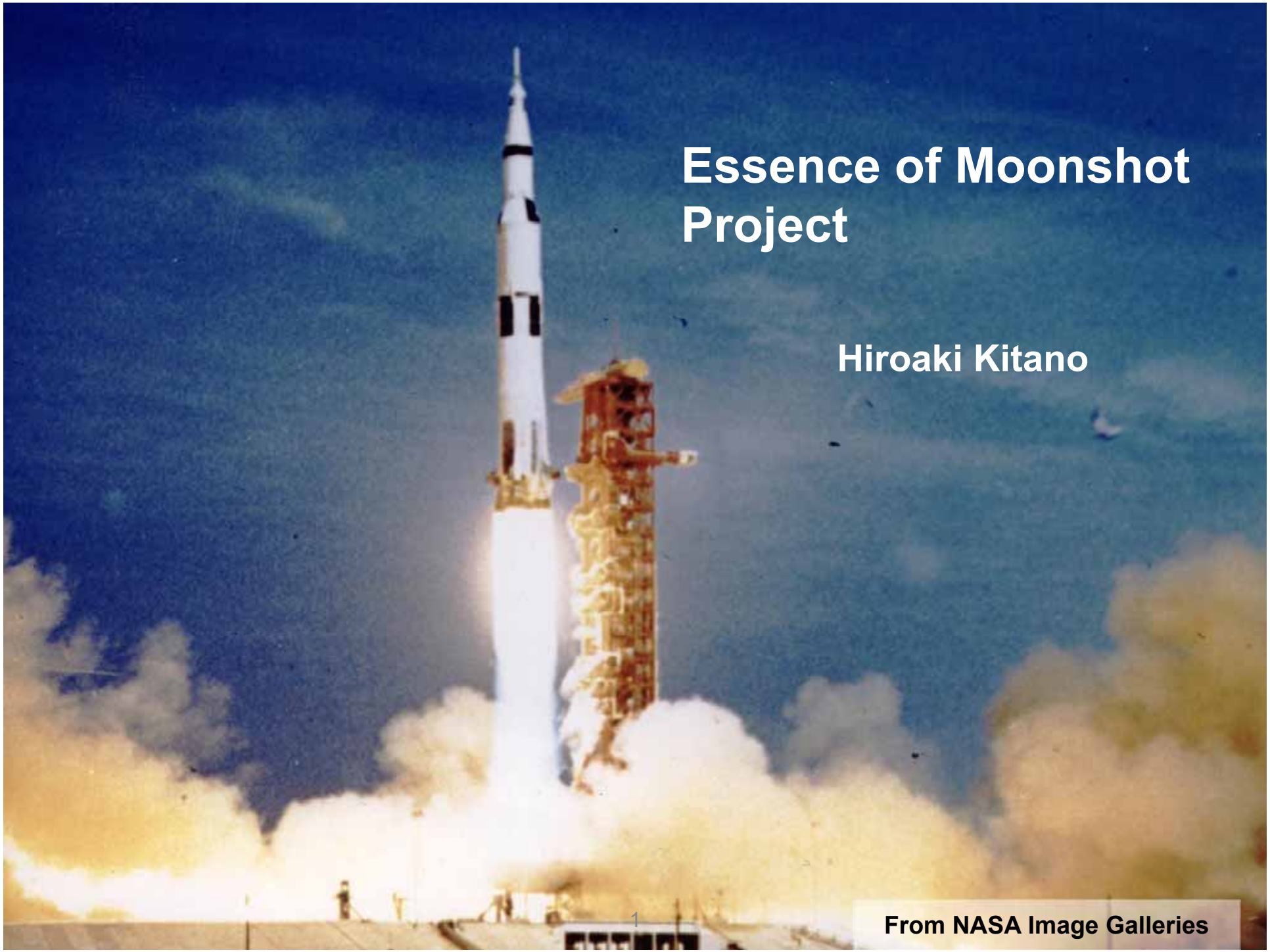


Essence of Moonshot Project

Hiroaki Kitano

From NASA Image Galleries

Apollo Program

Goal: Land human race on the Moon and return them safely to Earth

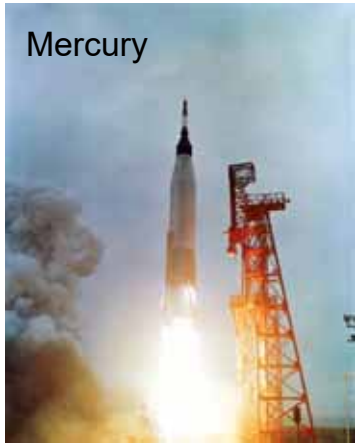
Apollo Project's goal went beyond lunar landings to strengthening technologies, science, and industry for extending US interests into space.

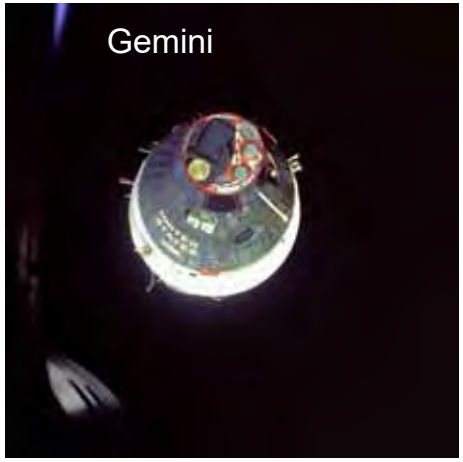
Project Apollo's goals went beyond landing Americans on the Moon and returning them safely to Earth:

- **To establish the technology to meet other national interests in space;**
- **To achieve preeminence in space for the United States;**
- **To carry out a program of scientific exploration of the Moon;**
- **To develop man's capability to work in the lunar environment.**

From NASA website https://www.nasa.gov/mission_pages/apollo/missions/index.html

Incremental programs





Research modalities

Three different research modalities. Typically…

…Moonshot research

Reaching the Moon

Set a clear and highly ambitious goal, then concentrate all available resource. Fundamentally an engineering project.

…Focus area research

Understanding all about the Moon

A focused and multi-dimensional research on an important field/topic. Ranges from basic to applied researches.

...Exploratory basic research

Finding and researching intriguing phenomena

Identify what matters, then research the subject. Driven by personal curiosity, sense of mission – spontaneity is the key

Images from NASA

Designing a Moonshot/Grand Challenge Project

Grand challenge project

Seek to resolve important issues or find possibilities in areas that will give a huge impact to the society. Set a clear goal. Define milestones for the journey towards the goal. Establish strategies for evaluation and management in line with those milestones.

Landmark grand challenge project

Set a goal that may not be significant for the society but will still intrigue and astonish all. Project achievements will be shared throughout the society.

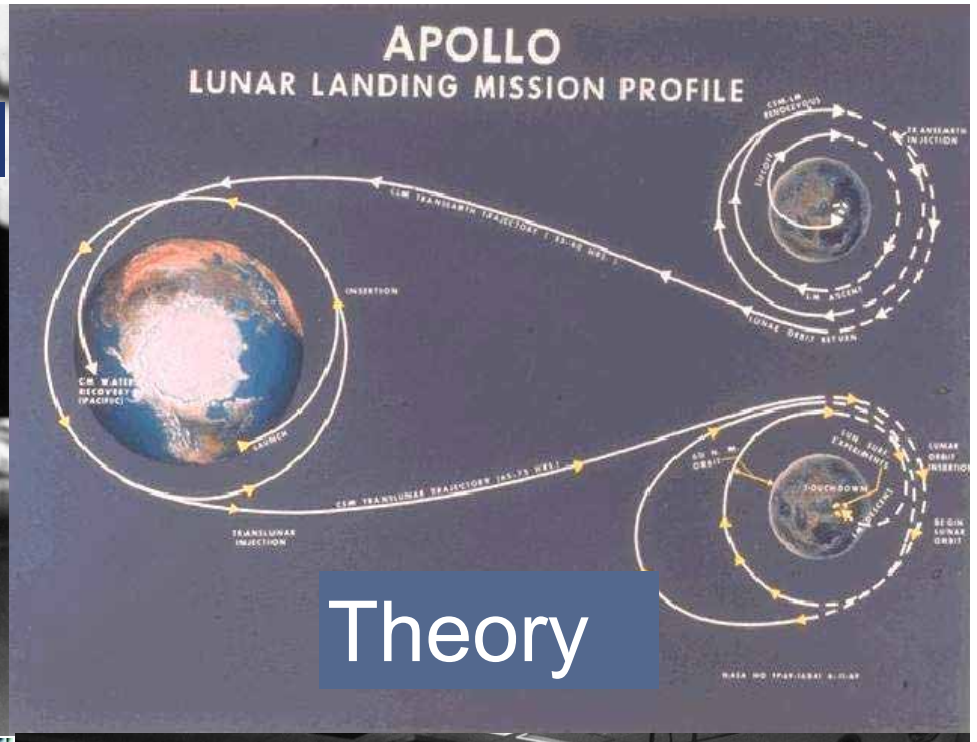
Many successful Grand Challenge Projects had Landmarks built in.

Strategic focus area
(never to be confused with Grand Challenge)

Drive research in an area considered critical by many experts. Consensus-based decision making. No specific goals. Loosely defined milestones, or none.

Unexpected and disruptive researches are likely to evolve outside these projects – ensure diversity at all times

Vision & Leadership



Theory

Technology Platform

Management

Images from NASA

Case Study: RoboCup

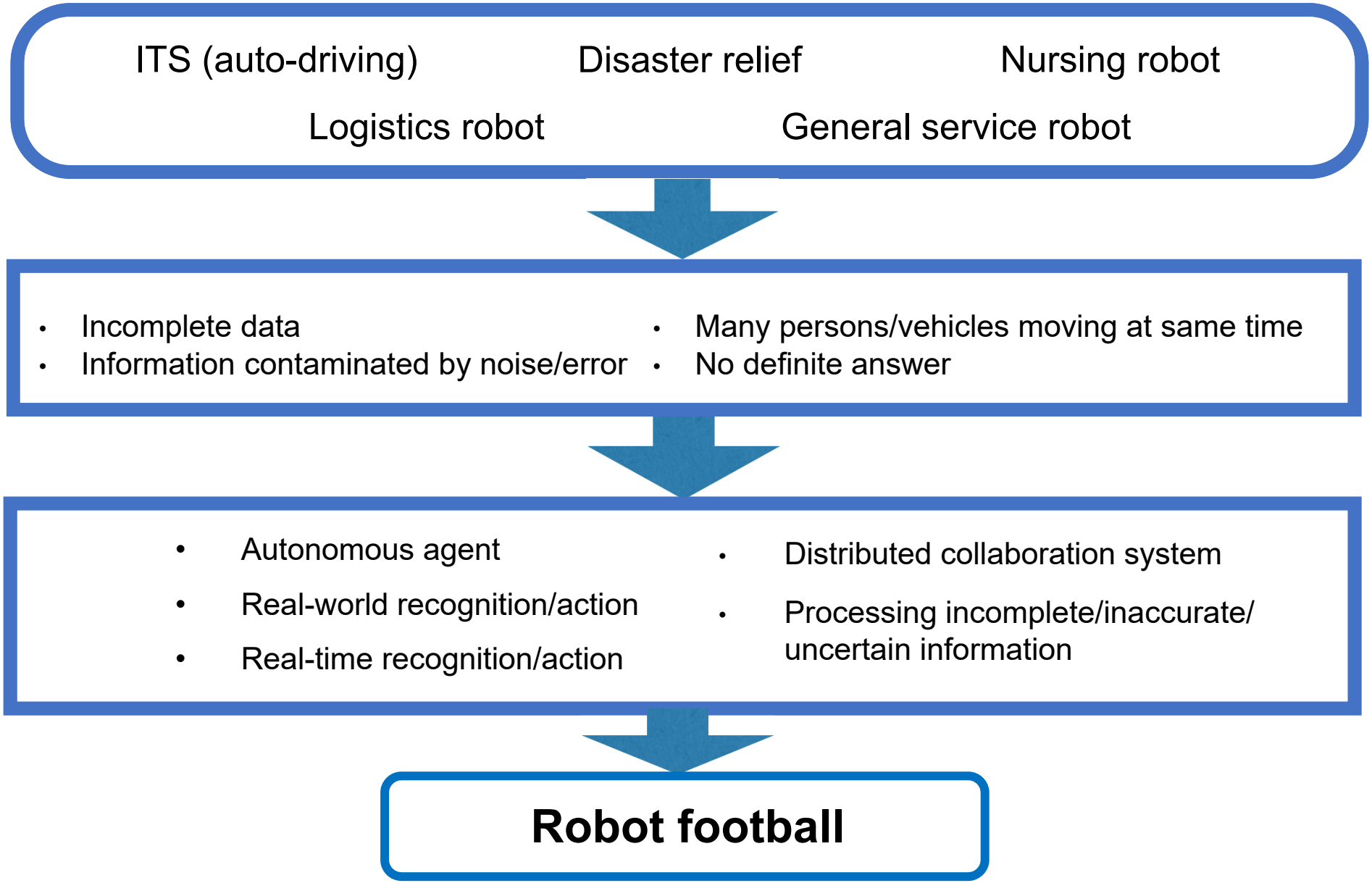
Goal

By 2050, build a team of fully autonomous humanoid which win against human world champion under the official regulation of FIFA.

Building a team of completely autonomous humanoid robots and win FIFA World Cup by 2050

Technologies developed during the process will redefine society and industries

Derive Task Sets from Exit Strategy



Imagination and Obsession

By starting from reality - clumsy, incompetent robots…

Image from The RoboCup Federation

… can we still keep believing in this future?

Image from Amazon Robotics

KIVA Systems was set up to use football robot technology for warehouse management.
The business was acquired by Amazon.com (at 775 million USD), renamed Amazon Robotics, and innovated logistics.

日経産業新聞
NIKKEI BUSINESS DAILY
2016年(平成28年) 7月14日 木曜日

掲載日 2016. 7. 1

News Focus

60社がブース 95-1
人材・技術に食指

世界企業、ロボカップ詣で

ロボカップ2016が開幕。試合前にロボを調整する参加者ら（ドイツ・ライプチヒ）

【ライプチヒ＝戸田… 太郎】世界最大級のロボット競技会「ロボカップ2016」が29日（日本時間30日）、ドイツのライプチヒで開幕した。ロボカップは「ロボット版サッカーワールドカップ」として1997年に始まった。20回目となる今回、ワールドカップの優勝チ… 殿の並世初等化を見据え…

家庭の標準機

ロボカップ20年、ビジネス色に

トヨタが狙う

1997年に始まったロボット競技の祭典「ロボカップ」が二十歳を迎えた。今月4日まで開かれた今年のドイツ大会には約3500人の研究者や学生らが参加。米アマゾン・ドット・コムが自社イベントを共同開催するなど、世界各国の企業が熱視線を送った。技術のタネを競うだけでなく、ビジネスを話し合う場に進化したロボカップ。最終章となる第8部では、現場ルポからロボット産業の未来を予想する。

企業と研究者

源流は日本に

ロボカップの源流は日本にある。犬型ロボット「AIBO（アイボ）」の開発に携わったソニーコンピュータサイエンス研究所の北野宏明社長らが中心となり、97年に名古屋市で第1回大会を開…

World's largest AI/robotics project, bringing together thousands of researchers as well as hundreds of thousands of young people

	Apollo	**RoboCup**
Vision/Leadership	1960s: land human race on the Moon and return them safely to Earth	By 2050: Build a team of completely autonomous humanoid robots that can win FIFA World Cup Championship
Theory	Swing-by navigation method and other technological principles	Open innovation Competition and collaboration “Passion drives the research”
Platform	e.g. Saturn V launch and control/guidance systems	Evaluation through competitions, panel discussions, a global initiative led by the RoboCup Federation (RFC)
Management	Large-scale project management and risk management by NASA	Decentralized management by RFC and other regional/national/technical committees, dynamic milestone management

Case Study: Solar Impulse

First aircraft to circumnavigate the world by solar power

Wide-ranging outreach to environment protection actions

Solar Impulse Web Site

Moonshot Fundamentals

- **Goal setting imperative: Moonshots' success hinges on their goals**
  - **Simple, easy to understand, and packing a punch**
    - **"Go to the Moon and comeback" (The Apollo Project)**
    - **"Robots beat human football world champions" (RoboCup)**
    - **"Fly around the world on solar energy" (Solar Impulse)**
  - **It will take many years to reach the final goal, but milestones should be set so initial gains can come quicker (materialized in three to five years) – keep this in mind when defining the goal and designing the project**
- **Essentially a large-scale technology project**
  - **Set an ambitious goal, concentrate resources to ensure the project gets there**
  - **By-products and repercussions of clearing the goal can be foreseen**
  - **Many spin-outs**
  - **Technology accelerates science**
  - **Not a basic research project (large-scale basic research needs a different framework)**
- **Project management most vital**
  - **Management must stay the course toward the goal**
  - **Moonshots are surrounded by doubts - criticism and disregard are the most likely response in the beginning**
  - **Steady achievement must be planned to ensure the project's survival as well as its ultimate success**