

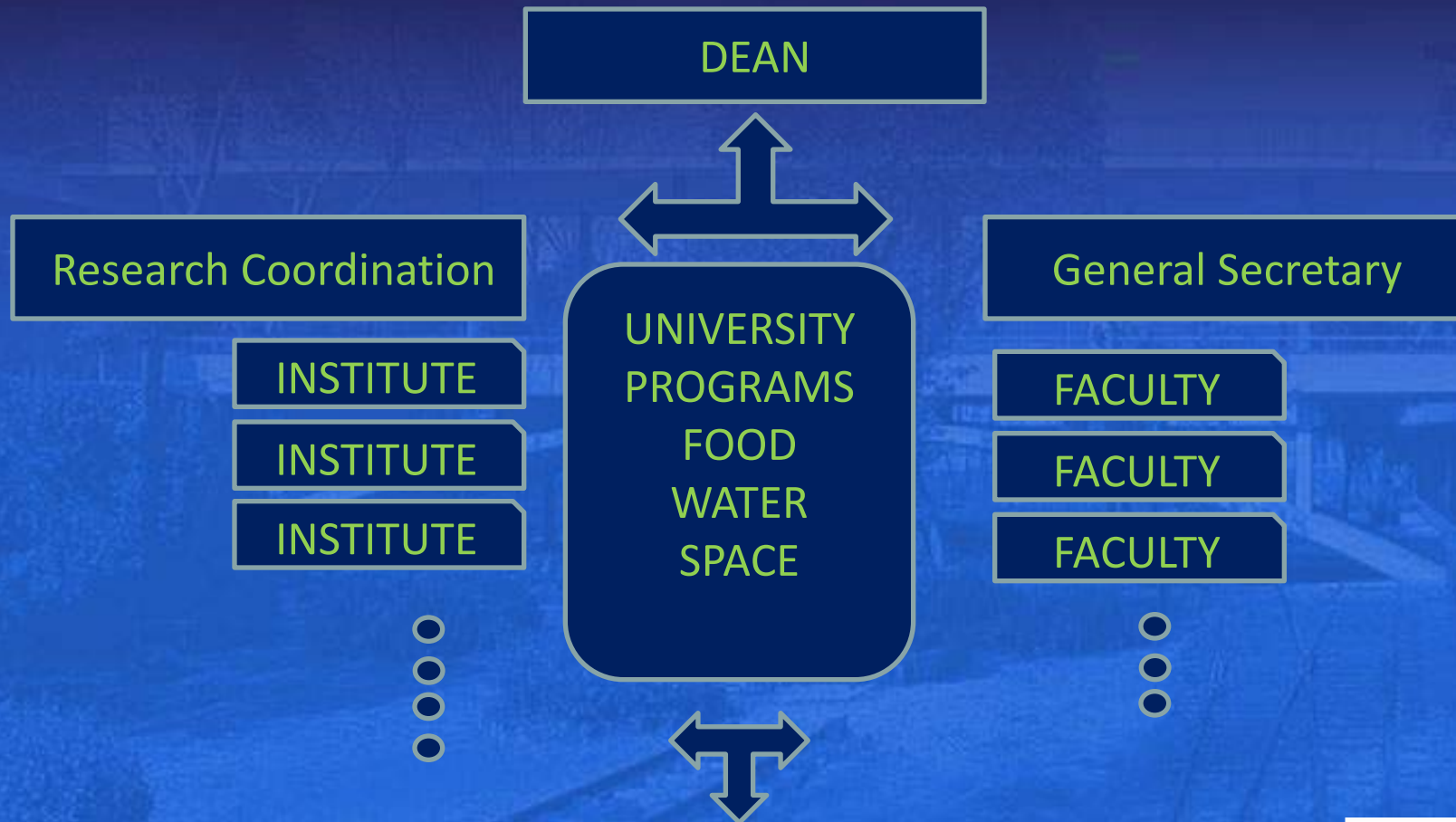


# UNAM's SPACE PROGRAM

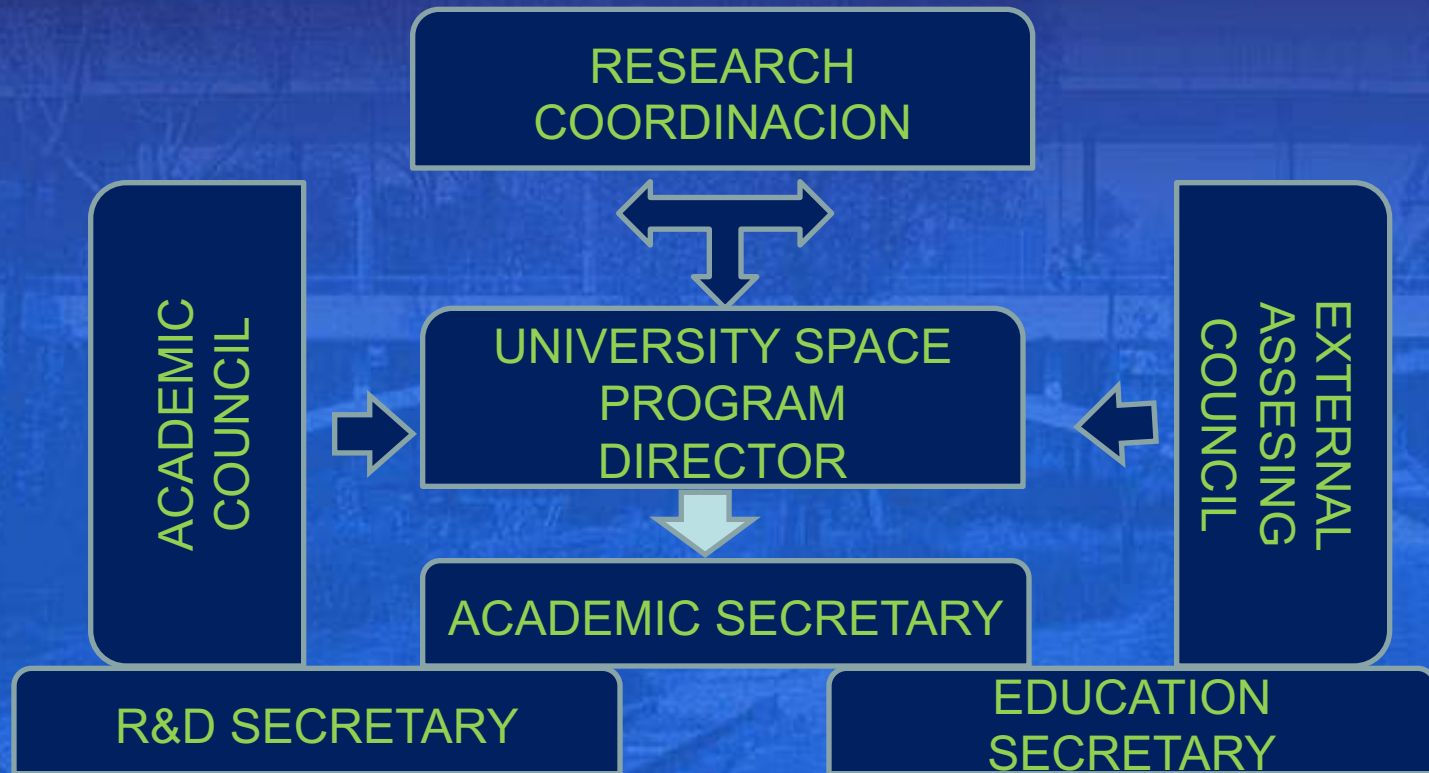
## Space Medicine & health

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# University programs



# Space program structure



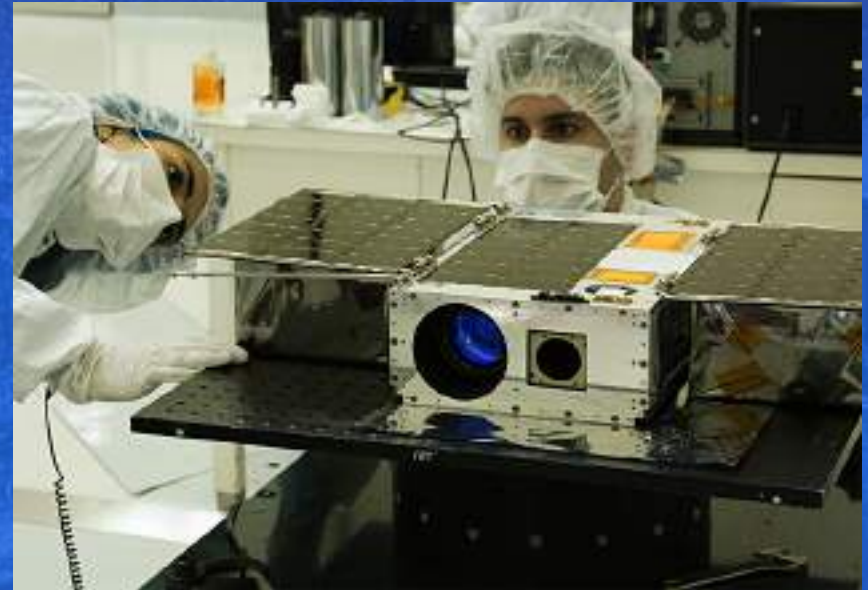
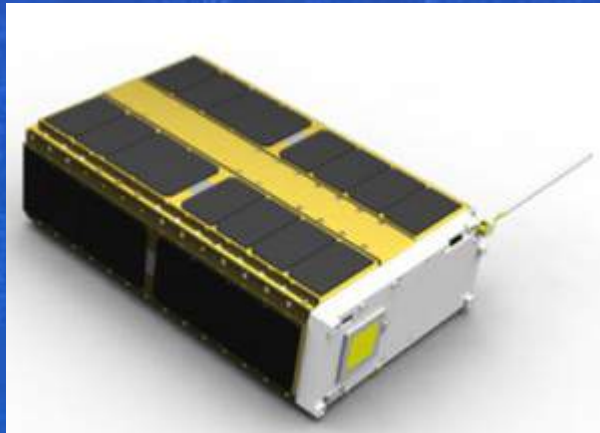


# Satellite project

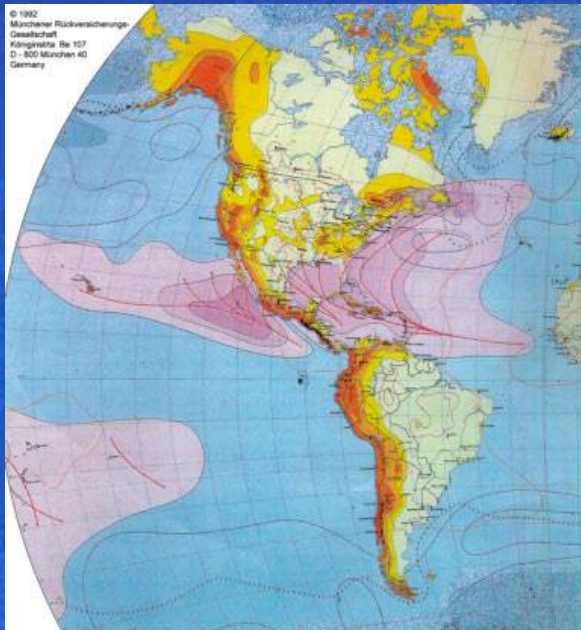
Remote sensing  
nanosatellite

IPN INAOE CICESE

Testing propulsión,  
control and optics .



# CIVIL PROTECTION COST





# National Laboratories

**LANCE**



**LINGEA**



**LANOT**



- LANOT Laboratorio de Observacion de la Tierra
- LANCE Laboratorio de clima especial
- LINGEA Laboratorio de Ingenieria Espacial y Automotriz

# Objectives

- Attraction of new actors to space R&D
- Interdisciplinary research both, inside UNAM and with other entities
- Use of current infraestructura \*\*\*\*\*
- Development of new research proposals
- Umlikely, but productive pertnerships





# WHERE ARE WE GOING?

- SPACE MINNING
- LUNAR COLONY
- MARS COLONY
- SPACE DEBRIS
- NEOS
- LONG TERM HUMAN SURVIVAL IN SPACE
- LANDING IN ASTEROIDS..ROSETTA
- HAYABUSA
- WHY???





# MINNING



# MINNING





# MINNING



HARVESTOR (TM) SERIES

DEEPSPACE

# MINNING





# ROSETTA



# HAYABUSA MASCOTT

**HAYABUSA 2**

The diagram illustrates the Hayabusa 2 mission. It shows the Sun at the center with the orbits of Mercury, Venus, Earth, and Mars. Asteroid 1999 JU3 is shown in its orbit around the Sun. Hayabusa 2 is depicted as a spacecraft with solar array panels, an ion engine, and various instruments. A detailed view of the spacecraft shows the Deployable Camera, Solar Array Panel, Ion Engine, Small Carry-on Impactor, and Thermal Infrared Imager. An inset shows the impact site on the asteroid's surface, with a small crater created by the bullet. A computer model of Asteroid 1999 JU3 is shown in the bottom left.

**1999 JU3**

Hayabusa 2, about the size of a refrigerator, is expected to reach the asteroid 1999 JU3 in 2018 and will spend around 18 months studying the surface

**Deployable Camera**

**Solar Array Panel**

**Ion Engine**

**Small Carry-on Impactor**

**Thermal Infrared Imager**

The probe will drop an 'impactor' that will explode above the asteroid's surface and fire a metal bullet into the crust at a speed of 4,5000 miles (7,200 l.) -- six times the speed of sound on Earth

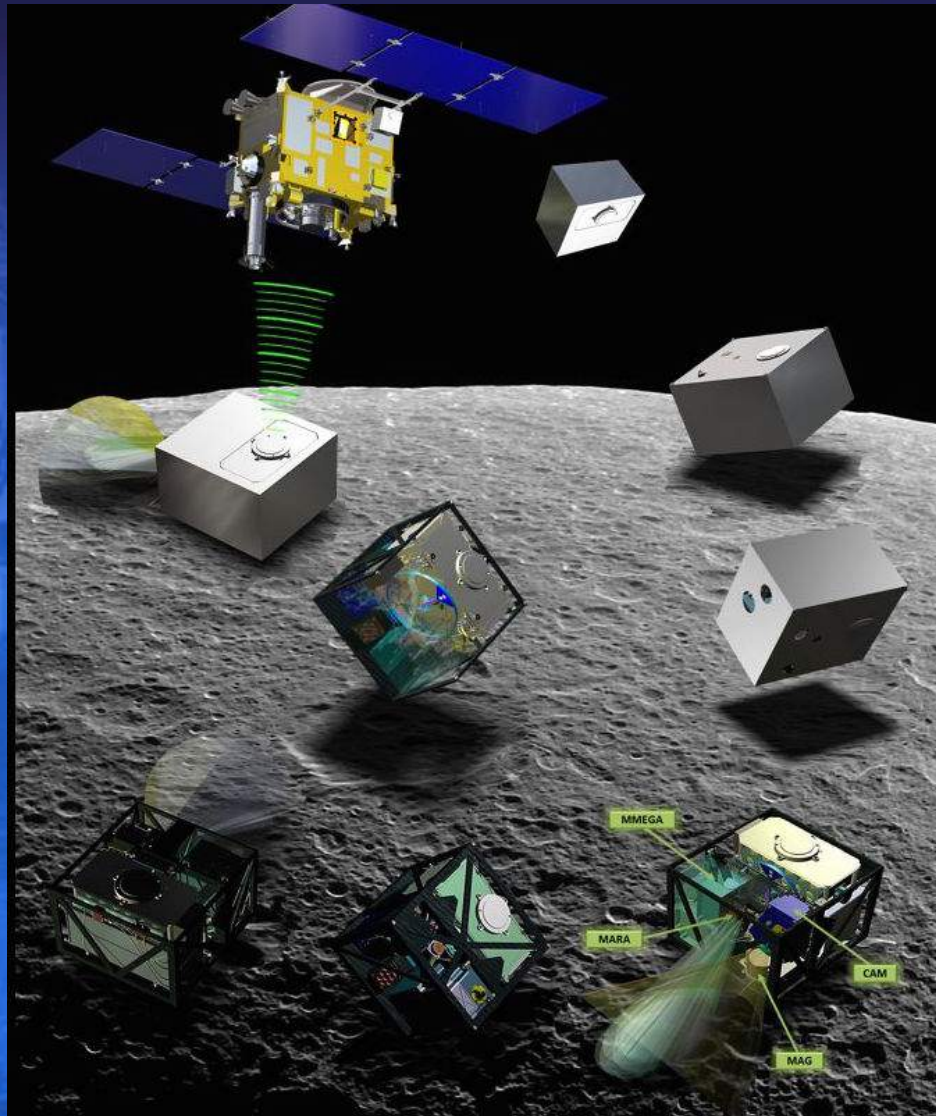
The bullet is expected to create a small crater that will enable the probe to collect material that will be returned to Earth in 2020

A computer model of Asteroid 1999 JU3

© MailOnline



# HAYABUSA MASCOT



# Space..for all??

- Current crew are selected, young, fittest and trained,
- Ageing processes
- Feeding
- Disposal
- Prevention
- Psych
- Cognitive
- Environment





# LONG TERM SURVIVAL...GROWING PLANTS



- EDEN STATION IN NORTH POLE
- DLR
- HYDROPHONIC
- ZERO WATER
- AUTOMATED LIGHTNING
- MINERAL AND NUTRIENTS FEEDING



# Long term survival

- Keeping healthy crew
- Workloads
- Agressive environments
- Artificial environment
- Tools
- Activities



## Memorandum of Understanding Between the NIH and NASA

- **NIH will use reasonable efforts to**
  - Publicize, to the intramural and extramural communities, the availability of the ISS as a research environment...
  - Give careful consideration through the standard review process to well-developed, investigator-initiated extramural applications and potential intramural activities related to space-related health research...

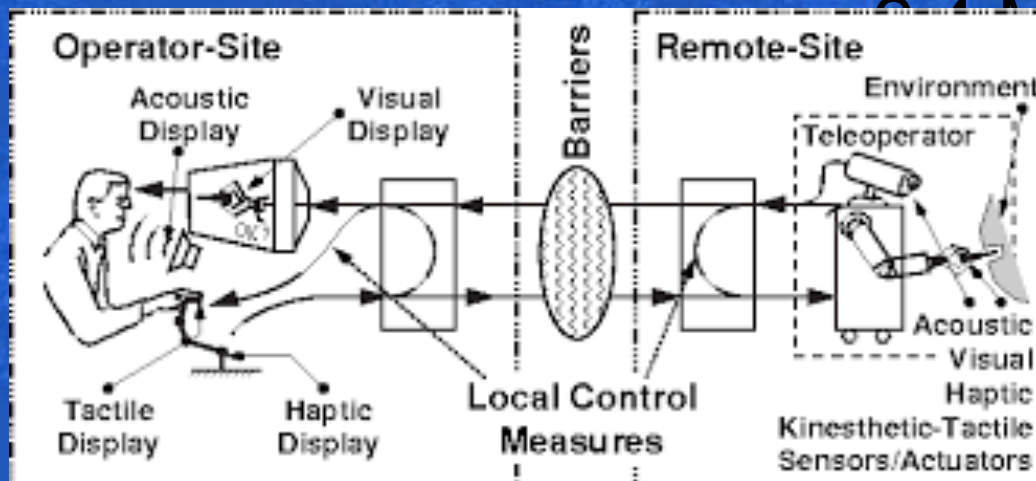


September 12, 2007: NIH Director Dr. Elias A. Zerhouni and NASA Administrator Dr. Michael D. Griffin shake hands after signing the MOU at the U.S. Capitol while Senators Kay Bailey Hutchison and Barbara Mikulski stand by.



# Telemetric health monitoring

- Automated Diagnosis
- Lab testing with microsamples
- Remote controlled haptics systems



# Medicine in the workplace



- COMPLEX OPERATIONS IN SPACE WALKING MISSIONS
- Possible accidents
- Prevention
- Treating injuries
- Stimulation
- Physiological Aids

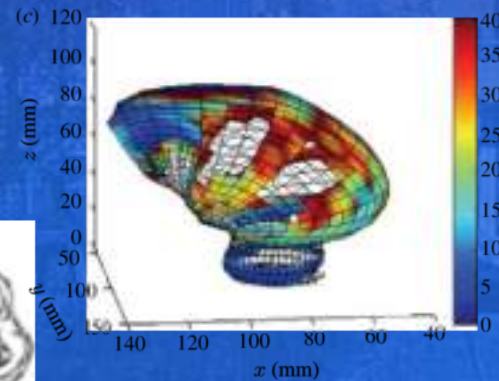
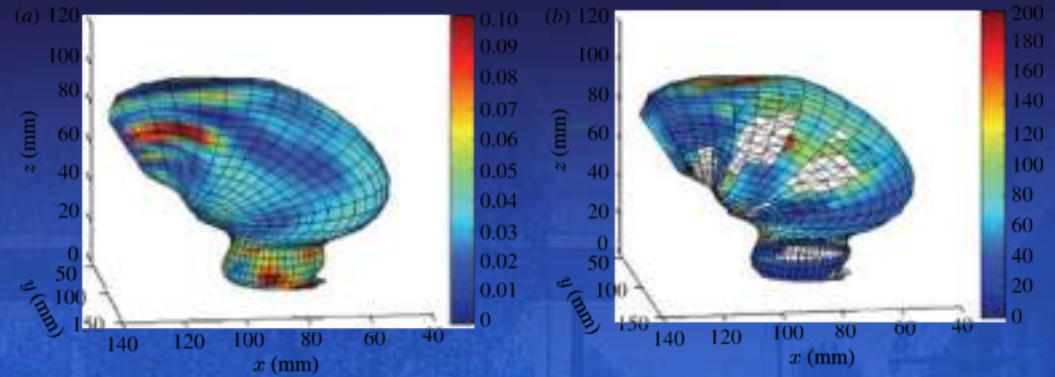
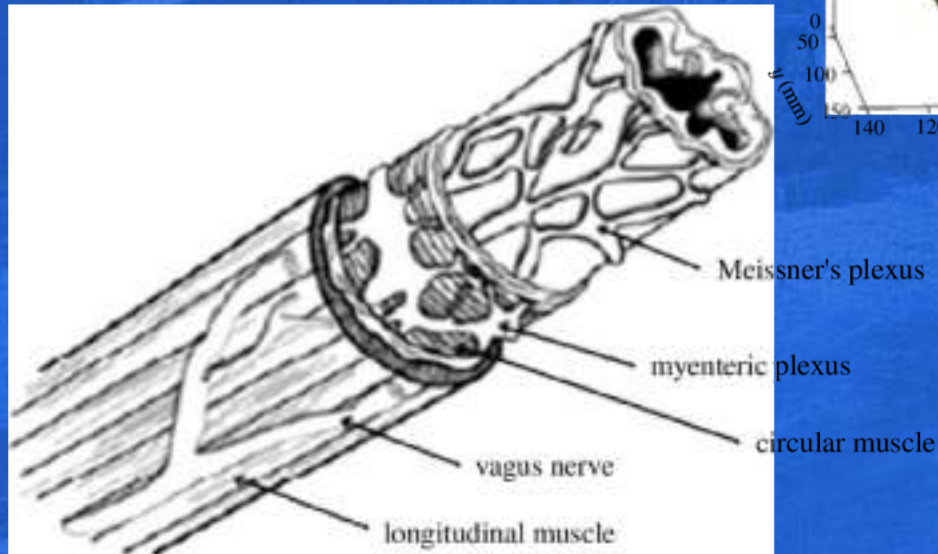




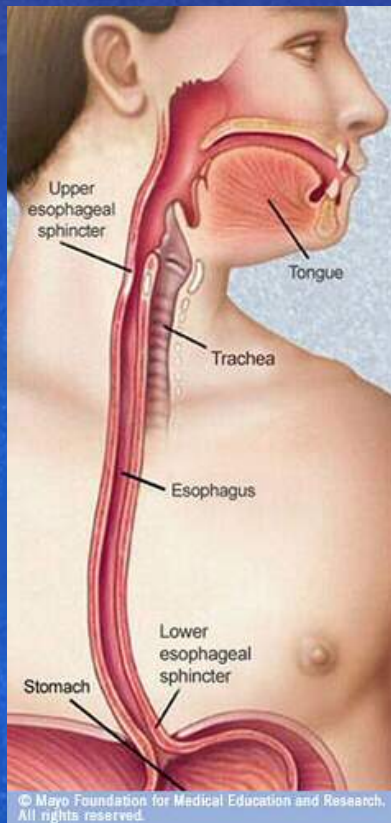
# Medicine for long term survival

- Testing
- Modelling
- Simulation
- Forecasting

## MODELING COLON TISSUE

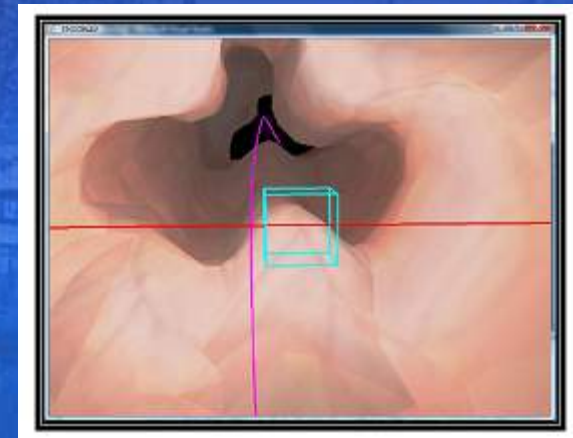


# Peristaltic flow through esophagus in dysphagic patients



Modeling of esophagus and stomach

Snapshot during navigation



Flow simulation using the Volume Finite Method (VFM) with a real mesh



# MONITORING EQUIPMENT

- Effects of space environment on:
- Different organs
- Metabolism
- Mental Aspect
- Reproductive aspects
- Different physical processes on the body
- DNA



# SURGERY



- ROBOTIC?
- INSTRUMENTAL DESIGN
- STERILE CONDITIONS
- Hazardous material DISPOSAL





# ROBOTIC SYSTEMS OPS AND MAINTENANCE

- Human Factors
- JIGS & TOOLS
- DFA DFM
- Control Board design
- Lighting
- Temperature
- Humidity
- Design of Haptics Systems
- Aids, Robotics, exoeskeletons,



# THE FUTURE

- ROBOTICS FOR AUTOMATED INSPECTION AND MINING
- EXOSKELETONS
- ECONOMICS, MANAGEMENT AND LAW
- NEOS, DEBRIS AND SPACE WEATHER RESEARCH







THANKS FOR YOUR ATTENTION  
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**“Por mi raza hablará el espíritu”**