

Movies about Mars

SCIENCE FACTOR SCIENCE FICTION?

Many space movies have hit our screens relaying drama, adventure, and scientific discovery

The recent cinema release of 'The Martian' even coincided with possible discovery of water on the red planet.

But how much is scientific fact and how much is Hollywood fiction?

We are going to follow Mark Watney's Journey to Mars and try to identify what is **FACT vs FICTION**

For each point, watch a short clip from the film, then discuss

Decide if the event or situation is really plausible ...

Ready? Here
comes the first
clip...





[Storm]
3:53 – 4:54

The storm...

True

False

The storm...



False

HERE'S WHY

The strength of the storm is not realistic - you do get dust storms on Mars but they are not this strong!

The Martian atmosphere is only 1% as thick as Earth's, so a Mars wind of 100mph

- possible although quite rare on the surface –**
- would only have the same force as a 10mph wind on Earth**

You could fly a kite in it, but it wouldn't knock you down as seen in this clip.

[Surviving on potatoes]
20:38 – 21:34

Surviving on potatoes ...

True

False

Surviving on potatoes ...



True (ish)

HERE'S WHY

Living off potatoes for
400 days **is** possible...



Potatoes are pretty high in almost all minerals, vitamins, and macronutrients the human body needs to survive



The Science

An experiment was carried out where a man spent a total of 60 days eating nothing but potatoes

HOWEVER, he was eating 15-20 potatoes (2000cals) a day - in the movie Mark was only eating 1 potato (162 cal)!

On Mars the gravity is $\frac{1}{3}$ of that on earth - so he would spend less energy AND he was supplementing his potatoes with rationed freeze dried food

So he could have survived on potatoes + rations!

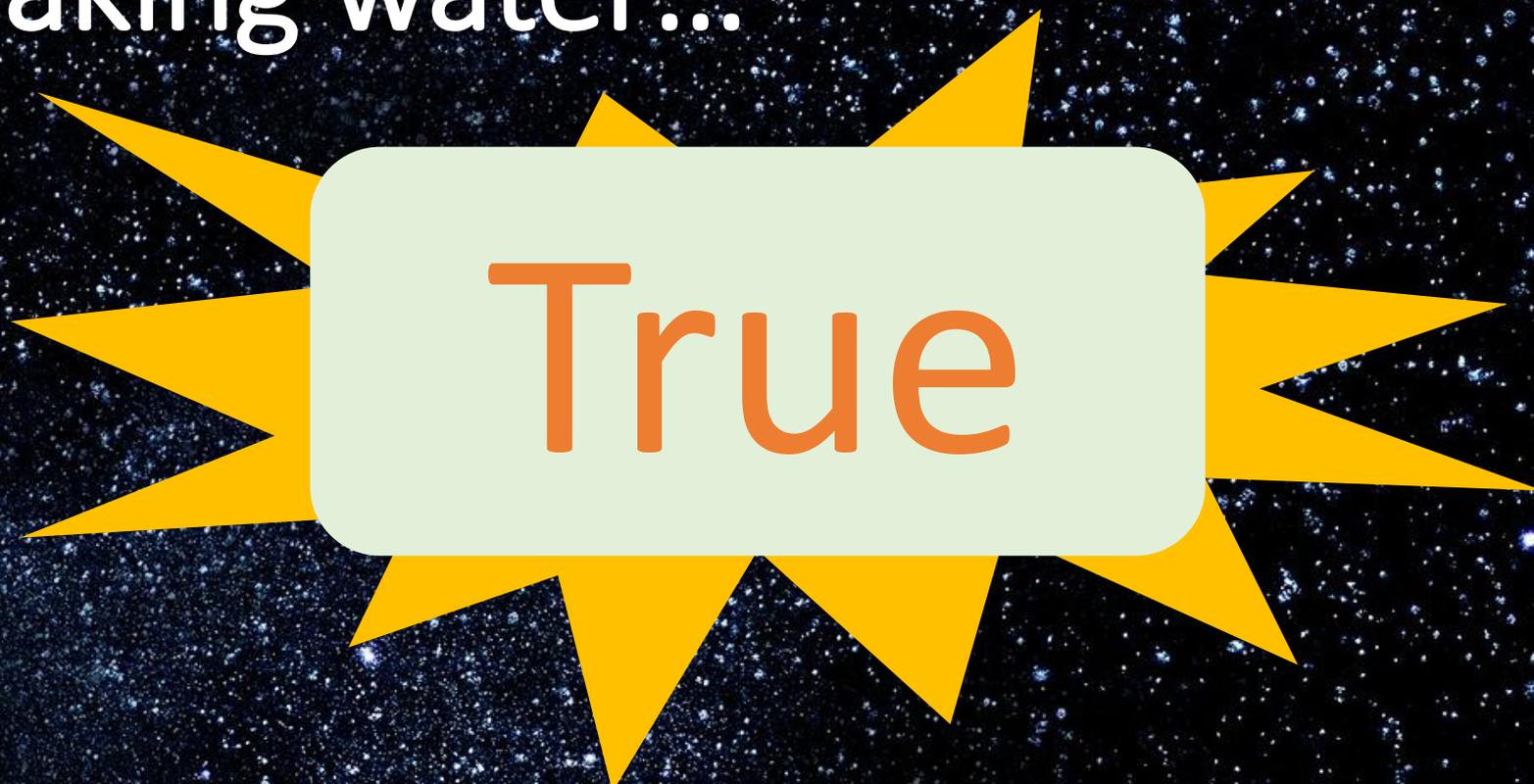
[Making water]
24:37 – 28:00

Making water...

True

False

Making water...



True

HERE'S WHY

Mark Watney took **hydrazine** from the rocket fuel and split it into nitrogen and hydrogen, which you **can do**

He then burned the hydrogen with oxygen to make water

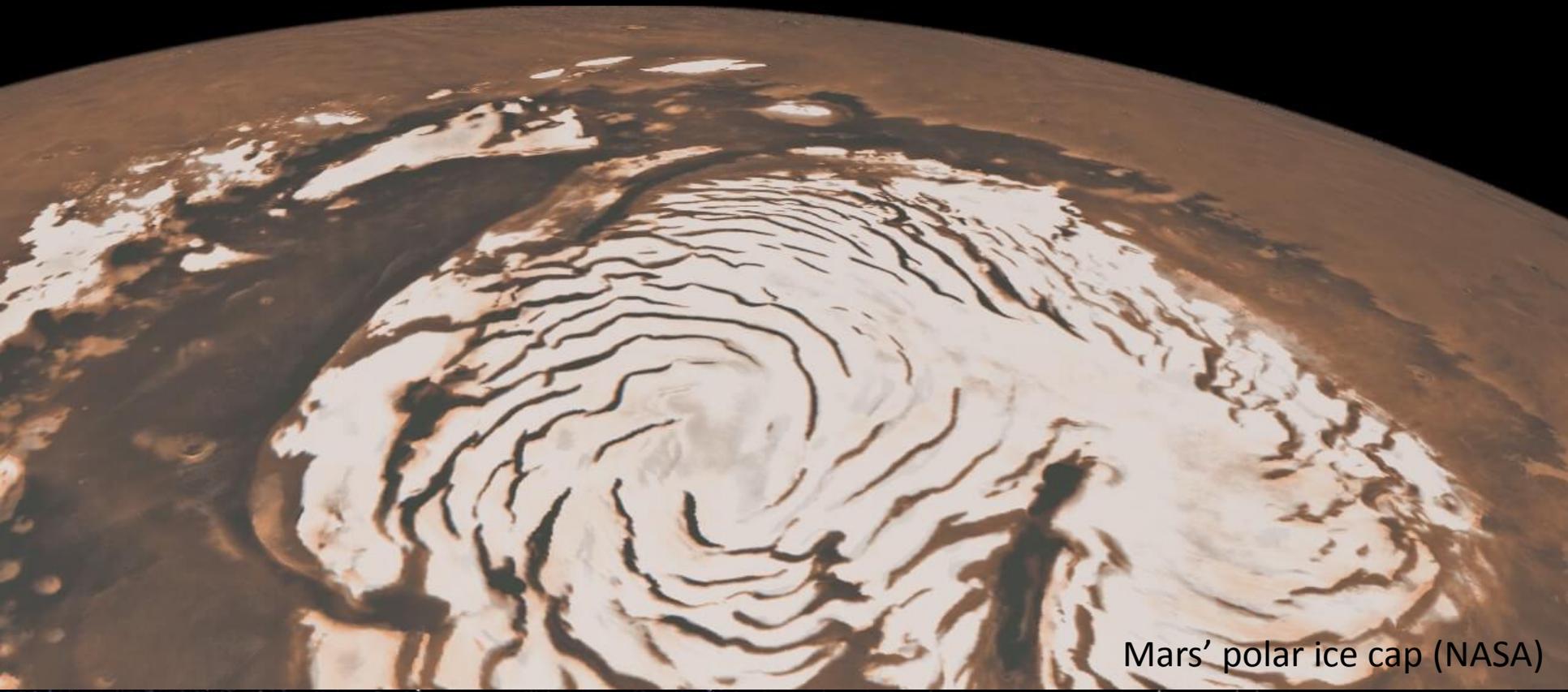
HOWEVER ...

Scientists have said that if they were stranded on Mars they would simply extract water out of the soil.



Water is available in its natural state on Mars as **ice, permafrost or contained within the soil**

So it is possible to **bake it** out of the soil



Mars' polar ice cap (NASA)

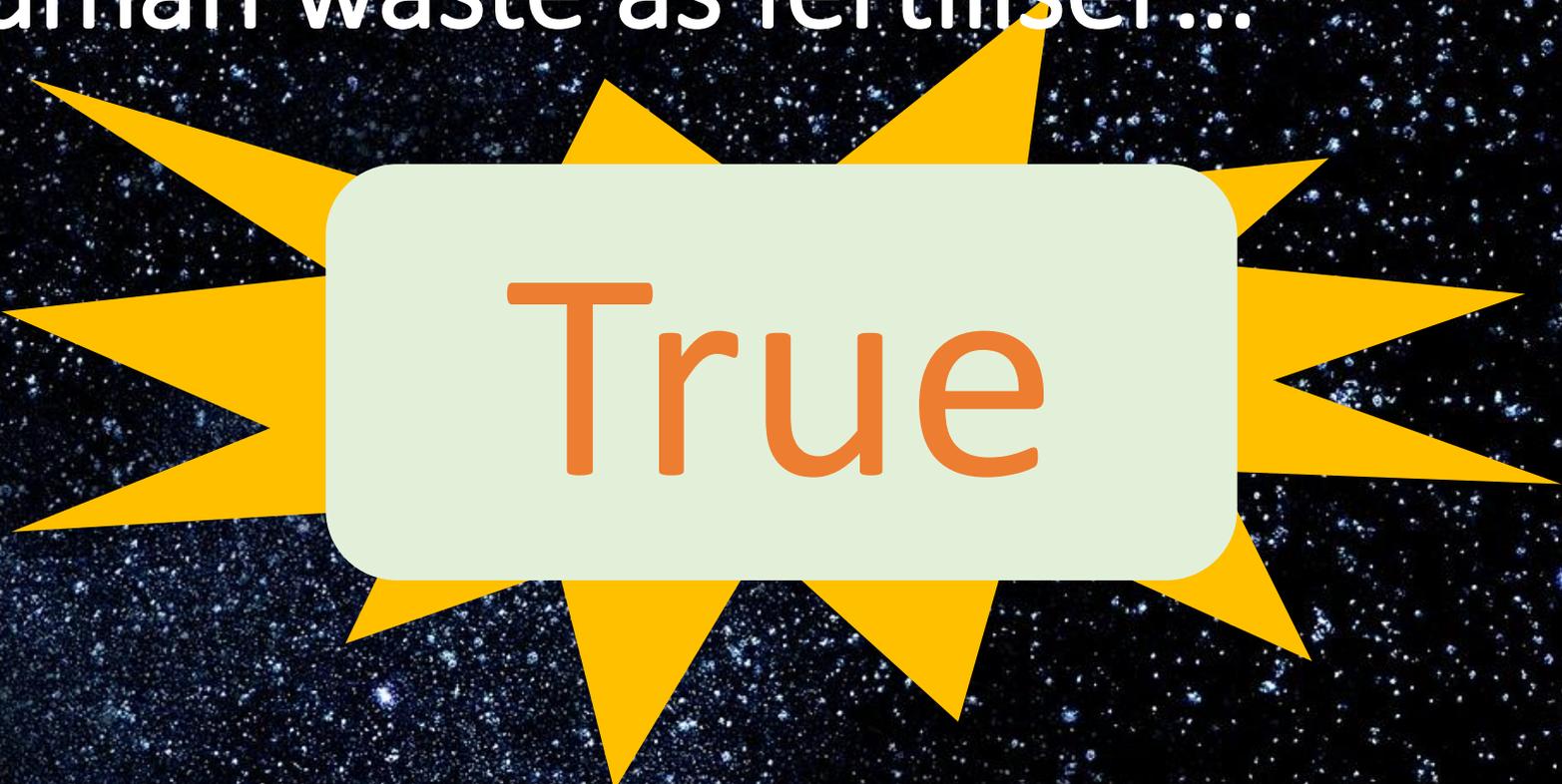
[Fertiliser]
23:24 – 24.17

Human waste as fertiliser...

True

False

Human waste as fertiliser...

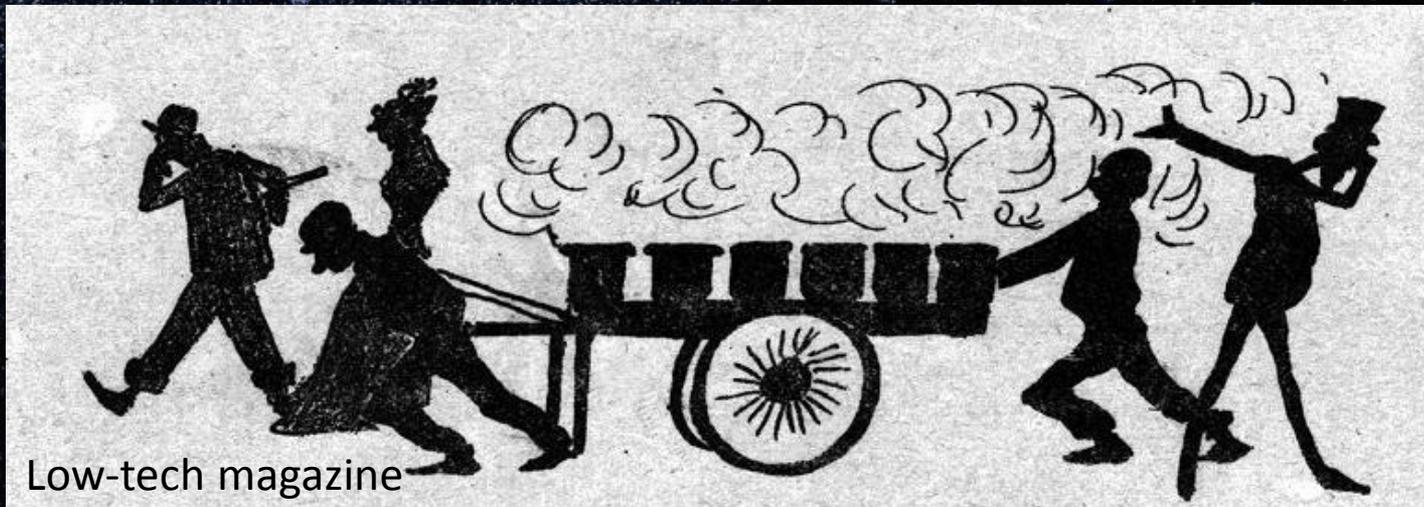


True

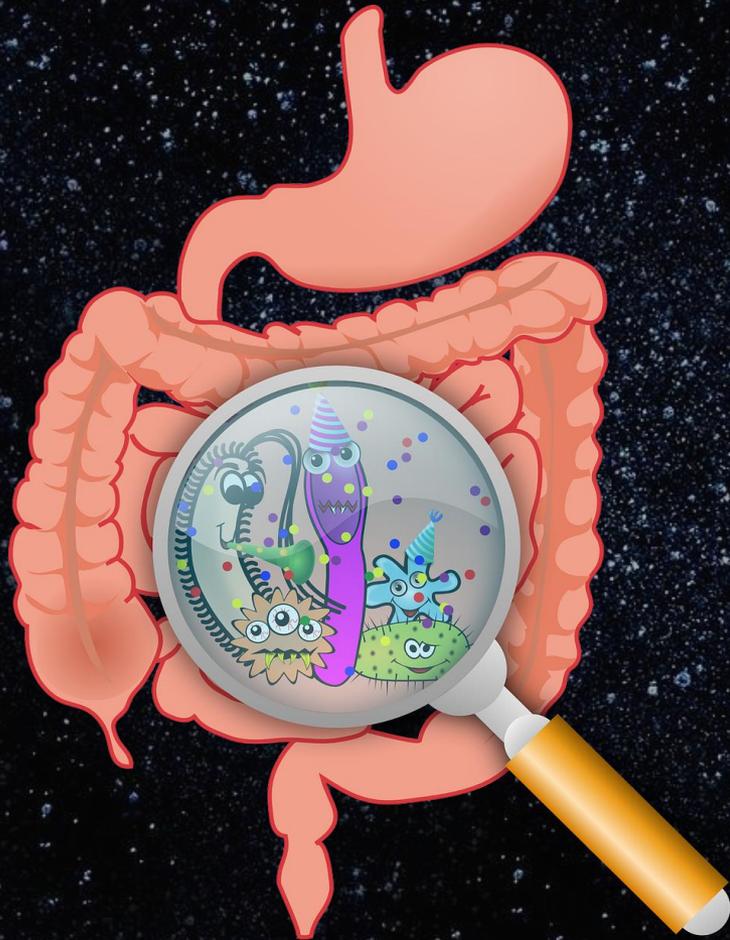
The history

Human and animal waste has been used as a fertiliser on Earth throughout history!

Known as **night soil**, waste was historically collected at night from cesspools and outhouses to be used - even in 2013, 55% of U.S. sewage was used as fertiliser.



The Science



Bio soils today are heavily treated feces... the raw stuff is rarely used as manure

This is because every human carries **pathogens** – things that make you sick (viruses, bacteria, parasites)

These could be transferred into the plants

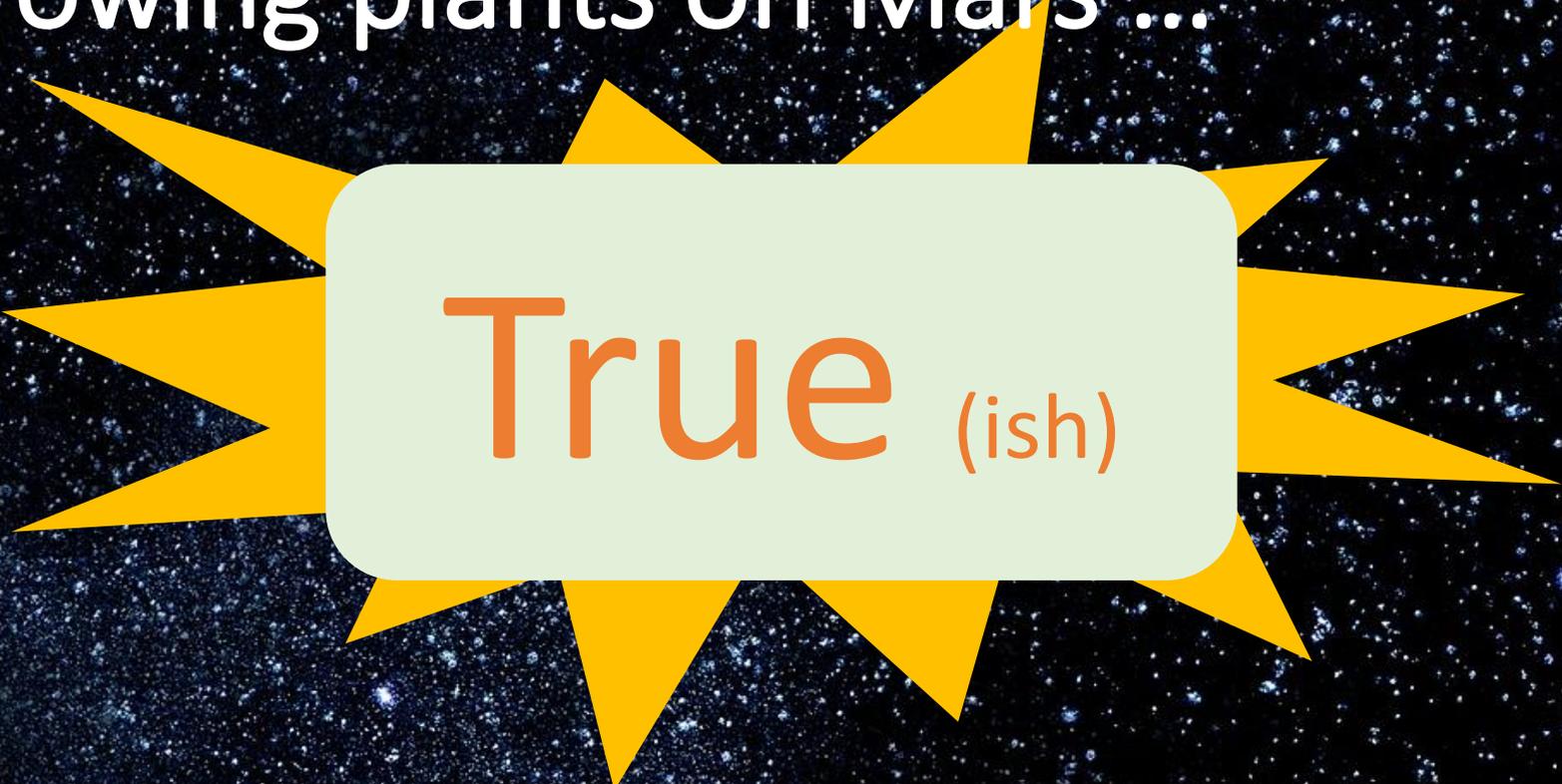
[Growing plants]
28:34 – 28:56

Growing plants on Mars ...

True

False

Growing plants on Mars ...



True (ish)

HERE'S WHY

With the addition of fertiliser it really would be possible to grow potatoes in Martian soil

However, wet chemical analysis of the soil on the surface of Mars has shown it to be 0.6% perchlorates (salts capable of disrupting the body's metabolic system) so you'd have to take care

Calculations have actually been done to show that the amount Mark Watney theoretically consumed was below a dangerous level



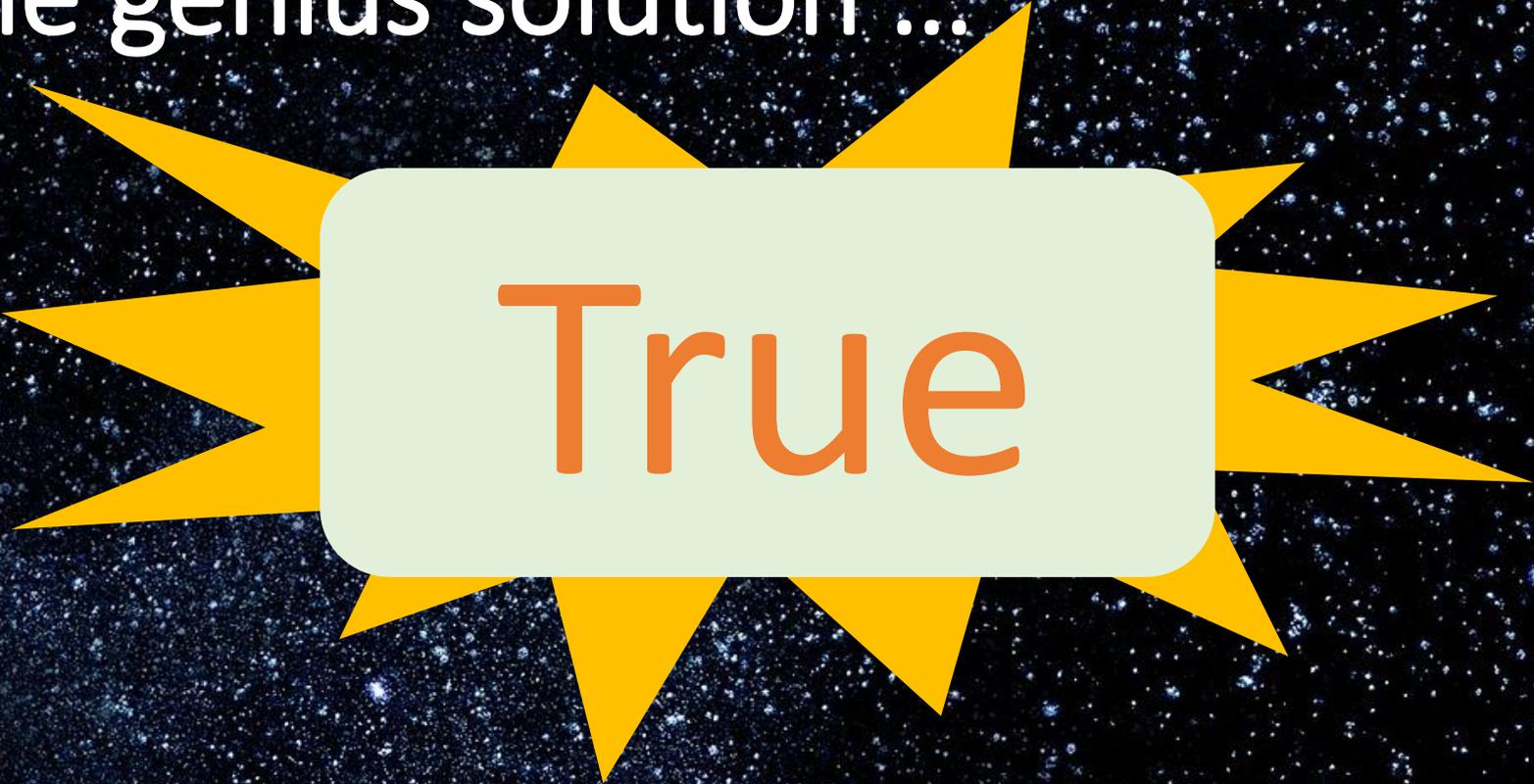
[Gravity Assist]
1:23:33 – 1:25:05

The genius solution ...

True

False

The genius solution ...



True

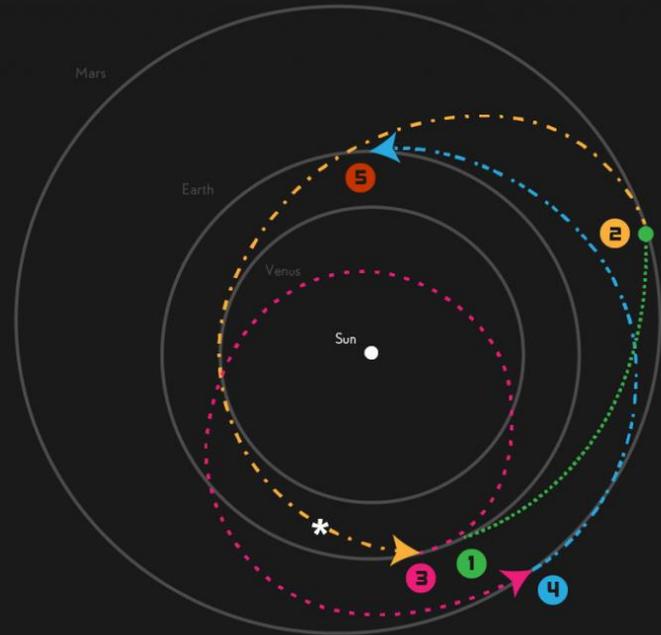
HERE'S WHY

There is a true history behind the genius character who comes up with the plan to save the day ...

THE TRAJECTORIES OF THE MARTIAN

by LAURA BURKE | graphic by MICHAEL GRESHKO

- 1 JULY 7, 2035**
The Ares 3 mission to Mars leaves low Earth orbit aboard the Hermes.
- NOVEMBER 7, 2035 (SOL 0)**
After nearly 124 days and over 150 million miles, the Hermes arrives at Mars.
- 2 NOVEMBER 13, 2035 (SOL 6)**
A freakishly strong dust storm forces the Ares 3 crew to abort, inadvertently leaving behind Mark Watney. The Hermes begins its return to Earth.
- * MAY 23, 2036 (SOL 192)**
The Hermes begins the Rich Purnell maneuver, which adds over 600 million miles to the mission—but gives the crew a chance to rescue Watney.
- 3 JULY 6, 2036 (SOL 229.7)**
The Hermes flies by Earth, using our planet's gravitational field to adjust its trajectory.
- 4 MAY 24, 2037 (SOL 549)**
The Hermes flies by Mars at 12,000 mph (5,36 km/s), successfully and harrowingly rescuing Watney.
- 5 DECEMBER 21, 2037**
The Hermes returns to orbit around Earth.



Burke, Laura. "An Examination of 'The Martian' Trajectory." NASA Glenn Research Center, 20 September 2015.

Flight paths reflect the optimized trajectory of the Hermes using the dates and spacecraft performance in "The Martian." The spacecraft has an inert mass of no metric tons and is capable of constant acceleration at 2 mm/s².

To see Andy Weir's original trajectories, visit galactanet.com/martian/hermes.mp4.

*The optimized initial leg takes 123.8 days. Date listings assume that the Hermes leaves Earth at 12:00 AM on July 7, 2035.

The history



Michael Minovitch - a trajectory analyst at NASA's Jet Propulsion Laboratory in 1960s

He came up with the idea of the gravity assist that became the basis of the Voyager programme to Jupiter, Saturn, Uranus and Neptune.

The history



Initially, no one believed him as he was a junior person, similar to the movie character.

The managers making the decisions were once engineers but hadn't done it in a while ... so Minovitch literally had to get out the chalk and walk them through the theory to convince them that it would work – just like the character in the movie

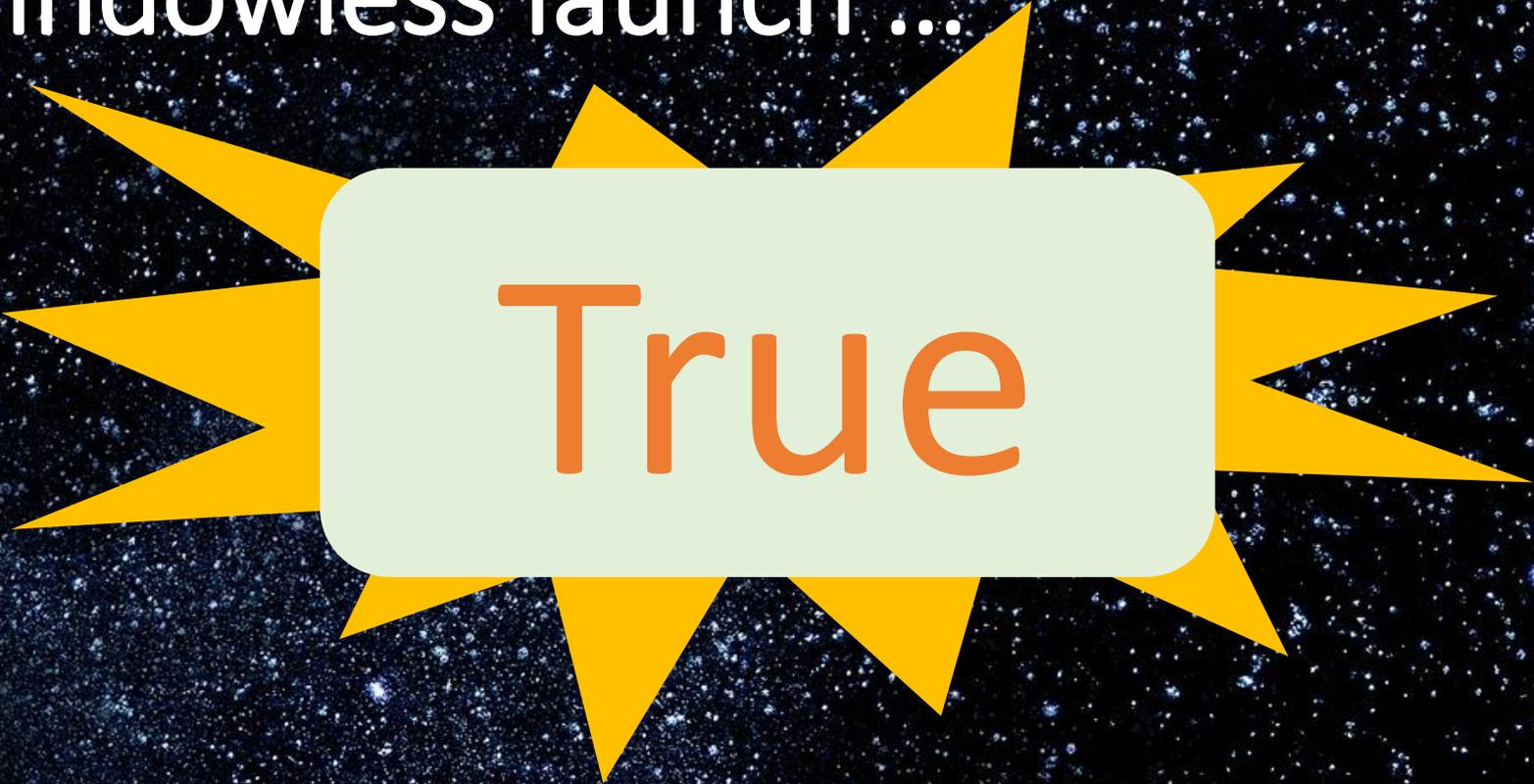
[Window-less launch]
1:45:08 – 1:45:50

Windowless launch ...

True

False

Windowless launch ...



True

Could you really survive a launch from Mars in a window-less rocket?

The **atmosphere is very thin**, so can you get high enough that the atmosphere becomes irrelevant, before you're going fast enough that the atmosphere is a threat

It depends on the thrust profile (acceleration and speed), but lots of mathematics proves it is possible ...

would you be brave enough?!



