# PROFESSIONAL PRACTICE/ OCCUPATIONAL HEALTH AND SAFETY

## Triumph In Engineering

Course MIM221

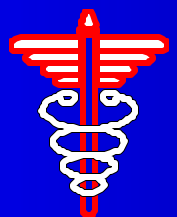
# INTRODUCTION

**Technology has a pervasive and profound effect on the contemporary world,and engineering plays a central role in all aspects of the development of technology.**

It is vital that there be an understanding of the,

- ETHICAL implication of engineer's work,

- Professional practice and



- Risk and safety

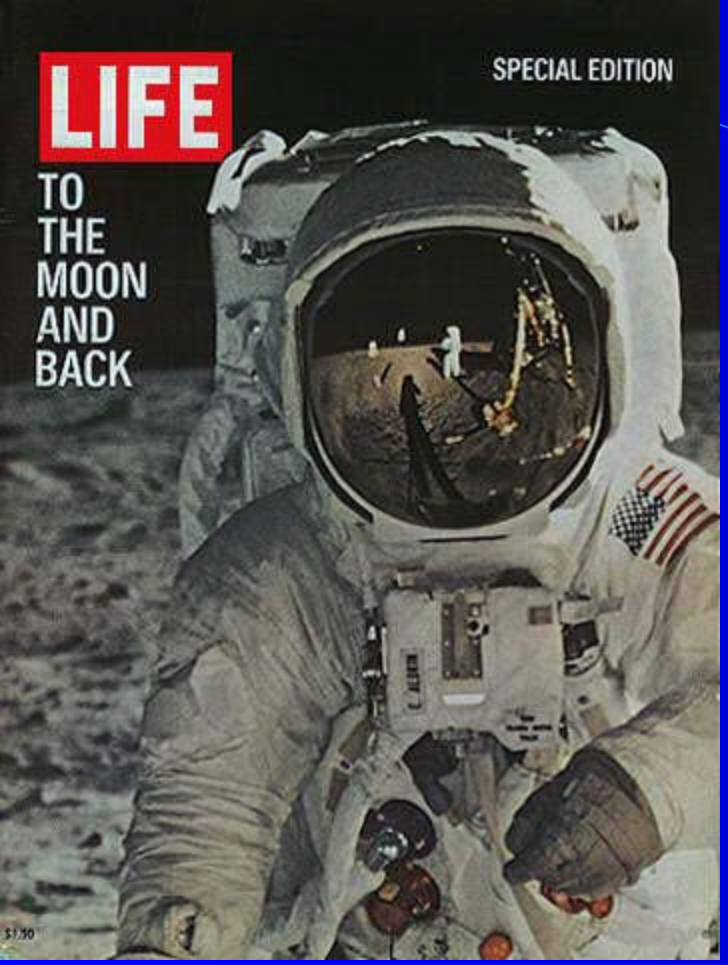
# ENGINEER

**Engineers create products and processes to satisfy basic needs for food and shelter---and in addition enhance the convenience, and beauty of our everyday lives.**

**They even make possible spectacular human triumphs once only dreamed of in myth and science fiction**

# EXPERT

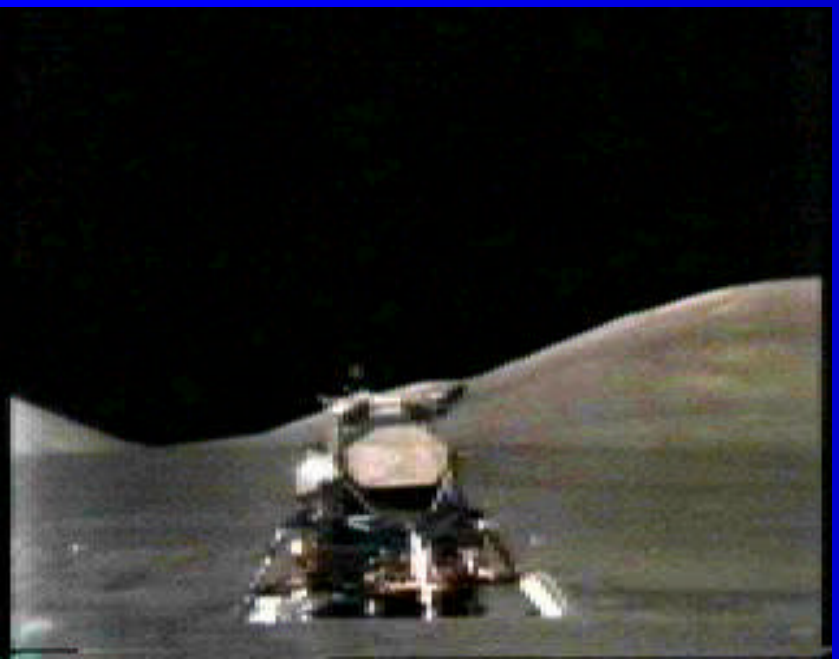
Is the one with a briefcase
coming
100Km from out of town!!




# TO THE MOON AND BACK

**A tense dialogue and then 'The Eagle has landed'**

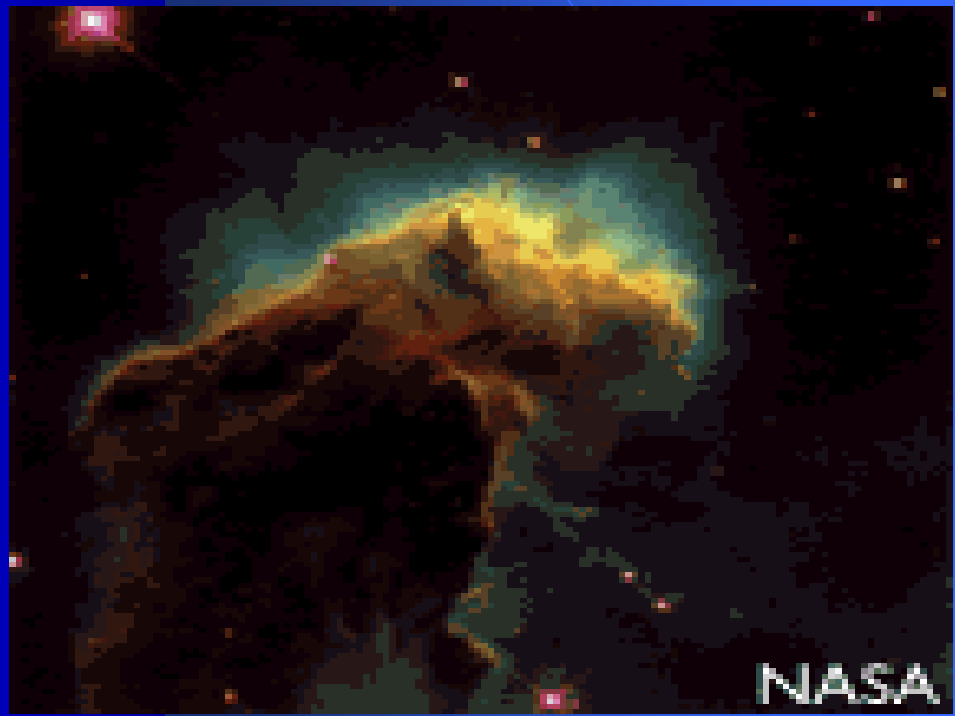
Eagle's powered let-down to the moon on Sunday afternoon was a surpassingly suspenseful maneuver.The dialogue between Eagle, whose on-board computer kept ringing false alarms, and Houston--with occasional interpolations by Apollo Control--was heard by tens of millions. A part of the sequence follows.



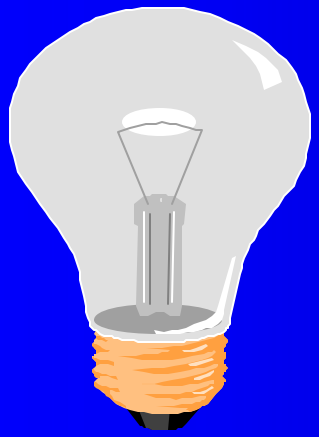
- TO THE MOON AND BACK
- A tense dialogue and then
- 'The Eagle has landed'
- A part of the sequence follows
- HOUSTON: Eagle, you are go--you are go to continue power
- descent.
- CONTROL: Good radar data. Altitude now 33,500 feet.
- EAGLE: Give us the reading on the 1202 program alarm.
- HOUSTON: Roger. We got--we're go on that alarm
- EAGLE: 12 alarm. 1201.
- HOUSTON: Roger, 1201 alarm.
- EAGLE: We're go. Hang tight. We're go. 2,000 feet. 47 degrees.
- HOUSTON: Eagle looking great. You're go.
- HOUSTON: 30 seconds.
- EAGLE: Drifting right. Contact light. Okay, engine stop
- HOUSTON: We copy you down, Eagle.
- EAGLE: Houston, Tranquillity Base here. The Eagle has
- landed.
- HOUSTON: Roger, Tranquillity, we copy you on the ground.
- You got a bunch of guys about to turn blue. We're
- breathing again. Thanks a lot.

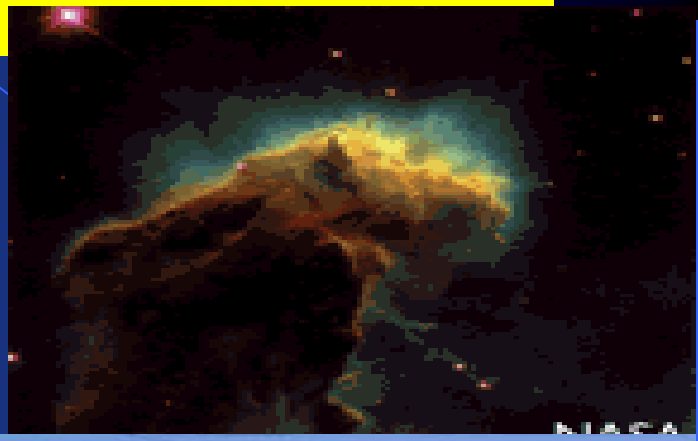
# Space Flight

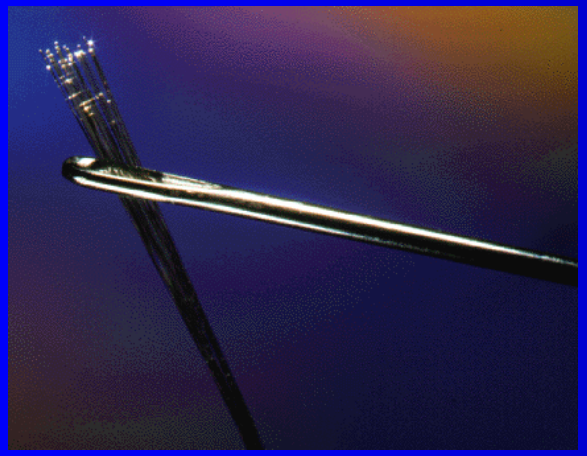

From NASA


NASA

# ENGINEERING TRIUMPHS







# ENGINEERING TRIUMPHS

- Engineering projects that are considered triumphs
  - Railway System in US
  - Space Program
  - WW II Production Effort
  - Channel Tunnel
  - Panama Canal
  - Nuclear Energy
  - Aswan Dam
  - Niagara Power Project
  - St. Lawrence Seaway
  - Shuttle Tiles

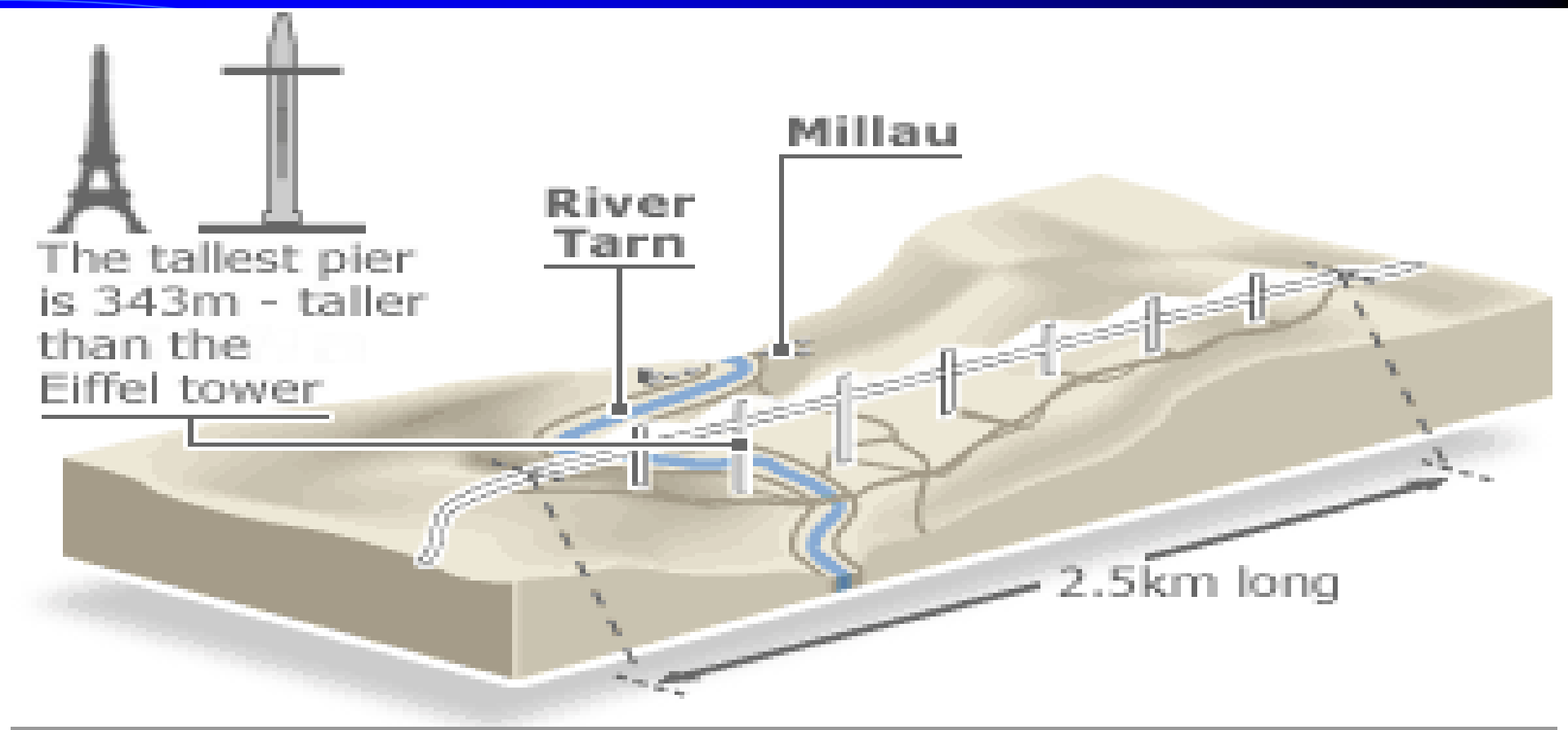
# ENGINEERING TRIUMPHS

- Atomic Bomb
- Alaskan Pipeline
- Western US Irrigation System
- Nuclear Powered Ships
- Assembly Line
- Genetic Engineering
- Internet
- Paper
- Interstate Highway System
- Glasses Clock
- Gunpowder
- Panama/Suez Canal
- Internal Combustion Engine
- computer

# ENGINEERING TRIUMPHS

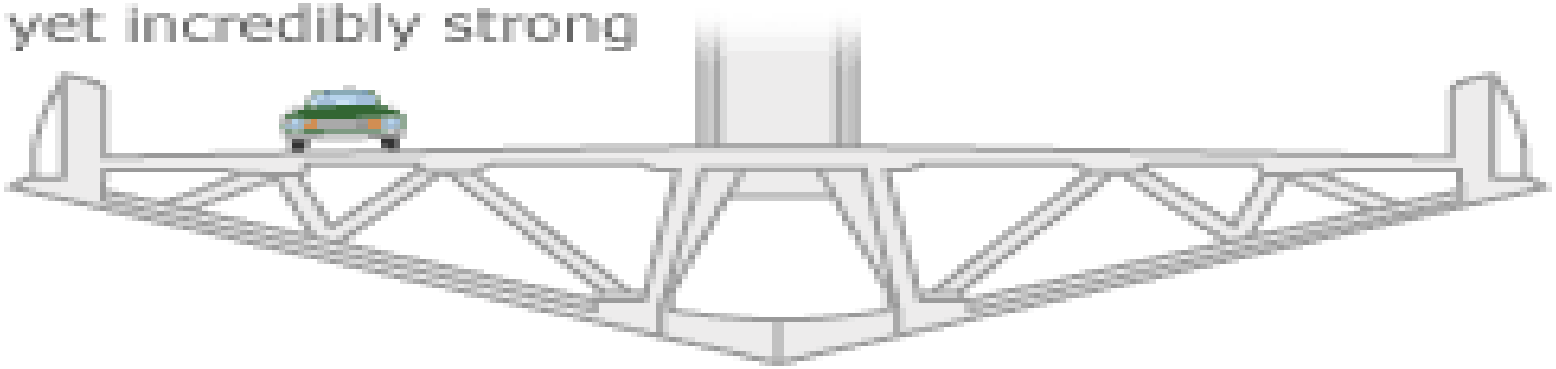
# The Millau Bridge


- The bridge over the River Tarn in the Massif Central mountains will carry vehicles across a 2.5km (1.5 miles) valley at a height of 270m (885ft).
- When finished, the highest pillar will stand at just over 340m (1,115ft) tall.
- The Millau bridge is expected to open for traffic by the end of the 2004, completing a new motorway link between Paris and the Mediterranean.
- Once its pylons and giant suspension cables are in place, the structure will be higher than the Eiffel Tower, which reaches 343m.




**CARRIAGEWAY CROSS SECTION**

The two lane dual carriageway is suspended almost 250m above the River Tarn. The deck structure is designed to be light yet incredibly strong



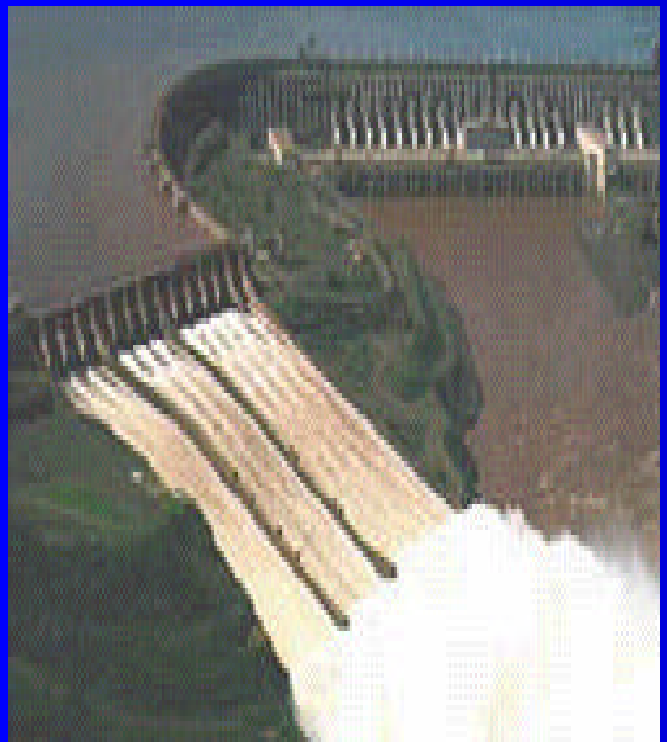

CSTB
Salle Immersive Le Corbusier
Viaduc de Millau
Salle immersive
Le Corbusier
cnes


*Le plus grand pont au monde*
*2460 mètres de long*
*343 mètres de haut*

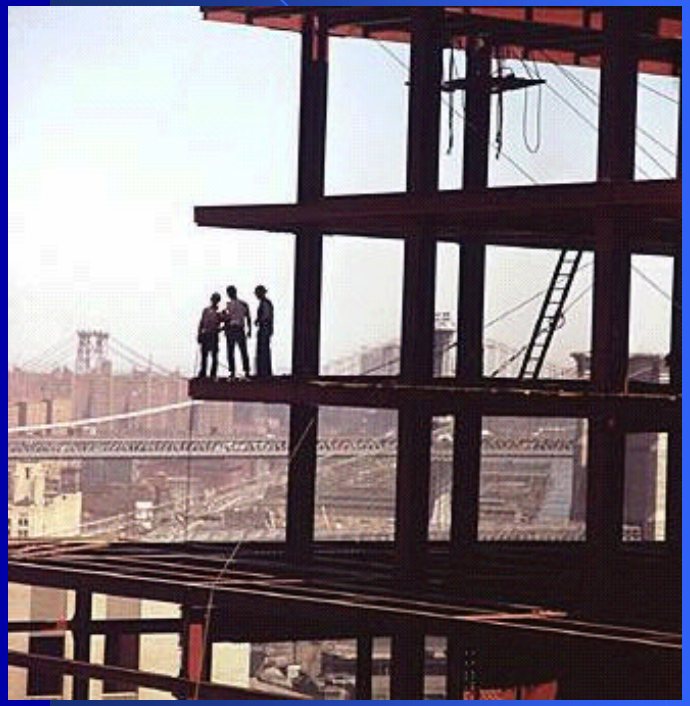

AP

# Such engineering projects makes one to be proud to be an engineer

# DAM ENGINEERING TRIUMPH



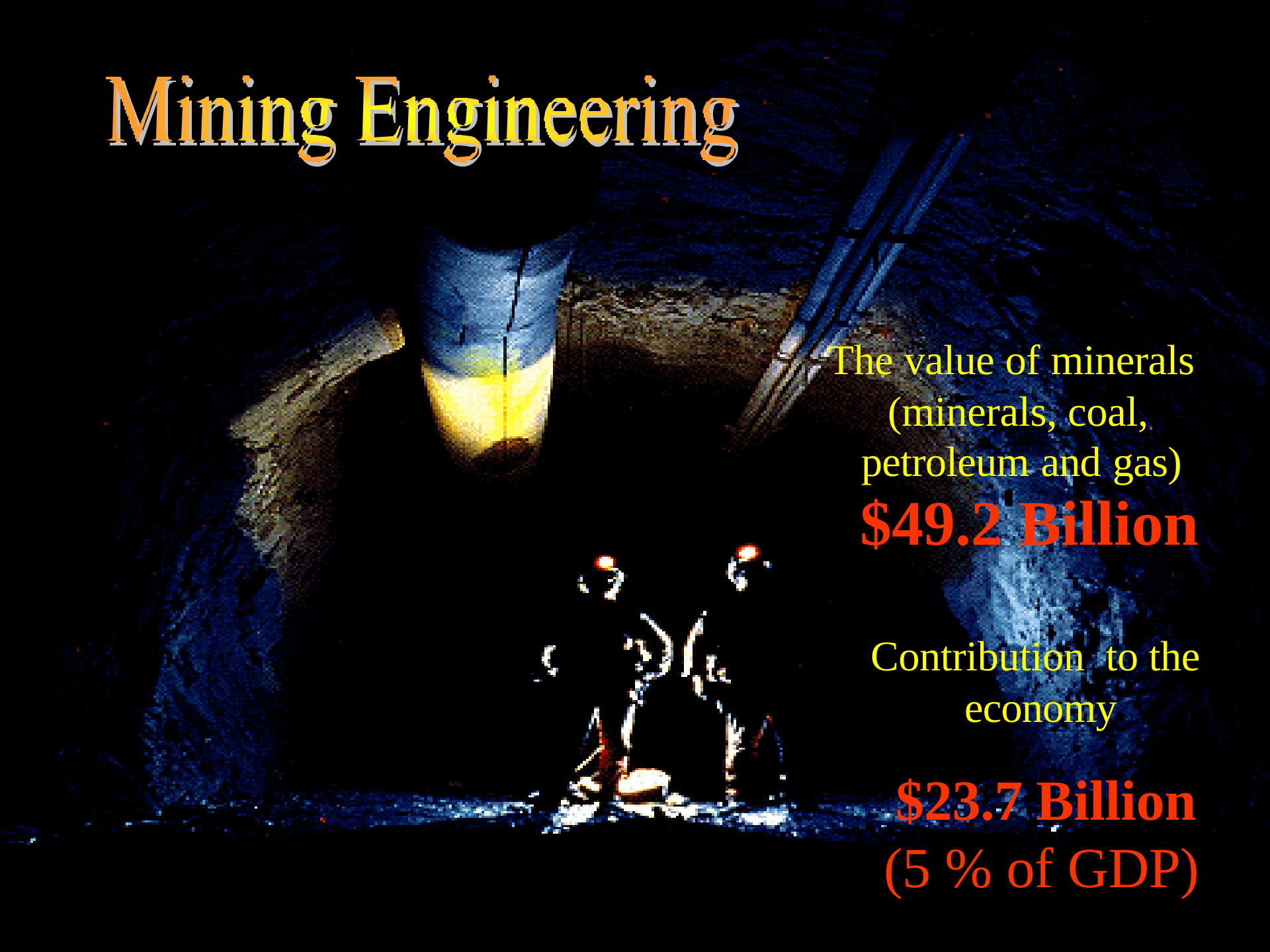
# Engineering Triumph



# ENGINEERING TRIUMPHS

# Energy

# Mining Engineering



The value of minerals (minerals, coal, petroleum and gas)

**$49.2 Billion**

Contribution to the economy

**$23.7 Billion**

(5 % of GDP)

100 years ago 2000m depth impossible
year 2000 we are mining at 5000m
year 2010 we will be mining at 8000m

# Deep Mining Issues

- **Canadians are thinking DEEP !!!**

Thinking 5-8 Km deep

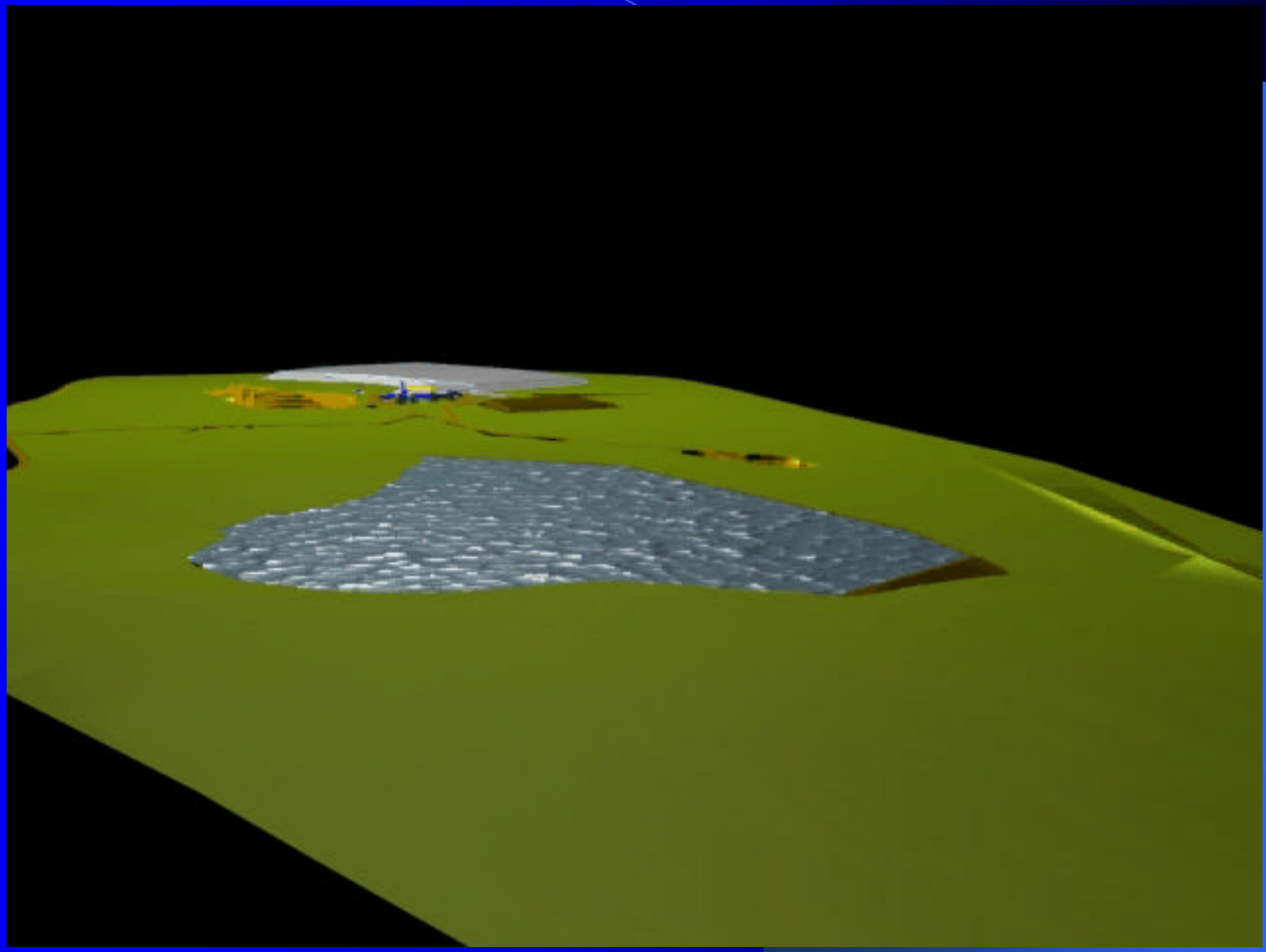
**Mining at depth :**

Total extraction • Geological Conditions

• High stresses

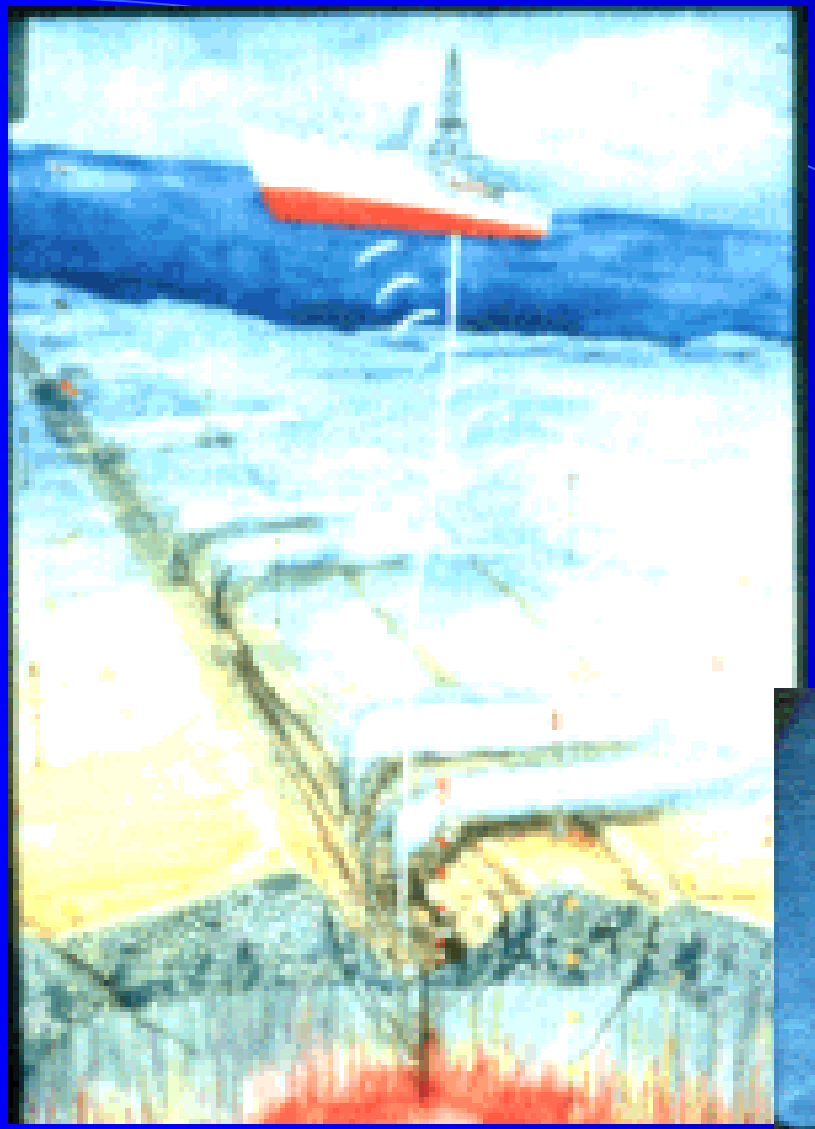
# CHILLY CHILI

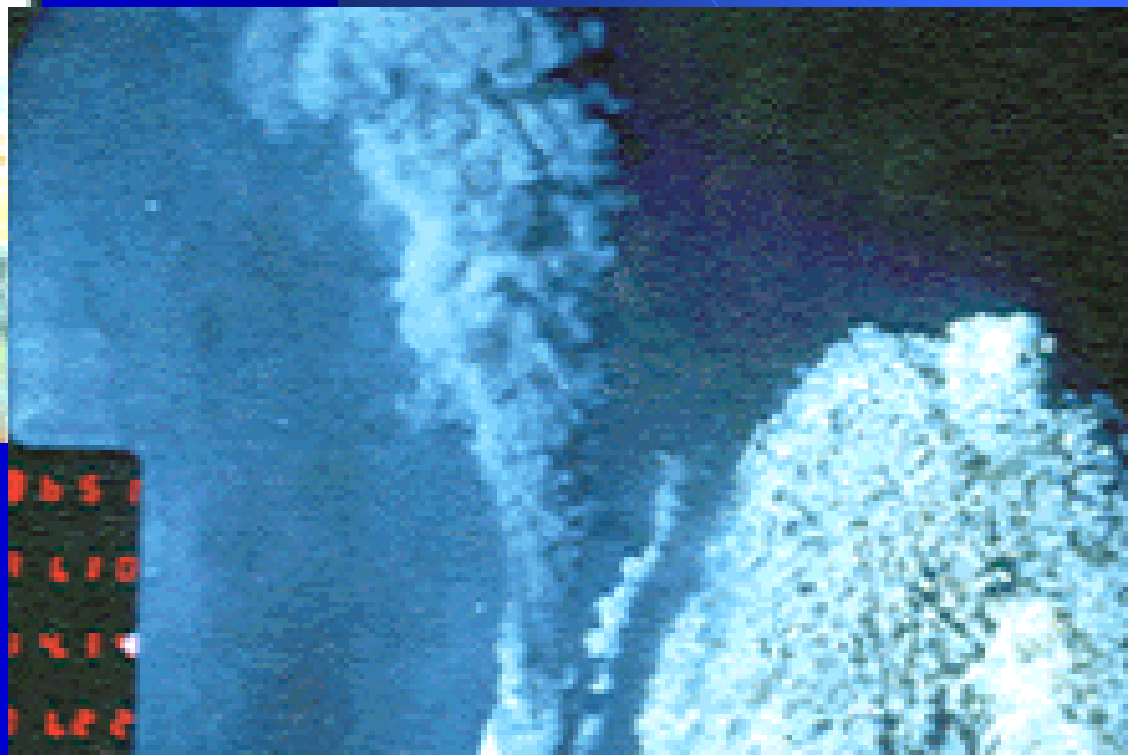
# Mine design simulations




Ocean Mining

# Mining the smokers



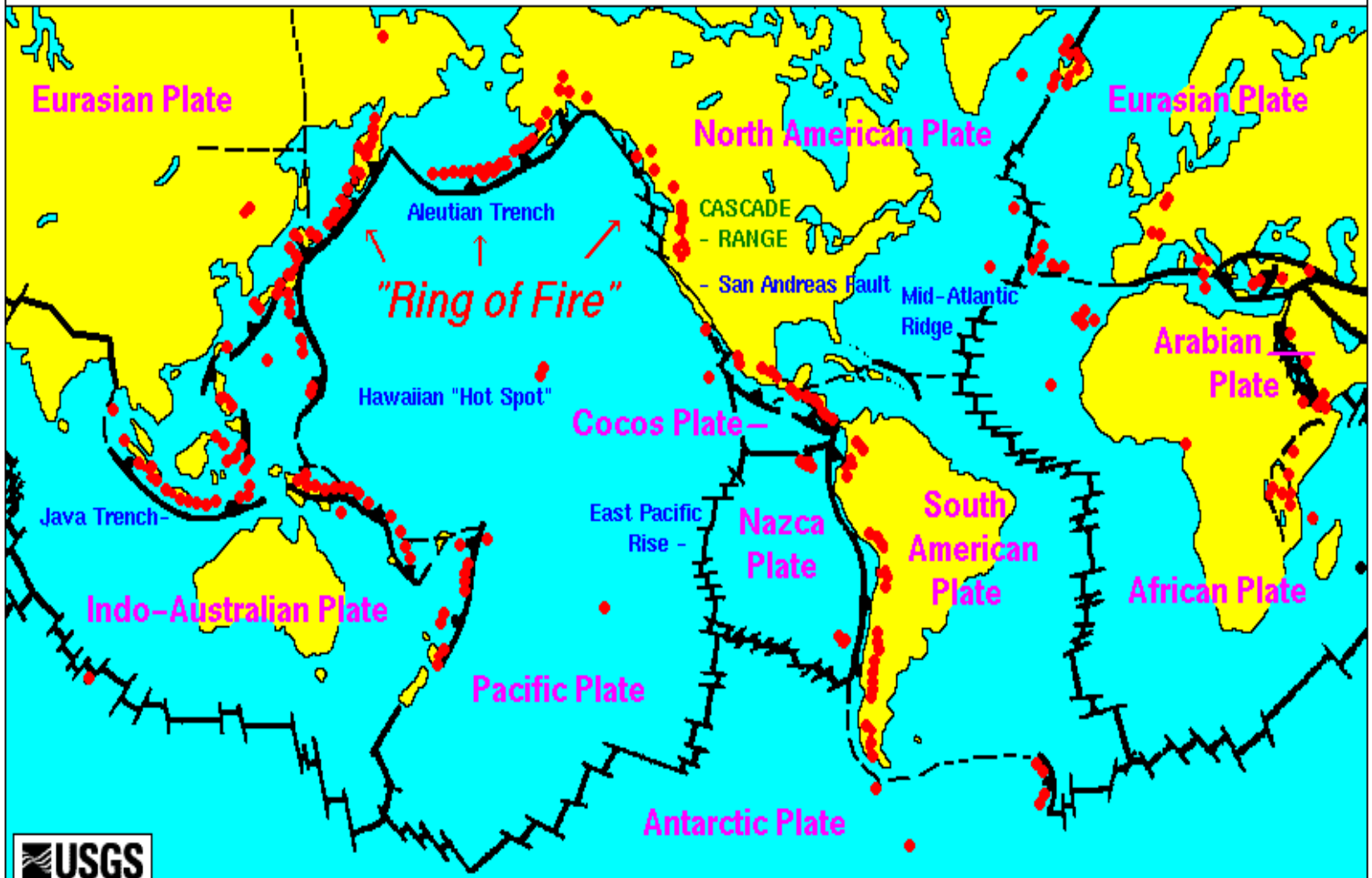


# Under water mining


# The state of the art technology and equipment



# Active Volcanoes, Plate Tectonics, and the "Ring of Fire"



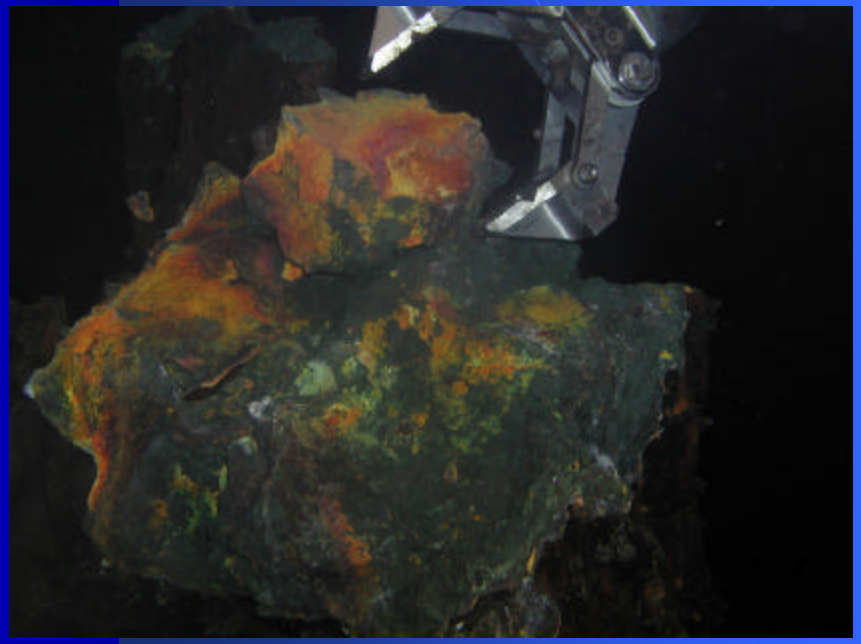

Topinka, USGS/CVO, 1997, Modified from: Tilling, Heliker, and Wright, 1987, and Hamilton, 1976

# Ring of Fire


RING OF FIRE
Aleutian trench
Kurile trench
Japan trench
Izu Bonin trench
Ryukyu trench
Philippine trench
Marianas trench
Challenger Deep
Bougainville trench
Equator
Java (Sunda) trench
Tonga trench
Kermadec trench
Middle America trench
Puerto Rico trench
Peru-Chile trench
South Sandwich trench


Eurasian Plate
Asia
North America
Gorda Plate
North American Plate
Caribbean Plate
Philippine Plate
Caroline Plate
Pacific Plate
Cocos Plate
Equator
Pacific Ocean
South America
Fiji Plate
Nazca Plate
Australia
Indian-Australian Plate
South American Plate
New Zealand
Antarctic Plate
Scotia Plate
Volcano
Plate boundary
Antarctica

# Minerals under the ocean

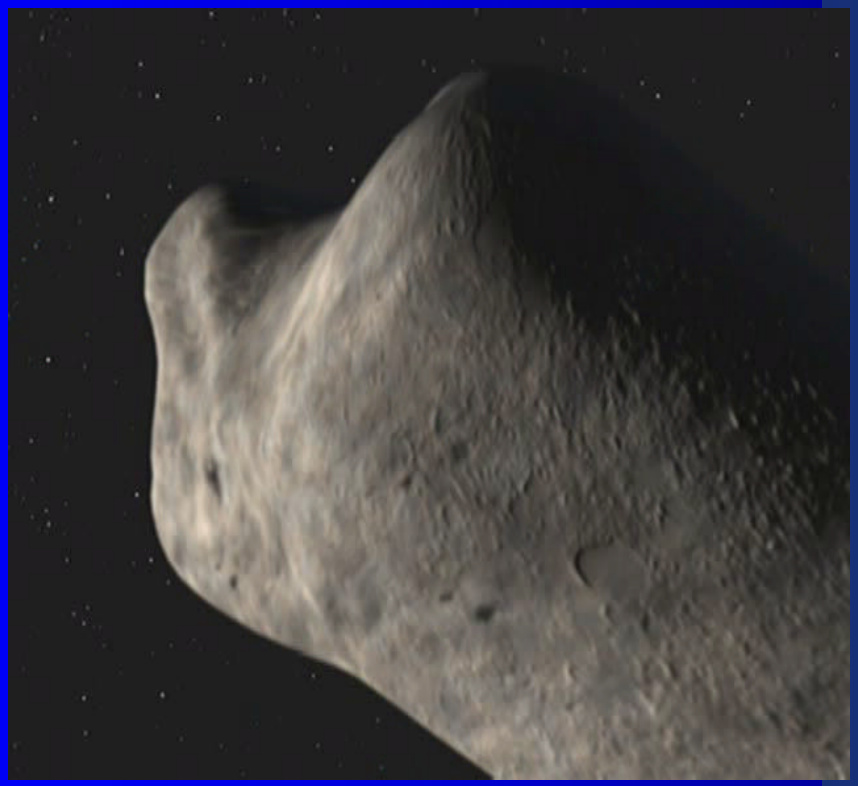


# What is the effect on environment

# MINING IN SPACE

- Why should we mine in other planets ?
- Is it feasible?
- What are the challenges

# Space and Mining



- NASA
- European Space Agency
- Canadian Space Agency

# Mining and Space

# Sudbury Ontario!!!!!!!!!!!!!!!!


Everything starts with mining

# Mineral resources, by weight in lunar samples

**Oxygen, 44%**
**Metals, 26%**
- **Iron 10%, Aluminium 9%, Magnesium 5%, Titanium 2%**

**Non-metal minerals, 31%**
- **Silicon 21%, Calcium 9%, NPK 0.5%**

**Carbon and nitrogen, less than 1‰**

# Human needs:


*Niklas Järvstråt*
Literati

# Surface Exploration Infrastructure Concept

- ✓ ***Modular hardware & common consumables for reduced logistics, and increase flexibility, & safety***
- ✓ ***ISRU plant on Lander or Habitat produces consumables for EVA and rover life support & power initially***
- ✓ ***Infrastructure is easily expandable from simple robotic lander and rover to full human presence***

## Robotic Precursors & Tele-robotic Science

- Short trips from habitat or lander
- Lots of start/stops for science
- Lander or habitat resupplies Fuel Cell (FC) reactants when rover returns with samples

## EVA Astronaut w/ Robotic Assistant

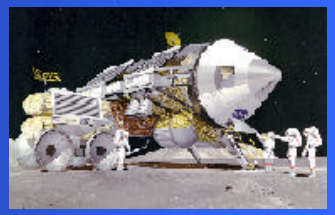
- Short trips (4 to 10 hrs)
- Rover carries equipment & supplies power
- Resupply EVA $O_2$ & FC reactants from Rover to extend EVA or emergency

## EVA Astronauts w/ Pressurized or Un-Pressurized Rovers

- Short trips from habitat
- 8 to 10 hrs
- Lots of start/stops for science
- Resupply EVA $O_2$ & FC reactants from Rover to extend EVA or emergency

- Long trips from habitat
- 1 to 5 days
- EVA's only for pre-screened science
- Rover stores EVA $O_2$ and power consumables – recharged before each EVA

## Landers



- ISRU plant on Habitat Lander
  - Propellant tanks used for FC reactant & ELCSS backup storage
- Crew Lander reused with ISRU Propellant

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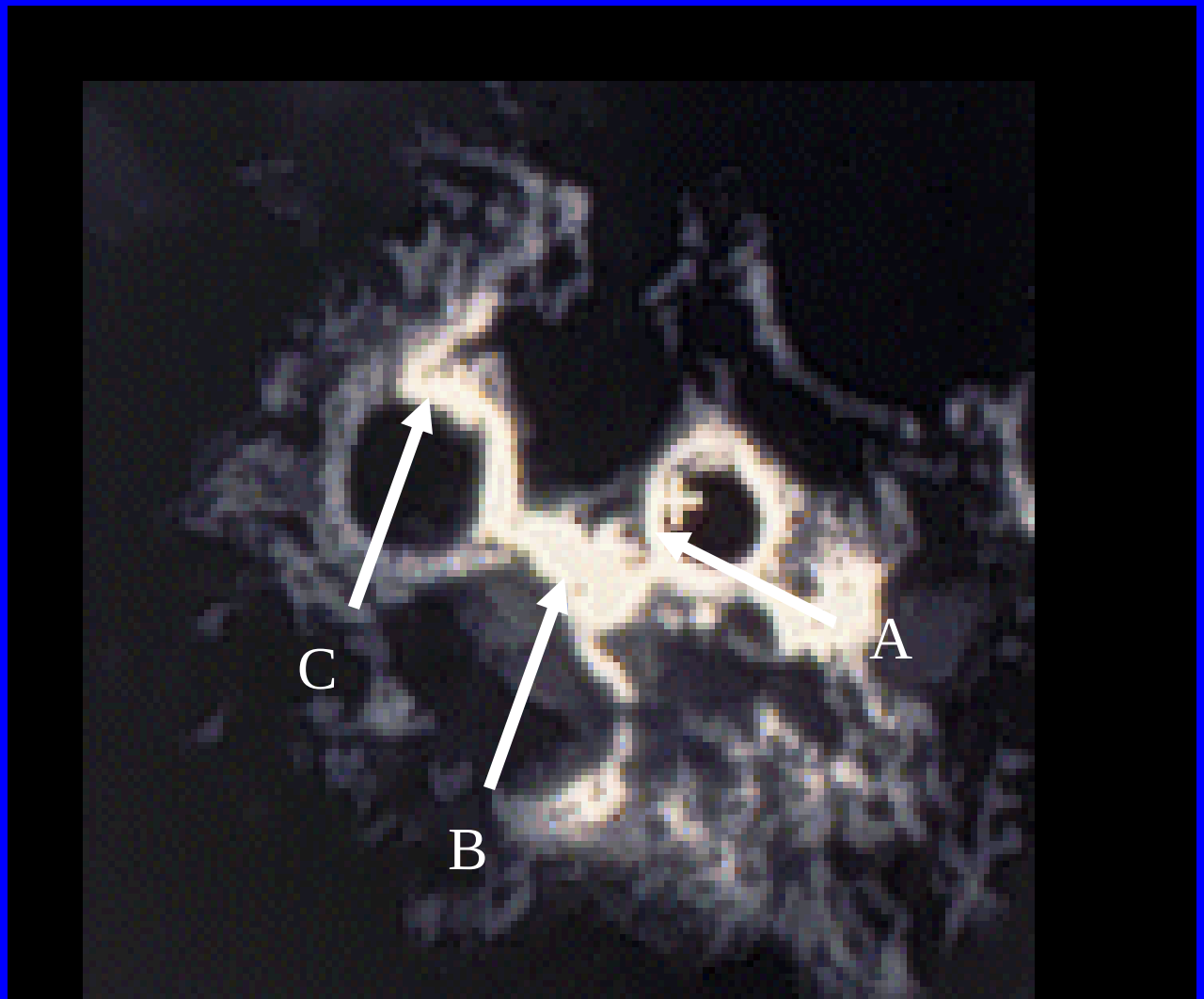
# *Lunar south pole illumination*



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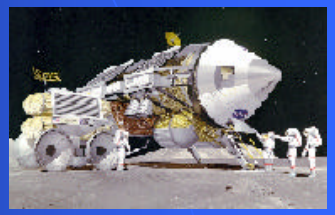
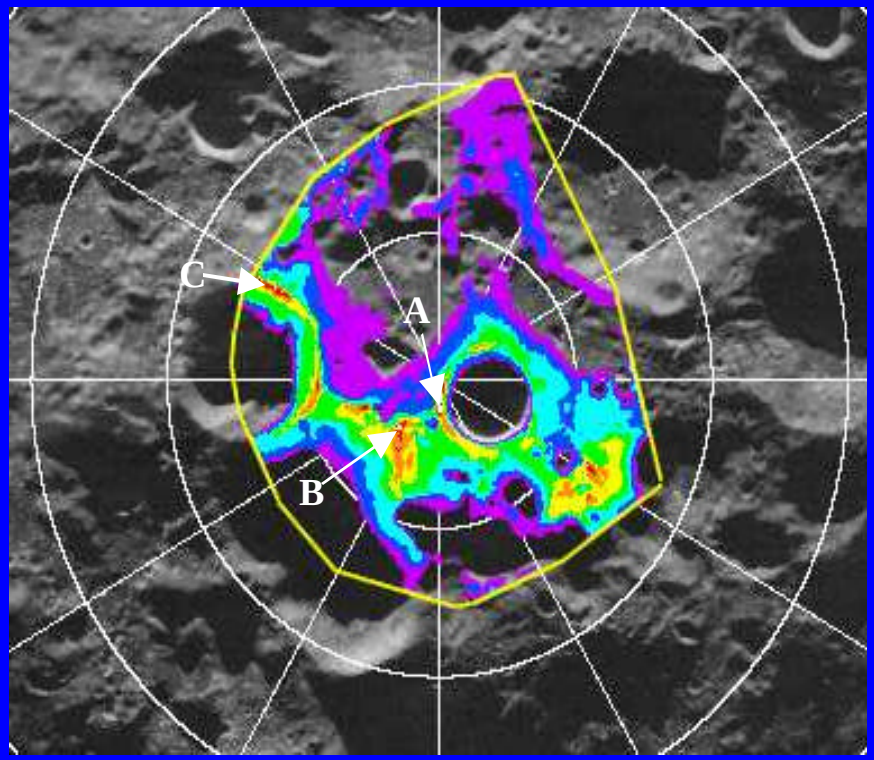


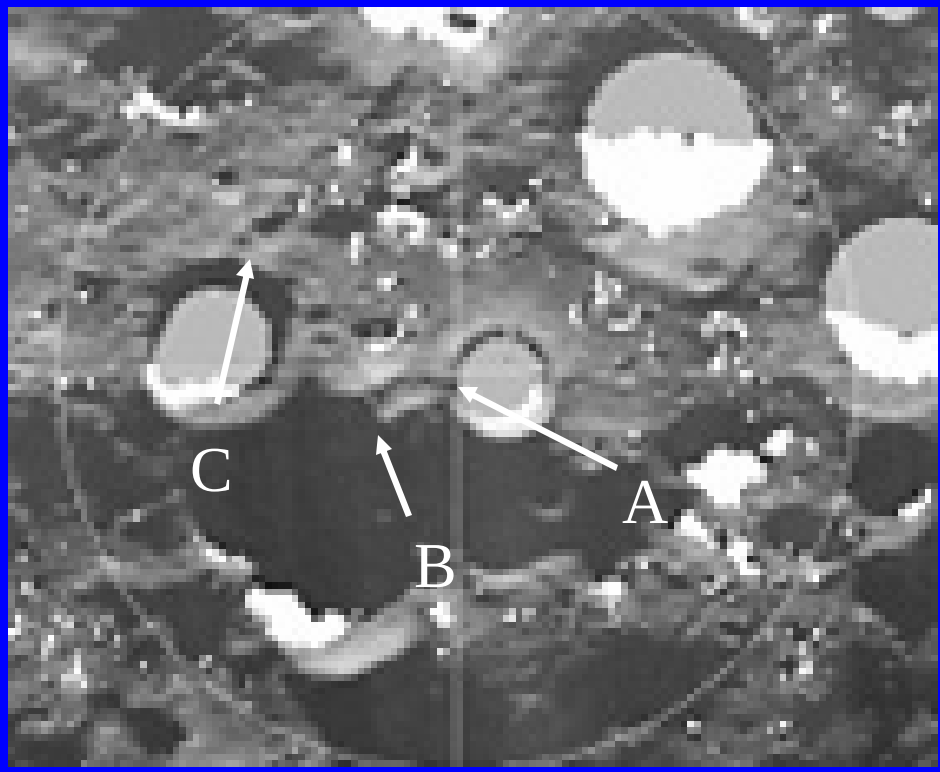
- ISRU plant on Habitat Lander
  - Propellant tanks used for FC reactant & ELCSS backup storage
- Crew Lander reused with ISRU Propellant

# *Lunar south pole*

illumination

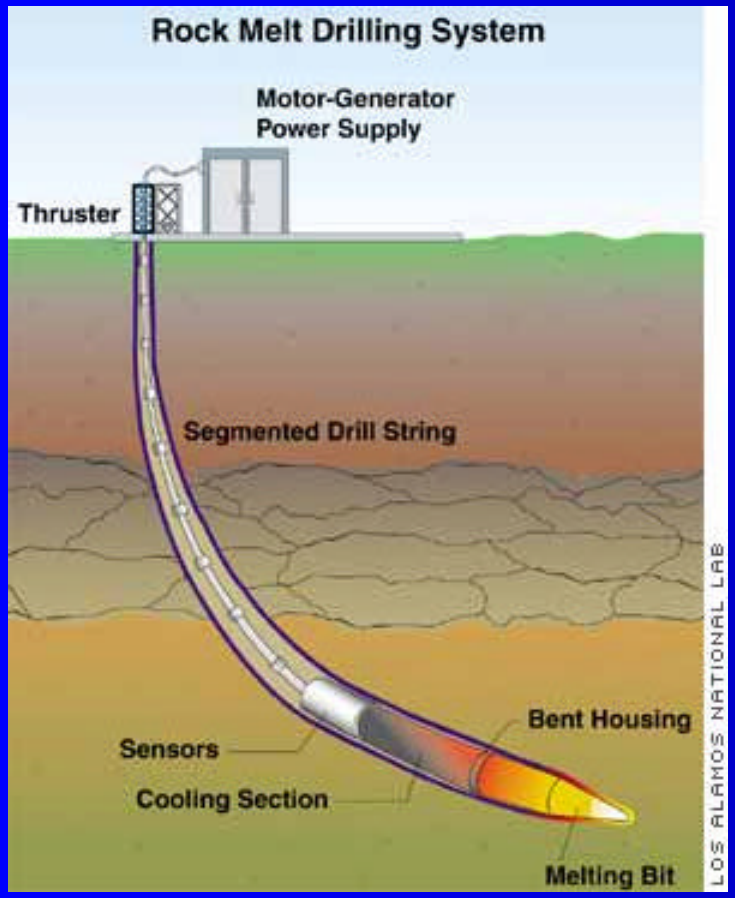


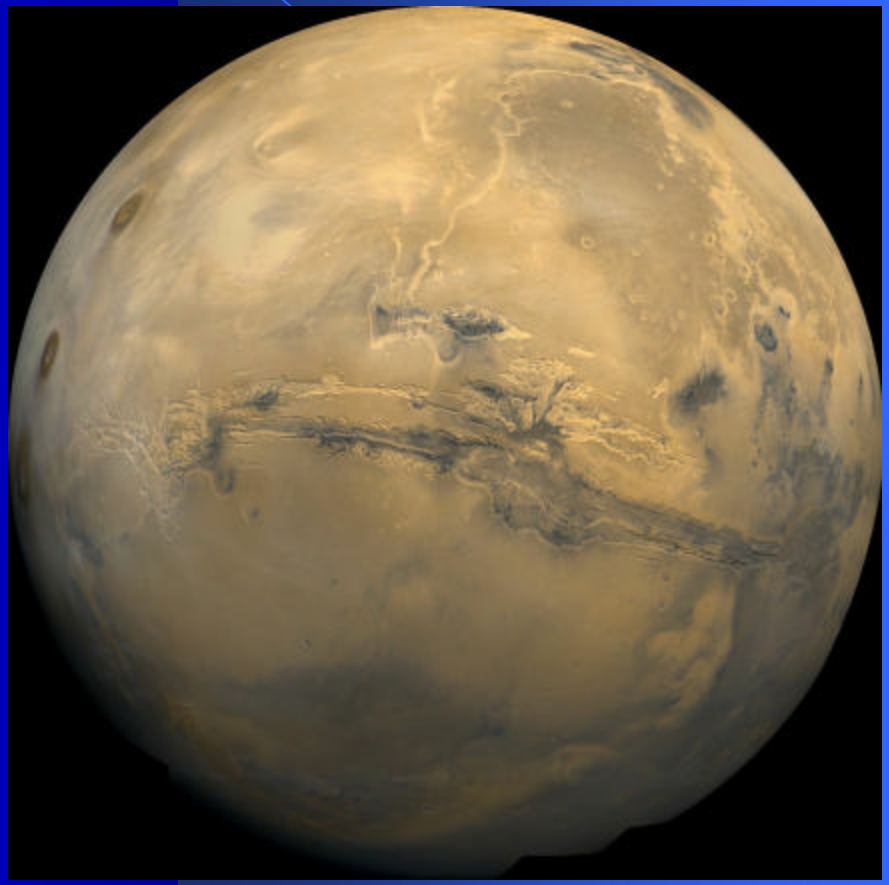

cold traps




100 km

# MINING IN SPACE



# BLAST


BLAST PLAY
MASTERS
THE SCIENCE OF EXPLOSION
ON ACTIVE DUTY
ADVENTURES for your mind
TLC

# Engineering Triumphs

**The consequences of many of the projects are mixed.**

**The Interstate Highway System. The most extensive and expensive engineering project ever undertaken, has contributed to**

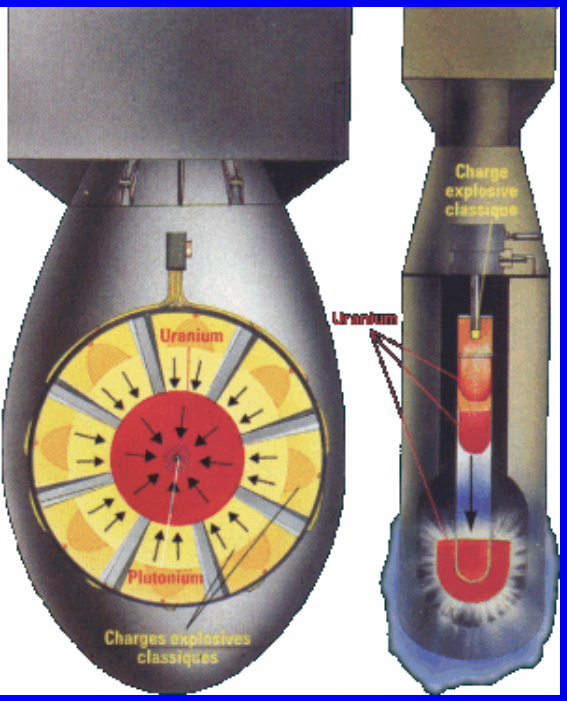
- **The decline of cities,**
- **The racial tensions (by physically separating urban populations),**
- **The rise of illness due to pollution.**

**These effects are still being debated; even the harshest critics deny the positive contributions of the project. But, many would claim, some of the negative results could have been avoided if engineers had assumed a greater role in the social aspects of planning the project.**

# Engineering Disasters

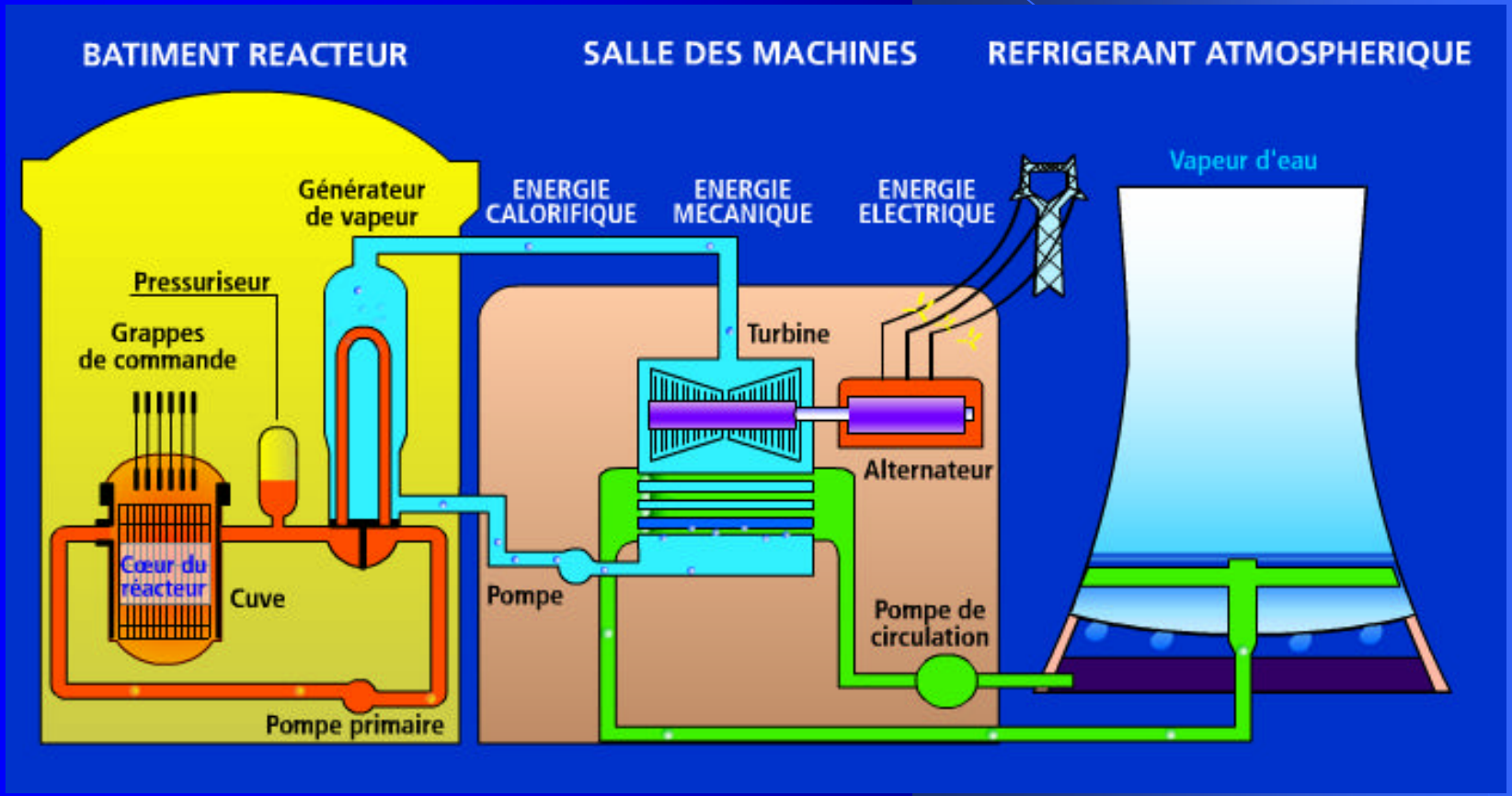
if engineers want to assume the credit for projects considered triumphs,shouldn't they also assume responsibility for projects that go wrong?

# Bombe atomique

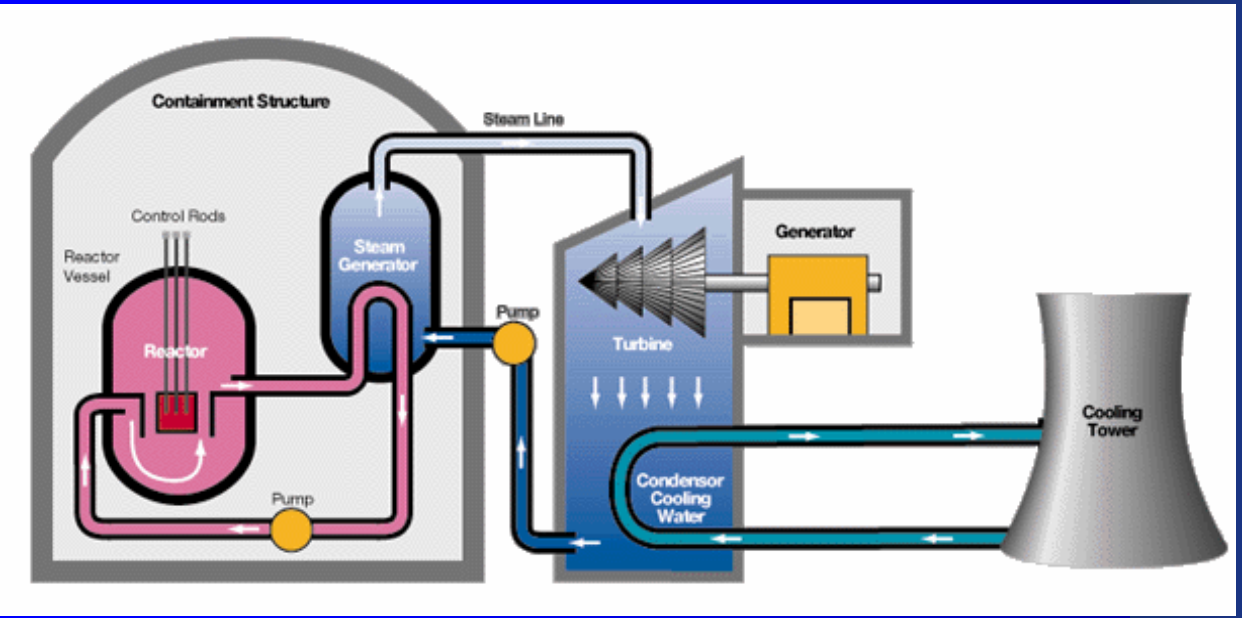


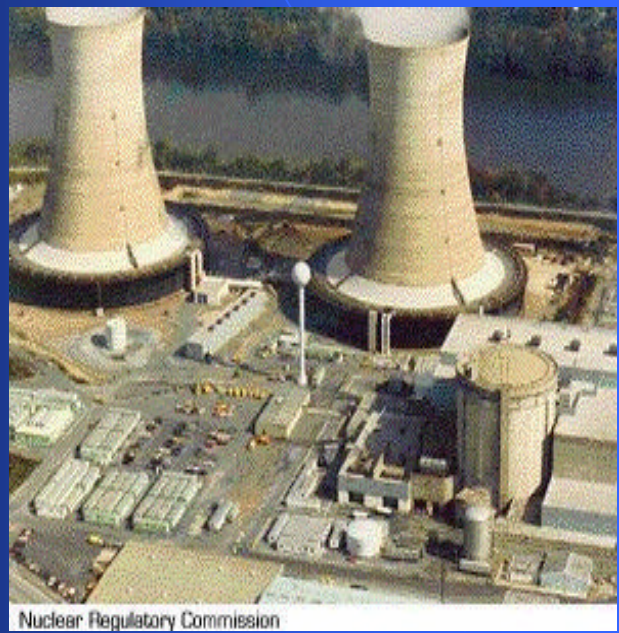

**Bombe atomique (little boy) ayant servi à Hiroshima.**

# Nuclear power station



# Nuclear Power



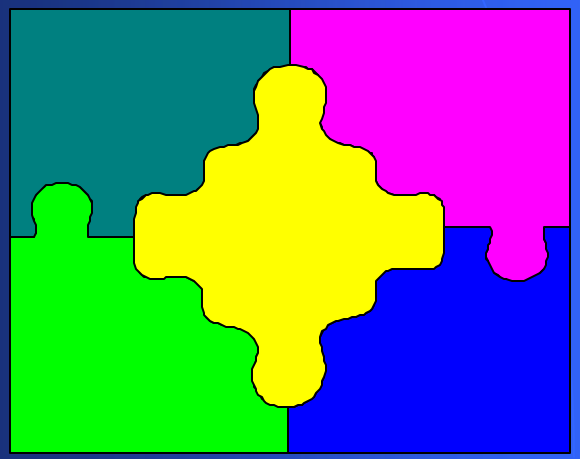



# CANADIAN EXPERIENCE WITH NUCLEAR POWER STATIONS

# BROTHERHOOD

**Agricultural Engineering**
**Aeronautical Engineering**
**Chemical Engineering**
**Computer Engineering**
**Civil Engineering**
**Electrical Engineering**
**Geological Engineering**
**Metallurgical Engineering**
**Mining Engineering**
**Petroleum Engineering**

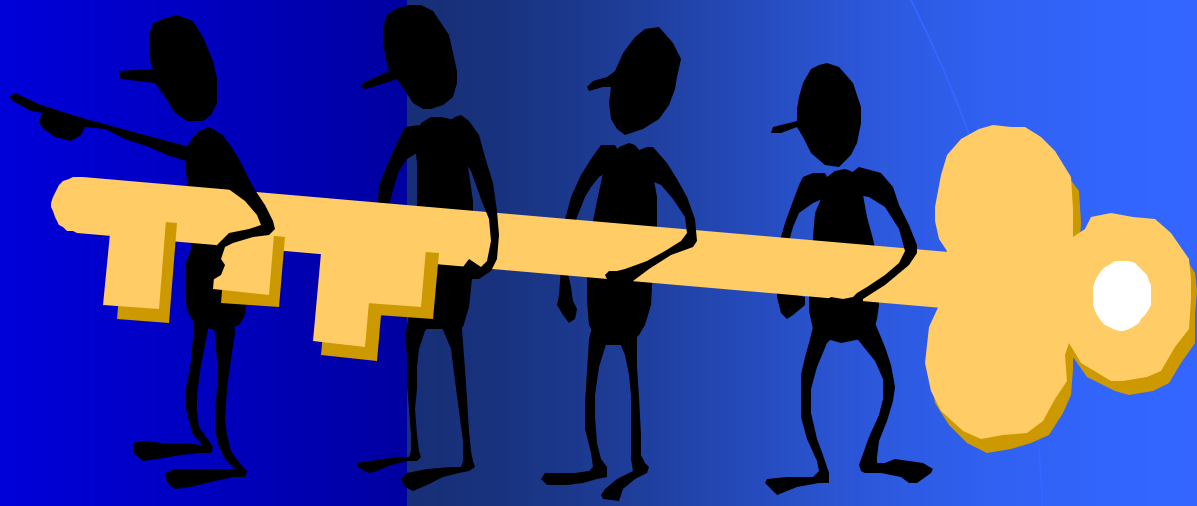
Acknowledge and Respect other disciplines



# Key to Success

## Engineering Code of Practice

## OCCUPATIONAL HEALTH AND SAFETY



# References

This presentation is put together from, course books , other presentations as well as various websites in the forms of text, photos, audio and video clips.

All the references will be given in the general reference section on the web Ct

THE END