

Surgical Innovation

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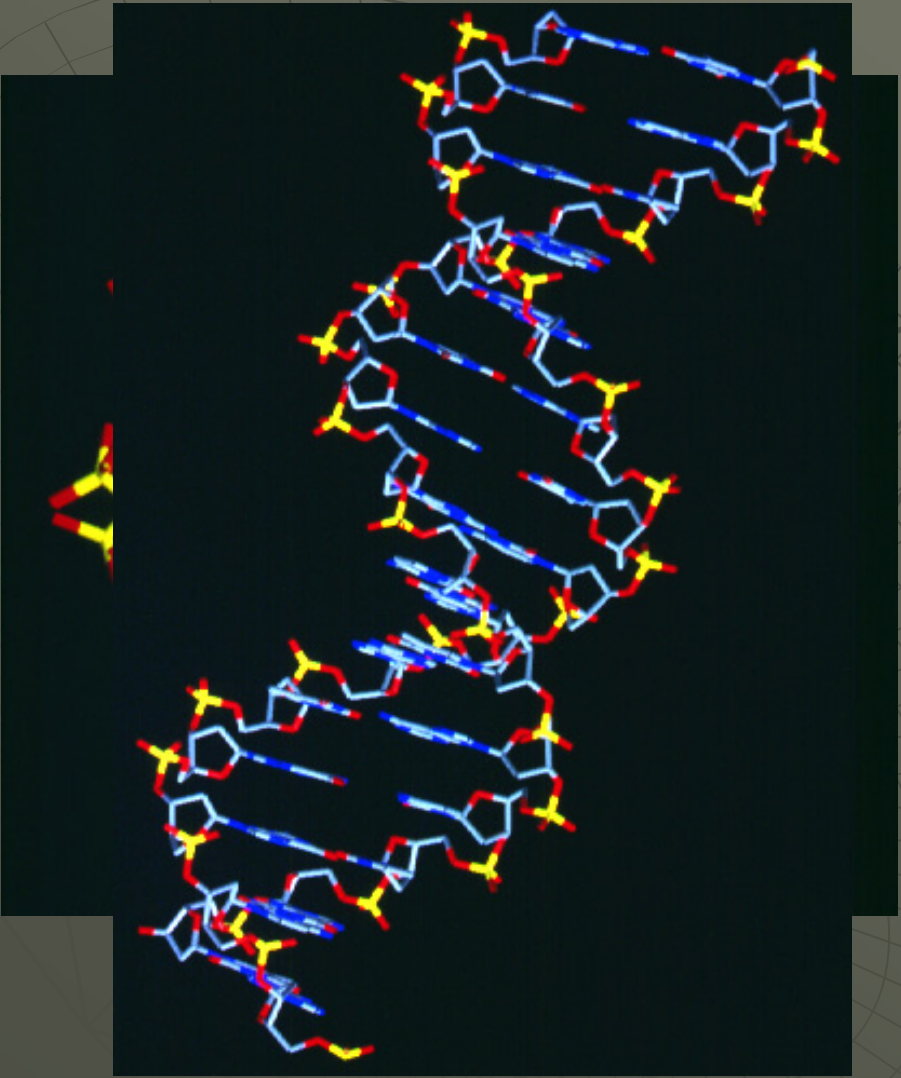
Department of Surgery




University of Cincinnati College of Medicine

Objectives

- ◆ *Understand the convergence of telecommunications, informatics and robotics that has enabled telesurgery*
- ◆ *Understand the needs, opportunities and challenges of telesurgery*
- ◆ *Understand current and future research in this rapidly emerging field*
- ◆ *Understand the impact that advanced networks and information systems will have in improving the quality of and access to surgical care*

Information

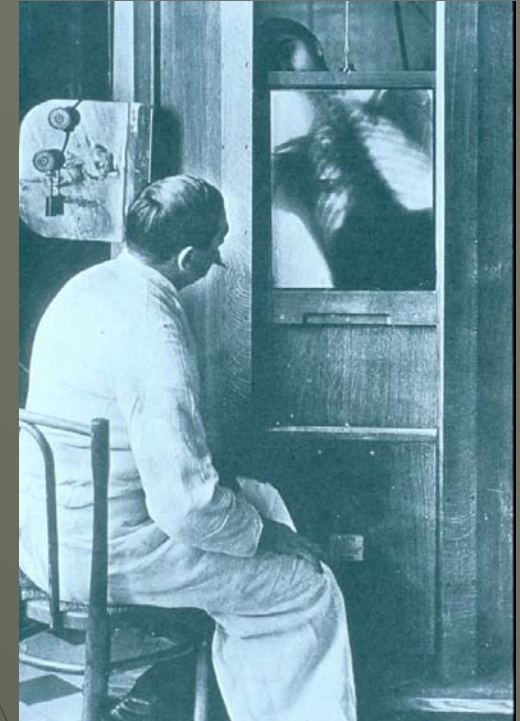
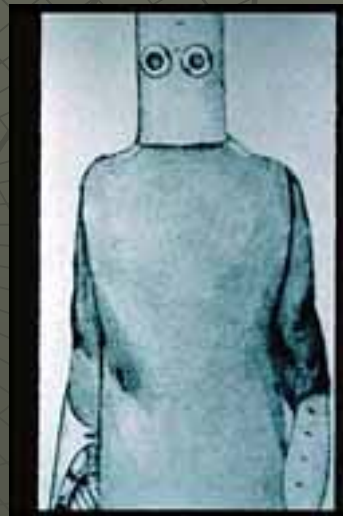


-  *Foundation of life*
-  *Foundation that enables medicine / surgery to change*
-  *Basis for reliable and efficient business processes*

Change

It is change, continuing change, inevitable change, that is the dominant factor in society today. No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be.

- [Isaac Asimov](#)



*Changing paradigms
Surgery education and practice*

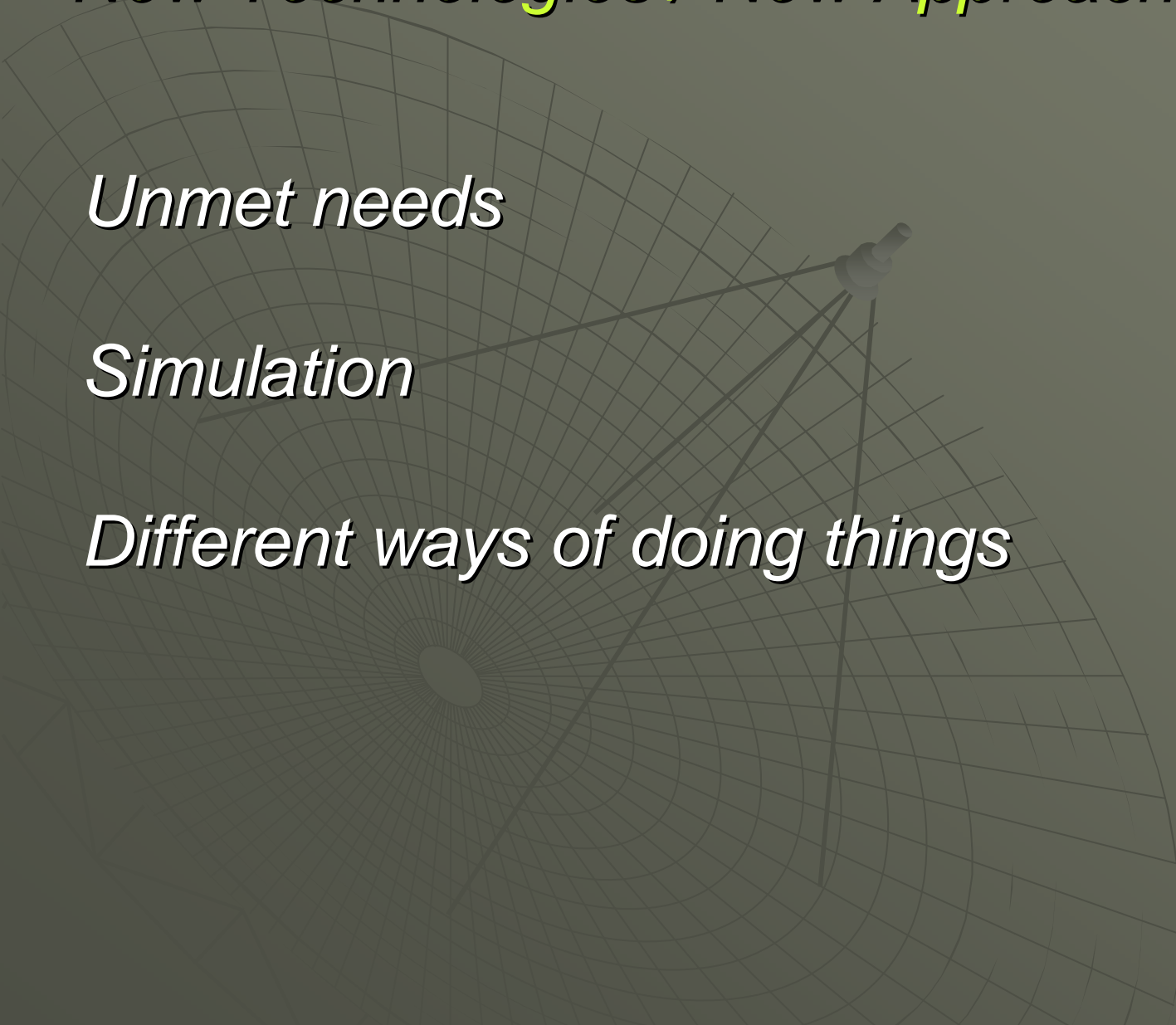


New Technologies / New Approaches

Unmet needs

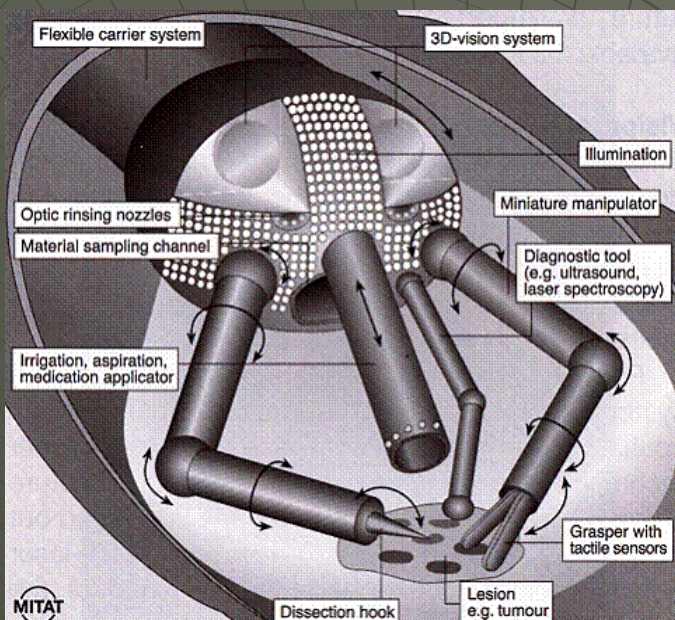
Simulation

Different ways of doing things



New Devices

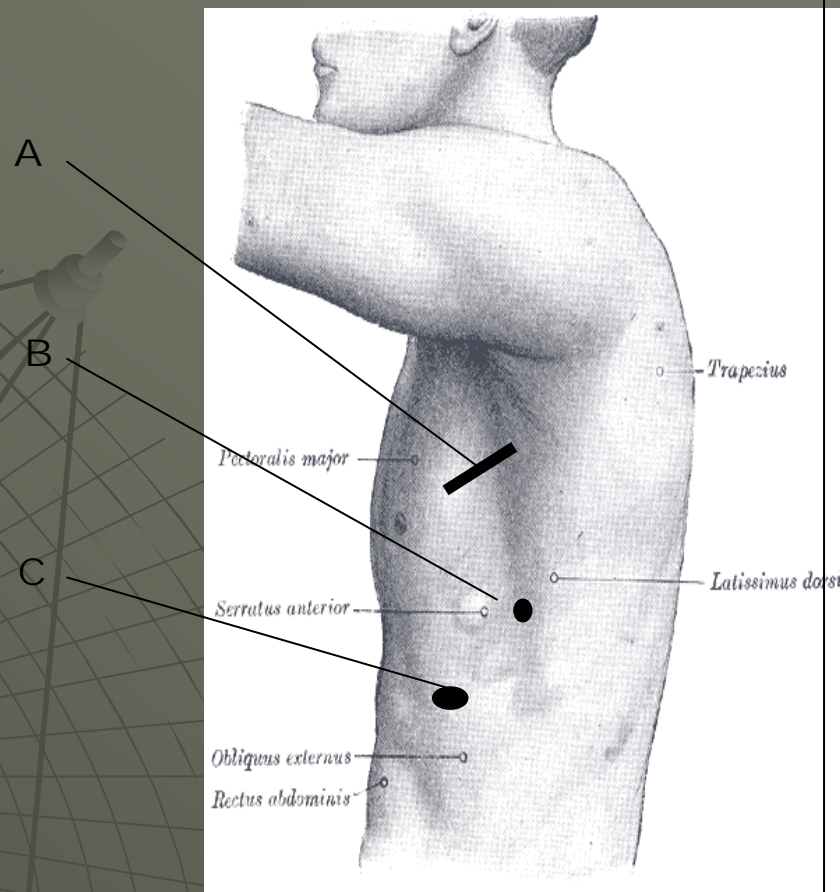
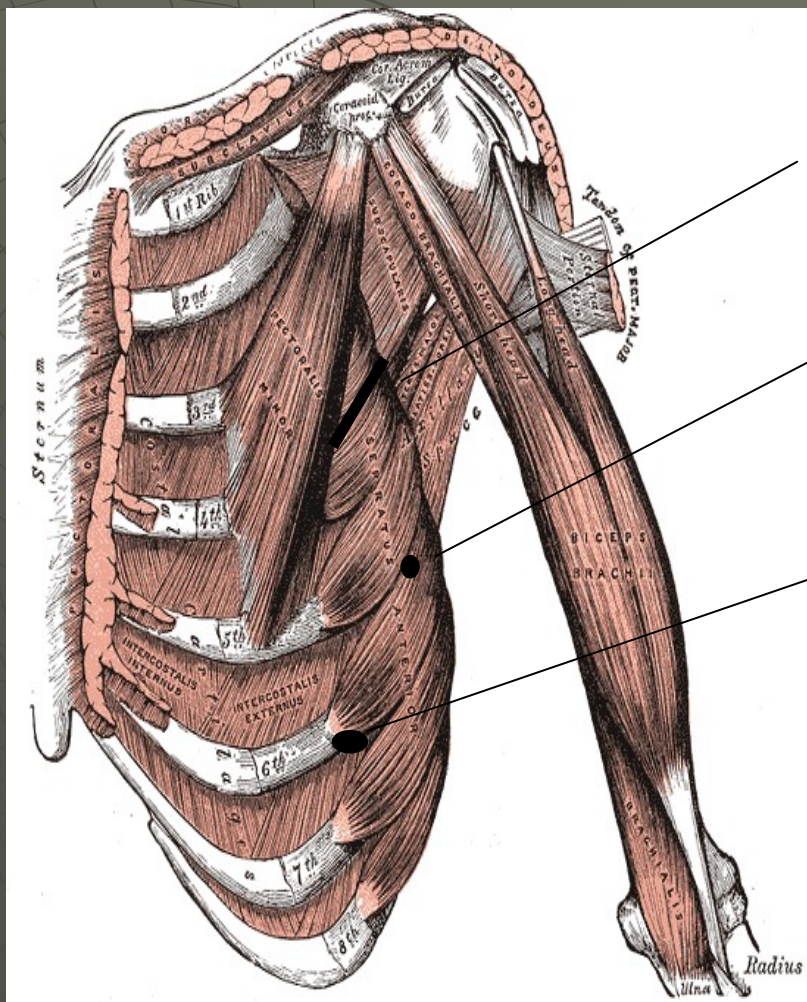
Neurosurgery



Haptics for da Vinci



New Procedures: Treatment of Atrial Fibrillation



Strategic Placement of Incisions:

A) Mini-thoracotomy in Auscultatory triangle – a region with no or few skeletal muscles, minimizing patient discomfort by avoiding Pectorals and Latissimus

B & C) 1 or 2 Ports between ribs avoid Serratus Anterior Muscles for visualization, retraction and bipolar RF device insertion

Enhanced Training Technologies - Simulation



Zeus (Computer Motion)



da Vinci (Intuitive Surgical)





Information rich environment

What is telesurgery?

- *What its not!*
- *Manipulation of a surgical robotic system where patient and surgeon are separated by a distance*

Remote / Extreme

- *Poor infrastructure*
- *Mobile facilities*
- *Low bandwidth solutions*



Operation Lindbergh

- *Trans Atlantic – dedicated com network*
- *Surgical removal of gall bladder*
- *Surgeon in New York – Patient in France*
- *Most missed story of 2001*



Canadian Telesurgery

- *45 Mbps 144msec MPLS IP VPN + Zeus TS*
- *Hamilton - North Bay*
- *Laparoscopic Nissen Funduplications*



Robotic Telesurgery Using da Vinci



ATA - Denver April 2005

First time ever daVinci used in to perform robotic telesurgery in inanimate experiments. Clinical trial (first time daVinci used in telesurgery and first time telesurgery performed in US) conducted at UC – March 2005. Collaborators include: Intuitive Surgical, Johns Hopkins, WRAMC and UC Center for Surgical Innovation.

NASA Extreme Environment Mission Operations

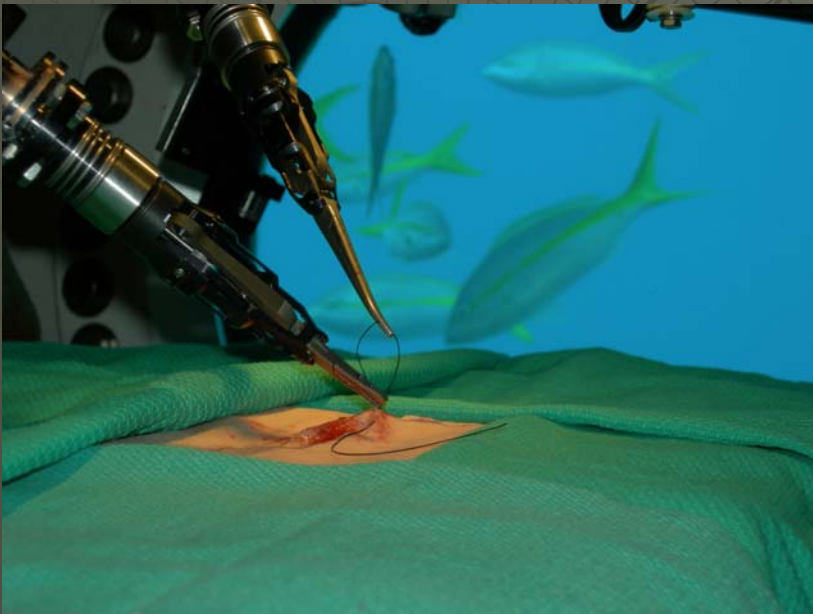


Great analog for space



NEEMO 9 Telepresence Surgery - Portable Robotic System

- Remote manipulation of M7 Robot from a site in Canada
- Dual use of systems
- TATRC funded



NEEMO 12

- *Evaluation of University of Washington's RAVEN robot*
- *Evaluation of SRI's M7 enhanced robot*
- *Autonomous task operation – ultrasound*
- *TATRC funded*
- *NASA, NOAA, Army, Navy, Air Force – academia and industry*



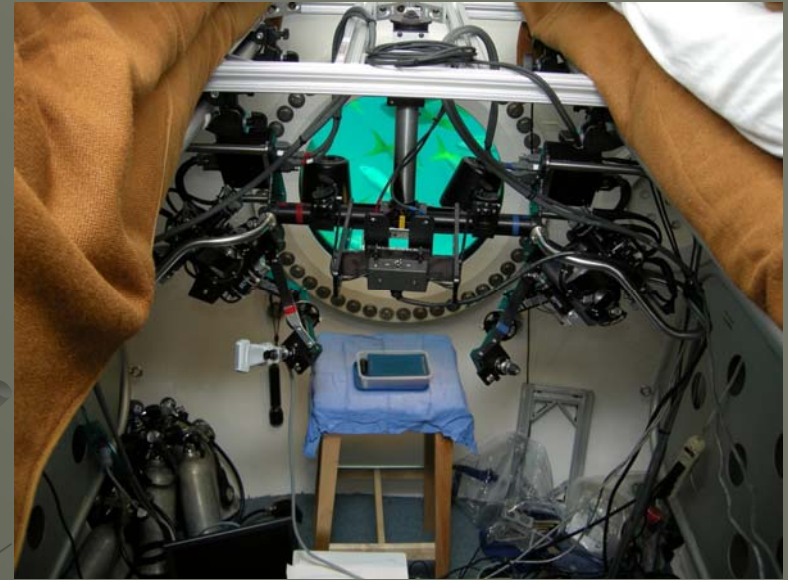
Mobile Robotic Telesurgery Systems

- *University of Washington – Army-funded RAVEN*
 - *Remote manipulation Nashville to Key Largo*
 - *SAGES FLS tasks*
- *SRI – M7*
 - *Autonomous function of ultrasound and needle placement*

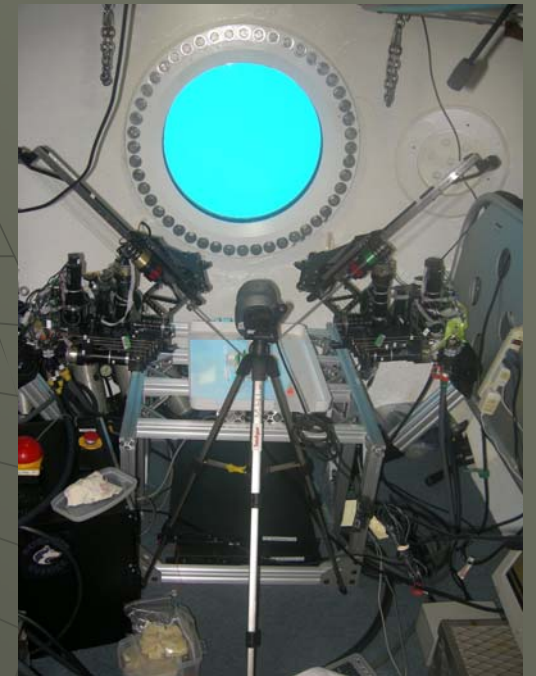
NEEMO 12

M7 - SRI

First autonomous manipulation of an ultrasound – needle insertion



RAVEN – Univ of Washington



NEEMO 12



HAPsMRT

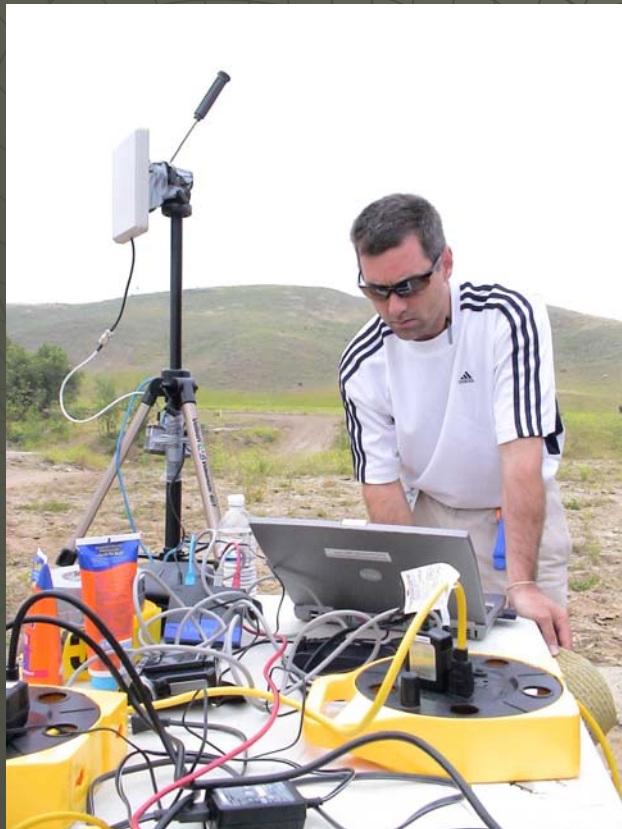


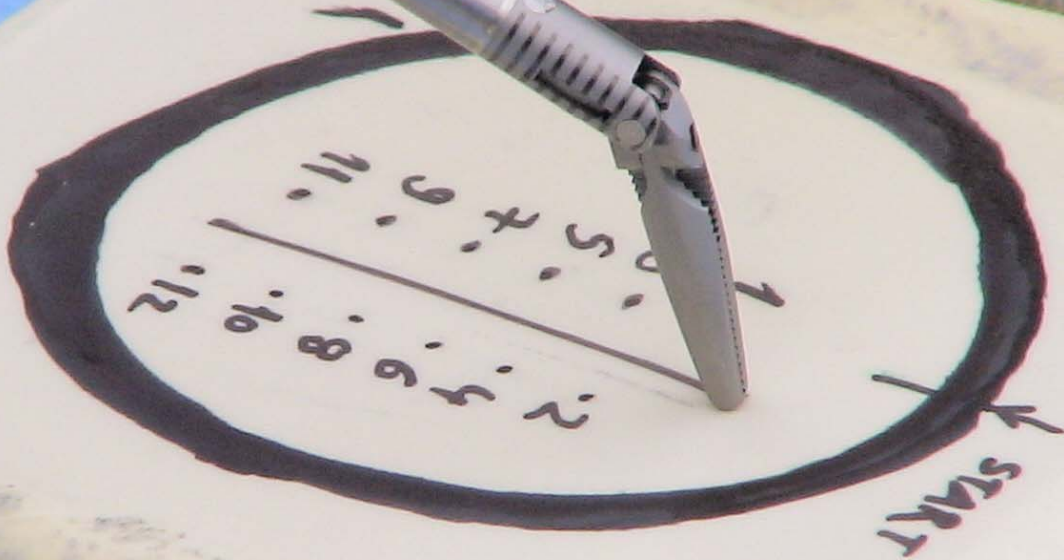
*Location – Simi Valley, CA - Arid – high
desert*



Challenges

- *Inoperable communication (Days 1-3)*
- *Redesign in real-time – 802.11g*





Birds eye view!

2006-06-08 22:28:14Z
MGRS: 11S LT 34195 98166

Alt: 1197 ft MSL
Mag: 218°



Front Camera
FOV Data:
Slant Rng: 87 m
CFOV Hdg: 232°
CFOV MGRS: 11S LT 34135 98137
Horiz. FOV: 30.6°

Surgery During Flight



- *NASA*
- *TATRC funded*
- *Evaluation of robotic surgical care in various gravity settings (0g, 1g, Lunar)*



Challenges and Opportunities for Telesurgery?

- *Increase access*
- *Decrease time to definitive care*
- *Extension of care*
- *Enabling education tools*
- *More efficient business models*
- *Licensure*
- *Robust and reliable networks*
- *Quality of service*



The Operating Room of the Future





The future of surgery