Bonestell’s Mars
Bonestell’s Mars

Mars is red, a color that comes from the lichen that cover its surface. It’s a flat red and cold world, cut by the broad outlines of its melancholy channels - 1952
Mars Or Bust! / Philcon / November 17th, 2018
You say Canali, I say Canals
You say Canali, I say Canals
You say Canali, I say Canals
Allan Hills 840001
Allan Hills 84001
Allan Hills 84001
Allan Hills 84001

- From Mars, 17 MYA.
Allan Hills 84001

- From Mars, 17 MYA.
- Landed 13 KYA, Antarctica
Allan Hills 84001

• From Mars, 17 MYA.

• Landed 13 KYA, Antarctica

• Life like shapes

Mars Or Bust!/Philcon/November 17th, 2018
Allan Hills 84001

- From Mars, 17 MYA.
- Landed 13 KYA, Antarctica
- Life like shapes
- Alternative explanations available
ALLAN HILLS 84001

- From Mars, 17 MYA.
- Landed 13 KYA, Antarctica
- Life like shapes
- Alternative explanations available
- Not generally believed
The Grand Tack
The Grand Tack

The inner Solar System

A simulated inner Solar System
The Grand Tack

• Why is Mars small?
The Grand Tack

- Why is Mars small?
- Jupiter wandered towards Sun
The Grand Tack

- Why is Mars small?
- Jupiter wandered towards Sun
- Locked in with Saturn
The Grand Tack

- Why is Mars small?
- Jupiter wandered towards Sun
- Locked in with Saturn
- And danced back out
Phobos and Deimos
Phobos and Deimos
Phobos and Deimos
Phobos and Deimos
Phobos and Deimos
Stages of Martian ring formation

- Inward orbit until breakup of weakest regions
- Ring formation
- Inward orbit of large remnants and ring decay

Phobos

Present
10^{-1} years

10^{7} years

10^{6} - 10^{8} years

Point of Total Ring Decay
Getting To Mars

TOTAL TIME: 0 Month(s)
TRANSFER TIME: 0 Month(s)
DISTANCE FROM SUN: 1.00 au
VELOCITY: 29.79 km/s

DELTA-V #1:
DELTA-V #2:
TOTAL DELTA-V:

HOHMANN TRANSFER ORBIT
Earth to Mars
TOTAL TIME: 0 Month(s)
TRANSFER TIME: 0 Month(s)
DISTANCE FROM SUN: 1.00 au
VELOCITY: 29.79 km/s

DELTA-V #1:
DELTA-V #2:
TOTAL DELTA-V:

HOHMANN TRANSFER ORBIT
Earth to Mars
LANDERS & ROVERS
First Photo of Mars
Sojourner
Spirit
Spirit
Spirit
Spirit
Spirit

NASA / JPL / Cornell / MRO-HiRISE / NM Museum of Natural History and Science
Spirit
Curiosity

- Why is Mars hard to land on?
- Advantages over previous
- Difficulties
7 Minutes of Terror
7 Minutes of Terror
We are much closer today to being able to send humans to Mars than we were to being able to send men to the Moon in 1961, and we were there eight years later. Given the will, we could have humans on Mars within a decade.” -- Dr. Robert Zubrin, Mars Society President
Simulation

- Mars Society
Simulation

- Mars Society
- Teamwork
Simulation

- Mars Society
- Teamwork
- Check out problems
Simulation

- Mars Society
- Teamwork
- Check out problems
- Will never check out all, but it is where you start
Biosphere II
Biosphere II

- Oxygen theft
Biosphere II

- Oxygen theft
- Men who think of goats
Biosphere II

- Oxygen theft
- Men who think of goats
- Hey, it’s an experiment
I’m going to have to science the [Potatoes] out of this!
I’m going to have to science the [Potatoes] out of this!
I’m going to have to science the [Potatoes] out of this!

- Orient
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
- Air
I'm going to have to science the [Potatoes] out of this!

• Orient
• Not bleed to death
• Not depressurize
• Air
• Food
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
- Air
- Food
- Security
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
- Air
- Food
- Security
- Entertainment
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
- Air
- Food
- Security
- Entertainment
- Communication
I’m going to have to science the [Potatoes] out of this!

- Orient
- Not bleed to death
- Not depressurize
- Air
- Food
- Security
- Entertainment
- Communication
- Rescue
Dying to Go
Dying to Go

- Hard Radiation
Dying to Go

- Hard Radiation
- Brrrrhh!
Dying to Go

- Hard Radiation
- Brrrhhhh!
- Tongues boiled here
Dying to Go

- Hard Radiation
- Brrrrhh!
- Tongues boiled here
- Hey it made superman strong?
Dying to Go

- Hard Radiation
- Brrrrhh!
- Tongues boiled here
- Hey it made superman strong?
- Death by inches
Dying to Go

- Hard Radiation
- Brrrhhh!
- Tongues boiled here
- Hey it made superman strong?
- Death by inches
- Over the horizon effect
Dying to Go

- Hard Radiation
- Brrrrhh!
- Tongues boiled here
- Hey it made superman strong?
- Death by inches
- Over the horizon effect
- Stalin’s rule
Water
Water

- Noachian period
Water

- Noachian period
- RSL: recurring slope lines
Water

- Noachian period
- RSL: recurring slope lines
- Water — briny, salty water — but water!
Water

- Noachian period
- RSL: recurring slope lines
- Water — briny, salty water — but water!
- Life needs better conditions to evolve than to endure
Methane - June 7th, 2018
Methane - June 7th, 2018

...some methanogens could survive on Mars's low pressure. Rebecca Mickol found that in her laboratory, four species of methanogens survived low-pressure conditions that were similar to a subsurface liquid aquifer on Mars. The four species that she tested were Methanothermobacter wolfeii, Methanosarcina barkeri, Methanobacterium formicicum, and Methanococcus maripaludis.
Terraforming Mars

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http://timeandquantummechanics.com
• Outer edge of habitable zone
Terraforming Mars

- Outer edge of habitable zone
- Build up the atmosphere
Terraforming Mars

- Outer edge of habitable zone
- Build up the atmosphere
- Build up the temperature
Terraforming Mars

- Outer edge of habitable zone
- Build up the atmosphere
- Build up the temperature
- Build up the magnetosphere
Terraforming Mars

- Outer edge of habitable zone
- Build up the atmosphere
- Build up the temperature
- Build up the magnetosphere
Terraforming Mars

Fig. 4 (a) Layout of 12 latitudinal superconducting cables around the surface of the Earth. (b) Cross-sectional view of proposed superconducting cable.
Planetary Protection Principle
Planetary Protection Principle

Complete Guide to NASA Planetary Protection
Policies for Spacecraft, Quarantine Program History
When Biospheres Collide
Human Mars Missions Workshop and Conferences, Manned Mars Reference Mission

Mars Or Bust! / Philcon / November 17th, 2018

http://timeandquantummechanics.com
The Case for Mars

The Plan to Settle the Red Planet and Why We Must

Robert Zubrin
Foreword by Arthur C. Clarke

With the latest information about life on Mars

http://nextgen4.marsssociety.org/home/about/founding-declaration/
• Knowledge of Mars

http://nextgen4.mars society.org/home/about/founding-declaration/
• Knowledge of Mars

• Knowledge of Earth

http://nextgen4.marsssociety.org/home/about/founding-declaration/
• Knowledge of Mars
• Knowledge of Earth
• Challenge

http://nextgen4.marsociety.org/home/about/founding-declaration/
The Case for Mars

• Knowledge of Mars
• Knowledge of Earth
• Challenge
• Youth

http://nextgen4.mars society.org/home/about/founding-declaration/
• Knowledge of Mars
• Knowledge of Earth
• Challenge
• Youth
• Opportunity

http://nextgen4.marsociety.org/home/about/founding-declaration/
• Knowledge of Mars
• Knowledge of Earth
• Challenge
• Youth
• Opportunity
• Humanity

http://nextgen4.marssoceity.org/home/about/founding-declaration/
The Case for Mars

- Knowledge of Mars
- Knowledge of Earth
- Challenge
- Youth
- Opportunity
- Humanity
- Future

http://nextgen4.marssoiety.org/home/about/founding-declaration/
The Curiosity Rover celebrated six years on the surface of Mars!
The *Curiosity* Rover celebrated six years on the surface of Mars!
InSight

https://mars.nasa.gov/insight/
Mars 2020 Rover

SCIENCE GOAL 1: Determine Whether Life Ever Arose on Mars

SCIENCE GOAL 2: Characterize the Climate of Mars

SCIENCE GOAL 3: Characterize the Geology of Mars

SCIENCE GOAL 4: Prepare for Human Exploration
• Packing for Mars - Roach
• 4th Rock from the Sun - Jenner
• The Martian - Weir
• Mysteries of Mars - Blasio
• The Case for Mars - Zubrin
• Curiosity - Lakdawall
• Terraforming Mars
• NASA