Engineering Assisted Surgery™ Robots and Nanobots

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UOT – BME

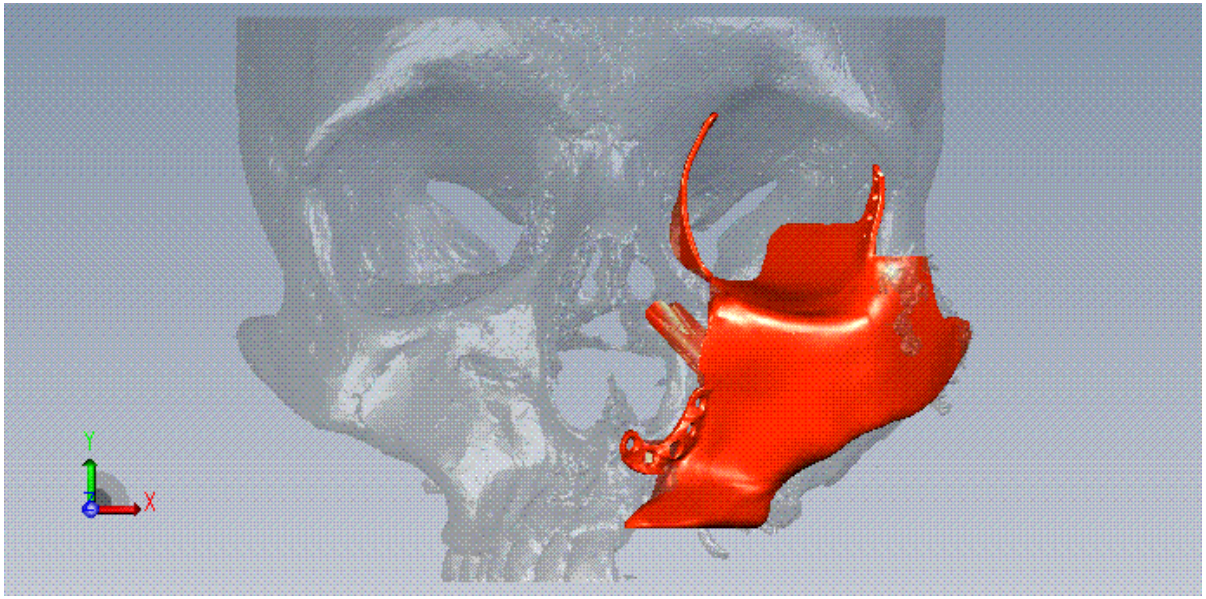
5th Level Biomedical Instruments

Engineering Assisted Surgery™

the application of engineering and industrial

technology in the delivery of healthcare

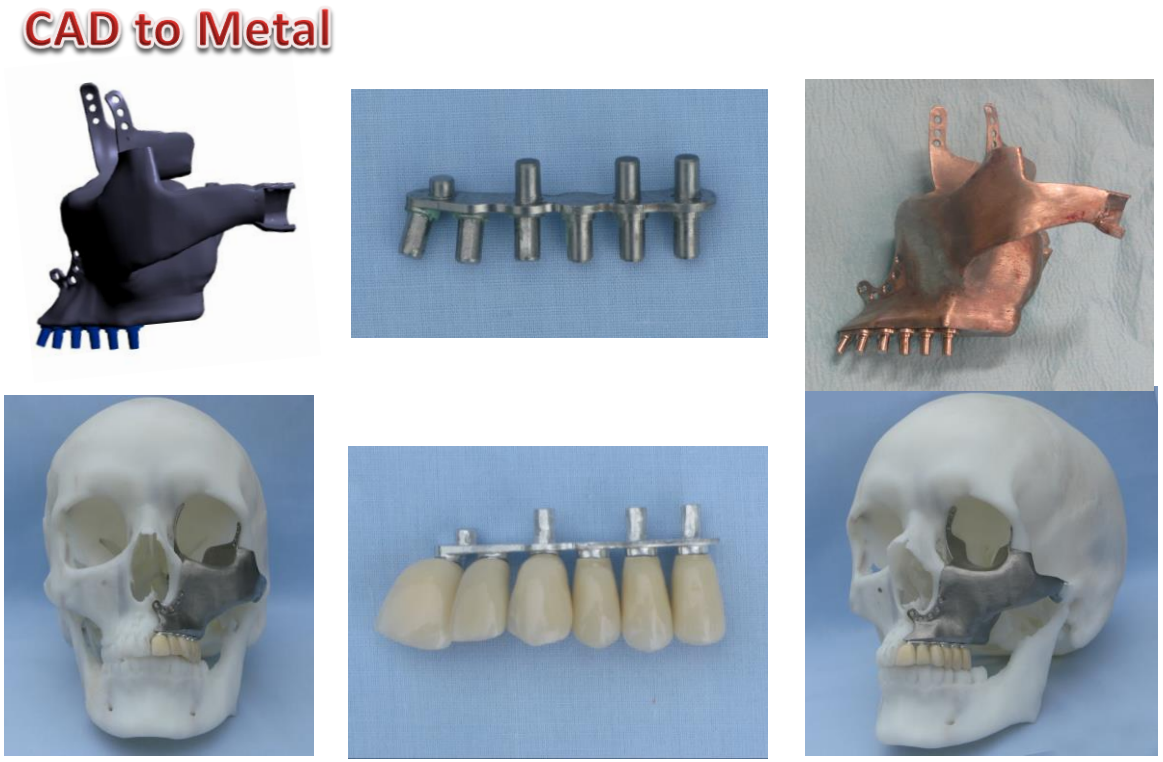
Engineering Assisted Surgery™



Customised Implants

Ninian Peckitt

Customised Implants



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Medical Robotics

the use of intelligent machine technologies

……..in clinical and surgical medicine

Medical Robotics

Patient monitoring and stabilization

Minimally Invasive Surgery (MIS)

Remote surgery (telesurgery)

Patient rehabilitation

Medical training

Nano-Robots (Nanobots)

£200k

RP 7 Robotic Doctor

Touch Health

Robotic Exoskeleton (REX)

Rex Biotics Auckland N.Z

Smart Pills

Proteus Smart Pill **http://www.proteus.com**

- Sensors signal and relay vital-stat information after ingestion
- Monitors Compliance / Therapeutic progress
- Signal triggered by Pill's minerals mixing with gastric fluids
- Band-Aid style Microelectronic receiver is placed on the skin.

  ✓ date–stamps information

  ✓ tracks compliance /sleep patterns / posture / falls / heart / respiratory rates

Heart Monitoring

Avivo Heart Monitoring Device **http://www.corventis.com**

- Wireless Blue Tooth technology
- Disposable Band-Aid sensor
- Cell phone–sized receiver

- Posture / Activity / Fluid status/ Heart /Respiratory Rates

daVinci Surgical System

http://davincisurgery.com

- Intuitive Surgical - Debut 1999 joystick-controlled
- three robotic hands (for a camera and instruments)
- precise “keyhole” incisions
- perform complex surgeries via optics and imaging
- Million-dollar-plus price tag

Freehand Laparoscopic Camera Controller (Prosurgics Ltd)

Automated device with steady hands for Minimally Invasive Surgery

Holding lights / cameras / telescopes

The surgeon wears a sensor

Much like a climber's headlamp

Controls the robotic arm head movements and a foot pedal

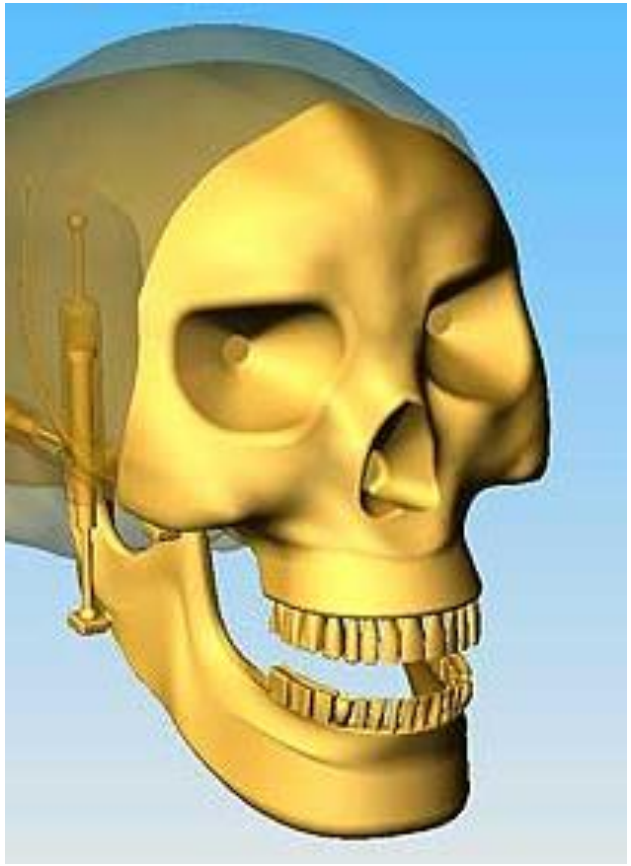
Cost $20,000

http://www.freehandsurgeon.com

Robotic Jaw

School of Engineering and Advanced Technology, Massey University, New Zealand

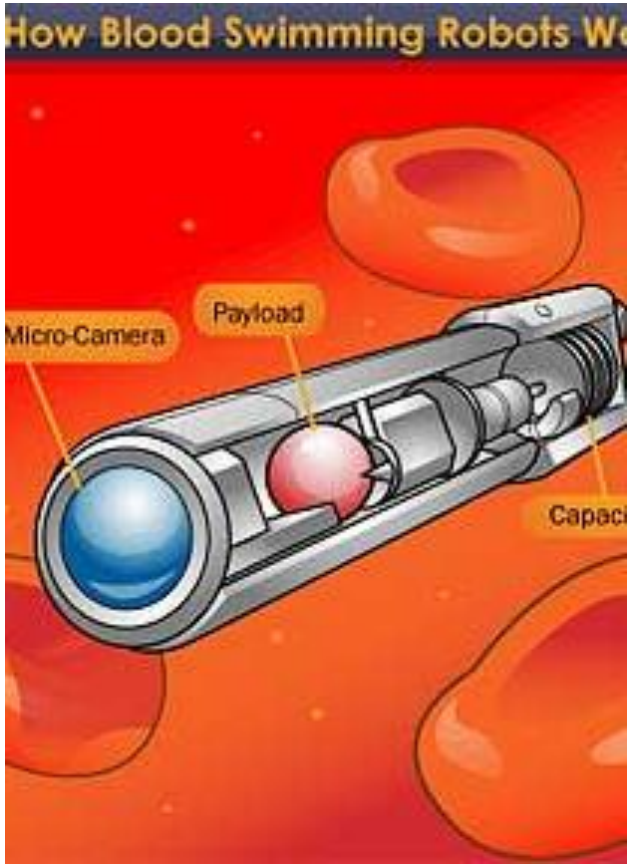
- forces /movements in the chewing food
- complete picture of motion
- applications across medicine / food technology



Torrance JD, Hutchings SC, Brolund JE, Huang L, Xu WL
Int. J. of Intelligent Systems Technologies and Applications 2010 Vol 8 No 1/2/3/4 pp288-302

Nanobots

- Nanobot biomedical applications likely in 10 years
- Molecular-scale electronics, sensors and motors are expected to enable microscopic robots with dimensions comparable to bacteria
- Recent developments in biomolecular computing demonstrate feasibility of processing logic tasks by bio-computers



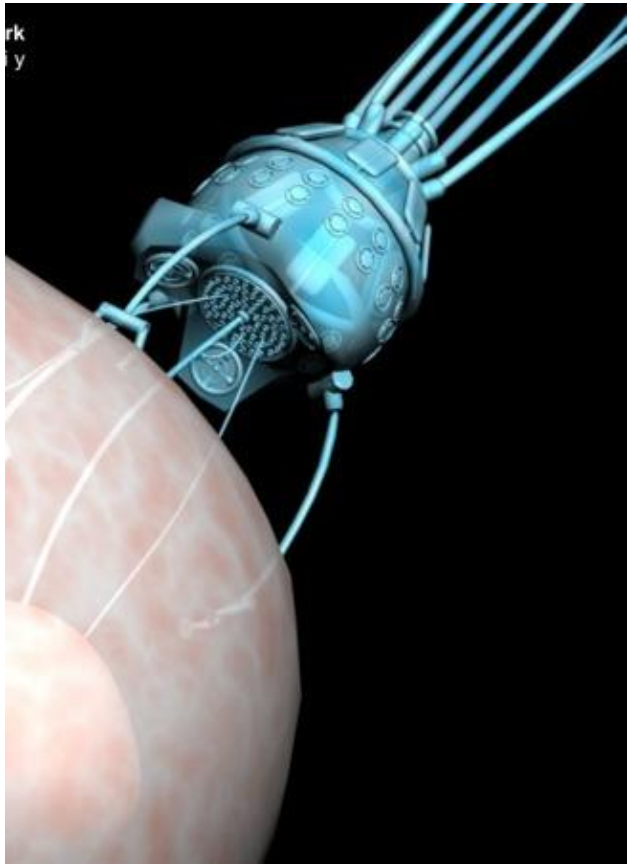
Nanobots

- Building Biosensors and Nano-Kinetic Devices Studies for Operation and Locomotion of Nanobots are now advanced

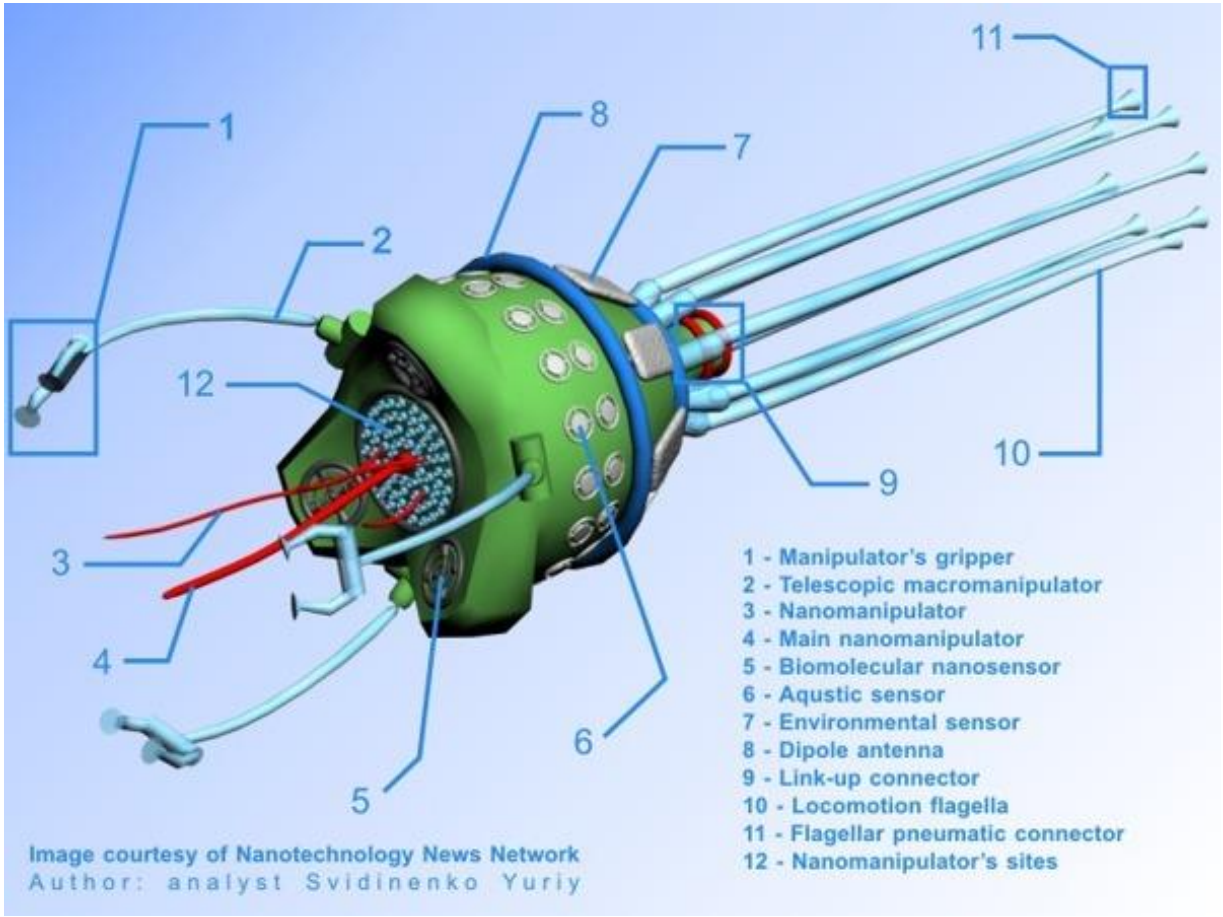
- Classical objections to the feasibility of nanotechnology now resolved:

  -quantum mechanics
  - thermal motions
  - friction

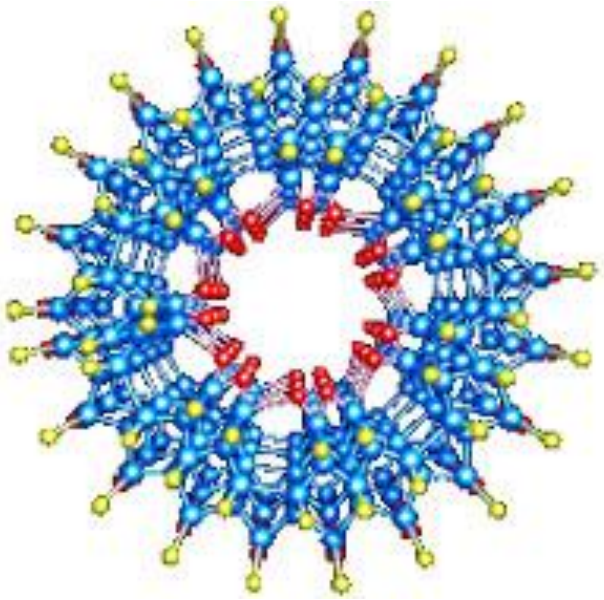
- Complex integrated high performance nanosystems can be analysed / simulated to pave the way for use of nanorobots in biomedical engineering



Nanobots and Cell Surgery



Nanomanufacturing

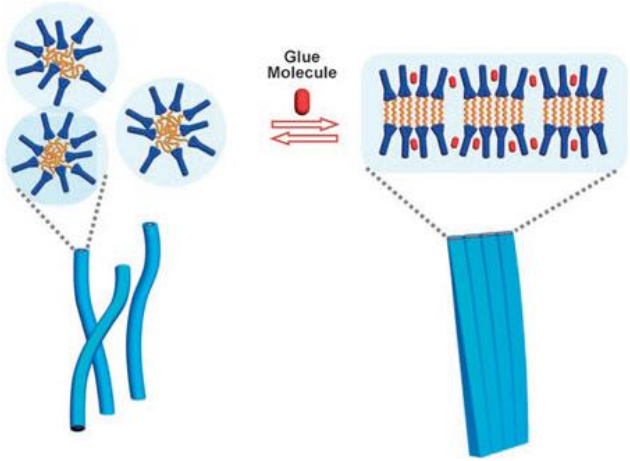


Creation of materials and products through:

1. **Direct Molecular Assembly (DMA)**

2. **Indirect Crystalline Assembly (ICA)**
   creation of conditions that foster the growth of nanoscale crystals that are then combined into macroscale materials and products

3. **Massive Parallelism Assembly (MPA)**
   the creation of many nanomachines /nanobots
   synergy to assemble atoms and molecules
   Into macroscale materials and products.



Making Nano Robots

Nanobots and Nanobotic Control Devices

- Biochips for medical applications
- DNA based Micro-Robots
- Bacteria / Biologically integrated devices controlled by Electromagnetic Fields
- Voice-Controlled / Mind-Controlled Robots
  - Neuronal impulses to trigger actions
  - Robotic Arm could very well function as a real human arm.