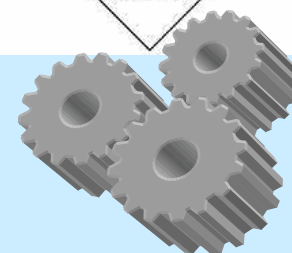
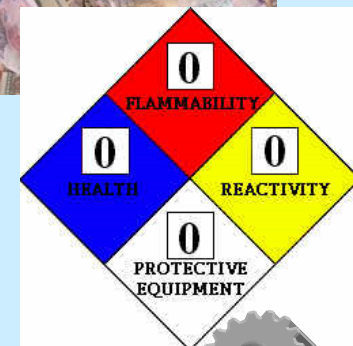


ABET Considerations

Flat Gold Nanoparticles & PEG Layers, Ernie Sanchez 2009S

- **Economic** – Small tech, big money:
 - Nanotechnology is currently a growth industry, advancing knowledge in this field is helping its development
- **Environmental** – Our labs use proper procedures for the treatment and disposal of chemicals
- **Sustainability** – We emphasize efficiency and reuse any where we can. Guidelines for efficient use of equipment and reuse of samples when possible allow us to do more with less.
- **Manufacturability** – In each project we have focused on cheap and effective procedures, increasing efficiency of manufacture, should it arise.
- **Ethical** – We attempt to keep analysis as clean as possible, so that our results are clear and accurate.
- **Health and safety** – Proper training in chemicals and equipment is important for functioning in the lab.
 - The microscopes deal with lasers, radiation, chemicals, etc
 - Possible health applications of PEG
- **Social** – The progress made benefits other researchers in the field.
- **Political** – This experience allows me to better understand science and nano-tech policy decisions.



Engineering Considerations

Metallic Nanomesh Fabrication Using Alumina Templates: Sasha Down 2007S

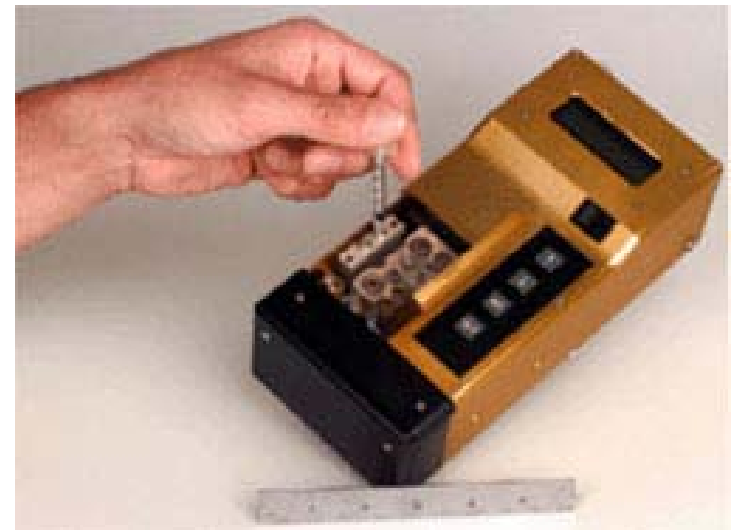
- Economic
- Environmental
- Sustainability
- Manufacturability
- Ethical
- Health & Safety
- Social
- Political

Applications of metal nanomesh

– MEMS

– Lab-on-a-chip

Applications will affect all considerations



http://aemc.jpl.nasa.gov/images/test_chromatograph.jpg

Considerations

*Kinematic Modeling of Ackerman Steering,
Timothy Nall, 2005F*

- Economic: Choices in hardware
- Environmental: Rechargeable batteries
- Sustainability: Use of standard commercial products
- Manufacturability: PER frame
- Ethical: Credit given where due
- Health and Safety: Proper use of tools
- Social: Entertaining and educational
- Political: Further research of robotics

ABET Considerations

Nano-Scale Superconductivity and the Proximity Effect, Christian Crowe 2008S

- Economic, Sustainability, and Environmental
 - Superconductor use in power distribution and storage can prevent large amounts of energy from going to waste
- Health and Safety as well
 - MRI machines maintain their supercurrent flows without additional power input and produce fields that would otherwise be impossible to create in a hospital setting



MRI Machine

Image from radiologyinfo.org

Eight Considerations

Linear Polyethyleneimine Glucose Sensors, Mbonda Siewe, 2007S

Economic

- Diabetes Industry many billion dollars \$\$\$
- Chemical sensor industry \$2.8 billion
- Initial purchase of old technology low cost
 - High Upkeep
- Wireless solutions very expensive
 - Dexcom wireless starter kit \$800
- New technology developers will win big

Environmental

- None Really

Sustainability

- Film stability a major issue
- Degradation studies
- Refresh cycle
- Continuous usage vs. Short-period usage

Manufacturability

- Standardized synthesis of LPEI-Ferrocene
- Repeatable film deposition
- Device size

Ethical Concerns

- Not a controversial or potentially objectionable study, no real issues here

Health & Safety

- Blood coagulation
- Toxicity (Ferrocene LD50 1320mg/kg)
- Possibility of infection

Social Concerns

- People's thoughts about machines in them
- Explain tech to children
- Insurance or socialized healthcare plan

Political

- Animal Testing?

Engineering Physics: Considerations

*Tissue Engineering the Temporomandibular Joint Disc,
Sarah Lumpkins, 2007S*

■ Health and Safety

- Precautions must be taken when handling potentially infected umbilical cords

■ Social

- Tissue engineered disc could substantially improve the lives of those afflicted with TMJ disorders

■ Environmental

- Tissue waste/solvents must be properly disposed of

■ Ethical/Political

- FDA approval in future may be more difficult, as HUV will change status from “minimally processed transplant tissue” to a “medical device”
- Consent must be obtained from the cord donors

Design Constraints & Implications

*PbSe Quantum Wires for Use in Thermoelectric Cooling Devices,
Robert Nicholas, 2007S*

- Economic – Thermoelectric devices are cheaper than compression cooling systems.
- Environmental - Solid state refrigeration applications will lower greenhouse gas emissions.
- Sustainability – Safe to assume that cooling systems will always have a place in our society.
- Manufacturability
 - Single devices grown by MBE
 - Scalability is an issue with MBE systems
 - New tools are being developed to address this issue.
- Health & Safety – Many source materials used in MBE growth are hazardous to human health.
 - Necessary precautions must be put in place to protect scientists & engineers working with these systems.

ABET Considerations: SEM Installation

*Installing an SEM for High Resolution Electron Beam Lithography,
Robert McClure, 2008F*

- **Economic**
 - New technology pushes economy, like the internet, cell phones, satellite TV, etc.
- **Environmental**
 - We are not directly polluting with our microscope
 - It uses significant electrical power
- **Sustainability**
 - By refining procedures, we can more reliably fabricate our samples
 - Works better with higher resolution.
- **Manufacturability**
 - EBL is already used in industry, so learning to write/develop samples faster is key
- **Political**
 - Perhaps a device like ours could aid in creating something as important to change the way we govern ourselves, like skin-imbedded microchips.
- **Health and Safety**
 - Room configured for operator safety
- **Social**
 - Other students and faculty will benefit from our successful installation
- **Ethical**
 - We do not plan to research stem cells with our microscope