Space commercialization and more

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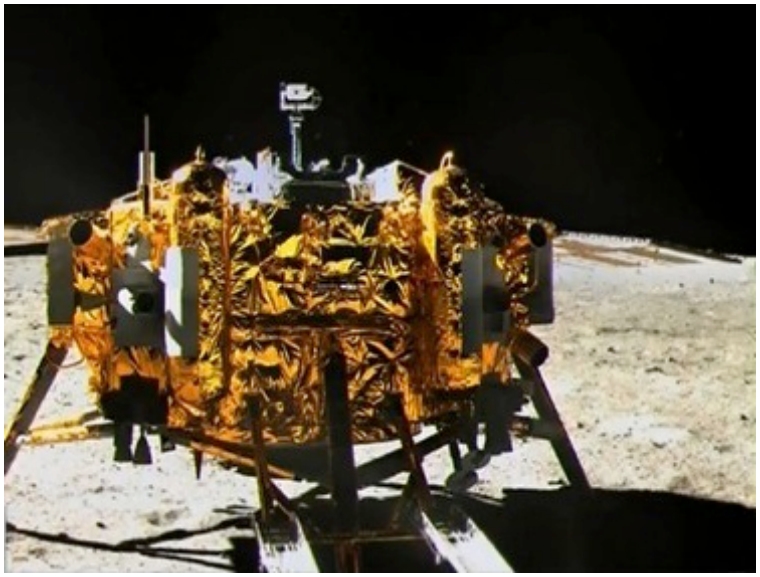
Ever wanted to be an astronaut?

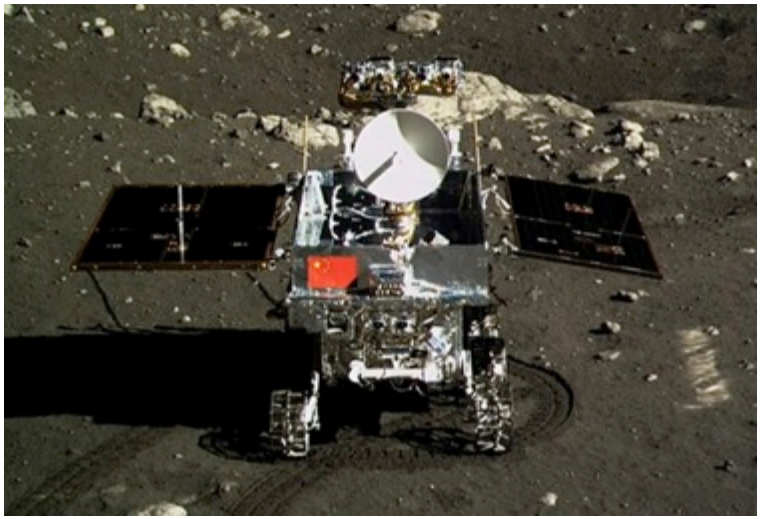
Space now

- Manned missions are not “as popular as used to be”
- Lot’s of unmanned missions
  - Let’s check few recent of them

China National Space Administration

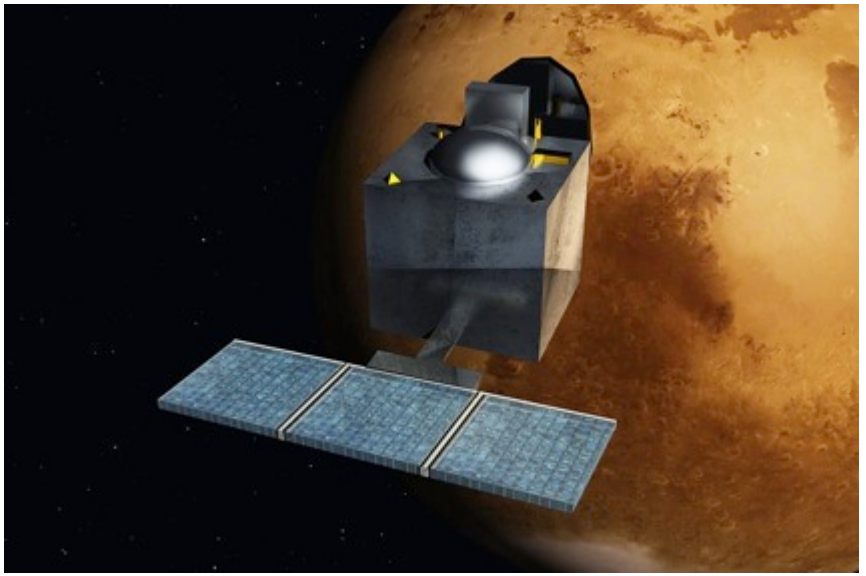
- Lunar exploration
  - Chang'e 3: lander
    - goddess of the Moon in Chinese mythology
  - Yutu: rover
    - Moon rabbit
- Landed on Moon 14 December 2013
  - Since 1976





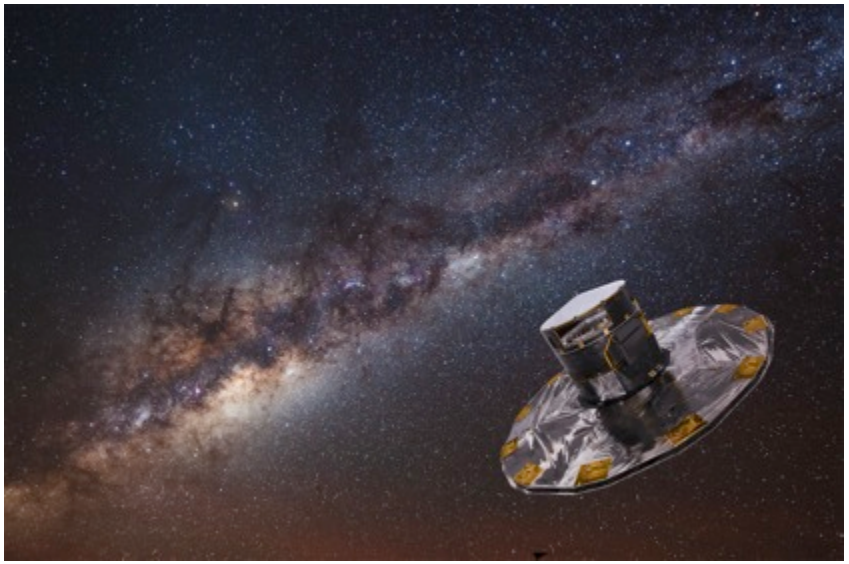
Indian Space Research Organisation

- To Mars!!!
- Mars Orbiter Mission
  - Mangalyaan (Sanskrit): Mars-Craft
- Planned to put into orbit 24 September of 2014



European Space Agency

- Moon is gone, Mars is gone, so let's travel to Galaxy ☺
- Build 3D map of Milky Way
  - Gaia: Mother of the Earth and Universe
- Observe ~1 bn astro objects
  - ~1% of the Milky Way population ☹
- … measure the diameter of a hair from 1000 km away …
  - Space is huge too



More nations joining space “club” …

Companies too!

Elon Musk

PayPal™

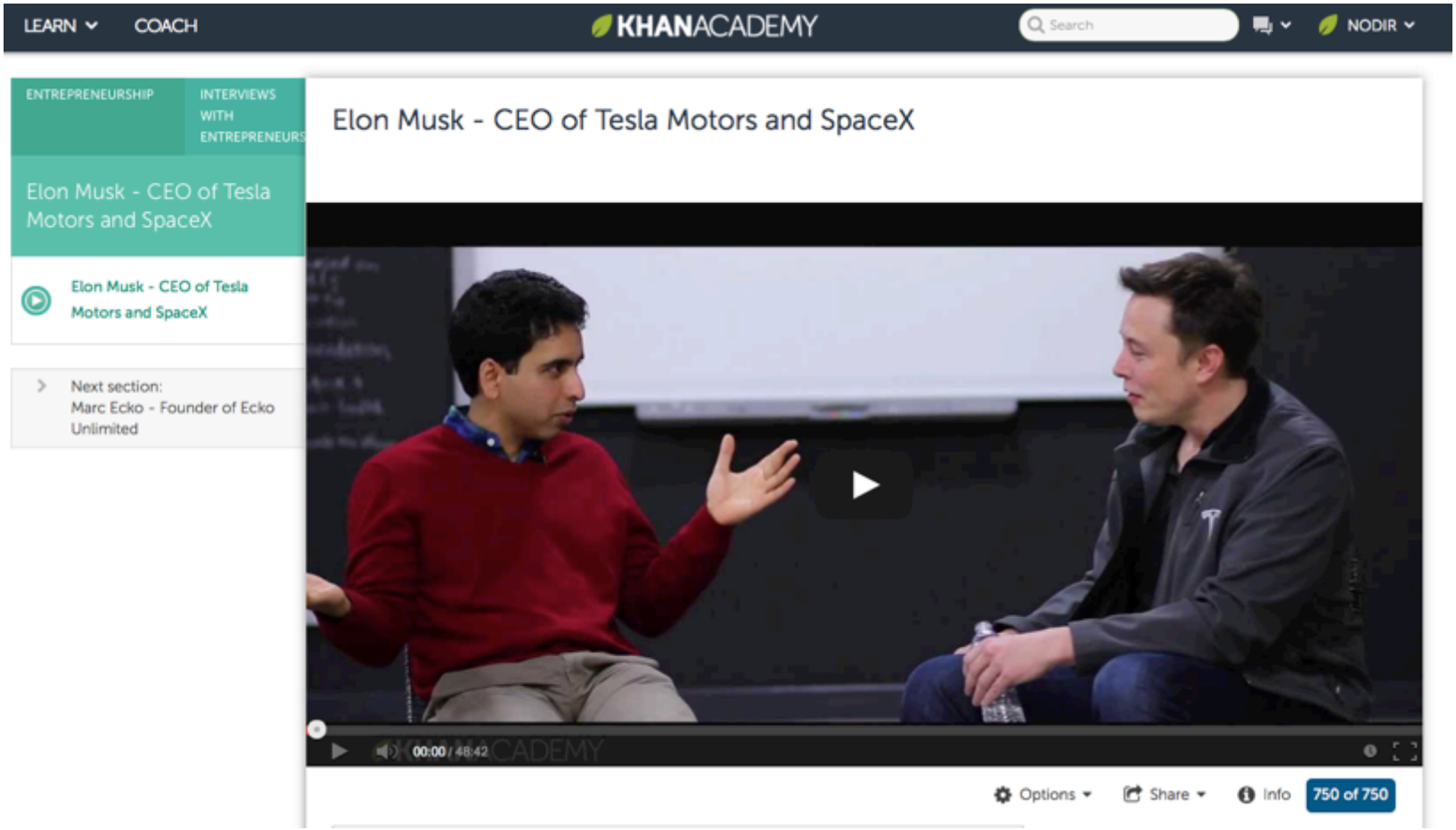
SPACEX

TESLA

SpaceX – reusable rockets

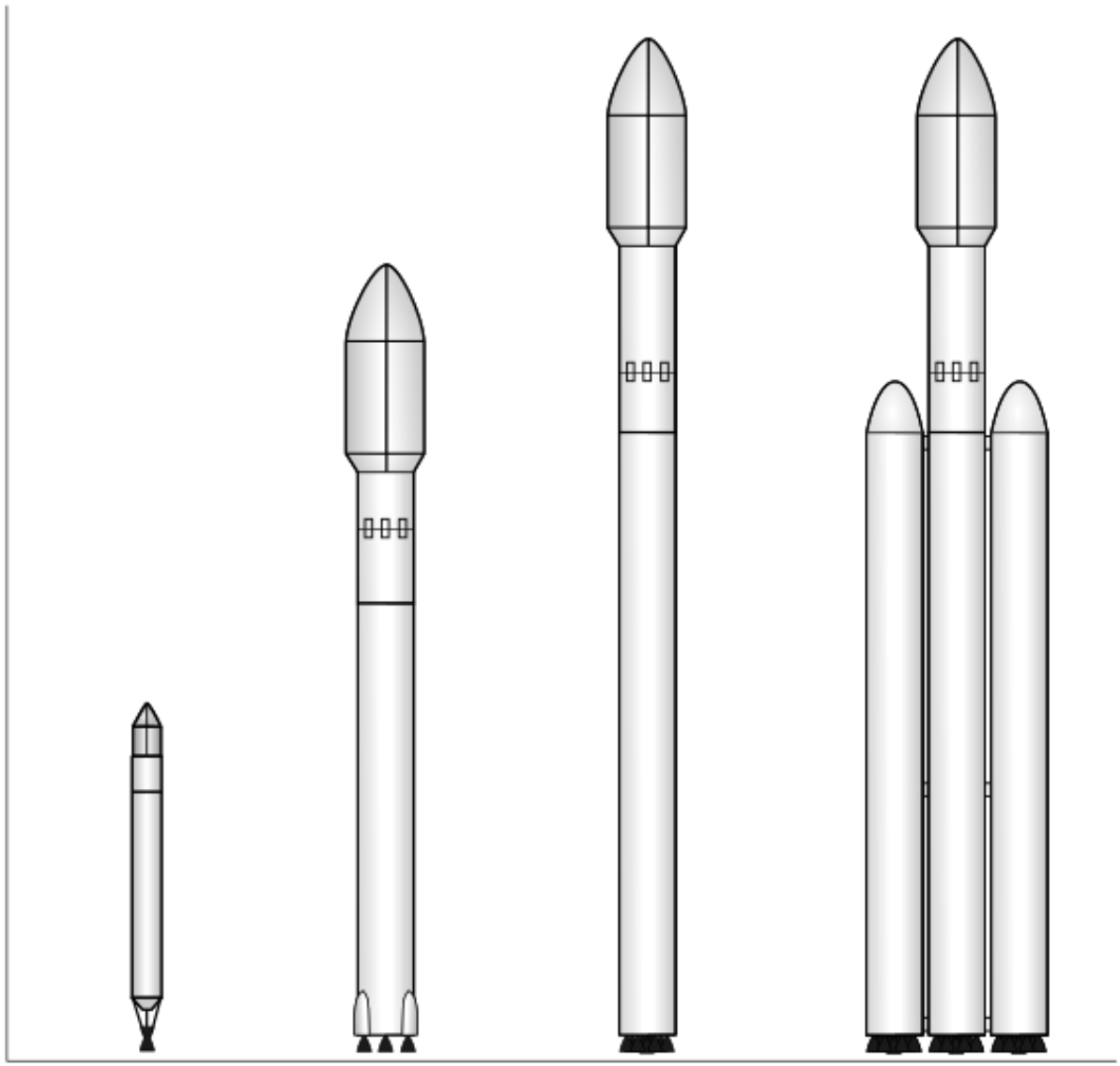
http://www.youtube.com/watch?v=ZxKWh7kLDzw

Why reusable rockets?



Falcon line rockets cost 60 million dollars

Fuel is only 200 K => 0.00034 % of the cost!



Falcon 1
Satellites to orbit

Falcon 9 v1.0 and v1.1
Cargo to ISS

Falcon Heavy
Crew to ISS and from there to Moon, Mars

Golden Spike – Train to the Moon

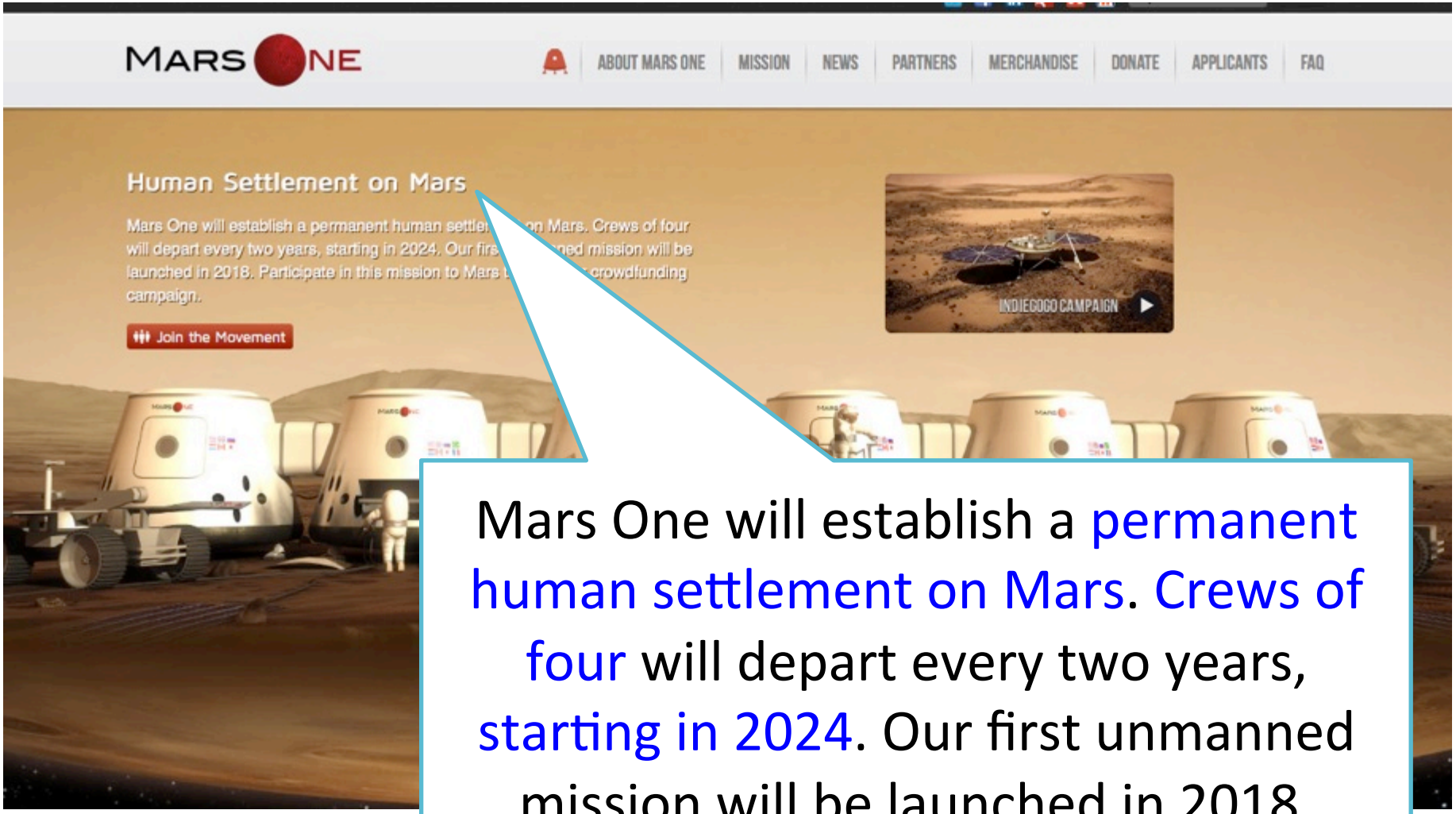
Serious? Who is backing them up?

- Mr. Gerry Griffin - Apollo Flight Director, former Director of NASA Johnson Space Center
- Dr. Alan Stern - planetary scientist, former head of all NASA science missions
- Mr. Jeff Ashby - former NASA space Shuttle commander
- …

More about Golden Spike

- Dialog:
  - Golden Spike: we can give a ride to NASA, if they want.
  - NASA: Go for it!
- Company need to raise around $8 billion to set up operations.
- Round trip cost to the Moon for one is about $1.5 billion
  - round trip ~750,000 km
- Golden Spike's market research identified 25 nations that are in a position to afford and have the desire for lunar expeditions…
- … make money with advertising, marketing and media deals, including naming rights for its spaceships …

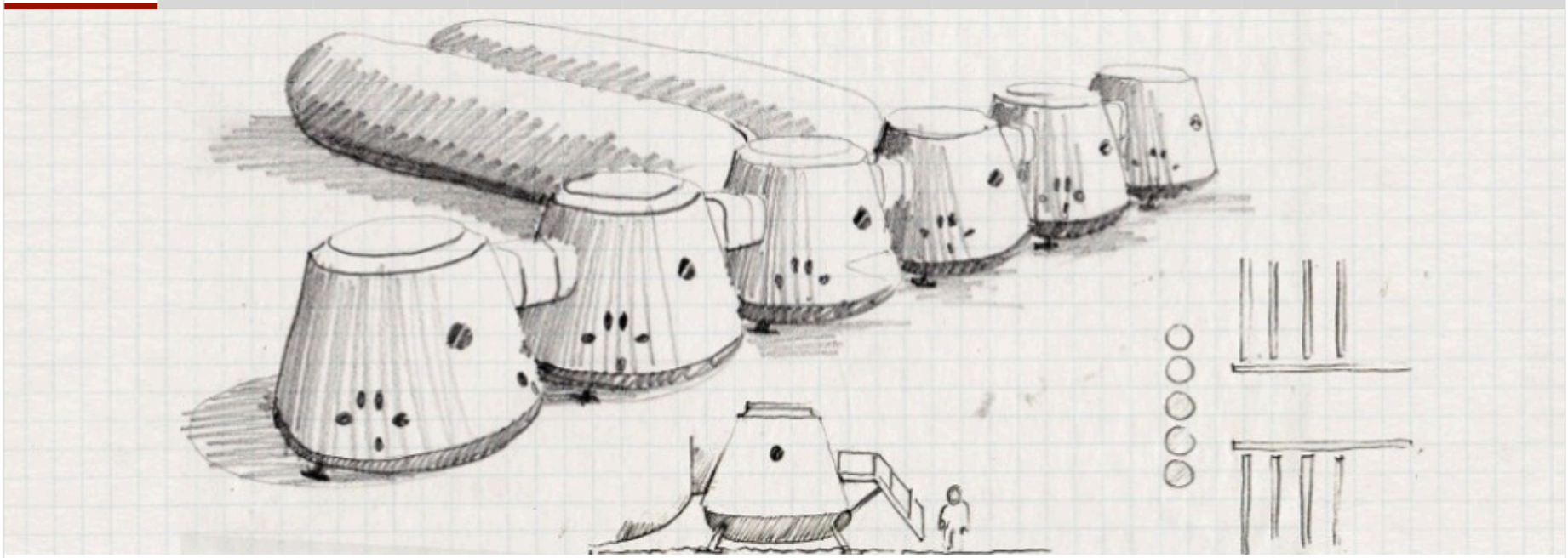
MarsOne



Mars One will establish a permanent human settlement on Mars. Crews of four will depart every two years, starting in 2024. Our first unmanned mission will be launched in 2018.

Roadmap

2011	2013	2015	2018	2020	2022	2023	2024	2025	2026
Mars One Founded	Start Crew Selection	Start of Crew Training	Demo & Comsat Mission	Rover Mission Launched	Cargo Missions Launched	Outpost Operational	Departure Crew One	Landing Crew One	Departure Crew Two



Foundations of mission plan laid

In 2011 Bas Lansdorp and Arno Wielders lay the foundation of the Mars One mission plan. Discussion meetings are held with potential suppliers of aerospace components in USA, Canada, Italy and United Kingdom. Mission architecture, budgets and timelines are solidified from feedback of supplier engineers and business developers. A baseline design for a mission of permanent human settlement on Mars achievable with existing technology is the result.

Unfortunately it's one way ☹

- Project costs $6-billion
- Company's public announcement
  - Who wants to fly to Mars, it's a free ride!
- ~200.000 already applied, from 140 countries
- 7000 Canadians too
- Application fee $5~75 depending on country
  - Average $50 x 200 K = 10 million already ☺
  - Reality show is planned to select the candidate
  - … and other ways of making money …

Martian time

Earth “day” = Mars “sol” (from *solar day*)

1 sol = 24 hours 39 minutes 35 seconds

Sol = Day + 40 mins

David Oh - Lead Flight Director for the Mars Science Laboratory rover Curiosity, NASA

Followed Mars sol
over a month
starting from the
first day of
Curiosity's landing

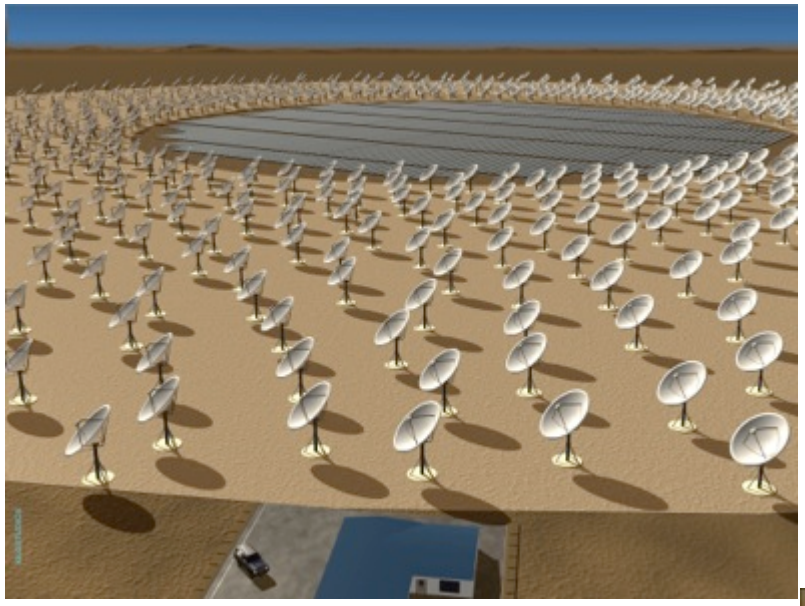
List of NASA planet observations

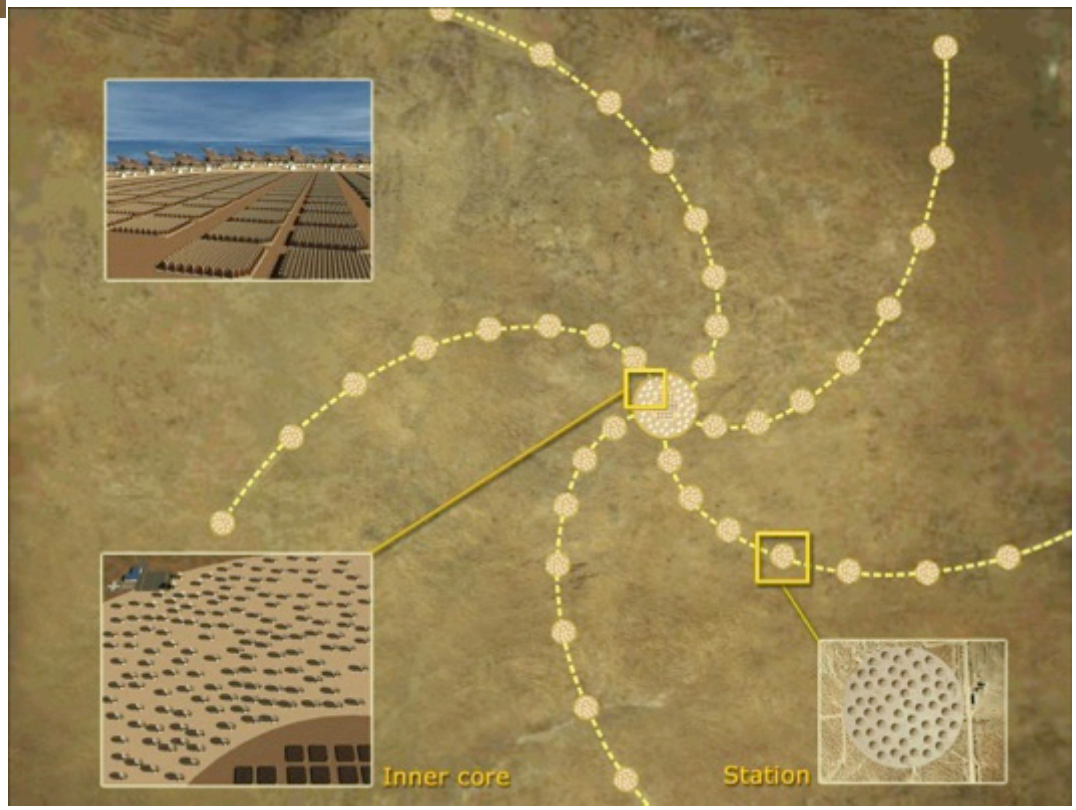
	Earth	Moon	Mars	Mercury	Venus	Sun	Universe and others
Past (from 1958)	14	16	15	1	3	1	10
Current	14	1	4	0	0	0	15
Future	6	0	2	0	0	0	3

Source: http://www.jpl.nasa.gov/missions/

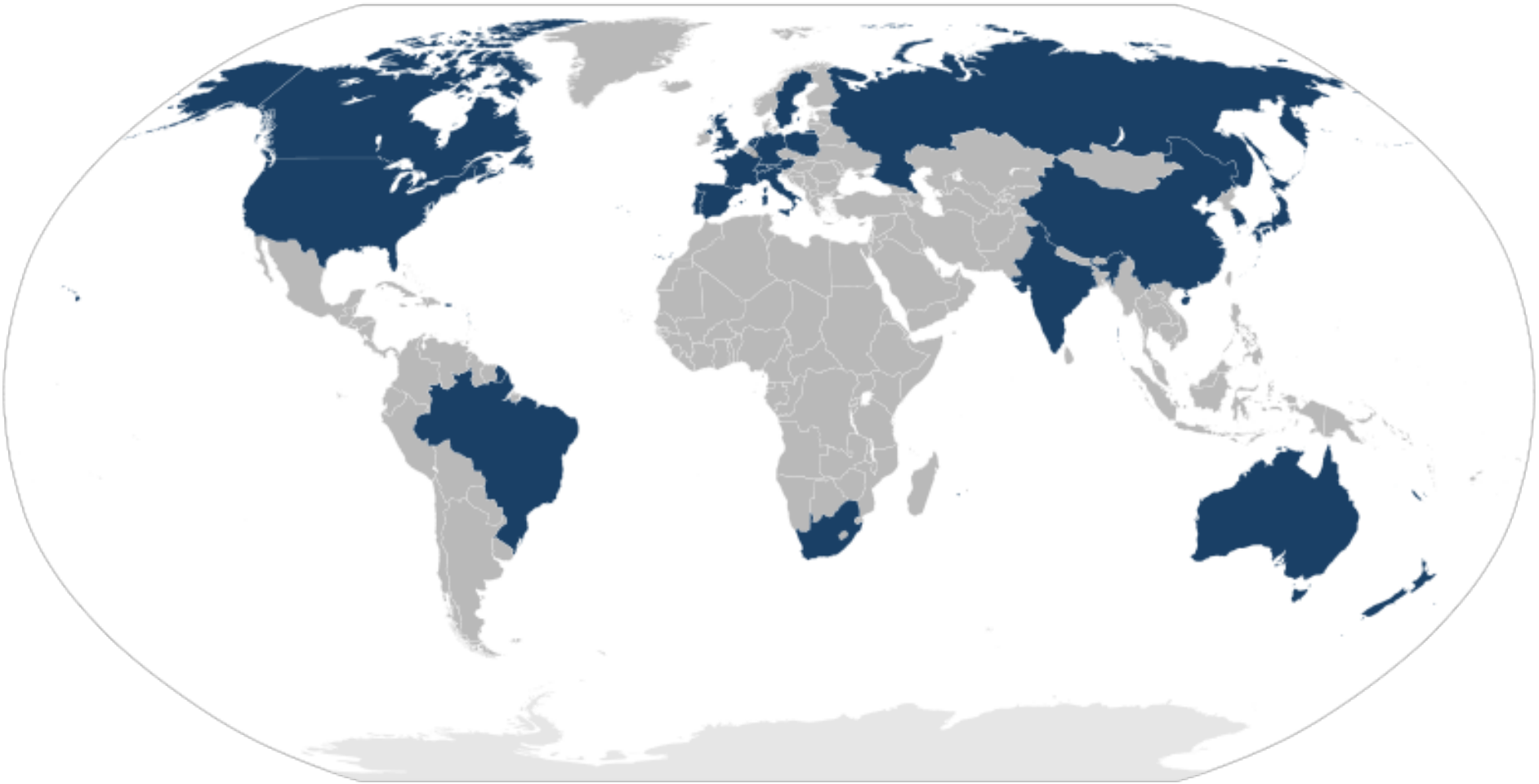
My favorite

- SKA is a radio telescope in development in Australia and South Africa which will have a total collecting area of approximately one square km

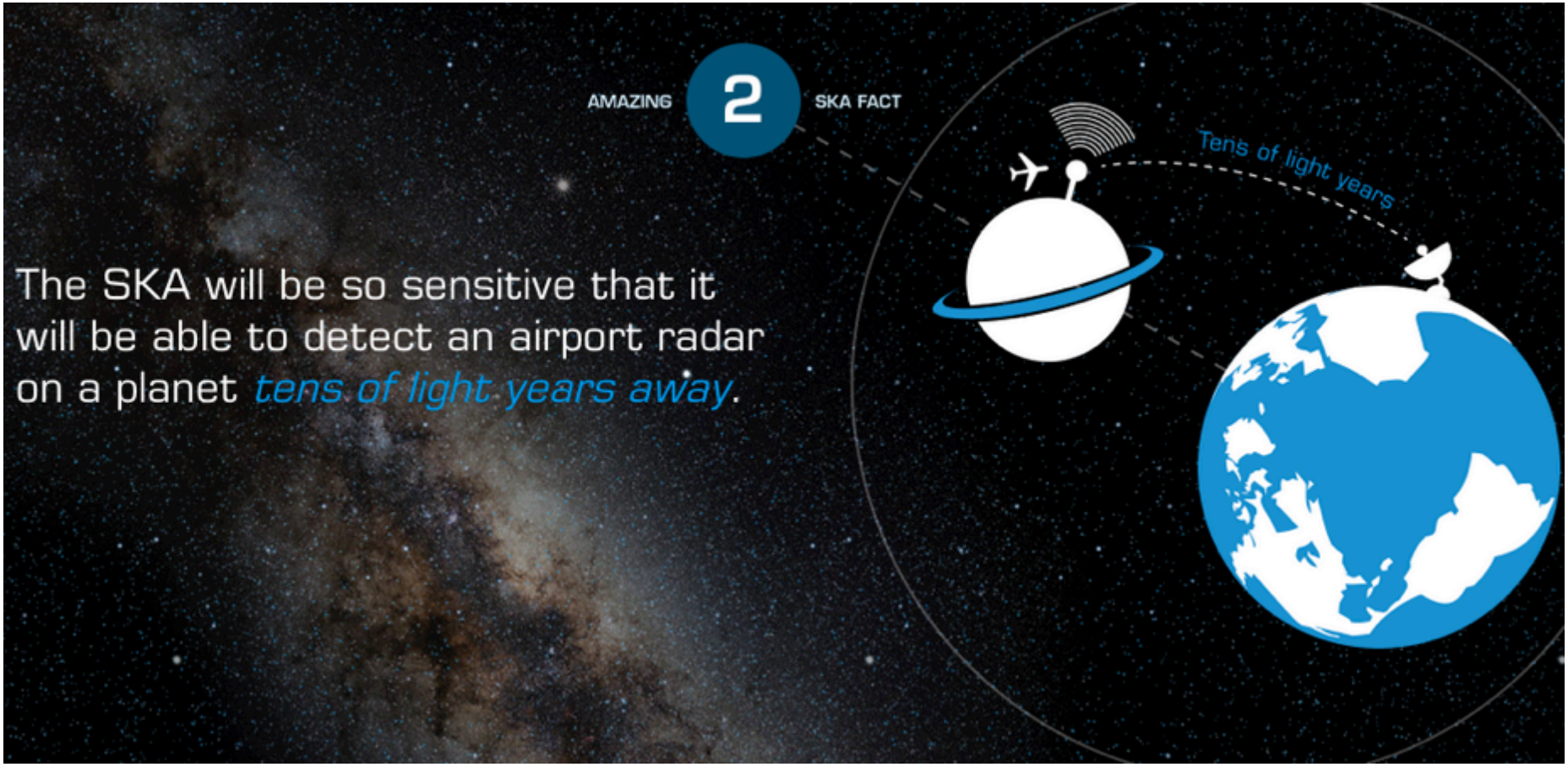



Inner core
Station

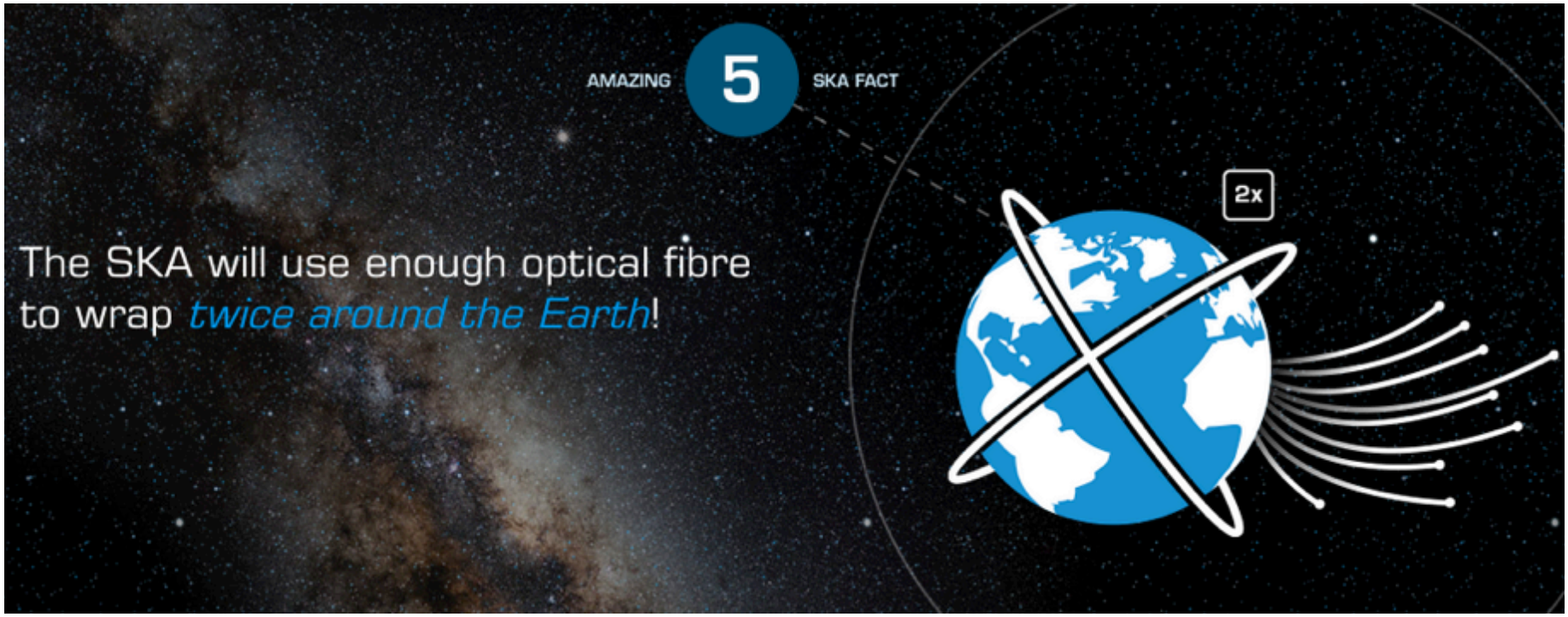
Participant countries

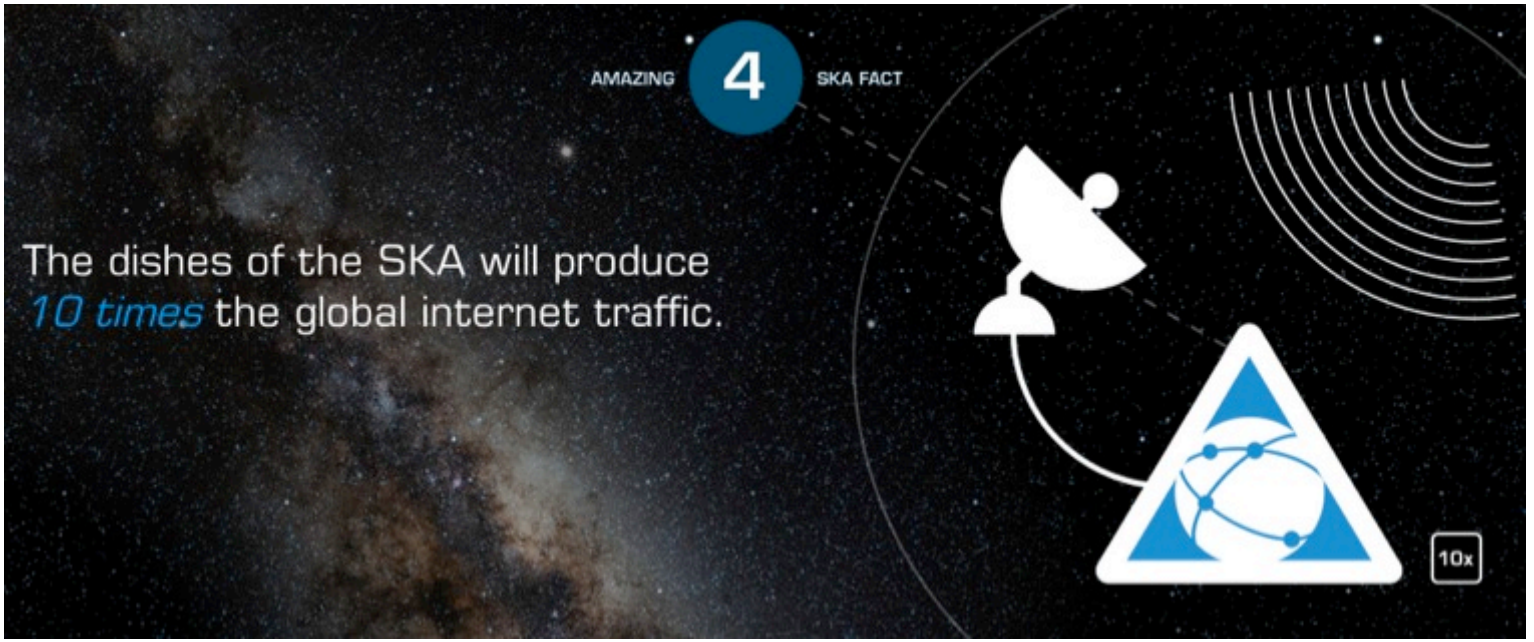


Sensitivity



Optical cables




AMAZING
4
SKA FACT
The dishes of the SKA will produce 10 times the global internet traffic.
10x


AMAZING
6
SKA FACT
The aperture arrays in the SKA could produce more than 100 times the global internet traffic.
100x

Why important?

- Key projects
  - Galaxy evolution, dark matter and dark energy
  - The origin and evolution of cosmic magnetism
  - Extreme tests of general relativity
  - Extraterrestrial life and habitable planets

Don’t explore, fix Earth!!!

Stephen Hawking at TED 2009

- I’m convinced that one day we human will have to colonize the other planets in order to survive.
- Space travel will become an everyday necessity.
- …
- To confine our attention to terrestrial matters would be to limit the human spirit.

Aim high, keep exploring ☺

Thanks for listening &
enjoy your weekend!