

One Whole Step for Man: Songs of Space Travel 2019

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SONG 1. ANIMAL ASTRONAUTS
by Molly Ruggles

Melody:

They came before us, each one a pioneer.
Animals in space helped to pave the way.
They were the first ones to leave our atmosphere,
Opening the gates to where we are today.
Belke and Strelke
Circled 'round the Earth and then returned to
 bark the tale.
Félicette was a fine courageous cat.

She came back in a parachute. Think of that.

In the beginning, they sent the simplest beings.
Sturdy strong and small, hardiest of all.
So worms and fruit flies became space travelers,
Sixty miles high, past the Kármán line.
And monkeys from Russia
From France and Argentina and from
 China and Iran,
And many from our own United States.
Monkey astronauts were our celestial delegates.

Ev'ry single astronaut should never ever be forgot.
Beetles, frogs and worms and spiders
And ants and fleas and rabbits
And bees and scorpions
And geckos, rats and snails.
Guinea pigs and tortoises

And fish and mice and crickets
And newts and jellyfish,
But never any whales.

Ev'ry single astronaut should never ever be forgot.
[Low Melody]: Animal astronauts, animal astronauts.
[High Melody]: Animal, animal astronauts.

Alto/Bass:

They came before us, each one a pioneer.
Animals in space helped to pave the way.
They were the first ones to leave our atmosphere,
Opening the gates to where we are today.
In Russia in nineteen sixty, those pups were frisky,
Orbited and then returned.

Then in nineteen sixty-three, the first cat, Felix,
 ran away.
He was French. Not bad for a stray.

In nineteen forty-seven, on captured German V2's,
Sturdy strong and small, hardiest of all.
And dogs and mice, suborbital flights,
Sixty miles high, past the Kármán line.
Soon after, and over decades,
Macaques and chimps and squirrel monkeys went
 in space. There were thirty-two in all.
Though many, too many never made it home,
They were our celestial delegates.

Ev'ry single astronaut should never ever be forgot.
On biosatellites in the sixties,
Skylab in the seventies,
Mir in the eighties and nineties,
I S S since.
Fifty years ago, two Russian tortoises circled
 the moon.
Two bullfrogs once stayed in orbit
For six months,
But never any whales, like Agrajag.

Ev'ry single astronaut should never ever be forgot.
Animal astronauts, animal astronauts.

SONG 2. BETWEEN POINTS A AND B
by Bruce Lazarus

Worlds beyond counting,
Vastness beyond measure, beyond measure.
Countless worlds and size without end - it never ends.
Immensity...
Worlds and size without end.
Even if... Even if we use the largest measuring rods,
The space between points A and B reliably is still astounding.
Boundless, endless.

Space without boundaries,
Time without ending, without ending.
Boundless space and time without end - it never ends.
Remarkably...
Space and time without end.
Even if... Even if we reached the speed of light
Our travel time between points A and B conceivably would take a hundred million lifetimes.

Journey outward, spanning miles.
Leaving Earth and moon and planets behind,
Leaving Sun and solar system behind,
[Towards immensities of space] and time, [on and on...]
[Voyage] outward, spanning light-years.
Say “goodbye” to constellations,
Likely cause some consternations.
[How line A to B has vanished] [to submicroscopic levels]
Intergalactic space surrounding... [repeated]
Space surrounding [repeated]

Space surrounding,
Vastness beyond measure,
Time without end

Countless worlds and size without end - it never ends.
Infinity...
Space and time without end.
Even if... Even if we try to stretch our minds
To gauge the space between points A and B emphatically is still astounding.
Boundless, endless.

Space surrounding,
Vastness beyond measure,
Time without end.

SONG 3. CAMBRIDGE PUBLIC SCHOOL MEDLEY

by Cambridge Public School Students, facilitated, tweaked, and arranged by David Haines

SONG 1: COME CRUISE THE MYTHOLOGICAL PLANETARY FAMILY TREE!

Here in the twenty-third century,
You can cruise interplanetarily.
Stow your luggage in your cabin,
There'll be plenty of room,
Before we launch... BOOM!! ZOOM!
[ZOOM! ZOOM! ZOOM! ZOOM!]
At noon from Spaceport Moon...

Seven planets make a mythic fam'ly tree.
On a cushion of foam lone Venus rose from the sea.
Uranus and Gaia married under starry sky.
Their son Saturn was a farming guy.
This is the planetary family tree.
Come take a mythological fam'ly space cruise
with me...

Saturn's son Neptune was the ocean king.
Neptune's brother King Jupiter could throw bolts
of lightning.
His son speedy Mercury around the heavens tore.
Mercury's brother red Mars was the god of war!
This is the planetary family tree.
Come take a mythological fam'ly space cruise
with me.

SONG 2: UNSUNG HERO - THE MICHAEL COLLINS SONG

I'm orbiting the Moon in Apollo eleven,
Gazing through the porthole at the star-studded
heavens,
Checking dials, pushing buttons, turning knobs
all day, [all day],
Making sure that Neil and Buzz are on the Moon
okay,
Making sure that Neil and Buzz are on the Moon
okay.

SONG 3: GUINEA PIG ON THE MOON

I'm Fluffball, the very first guinea pig on the moon,
Eating freeze-dried ice cream with a silver spoon.
GPASA sent me here to discover how high
I can jump, watch me fly
Six inches on Earth, three feet here!
Gravity's six times weaker, 'cause the moon's a mere
Eightieth of the mass of planet Earth,
Three-fifths of the density, one-quarter of the girth.
Watch me leap on my fresh green turf!
Happily chewing kibbles in my hemispherical dome,
My oxygenated lunar home.

SONG 4: RUFF RUFF UNIVERSE

A dog year is a length of time...
A light year is a length of space...
When light from Dog Star, Sirius shines...
Takes eight point six one years to race
From there to here
And now I'll tell you that that is:
Five point zero six one nine seven six one nine times
Ten to the power of thirteen miles! (ruffly)

SONG 5: A LITTLE PUSH GOES A LONG WAY

On Earth I jumped a foot, as high as I could go.
Gravity pulled me down again, twelve inches high,
then zero.
Time and space are bent by massive bodies and I'm
Reliably told Gravity's curved spacetime.

Up on the Moon I jumped six feet 'cause gravity's
weaker there.

Gravity pulled me down again. Green aliens stood
and stared...

Time and space are bent by massive bodies and I'm
Reliably told Gravity's curved spacetime.

In deep space I nudged myself away with gentle push
Floated away forever and a day. No gravity pulled
me back. Whoosh!

Time and space are bent by massive bodies and I'm
Reliably told Gravity's curved spacetime.

Time and space are bent by massive bodies and I'm
Reliably told Gravity's curved spacetime.

SONG 4. COOL MOON
by David Haines

No flowers, no trees, no water in the dusty seas,
No clouds in the sky, nothing ever lives, nothing dies,
No air, no sound, no breezes blowing leaves across the ground,
No joy, no fear, nobody there to shed a tear,
On the moon... [Repeated, sung 8 times total]

Once thought bone dry, ice crystals from the comets passing by
And wind from the sun bring water to the surface by the ton,
Not once, but twice our spacecraft have discovered water ice
With dust combined and in craters where the sunlight never shines
On the moon... [Repeated, sung 8 times total]

SONG 5. DROIDS IN SPACE
by David Bass

So long it seems we've harbored dreams
Of humans traveling through space
New planets rife with alien life
We'd study each exotic race.

Or maybe not, for space is fraught
With perils overflowing,
And it's so vast we can't go fast
Enough to get where we're going.

It can take 40 weeks or more
To travel from the Earth to Mars,
Thousands of years to reach frontiers
Of even the nearest of the stars.

And that's a long, long time,
And during all that time...

(Humans need, humans need...)
Humans need an environment that
Resembles their natural habitat:
Oxygen pressure and temperature tepid
And water and food for our heroes intrepid.

(Humans need, humans need...)
Humans need shielding from space radiation.
They can go mad cooped up in isolation,
And you can never know when you might
Be hit with a micrometeorite.

Low gravity damages blood and bones
And muscles, and gives you kidney stones,
Harms immune cells and heart and eyes.
You have to wonder if it's wise

To travel out in space.
Why send a human in space?

(Why send an astronaut, an astronaut?)
Sustaining the life of an astronaut
In space isn't easy and costs a lot (in space is hard, it costs a lot)
But we machines can do it for less,
Increasing the likelihood of success (increase the chances of success).

(Don't care if it's cold, don't care if it's hot.)
We don't need water, don't need air.
We don't produce waste and we wouldn't care (if we did).
No need for food or exercise,
We don't even need to socialize.

Don't need to be shielded from cosmic rays.
If need be, we'd sleep for ten thousand days,
And then we would work and never rest,
Performing each and every desired test,

Discovering all we want to learn
Without ever having to return,
Gather the data by the tome,
Then beam all the information home.

So...
Why then pursue with human crew
Space exploration? Do we dare?
Call me a fool, but sometimes it's cool
To do something just because it's there.

And there is so much there there.

SONG 6. EARTHRISE
by Daniel Kallman and Christine Kallman

Earthrise.
Home, my home.
Impossibly blue planet.
Impossibly black sky.
Beautiful oasis,
Warm, living.

At thousands of miles per hour,
We pass the ever-changing Earth below.
With whirling clouds, and flashing storms,
A dazzling picture show.
First we witness day, then the night,
The multitude of cities bright,
The green and dancing northern lights.
And what protects this fragile ball?
Our atmosphere – that thin blue line – is all.

Earthrise.
Home, my home.
Beautiful oasis,
Delicate, paradise!
We all ride together
On this spaceship
We call Earth.

SONG 7. THE EINSTEIN-ROSEN BRIDGE STRUT
by Daniel Kallman and Christine Kallman

Verse 1:

Well I'm struttin' up the west end,
And I'm feelin' mighty cool.
I'm callin' to my best friend,
When I look at the time, <*gasp!*>, I'm late for school!
Teacher told me if I'm late once more,
He's gonna have to show me the detention door.
Uh-huh, I'm looking for a wormhole.
Uh-huh, Gimme gimme dat wormhole.

Refrain:

An Einstein-Rosen Bridge will do the trick
When you need a way to get there quick!
Space-time folds like a paper sheet
And brings those distant points to meet.
When a black hole and a white hole say hello,
And connect for one-way traffic flow,
You can hop into the tunnel and— one, two, three—
Suddenly you've moved across the galaxy.
Uh-huh, I'm looking for a wormhole.
Uh-huh, Gimme gimme dat wormhole.

Verse 2:

Well, I'm jammin' at a party,
With some friends who roll and rock.
We're strumming a guitar beat,
When I jump to my feet, <*gasp!*>, and see the clock!
If I miss my curfew one more time,
My mom is gonna hang me on the line to dry.
Uh-huh, I'm looking for a wormhole.
Uh-huh, Gimme gimme dat wormhole.

[REPEAT Refrain]

Coda:

Maybe someday when we're smarter,
We will reach the nearest star,
Go to Proxima Centauri,
And it won't seem very far!
Maybe even time travel, [I'm looking for a wormhole.]
Just think of the fun— [Gimme gimme dat wormhole.]
I'll be back in my bed before the party's begun!

SONG 8. I'M YOUR MOON
by Jonathan Coulton, arranged by David Bass

They invented a reason, that's why it stings.
They don't think you matter, because you don't have pretty rings.
I keep telling you I don't care,
I keep saying there's one thing they can't change:

I'm your moon, you're my moon,
We go round and round.
From out here, it's the rest of the world
That looks so small.
Promise me you will always remember
Who you are.

Let them shuffle the numbers, [watch,] watch them come and go.
SOP: We're the ones who are out here,
ALTO: We're the ones who are, the ones who are
TEN/BASS: We're the ones, we're the ones who are
Out past the edge of what they know.
We can only be who we are,
Doesn't matter if they don't understand.

I'm your moon, you're my moon,
We go round and round.
From out here, it's the rest of the world
That looks so small.
Promise me you will always remember
Who you are.

TREBLE ONLY: Who you were, long before
They said you were no more.

S/T/B: Ahhh..
ALTO: Sad excuse for a sunrise, so cold out here.
Ice and silence and dark skies
ALL: [As we go] round another year.
[Let them] think what they like, we're fine.
I will always be right here next to you.

I'm your moon, you're/you are my moon,
[And] we go round and round [and round and round].
[And] from out here, it's the rest of the world that looks so small.
Promise me you will always remember
Who you are,
Who you are, who you are [you are].

SONG 9. ISS - YES, YES, THAT'S ME!
by David Haines

Zarya, Unity, Zvezda, Destiny,
Quest, Pirs, Harmony,
Columbus, JEM one, JEM two, Poisk,
Cupola, Tranquility,
Rassvet and Leonardo
And BEAM finally
Look up into the night sky:
Sixteen pressurized modules make one space station.
ISS, yes, yes, that's me!
ISS, yes, yes, yes, that's me!

See my shimmering space-based skeleton,
Huge trusses of shining steel
Holding everything together
As around blue Earth I gracefully wheel.
Orbiting at five miles each brief second,
Two hundred and fifty miles above you...
Circling Earth sixteen times each day,
Look up, I make a splendid view!
ISS, yes, yes, I do!
ISS, yes, yes, yes, I do!

With equipment, trusses, solar panels, modules, and all
Four hundred tons or more I weigh
Long and wide as a football field,
Inside as big as a jumbo jet, they say.
Forty rocket launches it took to build me:
Proton, Soyuz, and the Shuttle, too.
Always two Soyuz craft clinging to me,
Rescue 'lifeboats' for the crew.
Let's hope they never get used.

One hundred and fifty billion bucks I've cost,
The most expensive thing ever made.
Since I was born in nineteen ninety-eight,
More than two hundred astronauts with me have stayed.
Along with mice, snails, spiders, shrimp, bees,
Beetles, butterflies, flatworms, fleas,
Tulips, flax, dill, cabbage, onion, wheat, peas.
I'm a space garden, space farm, and space zoo.
ISS, yes, yes, it's true!
ISS, yes, yes, yes, it's true!

I'm the Solar System's one and only
Human-occupied space-based laboratory.
There is so much more to my story.
I'm important, don't ignore me!
ISS, yes, yes, that's me!
ISS, yes, yes, beautiful me!

SONG 10. LITTLE ROVER THAT COULD
by Molly Ruggles and Valerie Ambrose King

Imagine nineteen ninety-seven.
The first rover ever on Mars.
With a motor that could take it
Fifty meters in two hours.
Taking many pictures to send back home
With a nine K modem you'd use with a phone,
And an A P X spectrometer to look at rocks.
That Rover did good!
Little rover that could.

It was no bigger than a breadbox,
The pride of NASA's engineers.
Just the fourth probe on the Martian surface,
The first in over twenty years.
A twelve-year-old named Valerie, a studious youth,
Wrote about an abolitionist: Sojourner Truth,
How she fought for people's freedom. Her essay won a contest,
And that is how "Sojourner" became
The Martian rover's name.

Fine little rover,
Sending information to Earth,
Data and pictures.
Doing its job, proving its worth.

So the rover named Sojourner
Deep into space it was hurled
In a rocket named Pathfinder,
They landed on a bitter cold world.
Sojourner went exploring 'cross the landscape red.
Though designed for thirty days, it lasted three months instead.
Sojourner the rover was courageous as the woman,
And Valerie Ambrose became
The one who gave it the name.

Fine little rover,
Detecting a large iron core,
And signs of past flooding.
Do it for less, giving us more.

Fine little rover,
Sending information to Earth,
Data and pictures.
Doing its job, proving its worth.
Doing its job, proving its worth.
Little rover that could!

SONG 11. THE MOONDUST FOOTPRINT
by Bruce Lazarus and Bobbi Katz

We'd been watching, watching, watching
All day long into the night:
Mission Control in Houston
Apollo astronauts in flight.
A new chapter of history
Was about to open soon.
The Apollo slowed...then quickened,
Speeding closer to the moon.

We kept watching, watching, watching
Each slow stage on the TV:
The others went to bed,
But not Aunt Mary and me.
The hovering Landing Module,
The Sea of Tranquility
Astronauts Neil Armstrong and Buzz Aldrin,
Moving oh so carefully.

S/A: I was holding my breath
T/B: Aunt Mary said she'd held hers, too
ALL: Until we saw the moondust footprint
Made by Armstrong's ribbed left shoe!

T/B: That footprint marked a moment,
S/A: An awesome human
ALL: Victory.
We were watching history happen,
S/A: My Aunt Mary
T/B: And me.

We kept watching, watching, watching
Each slow stage on the TV:
The others went to bed,
But not Aunt Mary and me.

SONG 12. PROPULSION SONG: DAWNTREADER TO SHANGRI-LA
by David Haines

I won the lottery, ten zillion bucks.
I knew instantaneously what I would do.
I don't like people, but I do like space.
I commissioned a spacecraft.
Well, wouldn't you?

Boasting propulsion of several forms,
"Dawntreader" stands ready to take me far.
She will transport me to my land of dreams,
A distant asteroid named Shangri-La!
Shangri-La! Shangri-La...

Safe in my ship on the maglev launch sled,
Accelerate to Mach 8 up the mountain side.
Facing east near equator using planet's rotation
To gain more acceleration, what a ride!
At the peak of stratovolcano Chimborazo
(As far from Earth's center as you can go),
At twenty thousand feet, where air is thin.
With a mighty roar, my rocket ship's engine
Explodes into chemical life.
Liquid oxygen and hydrogen combine, combust,
Then exhaust water vapor at tremendous speed,
Emitted through the rocket's throat and nozzle
Give me spacebound thrust.
Twenty-five thousand miles per hour,
Escape velocity from planet Earth.
The first time I've broken free
From Gaia's gravitational grasp,
Since the day of my birth...

Now all is peace, the engines calm
As we drift at meteoric speed
Through velvet void, [through velvet void,]
I observe my sun sail [slowly] unfold,
And I tweak my course towards my asteroid.

We know that light has momentum,
Though photons no mass,
So my mile-square sail
Will drive me along, [will drive me along].
Radiation pressure is all I need [I need]
As I sing my space yacht sailor's song.

Solar panels unfurl from their origami nest,
Powering the ion drive to create,
By stripping electrons from xenon atoms,
A positive ion cloud, which accelerates
Electrostatic'ly, using Coulomb force
Toward positive, then negative grids, emerges unseen
(After neutralization by a cathode gun)
As a high-speed, low-mass ion beam,
High-speed, low-mass ion beam, ion beam.

My velocity increases, steady but slow,
On my journey to the planets to exploit gravitation
With the slingshot effect, which as I swing by,
Will vastly enhance Dawntreader's acceleration.
Gravity assist will use three inner planets:
Venus first, and then Earth, and then Mars.
At ev'ry visit, I'll gain much more speed as
Each massive body, Dawntreader veers past.
Succumbing to the planet's pull, we will quicken,
But when we escape, it may seem we have slowed,
But overall, we have gained
From this gravity assist maneuver
Orbital energy from the planet
So that much, much faster we can go.
Then the asteroid belt I'll overshoot,
Before using giant Jupiter to slow me down.
And then back to the belt again
To touch down at last on Shangri-La,
And build my home on asteroid [on asteroid] ground,
On asteroid ground...

I won the lottery, ten zillion bucks.
I knew instantaneously what I would do.
I don't like people, but I do like space.
So I'm living on an asteroid! Well, wouldn't you?
Well, wouldn't you? It feels so good!
Well, wouldn't you? If you could, I bet you would.
Yes, you would!

SONG 13. RE-ENTRY
by Andrea Gaudette and Richard S. Gaudette

SOPRANO:

With the moon as our canopy,
Under a snowstorm of stars,
We have seen the blue orb shine:
A marble on dense ebony velvet.
Now is our time to return, in fire.

Friction causes temp'ratures of thousands
of Kelvins.

Maximum forces of seven g's.
But we are safe in our cocoon.
Our heat shield will protect us soon,
While we descend in glowing fury.
Now is our time to return, in fire.

Ablation is the loss of matter:
Abrasion through friction and burning off.
Heat radiates away from our return vehicle.
Fire burns the gases away.
Losing mass.
The honeycomb design of the heat shield material
Makes the structure strong.
It's able to withstand the high temp'ratures
and friction
With hexagonal tubes four inches long.
Now is our time to return, in fire.

ALTO:

With the moon as our canopy,
Under a snowstorm of stars,
We have seen the blue orb shine:
A marble on dense ebony velvet.
Now is our time to return, in fire.

Friction causes temp'ratures of thousands
of Kelvins.

Molecules of air rub against the shield,
Sloughing off material.
Maximum forces of seven g's.
But we are safe in our cocoon.
Our heat shield will protect us soon,
While we descend in glowing fury.
Now is our time to return, in fire.

ALTO, CONTINUED:

Our heat shield was designed to consume energy
By ablation, radiation, and outgassing.
Losing energy so we can stay cooler
In our reentry vehicle.
Fire burns the gases away.
Losing mass.
Silica spheres in a vacuum impede
The induction of heat so the thermal conductivity is
Low and the fire won't reach inside
And the structure will stay strong.
Now is our time to return, in fire.

BASS:

We have seen the blue orb shine:
A marble on dense ebony velvet.
Now is our time to return, in fire.

Hypersonic speeds of up to Mach twenty-five,
Tearing through the atmosphere.
Maximum forces of seven g's.
But we are safe in our cocoon.
Our heat shield will protect us soon,
While we descend in glowing fury.
Now is our time to return, in fire.

Silica spheres in a vacuum impede
The induction of heat so the thermal conductivity is
Low and the fire won't reach inside,
And the structure will stay strong.
Now is our time to return, in fire.

SONG 14. SALLY RIDE: THE FIRST AMERICAN WOMAN ASTRONAUT IN SPACE
by Bruce Lazarus

SOPRANO/TENOR:

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally Ride! Sally Ride!

Who could foresee?

Sally Ride! Sally Ride!

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Tennis was her forte but her interests were diverse,
And she wanted deeper knowledge of the universe.

Tennis and physics,

What a long road she had to transverse!

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally retired from NASA,

Became a professor and writer.

Girls found a role model

And aimed higher!

Ooo...

Ooo... ooo...

Sally Ride! Sally Ride!

Sally Ride! Sally Ride! Sally Ride!

<shout> Ride, ride, Sally Ride!

Sally liked to turn somersaults in space.

Who could foresee that California girl in that place?

“Flying the arm,”

Charming and calm,

Not only boys can be that flying ace!

SOPRANO/ALTO:

Sally, Sally, Sally Ride!

Sally, Sally, Sally Ride!

Sally, Sally, Sally, Sally, Sally Ride!

SOPRANO/ALTO/TENOR:

Sally, Sally, Sally Ride!

Sally Ride! Sally Ride! Sally Ride!

ALTO/BASS:

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally was the first American woman astronaut in space.

Who could foresee that California girl in that place?

Weightless and free,

That California girl a flying ace?

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally Ride! Sally Ride!

On to ballistics.

Sally Ride! Sally Ride!

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally retired from NASA,

Became a professor and writer.

Girls found a role model

And aimed higher!

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally Ride! Sally Ride! Sally Ride! Sally Ride!

Sally Ride! Sally Ride!

Sally Ride! Sally Ride! Sally Ride!

<shout> Ride, ride, Sally Ride!

Sally liked to turn somersaults in space.

Who could foresee that California girl in that place?

“Flying the arm,”

Charming and calm,

Not only boys can be that flying ace!

TENOR/BASS:

Do, do, do, do, Sally Ride!

Do, do, do, do, Sally Ride!

Do, do, do, do, Sally Ride!

BASS:

Sally, Sally Ride!

Sally Ride! Sally Ride! Sally Ride!

SONG 15. SCIENCE FACT OR SCIENCE FICTION?

by Lauren Mayer

Science fact or science fiction?
Stories can seem like a prediction.
A futuristic wild ideal
Someday may end up being real.
But logic still is a restriction
Between science fact and science fiction.

From Jules Verne to H. G. Wells,
The Jetsons or Doctor Who
Science fiction sometimes foretells
Inventions that do come true.
In futuristic tales, we'd first seen
Handheld computers, with a touch screen.
What seems an impossibility
Could be real eventually.

Science fact or science fiction?
Stories can seem like a prediction.
A futuristic wild ideal
Someday may end up being real.
But logic still is a restriction
Between science fact and science fiction.

Fanciful ideas can be
In reality even greater,
Like 3D printers are the progeny
Of the Star Trek replicator.
Though Hal in Two Thousand and One was eerie,
We're not scared of Alexa or Siri.
The Jetson's robot maid, they say
Became the Roomba of today.

Science fact or science fiction?
Stories can seem like a prediction.
A futuristic wild ideal
Someday may end up being real.
But logic still is a restriction
Between science fact and science fiction.

You could someday make a case
For what is now just imagination,
Like flying cars, or hyperspace
Or subspace communication,
Which we first heard of from Captain Kirk.
And while today it may not work,
Sending messages faster than light,
Some day it might.

But some ideas exist in defiance
Of the basic laws of science,
Like faster-than light speed, or warp drive,
Or cryonic suspension that keep people alive,
Teleporting or a Death Star gun.
We may think light sabers would be fun,
But the technology has a long way to go,
Although you never know...

Science fact or science fiction?
Stories can seem like a prediction.
A futuristic wild ideal
Someday may end up being real.
But logic still is a restriction
Between science fact and science fiction,
Between science fact and science fiction,
Between science fact and science fiction.

SONG 16. SPACE TIME-OUT
by Ruth Hertzman-Miller and Meg Muckenhoupt

ALL:

When we moved into Einstein's old house,
I was mad and I started to shout,
And my Dad said, "It's time for time out."
So I went upstairs to my room all alone,
With my dog Amadeus by my side.
And there in my closet I found a ship
That could go near the speed of light!
I chose ninety-eight percent, and looked at
 my watch,
As I took the machine for a spin.
I flew ten minutes out, then I turned around
And flew back to my closet again.
I opened the door and ran downstairs,
And my mother said in dismay,
"You went up there nearly two hours ago.
No one's seen you for half of the day."

SOPRANO:

All time is relative, and when you travel fast,
You can't tell by your wristwatch just how
 long the journey lasts.
At ninety-eight percent light speed, a minute to you
Will be five minutes from an earthly point of view.

ALTO/TENOR/BASS:

The distinction between past,
Present, and future
Is a stubbornly
Persistent illusion.

ALL:

Next week we ordered pizza,
Which I'd missed since who knows when,
But I thought it was gross, so I threw it at Dad
And got sent to time out again.
I got in the spaceship and set the speed
To ninety-nine point five.
I flew ten minutes out and ten minutes back,
And my mother said when I arrived,
"It's been three whole hours since you were sent up.
What have you been doing since then?
Maybe time outs are not so effective for you.
Why don't you go play with a friend?"

SOPRANO:

All time is relative, and when you travel fast,
You can't tell by your wristwatch just how long
 the journey lasts.
At ninety-nine point five percent, a minute or so
Will be ten whole minutes for ev'ryone else you know.

ALTO/TENOR/BASS:

Clocks that are in relative motion
Measure time at different rates.
The distinction between past, present and future
Is a stubbornly persistent illusion.

ALL:

"But I have no friends!" I yelled, and I went
Right back to my spaceship and set the dial
For the maximum light speed percent.
But before I left, I stepped off the ship
Just for a minute, I swear.
And when I returned, my spaceship was gone
And Amadeus wasn't there!
He didn't come back for two whole weeks,
Then one night, lying in bed,
I was thinking about my missing dog
When I felt a wet tongue on my head.
I turned on the light. Amadeus was back!
The ship had returned at last.
My watch was inside, and it said that for him,
Only twenty minutes had passed!

SOPRANO:

All time is relative and when you travel fast,
You can't tell by your wristwatch just how long the
 journey lasts.
At ninety-nine point five percent, a minute or so
Will be ten whole minutes for ev'ryone else you know.

ALTO/TENOR/BASS:

Clocks that are in relative motion
Measure time at different rates.
Near the speed of light, the flexibility
Of time becomes readily apparent.
People like us, who believe in physics,
Know that the distinction between
Past, present, and future is only a stubbornly persistent illusion.
A normal adult never stops to think
About the problem of space and time.
My intellectual development was so slow
That I began to wonder when I was grown up.
Our willingness to trust our immediate impression
Causes an inaccurate impression.
Time travel is an inevitable feature of relativistic reality.

ALL:

I called for my parents to come,
And we were together and glad.
And next time I go in my ship,
I'll take my dog, and my mom and dad!

SONG 17. THIRTY-NINE
by Brian May, arranged by David Bass

SOPRANO:

Come hear our story of a journey to the stars.
Oo, aah, age at different rates.
Oo, we would expect the Doppler effect
To alter their clocks: the twins paradox.

In the days when lands were few, oo,
Sweetest sight ever seen.
Oo, that the score brave souls inside
For many a lonely day sailed across the Milky Way,
Ne'er looked back, never feared, never cried.

Don't you hear my call? Ah,
Don't you hear me callin' you?
For the day I take your hand
In the land that our grandchildren knew.

We see time dilation affect trip duration
And distance contraction due to the action
Of special relativity.

Oo, the volunteers came home that day.
Oo, heart so heavily weighed.
Oo, but my love, this cannot be.
For so many years have gone, though I'm older
but a year
Your mother's eyes from your eyes cry to me.

Don't you hear my call? Ah,
Don't you hear me callin' you?
For the day I take your hand
In the land that our grandchildren knew.
Don't you hear my call though you're many years
away?
Don't you hear me callin' you?
All your letters in the sand cannot heal me
like your hand.
For my life still ahead, pity me.
Oo, mmm...

ALTO:

Come hear our story of a journey to the stars.
Oo, aah, different rates. Relativity states
We would expect the Doppler
To alter their clocks: the twins paradox.

In the year of thirty-nine
Assembled here the volunteers
In the days when lands were few.
Here the ship sailed out into the blue and sunny morn,
Sweetest sight ever seen.
Oo, that the score brave souls inside
For many a lonely day sailed across the Milky Way,
Ne'er looked back, never feared, never cried.

Don't you hear my call? Ah,
Don't you hear me callin' you?
Write your letters in the sand for the day I take your hand
In the land that our grandchildren knew.

We see time dilation affect trip duration
And distance contraction due to the action
Of special relativity.

Oo, in the year of thirty-nine, came a ship in from the
blue.
The volunteers came home that day.
And they bring good news of a world so newly born,
Though their heart so heavily weighed.
Oo, but my love, this cannot be.
For so many years have gone, though I'm older but a year,
Your mother's eyes from your eyes cry to me.

Don't you hear my call? Ah,
Don't you hear me callin' you?
Write your letters in the sand for the day I take your hand
In the land that our grandchildren knew.
Don't you hear my call though you're many years away?
Don't you hear me callin' you?
All your letters in the sand cannot heal me like your hand.
For my life still ahead, pity me.
Oo, mmm...

SONG 17. THIRTY-NINE (continued)
by Brian May, arranged by David Bass

TENOR:

Come hear our story of a journey to the stars.
Oo, aah, and her starting place
Different rates. Relativity states,
Would expect Doppler effect
To alter their clocks: the twins paradox.

In the year of thirty-nine
Assembled here the volunteers
In the days when lands were few.
Here the ship sailed out into the blue and sunny morn,
Sweetest sight ever seen.
Oo, that the score brave souls inside
For many a lonely day sailed across the Milky Way,
Ne'er looked back, never feared, never cried.

Don't you hear my call though you're many years away?
Don't you hear me callin' you?
Write your letters in the sand for the day I take your
hand
In the land that our grandchildren knew.

We see time dilation affect trip duration
And distance contraction due to the action
Of special relativity.

Oo, in the year of thirty-nine, came a ship in from
the blue.
The volunteers came home that day.
And they bring good news of a world so newly born,
Though their heart so heavily weighed.
Oo, but my love, this cannot be.
For so many years have gone, though I'm older but a
year,
Your mother's eyes from your eyes cry to me.

TENOR AND BASS, LAST CHORUS:

Don't you hear my call though you're many years away?
Don't you hear me callin' you?
Write your letters in the sand for the day I take your hand
In the land that our grandchildren knew.
Don't you hear my call, though you're many years away?
Don't you hear me callin' you?
All your letters in the sand cannot heal me like your hand.
For my life still ahead, pity me.
Oo, mmm...

BASS:

Come hear our story of a journey to the stars.
Oo, a trav'ler in space and her starting place
Age at different rates.
Oo, we would expect the Doppler effect
To alter their clocks: the twins paradox.

In the year of thirty-nine
Assembled here the volunteers
In the days when lands were few.
Oo, sweetest sight ever seen.
And the night followed day, and the storytellers say
That the score brave souls inside
For many a lonely day sailed across the Milky Way,
Ne'er looked back, never feared, never cried.

Don't you hear my call though you're many years away?
Don't you hear me callin' you?
Write your letters in the sand for the day I take your
hand
In the land that our grandchildren knew.

We see time dilation affect trip duration
And distance contraction due to the action
Of special relativity.

Oo, in the year of thirty-nine, came a ship in from
the blue.
The volunteers came home that day.
Oo, heart so heavily weighed.
For the Earth is old and gray, little darlin' we'll away,
But my love, this cannot be.
For so many years have gone, though I'm older but a
year,
Your mother's eyes from your eyes cry to me.

SONG 18. WEIGHTLESS
by Tim Maurice

Ooo...
What is weight?
The force on an object due to gravity.
Say again?
Weight is the total gravitational attraction on an object.

Here on Earth,
You sit in your chair, and gravity pulls you down.
We think we feel [our] weight,
Against the chair,
But in fact, the normal forces push back,
The chair pushes back,
The ground pushes back,
Counteracting gravity.
But wait...
Out in space, you feel weightless, so weightless.
It's just an illusion that you're freely suspended.

So on Earth,
Repulsive forces make us feel "weight".
But out in space,
We don't have repulsive forces to counteract gravity.
There's nothing
Pushing back,
[Nothing] [pushing] back,
Space shuttles flew around the Earth
At seventeen thousand five hundred miles an hour.
Momentum driving forward, and gravity pulling down,
Perfectly balanced, falling around the Earth,
A sustained fall creates the illusion
Of being weightless, so weightless.
You're floating, majestic'ly.
Ooo...
Weightless.

SONG 19. WOMEN IN SPACE
by Lauren Mayer

These historic pioneers,
Exploring new frontiers,
They worked hard to prove their worth
Out in orbit and here on Earth.
Look at what they had to face,
The first women in space.

NASA told women they had to wait,
Couldn't even apply till nineteen seventy-eight.
And when a few women NASA did admit,
They issued them a full space makeup kit
And worried that women couldn't stay calm,
Or their kids would object to an astronaut mom.

These historic pioneers,
Exploring new frontiers,
They worked hard to prove their worth
Out in orbit and here on Earth.
Look at what they had to face,
The first women in space.

The Soviets first made history
With Valentina Tereshkova in 'sixty-three.
The U. S. began with Sally Ride
And soon more women, both here and worldwide.
From Canada and Russia and many more,
Women astronauts with a lot to explore.

Each historic astronaut
Had to overcome a lot.
They were ridiculed and dismissed.
Nevertheless they did persist
As they fin'ly made their case,
The first women in space.

There have been sixty-three so far,
And more are on the way.
And fifty of those female astronauts
Have been from the U S A.

In two thousand and one, Susan Helms came through
As the first woman on a Space Station crew,
And Peggy Whitson impressed the nation
As the first woman to command the Space Station.
And Kathleen Rubins, who won the race
To be the first to sequence DNA in space.

These historic pioneers,
Exploring new frontiers,
They worked hard to prove their worth
Out in orbit and here on Earth.
Look at what they had to face,
The first women in space,
The first women in space,
The first women in space.

SONG 20. EXOPLANET EXPLORER

by David Haines

Out there in space there's a planet like Earth...
On a galactic scale not so very far.
Watery, rocky, not too big, nor too small,
Nor too far from nor too near to its star.

We are explorers, exploring new worlds
Orbiting stars far beyond our own.
Soon we shall find a planet like Earth,
But will it prove to be home
To life?

How do we see these pinpoints in the sky?
Far harder than finding a needle hidden in hay.
Electronic senses and digital intelligence
Enhance our chance to see far, far away far away far away, far away...

Radial velocity spots change in star's speed
In its dance with its planets Doppler shift we see.
Transit Technique sees slight changes in light
When planets pass star it becomes a little less bright...

With direct imaging snap planets around
Stars by blocking starlight so planets are found.
Gravitational microlensing astronomy,
Two more ways these exoplanets may be seen...

Out there in space there's a planet like Earth...
On a galactic scale not so very far.