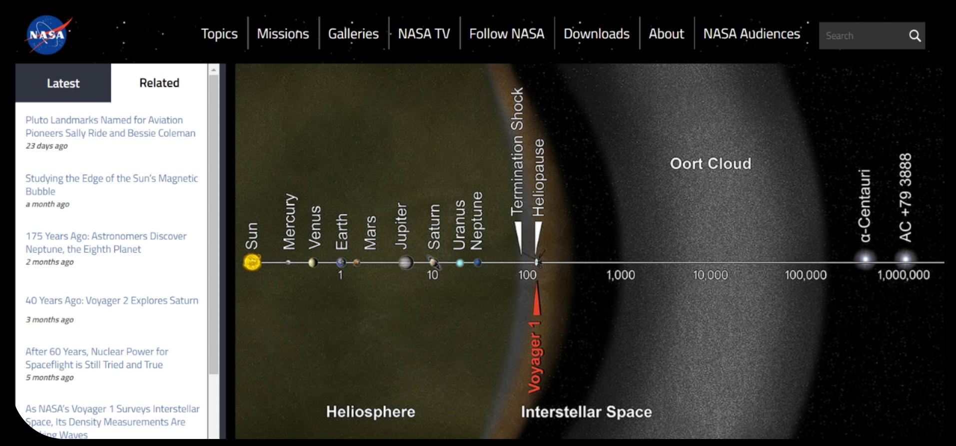



### Set Up Array of Giant Antennas to Receive Messages

We have built several solar systems receiving Stations, which are enormous arrays of antennas stretching for many miles in different locations on Earth, Mars and Moon.

Icarus is capable of reaching the nearest neighbouring star system, about 2.35 trillion miles (3.78 trillion kilometres) away - But how such a ship might stay in contact with us as it journeyed across the enormity of interstellar space. In addition to our innovative bread-crumb-like trail of communications links that Icarus would leave in its way. But, back on Earth, Mars and Moon, those monitoring the mission had been faced the challenge of trying to pick up signals from the star-ship and filter out the ambient electromagnetic noise of space - a task made even more difficult by the planet's atmosphere, which is weakening the signals.

To maximize the ability to do that, Project Icarus' planners have built several solar systems receiving stations, which are enormous arrays of antennas stretching for many miles in different locations on Mars. The antennas in such an array would work in synergy to spot and capture the faint signals containing Icarus messages. Because Mars rotates, the antennas only be pointing at the distant Icarus for a small fraction of each day, and the weather in that location on Mars could hinder the reception. For that reason, we have built multiple arrays of antennas in different locations on Mars, to ensure that we can stay in near-continuous communication.

### Use the Sun as a Signal Booster

Communications craft uses the sun as a lens to magnify signals from the star-ship and transmit them to Earth.

According to Einstein's relativity theories, extremely massive objects' gravitational forces can deflect light that's passing near them and concentrate it, the way a hand-held magnifying glass does. Icarus utilizes that effect to focus and boost transmissions from a distant spacecraft. A spacecraft capable of receiving communications transmissions have been positioned in interstellar space opposite the direction that the star-ship is going, about 51 billion miles (82 billion kilometres) away from the sun. That's really, really far - about 18 times the distance between Pluto and the sun - The communications craft then uses the sun as a lens to magnify the signals it gets from the distant star-ship, and then transmits them back to Earth through some other system, such as a network of satellites with laser links.

The potential gain from doing this is immense. The transmitter power on Icarus is able to ramp down to much lower levels without impacting the available data rate, or if the power is kept the same, we are receiving much more data than a direct link would provide. We keep the receiver spacecraft, the one getting the signals from the star-ship, pretty close to perfectly aligned at all times.

### Super-Sensitive Electronic Ears For Extremely Faint Signals from Space

The Goldstone Deep Space Station (Calif.) antenna is part of the Deep Space Network (DSN), an international network of large antennas and communications facilities that support interplanetary spacecraft missions.

By the time transmissions from a distant spacecraft reach Mars, they've become degraded, to the point where a signal may contain less than a photon worth of energy. And that's weak. Remember that photons, the tiny massless particles that are the smallest unit of energy, are incredibly tiny; a typical cell phone emits 10 to the 24th power worth of photons every second. Picking out that mind-bogglingly faint signal from the irrepressible cacophony of space and making sense of it might be as difficult as, say, finding a message floating in a bottle somewhere in the Earth's oceans. But researchers have come up with an intriguing solution.

Instead of sending out a single signal or pulse of energy, a spaceship trying to communicate with Mars, sends out many copies of that signal, all at once. When the weakened signals got to Mars, mission control uses a device called a structured optical receiver, or Guha receiver, to essentially reassemble the surviving tiny, weak bits and pieces of all those duplicate signals, and put them together to reconstruct the message. Imagine it this way: Take a message typed on a piece of paper, and then print a thousand copies of it, and run them all through a shredder and then mix up the tiny pieces that result. Even if you throw most of those little pieces into the trash, the ones that remain might well give you enough information to reconstruct the message on the paper.

### Faster-than-Light Neutrinophones

Faint communications signals struggle to reach us from deep space.

No matter how many mind-bogglingly complicated gadgets we develop to piece together faint communications signals struggling to reach us from deep space. In our solar system, the distances are so great that easy, instantaneous back-and-forth communication of the sort that we're accustomed to on Earth isn't feasible. Icarus is reaching our nearest interstellar neighbour, the Alpha Centauri star system trillions of miles away, it would take 4.2 years for each side of a voice, video or text transmission to cross that mind-blowingly large distance without transmitting messages via beams of subatomic particle that would travel faster than light.

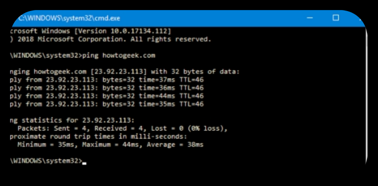
# DATA

## 2. HOW FOLKS ON MARS COMMUNICATE WITH FOLKS ON OTHER PLANETS.

Once you assume a constantly changing, very long delay in between everything that you say (for example, at its most distant, it takes 42 minutes for a round trip to Mars and back at the speed of light), it becomes clear that this will be a very different way to communicate. It is also an opportunity to think about how we define a conversation and question the assumptions and affordances that we find in modern communication tools. Can we use this delay as material to imagine how we'll communicate in the future?

Interplanetary Data Plans

what is the infrastructure of the solar system like and what does it prioritize?
Who gets to talk to other planets?
Will we have a broadly available link directly from the internet we know today to the interplanetary one?



Anticipatory Pings

When you're communicating at a distance, it's a bit trickier to say "You up?" So how do we coordinate an impromptu conversation with such large delays?
"Anticipatory pings", a function that would help time-shifted parties coordinate, facilitating when a good time to talk would be while using minimal bandwidth for efficiency, and providing some user interface queues for the next time both parties will be available.

AI Avatars

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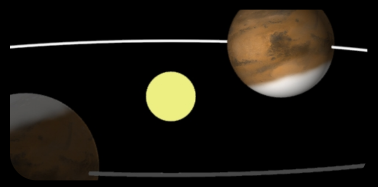

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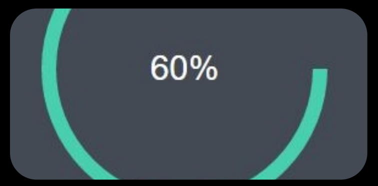


Interplanetary Progress Bars

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Speculative Miscellany

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- Given the complexity of scheduling around different night and day cycles across different planets, perhaps we will need a 3D Doodle poll
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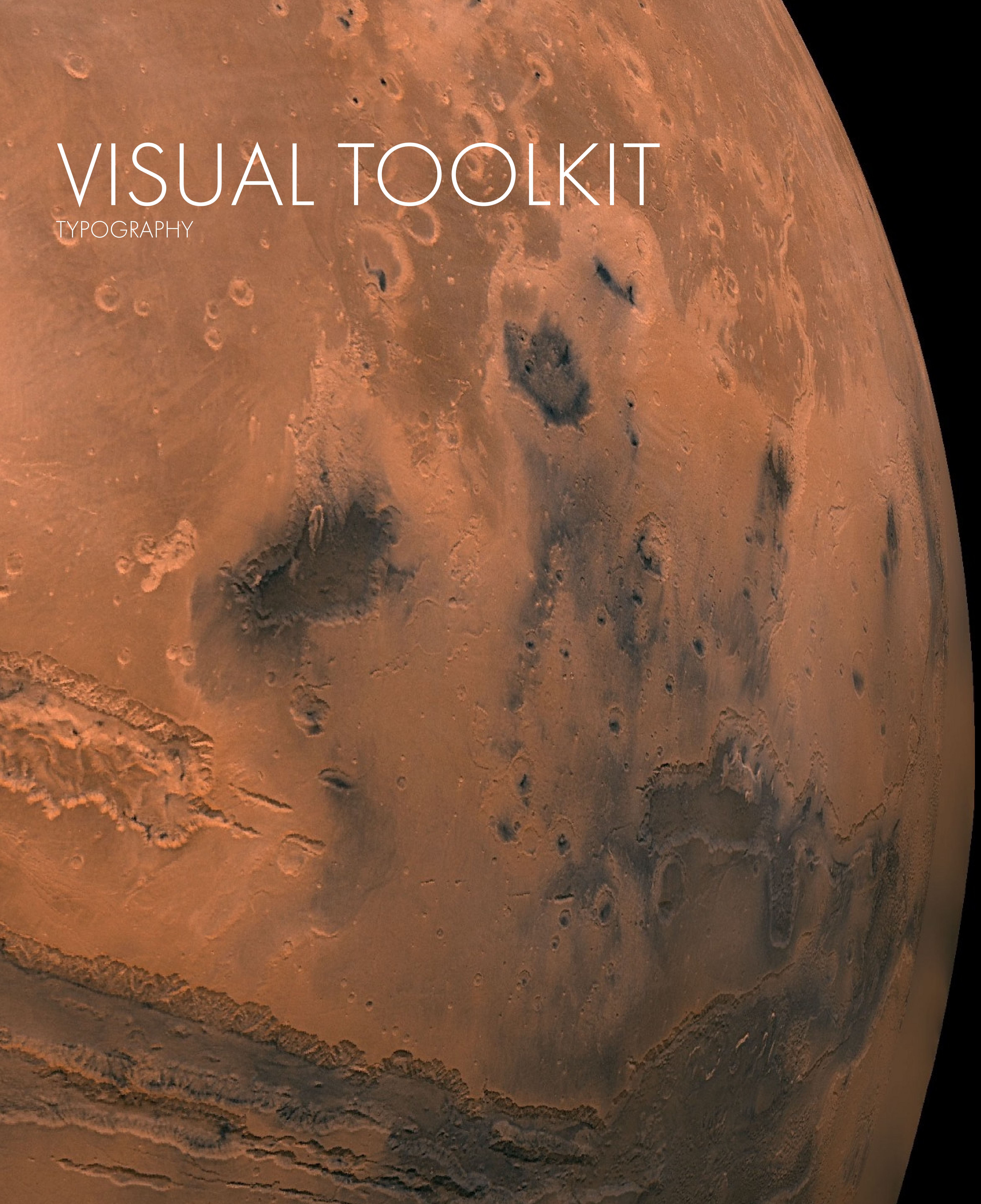

# VISUAL TOOLKIT

TYPOGRAPHY

MARS — Quara
Lorem ipsum dolor sit amet, consectetur adipiscing elit.

MARS — POSTER GOTHIC ATF
LOREM IPSUM DOLOR SIT AMET, CONSECTETUR ADIPISCING ELIT.

MARS — SOFACHROME
LOREM IPSUM DOLOR SIT AMET, CONSECTETUR ADIPISCING ELIT.

MARS — PIRULEN
LOREM IPSUM DOLOR SIT AMET, CONSECTETUR ADIPISCING ELIT.

MARS — UNIWARS
LOREM IPSUM DOLOR SIT AMET, CONSECTETUR ADIPISCING ELIT.

MARS — Sneakers Pro
Lorem ipsum dolor sit amet, consectetur adipiscing elit.

MARS — Nasalization
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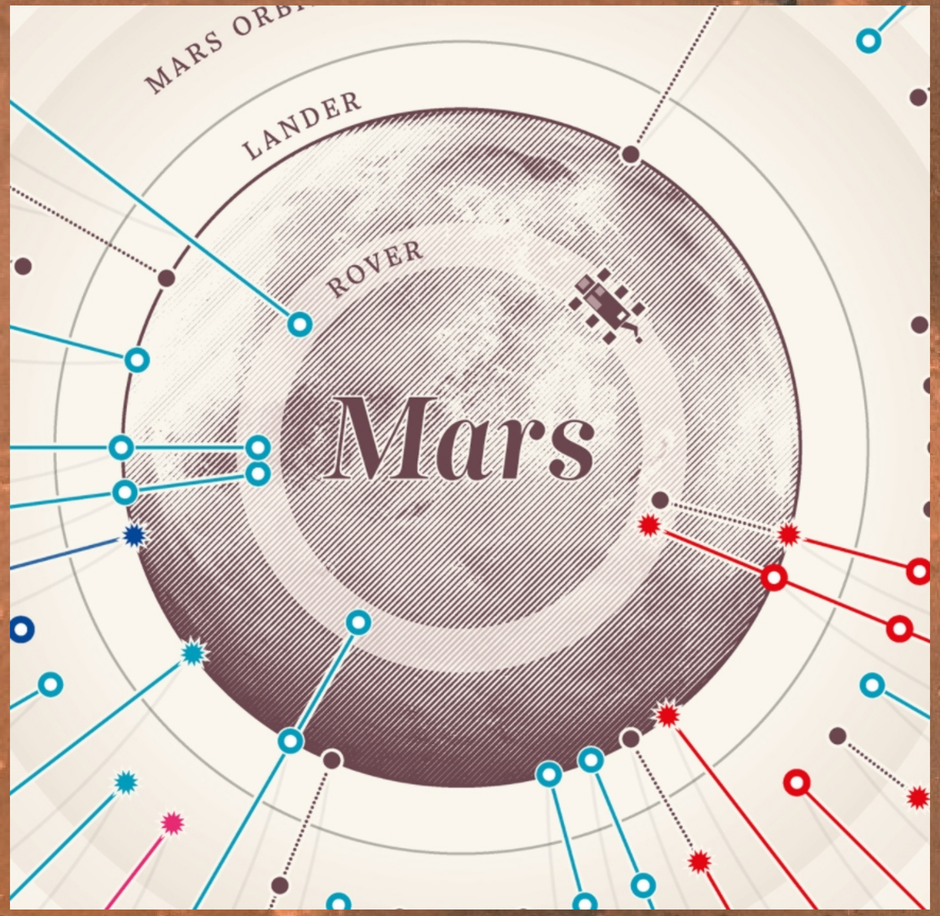
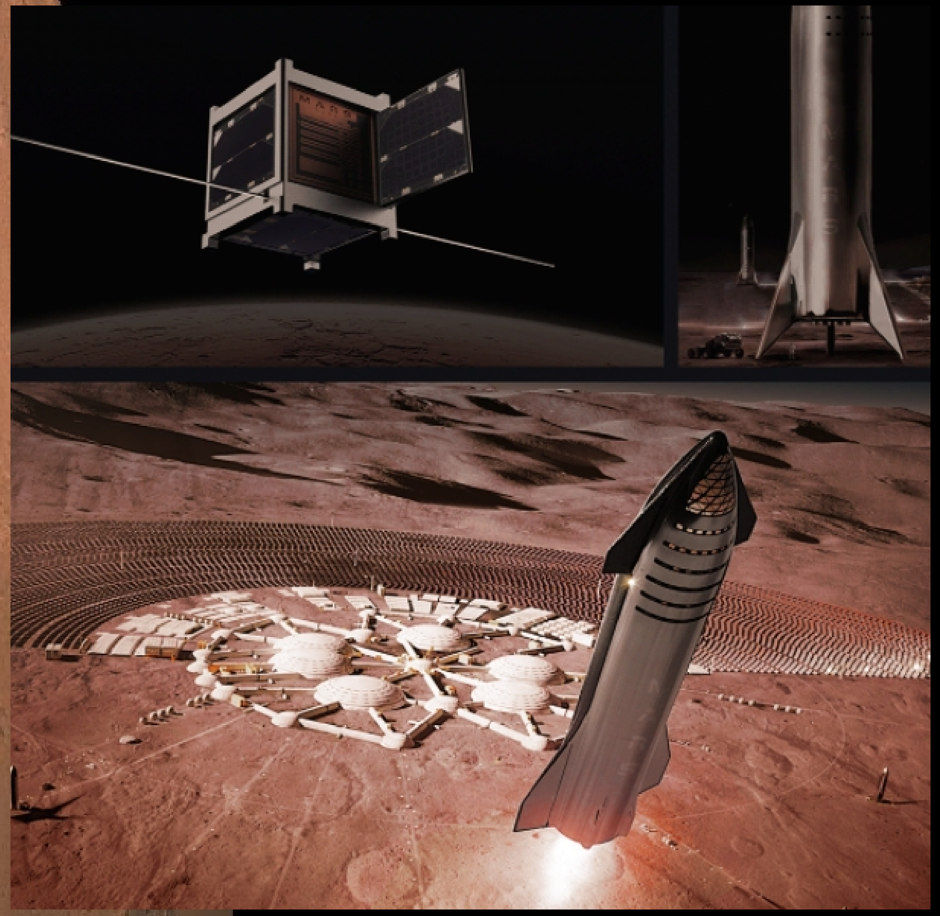
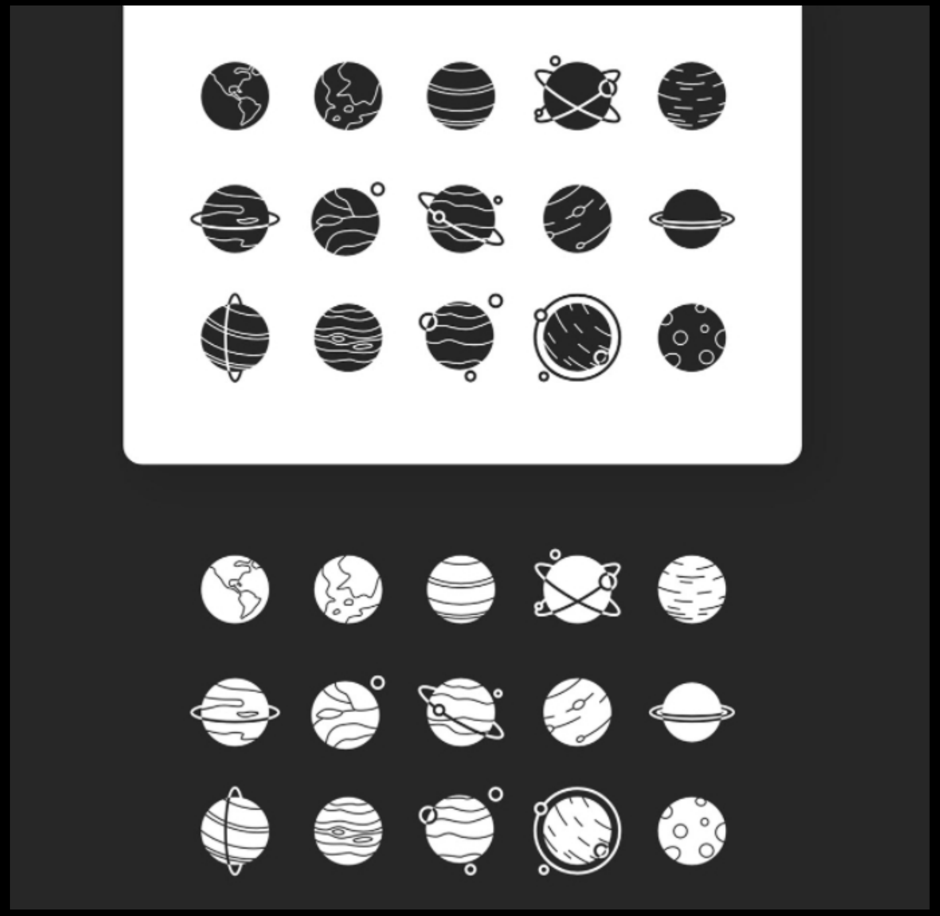
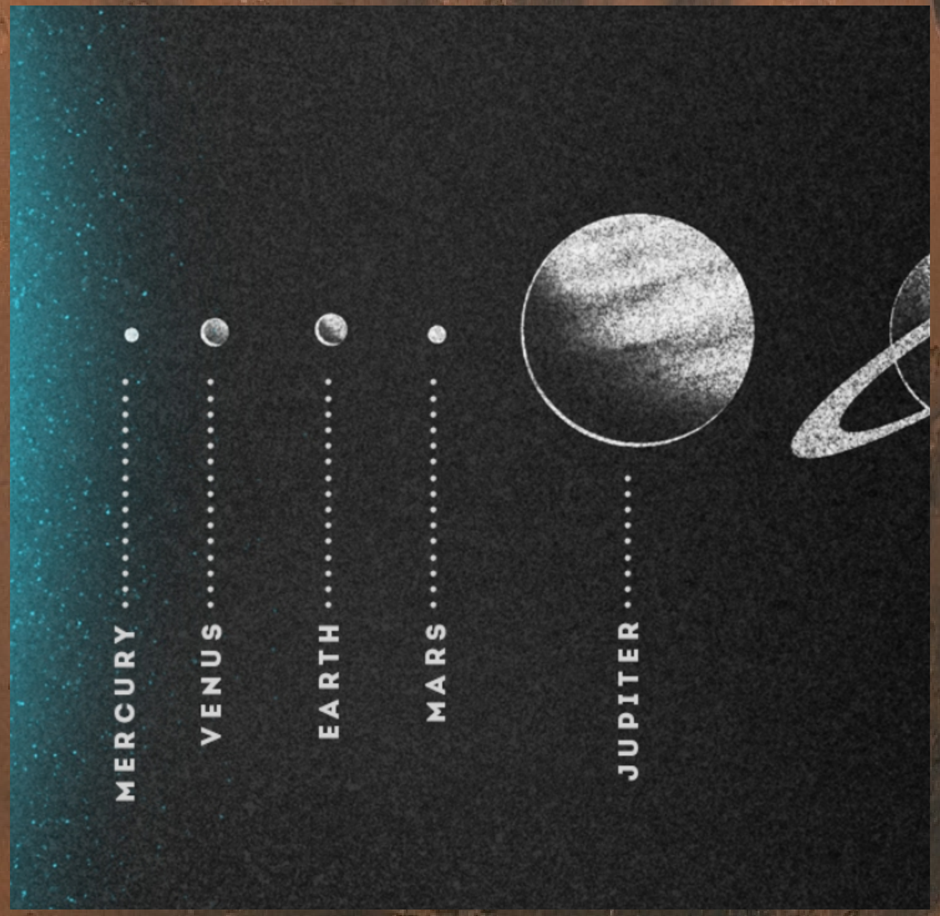
# VISUAL TOOLKIT

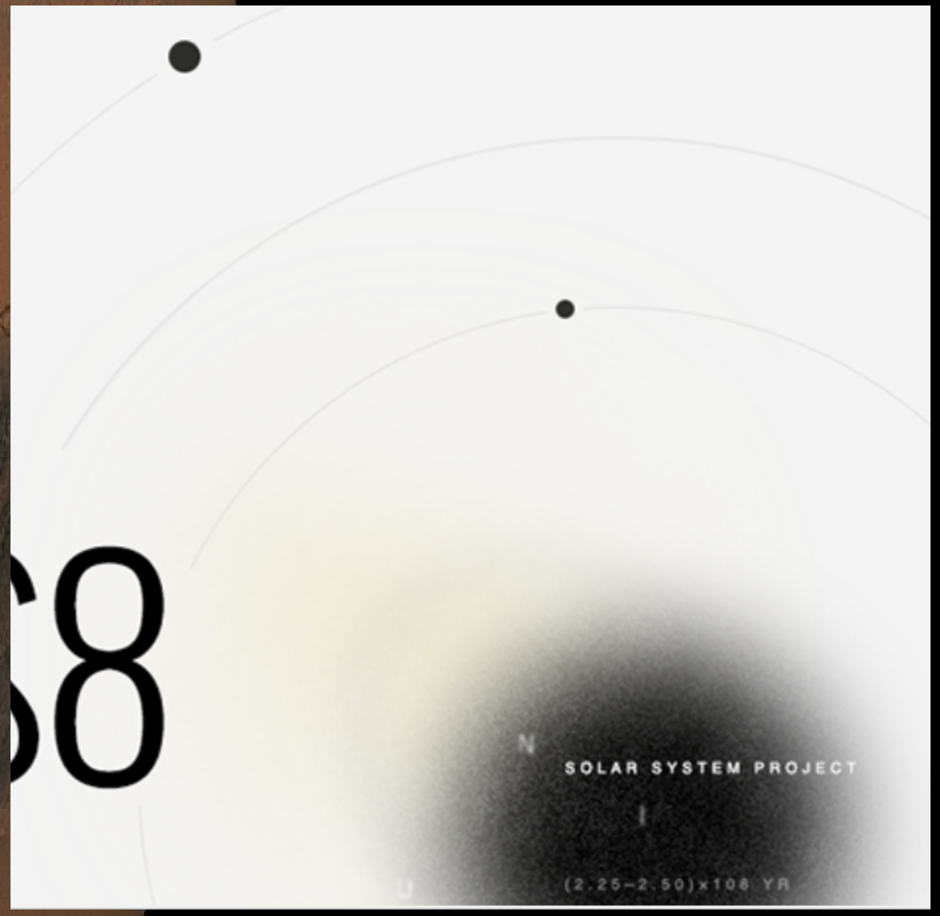
MOODBOARD

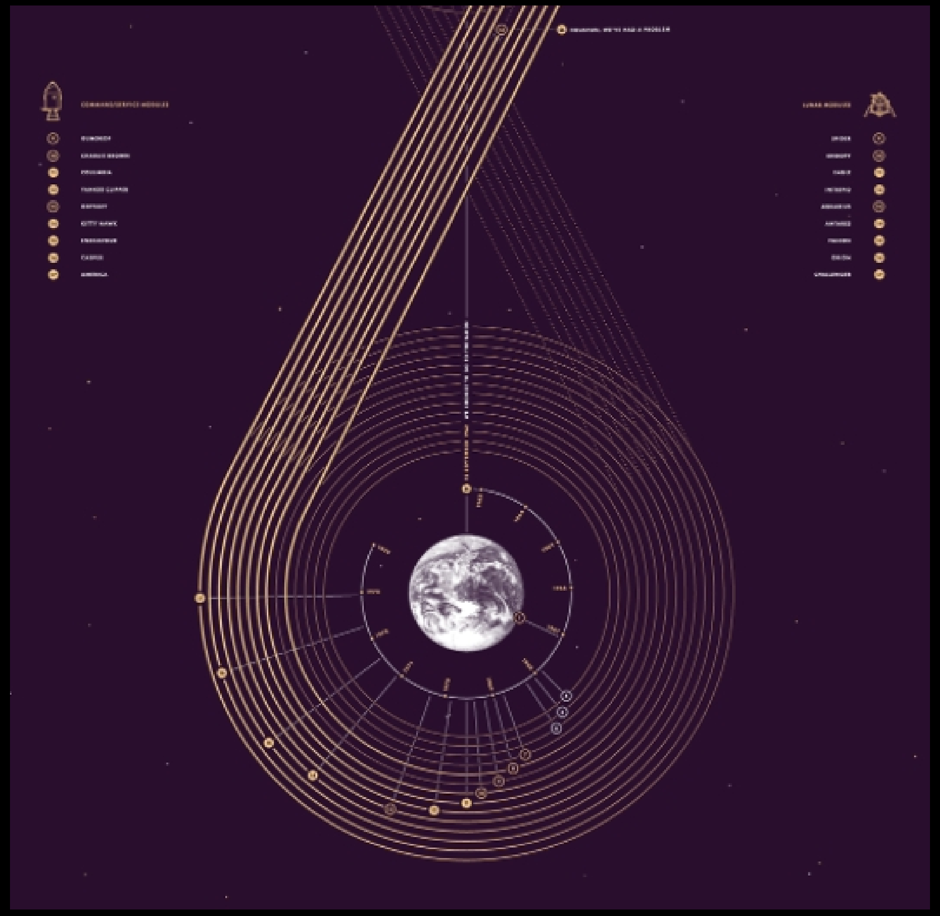


# VISUAL TOOLKIT

COLOUR

**Create an Interplanetary Network of Communications Satellites / a global communications network of orbital satellites**
building a satellite network that stretches almost the entire 3.7 billion-mile (6 billion-kilometre) length of the solar system from Mercury to Pluto. Setting up long-distance digital transmissions in space, via radio waves.

Three satellites would be put in polar orbit around the sun, and others in either geosynchronous or polar orbits around the various planets.

The satellites would then be linked into a network that could pick up radio messages from manned spaceships or robotic probes, and then relay them up or down the line from one planet or another until they reached Earth.

The cost of putting multiple satellites in orbit around distant heavenly bodies is likely to be enormous.

**Patching Probes and Rovers into an Interplanetary Communications Network**
To equipped every craft or object that was launched into space, so that they all could communicate with one another and serve as nodes of a sprawling interplanetary network.

Imagine how your laptop computer, tablet, smartphone, game console, webcam and home entertainment centre could all link into your wireless Internet router and share content with one another.

To relaying information, such an interplanetary network ties into the Internet on Earth, so that scientists could connect with orbital satellites or rovers and check out what they are seeing.

"It may well be the way a homesick space explorer sends e-mail back home"

Connecting spacecraft and probes in a vast network across space, so that scientists could connect to them the way that they do to a Web site on the Internet.

**Building Satellites and Relay Stations for Other Planets**
One of the big challenges in communicating with a Mars base is that Mars is in motion. Sometimes, a base might be turned away from the Earth, and every so often -- approximately once every 780 Earth days -- Mars and the Earth have the sun directly between them. That alignment, called conjunction, potentially could degrade and even block communication for weeks at a time, which would be a pretty lonely, scary prospect if you were an astronaut or a Martian colonist.

Satellites normally orbit planets in Keplerian orbits. Putting a pair of communications satellites around Mars in something called a non-Keplerian orbit, which basically means that instead of moving in a circular or elliptical path around Mars, they'd be off to the side a bit, so that the planet wouldn't be at the centre. In order to stay in that position, however, the satellites would have to counteract the effects of gravity, which would pull them toward Mars. To keep them in place, the scientists have proposed equipping them with electric ion propulsion engines, powered by solar-generated electricity and using tiny amounts of xenon gas as propellant. That would enable the satellites to relay radio signals continuously, even during periods when Mars and Earth are in conjunction

**Set Up Array of Giant Antennas to Receive Messages**
The scientists and futurists working on Project Icarus - a speculative attempt to design a star-ship capable of reaching the nearest neighbouring star system, about 2.35 trillion miles (3.78 trillion kilometres) away. Back on Earth, those monitoring the mission would still face the challenge of trying to pick up signals from the star-ship and filter out the ambient electromagnetic noise of space - a task made even more difficult by the Earth's atmosphere, which would weaken the signals.

several solar system receiving stations, which would be enormous arrays of antennas stretching for many miles in different locations on Earth. The antennas in such an array would work in synergy to spot and capture the faint signals containing star-ship messages.

Because the Earth rotates, the antennas in a particular SSRS would only be pointing at the distant star-ship for a small fraction of each day, and the weather in that location on Earth could hinder the reception. For that reason, it might be wise to build multiple arrays of antennas in different locations on Earth, to ensure that we can stay in near-continuous communication

**Super-Sensitive Electronic Ears For Extremely Faint Signals from Space**
By the time transmissions from a distant spacecraft reach Earth, they've become degraded, to the point where a signal may actually contain less than a photon worth of energy.
Remember that photons, the tiny massless particles that are the smallest unit of energy, are incredibly tiny; a typical cell phone emits 10 to the 24th power worth of photons every second,
Similar to finding a message floating in a bottle somewhere in the Earth's oceans.

Instead of sending out a single signal or pulse of energy, a spaceship trying to communicate with Earth would send out many copies of that signal, all at once. When the weakened signals got to Earth, mission control would use a device called a structured optical receiver, or Guha receiver (after the scientist, Saikat Guha, who invented the concept), to essentially reassemble the surviving tiny, weak bits and pieces of all those duplicate signals, and put them together to reconstruct the message.
Imagine it this way: Take a message typed on a piece of paper, and then print a thousand copies of it, and run them all through a shredder and then mix up the tiny pieces that result. Even if you throw most of those little pieces into the trash, the ones that remain might well give you enough information to reconstruct the message on the paper.

**Interplanetary Data Plans**
What is the infrastructure of the solar system like and what does it prioritize?
Who gets to talk to other planets?
Will we have a broadly available link directly from the internet we know today to the interplanetary one?

**Anticipatory Pings**
When you're communicating at a distance, it's a bit trickier to say "You up?" So how do we coordinate an impromptu conversation with such large delays?
"Anticipatory pings", a function that would help time-shifted parties coordinate, facilitating when a good time to talk would be while using minimal bandwidth for efficiency, and providing some user interface queues for the next time both parties will be available.

**AI Avatars**
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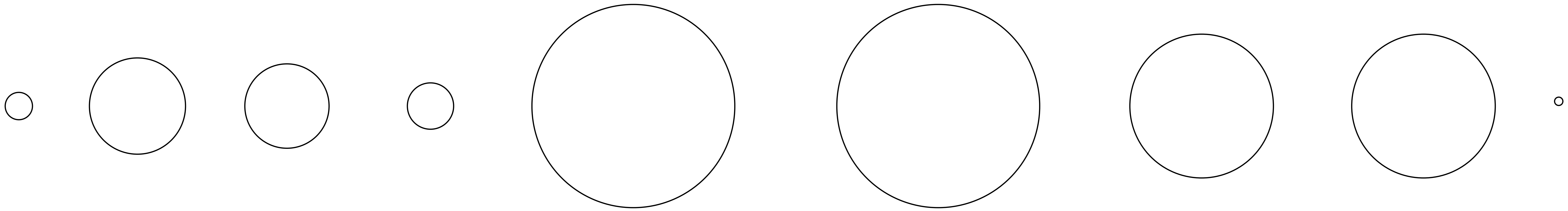
**SUN**



**Switching from Radio Signals to Lasers**
data transmissions in space currently are stuck at rates that are vastly slower than the broadband Internet that we're accustomed to having on Earth. Because of the relative frequencies in which radio waves operate, they're limited in how much data they can handle.
Using radio waves limits the speed of data transmission.

The concentrated energy of a laser light, which has a shorter frequency, can handle a lot more data. Because lasers don't spread out as much as radio transmissions, they require less power to transmit data. We are switching to utilizing lasers instead of radio transmitters and receiver.
That would up the amount of data being transmitted by 10 to 100 times what state-of-the-art radio rigs can do, which would make interplanetary Internet roughly as fast as a typical broadband connection on Earth.

Laser data transmission make it possible to send high-definition, live video from Mars.

**An Internet That Works in Space**
The Internet's basic design wouldn't work very well in space. The Internet protocol that we use on Earth relies upon breaking up everything we transmit into little pieces of data, which is then reassembled at the other end. That's a pretty good way to do things, as long as all that information moves along at high speed with few delays or lost packets of data, which isn't that tough to do on Earth.

Where the distances are enormous, celestial objects sometimes get in the way, and there's a lot of electromagnetic radiation all over the place to mess with the signal. Delays and interruptions of the data flow are inevitable.
A new sort of protocol called disruption-tolerant networking (DTN). Unlike the protocol used on Earth, DTN doesn't assume a continuous end-to-end connection will exist, and it hangs onto data packets that it can't immediately send, until the connection is re-established. To explain how that works, NASA uses a basketball analogy, in which a player just holds onto the ball patiently until another player is open under the basket, rather than panicking and tossing up a wild shot or throwing the ball away. In 2008, NASA ran its first test of DTN, using it to transmit dozens of images from a spacecraft located about 20 million miles (32.187 million kilometers) from Earth

**Leave a Bread-Crumb Trail of Relays**
Interplanetary communication, of course, isn't necessarily just about our own solar system. Since astronomers discovered the first planet orbiting a star similar to the sun in 1995, scientists have discovered scores of other exoplanets, as worlds outside our solar system are called. In October 2012, they even discovered a planet roughly the size of Earth orbiting the star Alpha Centrauri B, which is in the closest neighbour system of stars, about 2.35 trillion miles (3.78 trillion kilometres) away

Project Icarus, a recent effort by space scientists and futurists to come up with a blueprint for such a mission, pondered the problem of how such a ship would continue to communicate with Earth as it got further and further into the unknown. They came up with one intriguing solution: Along the way, the massive ship would periodically jettison empty fuel canisters equipped with signal relay equipment, forming a chain that would pass back messages from the spacecraft to Earth. "The idea is that with a chain of relays between Icarus and Earth, each 'hop' of the signal is a much shorter distance than the whole distance of several light years, so we could, potentially, reduce the transmitter power requirement, or the antenna size on Icarus, or alternatively, increase the data rate that can be sent over the link"

**Use the Sun as a Signal Booster**
According to Einstein's relativity theories, extremely massive objects' gravitational forces can actually deflect light that's passing near them and concentrate it, the way a hand-held magnifying glass does. We can use that effect to focus and boost transmissions from a distant spacecraft.
A spacecraft capable of receiving communications transmissions would be positioned in interstellar space opposite the direction that the star-ship is going, about 51 billion miles (82 billion kilometres) away from the sun. That's really, really far - about 18 times the distance between Pluto and the sun, in fact - but let's assume that an Earth civilization capable of sending a star-ship trillions of miles from Earth can do that. The communications craft would then use the sun as a lens to magnify the signals it gets from the distant star-ship, and then would transmit them back to Earth through some other system, such as a network of satellites with laser links.
"The transmitter power could be ramped down to much lower levels without impacting the available data rate, or if the power is kept the same, we could be receiving much more data than a direct link would provide."
It'd be necessary, for example, to keep the receiver spacecraft, the one getting the signals from the stars-hip, pretty close to perfectly aligned at all times, and keeping it that way could prove very, very difficult

**Faster-than-Light Neutrinophones**
Faint communications signals struggling to reach us from deep space.
Inside our solar system, the distances are so great that easy, instantaneous back-and-forth communication of the sort that we're accustomed to on Earth isn't really feasible, at least with present technology.
If a star-ship reached our nearest interstellar neighbour, the Alpha Centauri star system trillions of miles away, it would take 4.2 years for each side of a voice, video or text transmission to cross that mind-blowingly large distance.

Transmitting messages via beams of subatomic particle that would travel faster than light.

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A conceptual framework for when two planets are close to each other or far away, which has implications for how long a conversation would take to play out. Are we in the season where communications are relatively quick between the two planets, or the one where they would take close to an hour?

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