

# The Future Surgeon, the Future Surgeries, and How it has Evolved

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**NEZHAT'S  
HISTORY OF ENDOSCOPY**

A HISTORICAL ANALYSIS OF ENDOSCOPY'S ASCENSION SINCE ANTIQUITY

Camran Nezhat, M.D.

FOURTH EDITION

**Nezhat's** Video-Assisted  
and Robotic-Assisted  
Laparoscopy and  
Hysteroscopy



EDITED BY: Camran Nezhat,  
Farr Nezhat, and Ceana Nezhat

CAMBRIDGE

Medicine





Thank You



# ENDO METRIOSIS WORLDWIDE MARCH

March 13, 2014



# Objective

- Discuss the history of surgery and how we got here and what the future holds



# 18th Century

First successful laparotomy  
performed longitudinally



Ephraim McDowell 1771 - 1830

# 19th Century

First transverse laparotomy



Johannes Pfannenstiel 1862-1909

# ABDOMINAL WOUND DEHISCENCE AFTER C-SECTION (vertical vs. Pfannenstiel)

	Vertical	Transverse
No.	1635	540
Dehiscence	48	2
Rate	2.94 %	0.37 %



# Bozzini's Lichleiter



# 20th Century

## Laparoscopy



**Dr. Hans  
Christian  
Jacobeus  
1910**



**Dr. George Kelling  
1910**



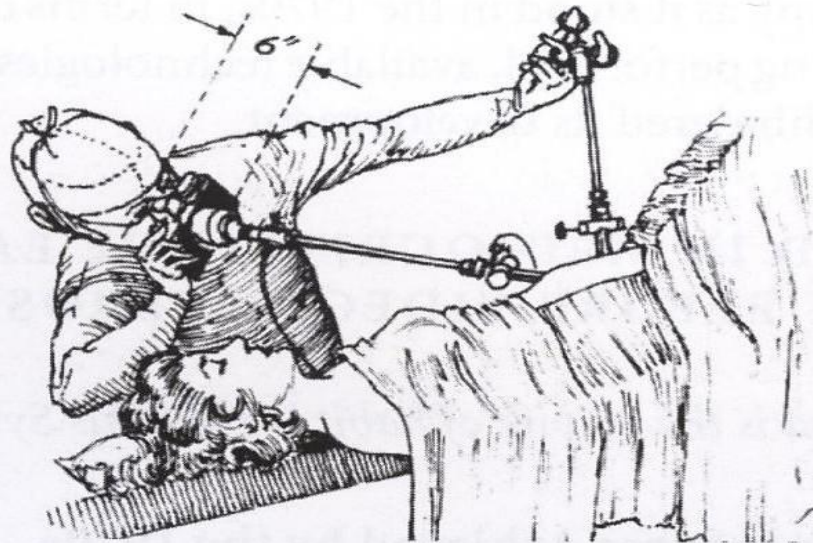
**Dr. Raoul Palmer  
1940**



**Dr. Kurt Semm  
1960**

# History of Laparoscopy

*With camera attached, the surgeon's head and body are 4" to 6" farther away from his instruments: surgical reach is awkward.*

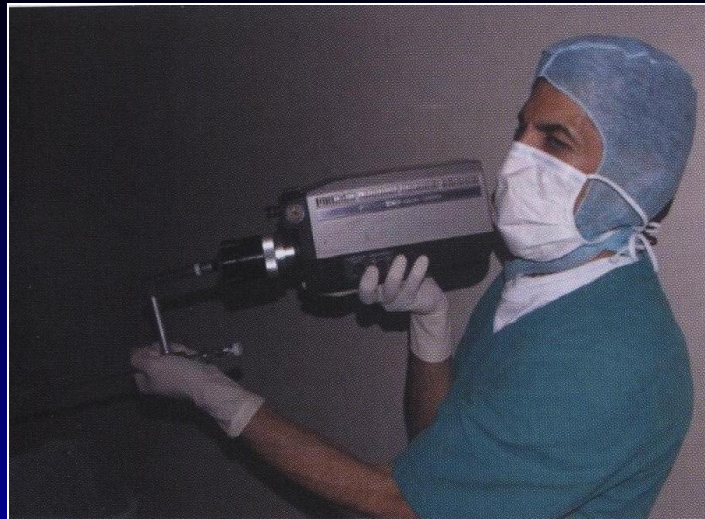


# The role of TV and video devices: referred to as “teaching attachments”



Dr. Perci peering through a teaching attachment in 1977.

# Looking to the Future



One of the first cameras used for video-laparoscopic surgery by Camran Nezhat, MD  
Nezhat C, Crowgey SR, Garrison CP. Surgical treatment of endometriosis via laser  
laparoscopy. Fertil Steril 1986;45:778-83.

# Beginning of Videosurgery

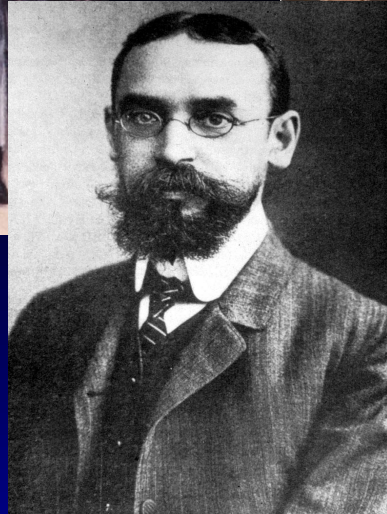


Dr Camran Nezhat, in the early 1980's  
Nezhat C, Crowgey SR, Garrison CP. Surgical treatment of endometriosis via laser  
laparoscopy. Fertil Steril 1986;45:778-83.

# Another 100 years!?



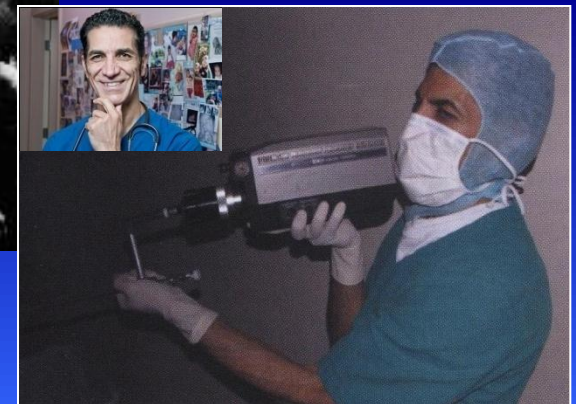
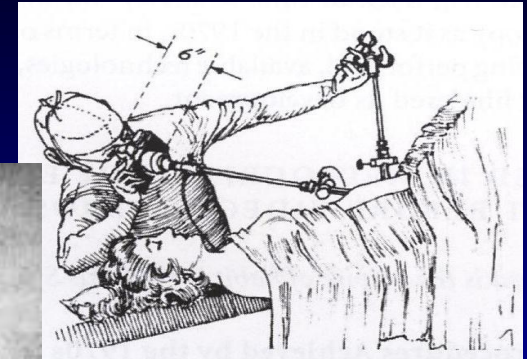
18<sup>th</sup> Century



19<sup>th</sup> Century



20<sup>th</sup> Century



21<sup>st</sup> Century

Kelley WE, Jr. The evolution of laparoscopy and the revolution in surgery in the decade of the 1990s. JSLs 2008;12:351-7.



# Limitations



Skill and experience of  
the surgeon

Availability of proper  
instrumentation



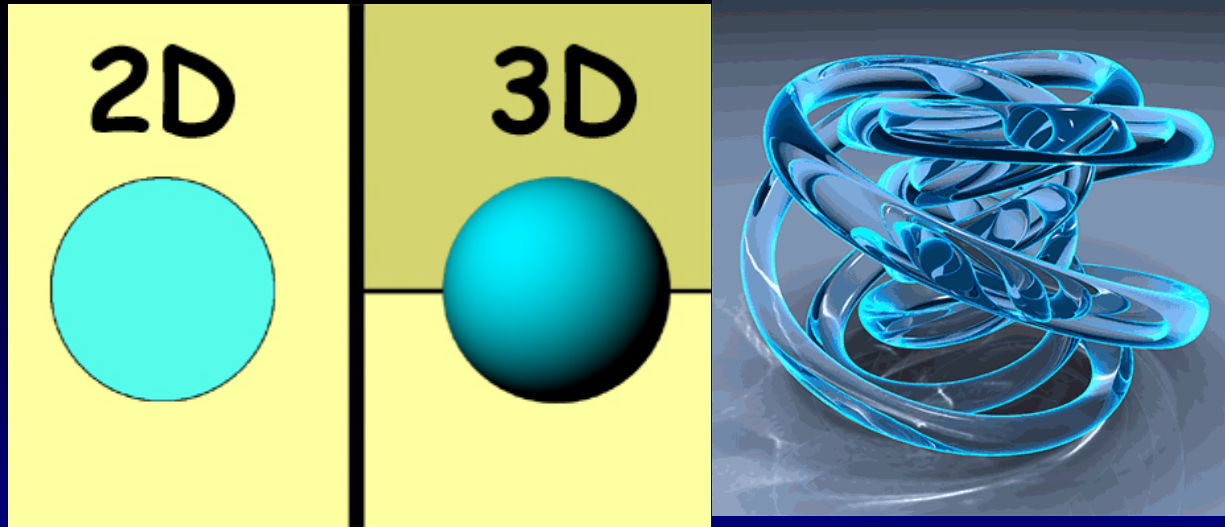
# Two major limitations

2-D vision

Suturing



# 2D, 3D, 4D HD





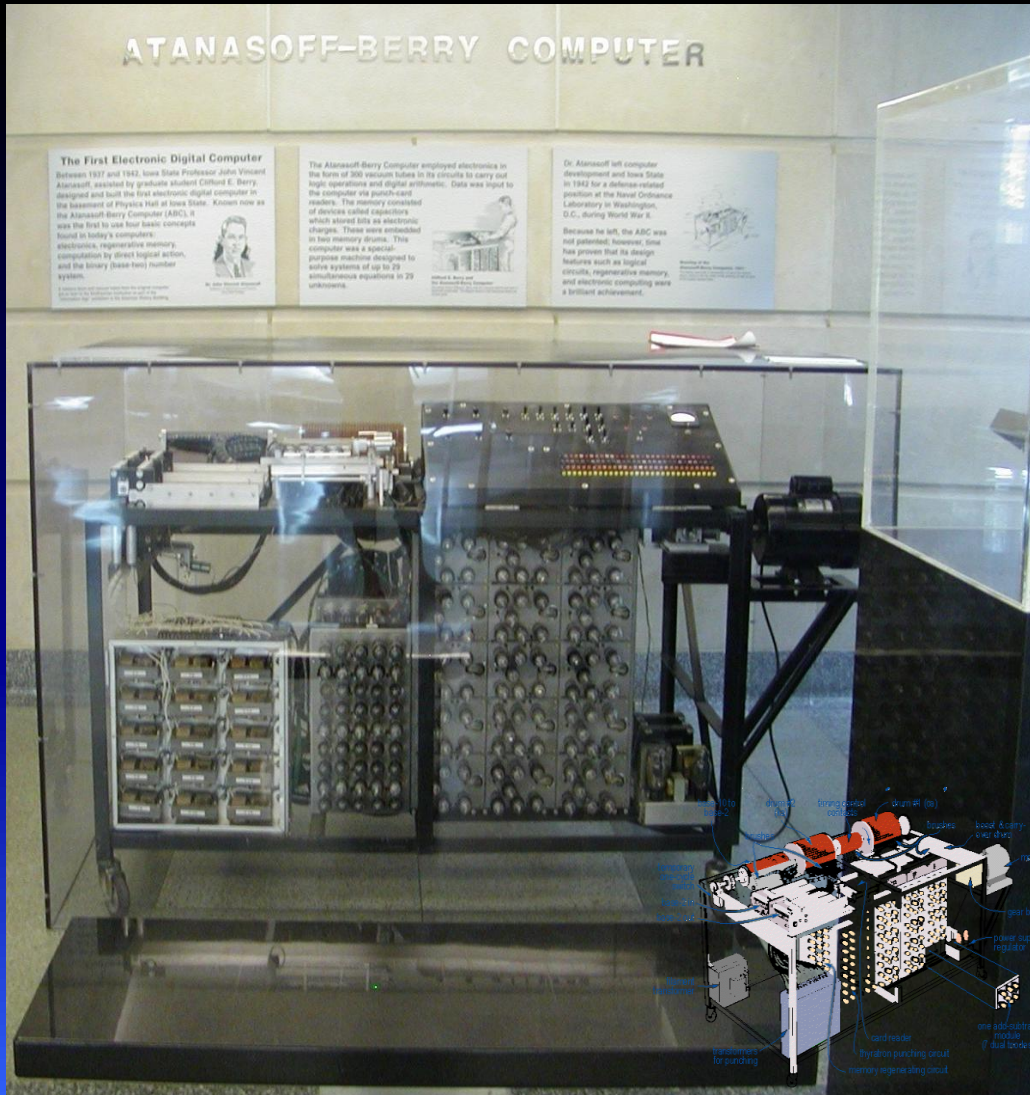
**Ajit Shah, PhD co-inventor of the da Vinci robot at Stanford Research Institute and Camran Nezhat, MD**



# Bulky Size and Limited Access



# Atanasoff–Berry Computer: Conceived in 1937



The Atanasoff–Berry Computer (ABC) was the first electronic digital computing device. Conceived in 1937, the machine was capable of solving up to 29 simultaneous linear equations and was successfully tested, though its input/output mechanism was still unreliable in 1942 when its inventors left Iowa State College for World War II assignments.

John Vincent Atanasoff's and Clifford Berry's computer work was not widely known until rediscovered in the 1960s, amidst conflicting claims about the first instance of an electronic computer. The ENIAC computer is usually considered to be the first computer in the modern sense, but in 1973 a U.S. District Court invalidated the ENIAC patent and concluded that the ABC was the first "computer"

# Newest Technology



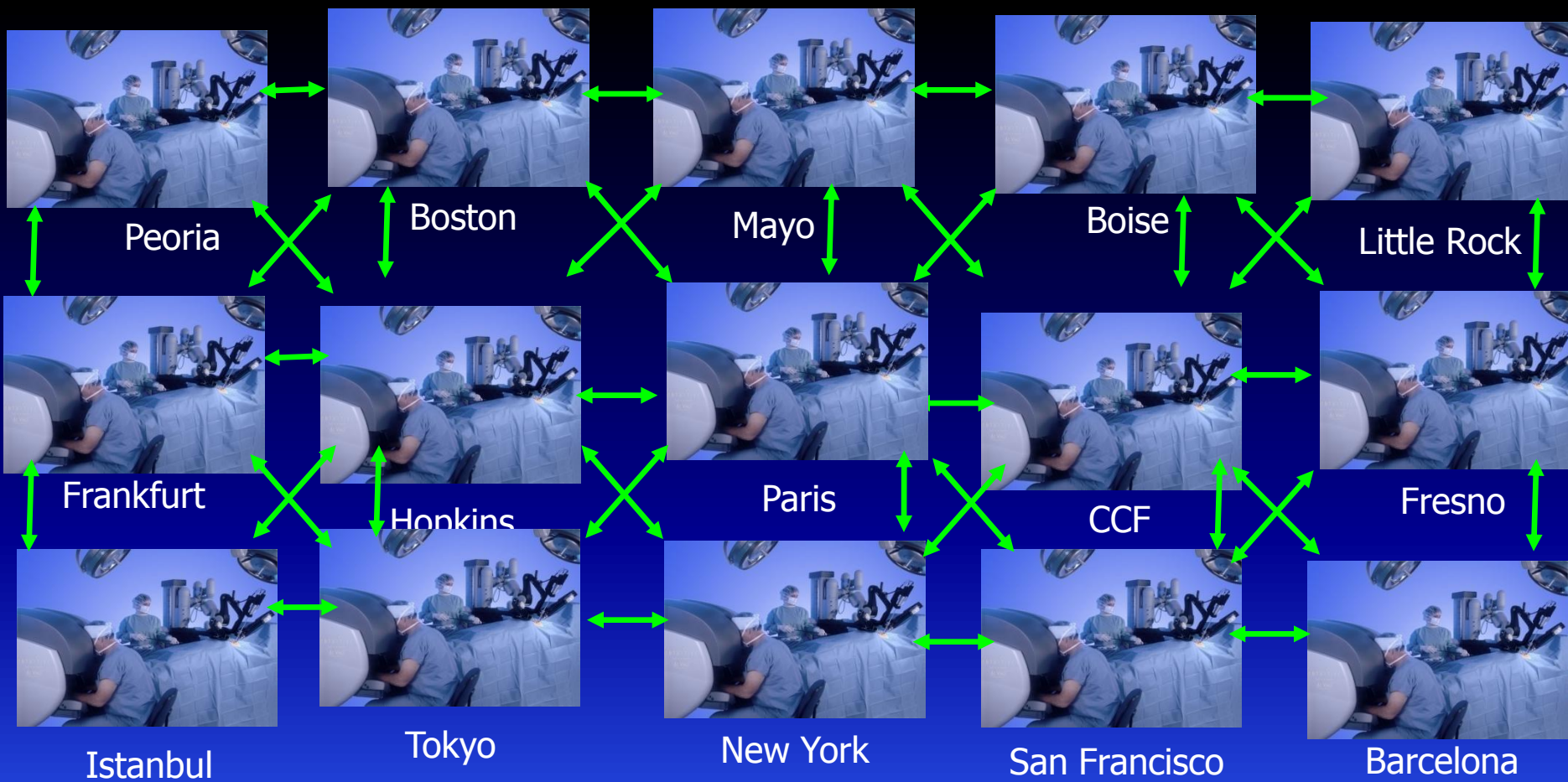
# Telesurgery



Gottlieb S. Surgeons perform transatlantic operation using fibreoptics.  
Br Med J 2001; 323:713.



# The Future of Surgery



# Future Surgeries

- Customizable
- Replicable

**With computer enhanced technology and robots this goal is achievable.**



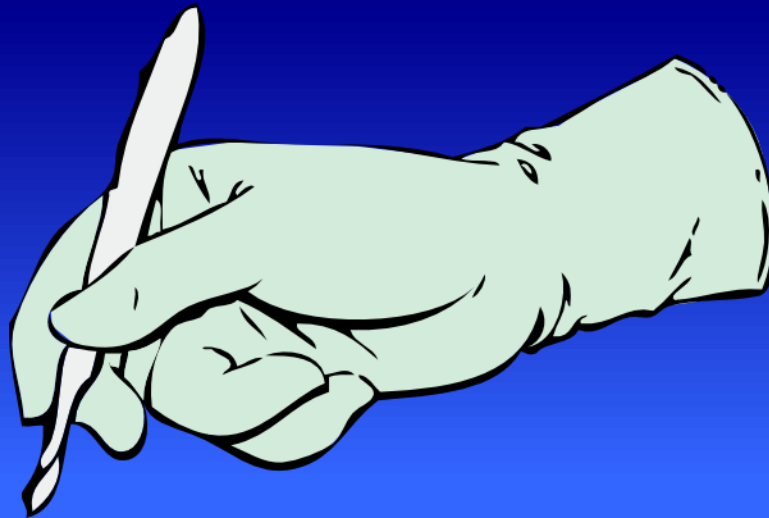
In medicine, when we order a medication like 500 mg of amoxicillin, everybody around the world receives the same thing.



# Surgery is different.

It depends on

- The surgeon
- Surgical team
- Instruments
- And many other factors.



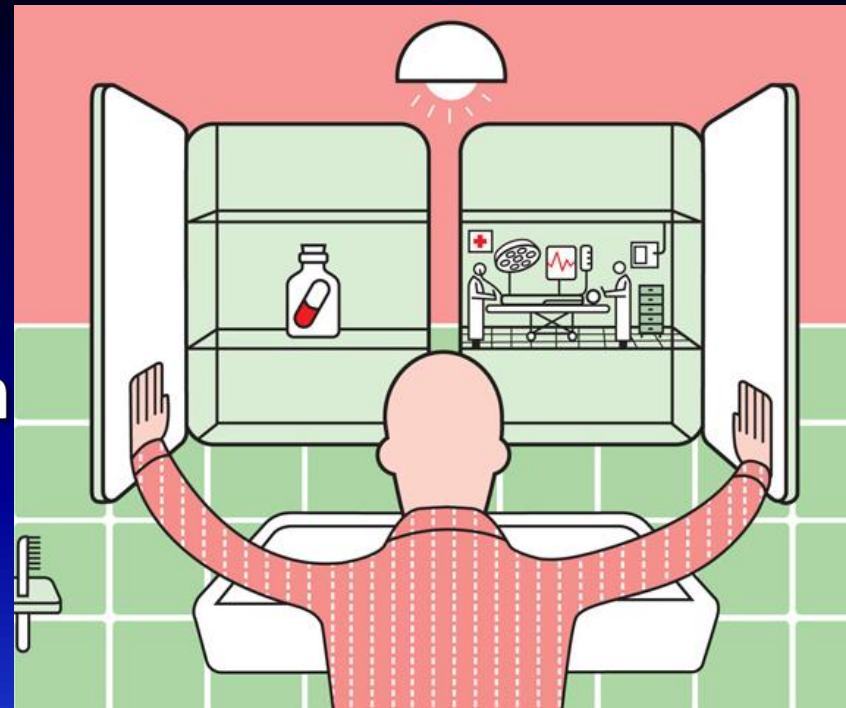


# Options Present Today

1. Open Surgery
2. Minimally Invasive with and without robot assistance
3. Natural orifice surgery
4. Image guided surgery
5. Medical and Chemotherapy

# Medical and Chemotherapy

- PPIs for gastric ulcer
- Methotrexate for ectopic pregnancy
- Chemotherapy for ovarian and testicular cancer
- Etc.

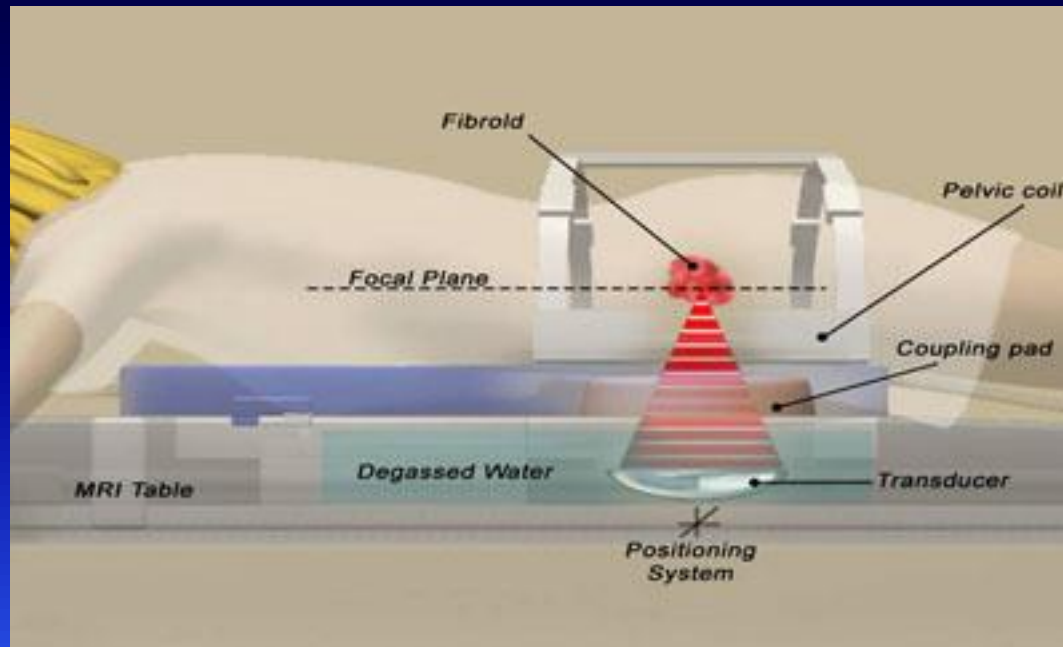


# Image-guided Surgery

## Hybrid Operating Room



# Magnetic Resonance Guided Focused Ultrasound Surgery (MRgFUS)

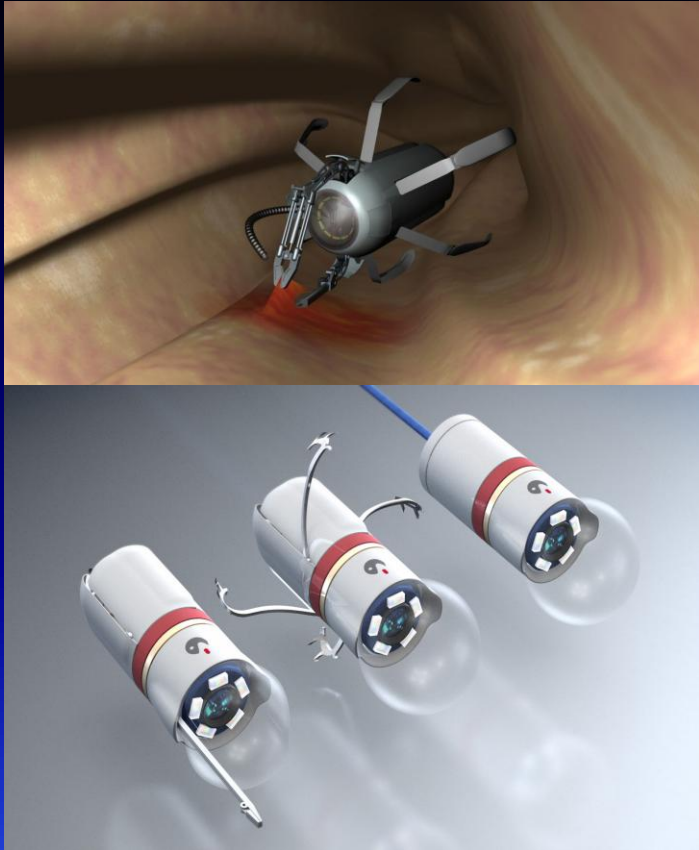




# CyberKnife



# Self-Propelling Gastrointestinal Endoscope Core functions



- Core capsule systems
- Diagnostic system
- Therapeutic Biopsy System
- Locomotion System



# Hanson Robotics



# Micro-robots

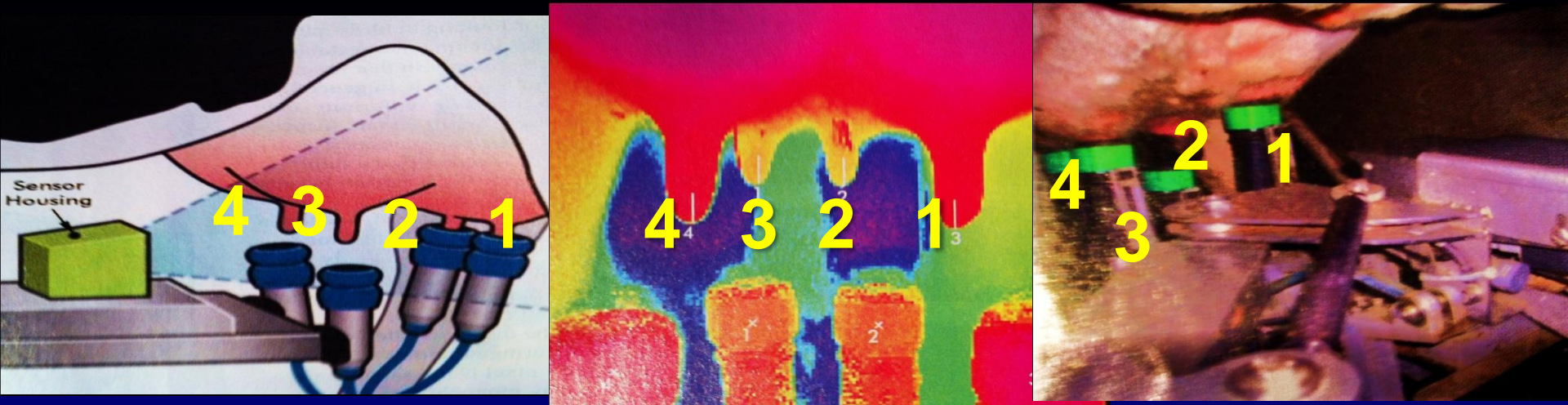


Open Manufacturing Program

Magnetically actuated micro-robots for  
advanced manufacturing applications

**SRI International**

# Hyperspectral Analysis and Motion Control Automatic Milking Machine



- Hyper spectral identifies udder and teats
- Near-infrared for geometry
- ToF for distance, position
- Closed loop control for cup guidance
- Robotic Arms for placement

# Humanoid Robot for Rescue Operations

- Rescue Bot – DARPA Robotics Challenge
  - Robotics competition in which teams construct robots who are to complete a series of tasks related to man made or natural disasters
- Tasks include
  - Walking through debris
  - Cutting through a wall
  - Driving an emergency vehicle
- THOR, humanoid robot by a Virginia Tech-led team



# Video of THOR



T.H.⊕.R.

Tactical Hazardous Operations Robot

First Walking Test  
October 2012

RoMeLa  
ROBOTICS & MECHANISMS LABORATORY

# Intelligent Prosthetics



Rheo Bionic  
knee Ossur,  
Reyknavik,  
Iceland



C-leg, Otto  
Block,  
Minneapolis,  
MN



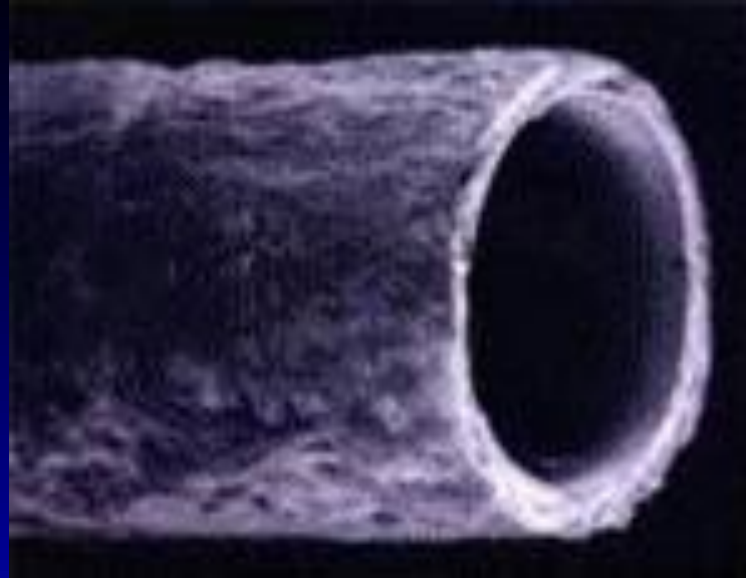
# Tissue Engineering

## Artificial Ear



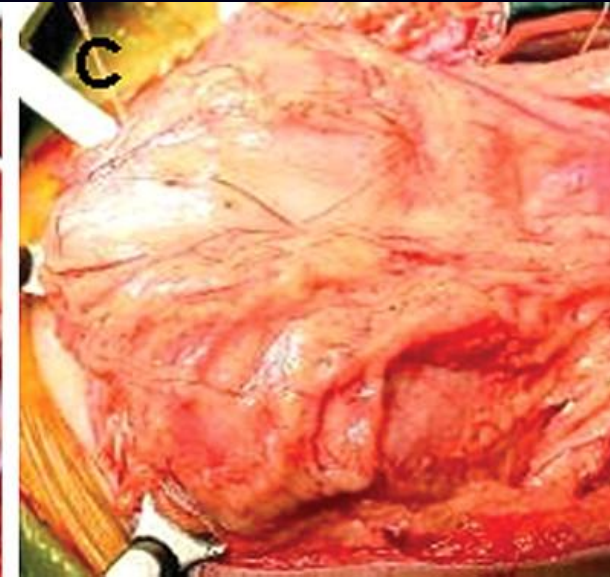
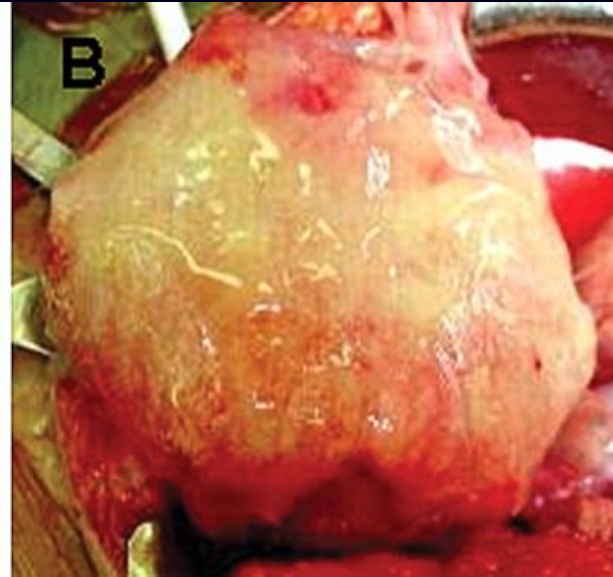
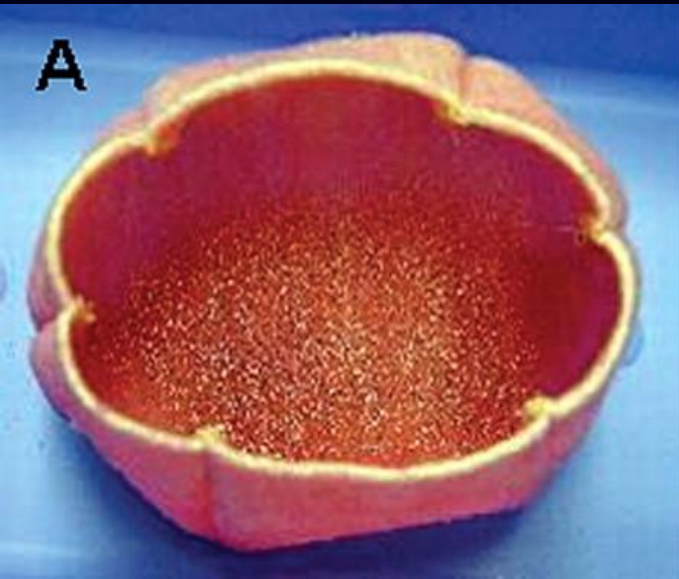
J. Vacanti, MD MGH March, 2000

# Artificial Blood Vessel



J. Vacanti, MD MGH March, 2000

# Tissue-engineered Urinary Bladder



Credit: Anthony Atala, MD Wake Forest Institute of Regenerative Medicine, 2013

# Cell Surgery



# Preimplantation Genetic Diagnosis

NewScientist

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## Five "designer babies" created for stem cells

› 17:36 05 May 2004 by [Shaoni Bhattacharya](#)

Five healthy babies have been born to provide stem cells for siblings with serious non-heritable conditions. This is the first time "saviour siblings" have been created to treat children whose condition is not genetic, says the medical team.

The five babies were born after a technique called preimplantation genetic diagnosis (PGD) was used to test embryos for a tissue type match to the ailing siblings, reports the team, led by Anver Kuliev at the Reproductive Genetics Institute in Chicago, US.

The aim in these cases was to provide stem cells for transplantation to children who are suffering from leukaemia and a rare condition called Diamond-Blackfan anaemia (DBA).

- Genetically "designed" child

# Preimplantation Genetic Screening

- Genetic screening technology
- RB1 gene
- Eye cancer

**THE TIMES** £1.20  
No. 68699 • SATURDAY MAY 13 2006 • NEWSPAPER OF THE YEAR

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NEWS page 4

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SPORT

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**First baby in Britain designed cancer-free**  
By Mark Henderson  
Science Editor

A WOMAN is pregnant with Britain's first designer baby selected to prevent an inherited cancer, *The Times* can reveal.

Her decision to use controversial genetic-screening technology will ensure that she does not pass on to her child the hereditary form of eye cancer from which she suffers.

Although they did not have fertility problems, the woman and her partner created embryos by IVF. This allowed doctors to remove a cell and test it for the cancer gene, so only unaffected embryos were transferred to her womb.

The couple are the first to take advantage of a relaxation in the rules governing embryo screening.

When the technique was developed in 1989 it was allowed only for genes that always cause disease, such as those for cystic fibrosis. However, it was approved last year for the eye cancer, which affects only 90 per cent of those who inherit a mutated gene.

The pregnancy will increase controversy over the procedure, which the Government's fertility watchdog authorised on Wednesday for genes that confer an 80 per cent lifetime risk of breast and bowel cancer.

Critics argue that the action is unethical because it involves the destruction of some embryos that would never contract these illnesses if they were allowed to develop into children. Even those that would potentially become ill could expect many years of healthy life first, and some of the disorders involved are treatable or preventable.

The mother-to-be, who wishes to remain anonymous, conceived after receiving treatment from Paul Serhal, of University College Hospital, London.

Mr Serhal has pioneered the use of pre-implantation genetic diagnosis (PGD) to detect heritable cancers in Britain, though it has been used

Continued on page 4

**Beating eye cancer**  
The eye cancer retinoblastoma, seen left in a young boy, affects about 1 in 15,000 children. About half the cases are hereditary and those who inherit the defective gene have a 90 per cent chance of developing cancer. Up to 95 per cent of tumours detected early can be treated, but this requires chemotherapy and surgery that can cause blindness. A scan in early pregnancy, the stage that the embryo pictured above has

# Human Cloning

**TheScientist**  
EXPLORING LIFE, INSPIRING INNOVATION

## Human Embryos Cloned

South Korean team demonstrates cloning efficiency for humans similar to pigs, cattle

**BBC NEWS**

You are in: **Sci/Tech**  
Tuesday, 16 April, 2002, 10:41 GMT 11:41 UK

**Chinese cloning control required**



[Click here for more news, features and analysis](#)

**Key stories**

**Background**

**Milestones**

**AUDIO/VIDEO**

▶ Best of BBC coverage

**INTERACTIVE**

**See also:**

▶ 14 Apr 02 | Sci/Tech  
Complete genome map 'in 2003'

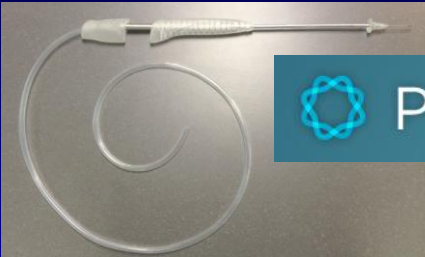
COMMONWEALTH GAMES

*“One group in the Central South University in Changsa is said to be producing human embryo clones...”*



# Previvo Genetics Uterine Lavage System

## PGS & PGD without *in-vitro* Fertilization



- Indications:
  - Multiple Miscarriage
  - Advanced Maternal Age
  - Unexplained Infertility
  - High Risk Genetic Profile
  - Fertility Preservation





# Moral and Ethical Issues





# Technology will change the future

- The rate of new discovery is accelerating exponentially
- The changes will raise profound fundamental issues

# Options for the Future Surgeries

1. Open Surgery
2. Minimally Invasive with and without robot assistance
3. Natural orifice surgery
4. Image guided surgery
5. Intelligent robots performing surgery



# Future Surgeons



- Super specialists on specific procedures who perform large volumes of procedures aided by thinking robots who are enabling human surgeons to mass lead and direct the surgeries as a general does for an army of soldiers.
- Thinking robots are going to be so precise that the possibility of error is almost none!

# Hanging Up the Knife

A novel surgical technique promises to save patients time, money and blood



## One Tool, Many Uses

- Appendicitis
- Bowel tumors and adhesions
- Gallstones
- Gynecological problems: fibroid tumors, endometriosis, ectopic pregnancies
- Lung lesions

**'In 20 years, major abdominal surgery will be nearly extinct': Nezhat**

table, but no one is wielding a knife. In place of the usual seven-inch incision, Dr. Camran Nezhat makes a small puncture in her navel and inserts a baton-size scope equipped with a tiny video camera and a laser. Then, after easing irrigation and grasping instruments through even smaller openings just above her pubic bone, he turns on the camera and sets about his work. Eyes fixed on one of four TV screens, he moves deftly through her abdominal cavity, searing through the webs of scar tissue that have once again mummified several organs and attached her bowel to her abdominal wall. Within about 90 minutes, Martha B. is out of the operating room, having lost teaspoons instead of cups of blood. She'll leave the hospital within hours instead of days, and return to work in one week instead of three. If she's lucky, she may even end up pregnant.

**First report:** The treatment promises to

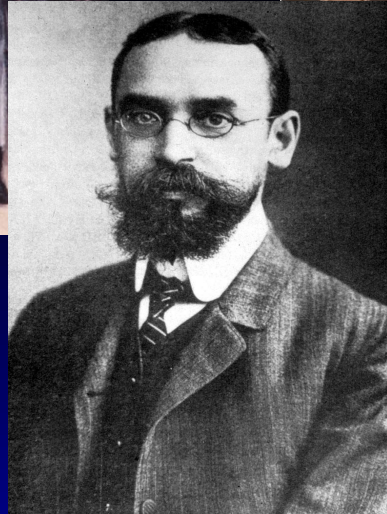
# Newsweek

February 12, 1990

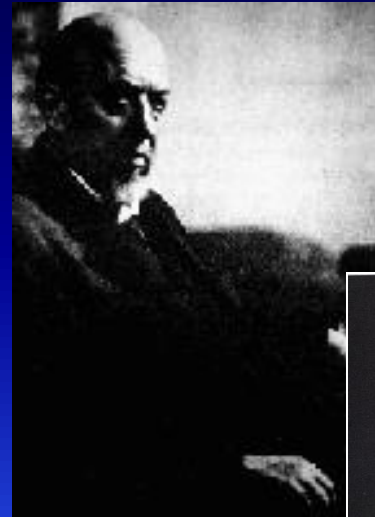
# Another 100 years!?



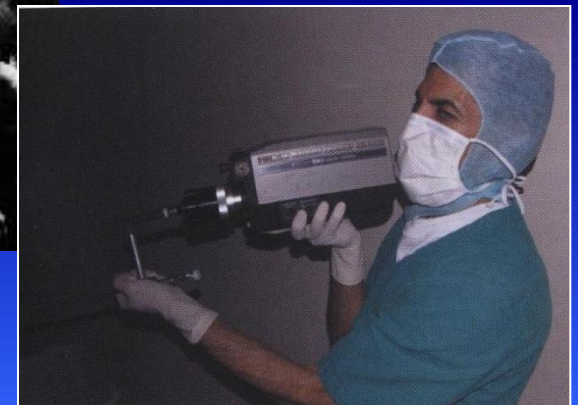
18<sup>th</sup> Century



19<sup>th</sup> Century



20<sup>th</sup> Century



21<sup>st</sup> Century

**6<sup>th</sup>** annual seminar on  
**Minimally Invasive Gynecologic Surgery**  
*with hands-on workshop on laparoscopic suturing and knot-tying*

**December 11-12, 2014**  
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[www.nezhat.org](http://www.nezhat.org)