Grand Challenges

Advance Personalized Learning	Secure Cyberspace
Make Solar Energy Economical	Provide Access To Clean Water
Enhance Virtual Reality	Provide Energy From Fusion
Reverse-engineer The Brain	Prevent Nuclear Terror
Engineer Better Medicines	Manage The Nitrogen Cycle
Advance Health Informatics	Develop Carbon Sequestration Methods
Restore And Improve Urban Infrastructure	Engineer The Tools Of Scientific Discovery

Your Grand Challenge: _____

Description of Challenge in your own words: _____
_____

Brainstorm before researching: What problems/solutions might your challenge involve?

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-
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Research online:
What solutions exist that

...have already been developed?	...are currently in development?	...could be developed in the future?
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•

What are the biggest difficulties in developing those solutions?_____
_____
_____

Choose one of those difficulties and expand on it. Why is it difficult? How could you improve it?
_____
_____

Invention ideas:

Machines

	Flat	**Not Flat**
Metal	Waterjet	Mill, lathe
Plastic	Laser cutter	3D printing, mill, lathe

- Mill
    - Vertical machining center = VMC (table moves)
    - Gantry style router (tool moves)
- Lathe
- Manual vs CNC
    - CAM, Gcode
- Waterjet
    - Cutting width
- Laser cutter
    - Only certain materials
    - Metal and PVC very bad
- Precision machines vs prototyping machines

Machining tools
- Endmill
- Drill bit
- Turning tool

Processes
- Anodizing
- Welding
- Splining

Shop tools
- Drill press
- Band saw
- Grind wheel
- Hydraulic Press
    - Bearings
- Sheet metal brake
- Cordless Drill
- Sandblaster

Hand tools
- Wrench (need two!)
    - Socket + ratchet
    - Torque wrench
- Caliper
- File
- Deburring tool
- Screwdriver, nutdriver
- Allen key / allen wrench

Fasteners
- Screw / bolt assembly
    - Socket head, hex head, phillips head, flathead
    - Nut, washer
- Shafts: retaining ring / e-clip, shaft collar
- Locking: Cotter pin, safety wire, locknut, locktite

How to Perform a Prior Art Search

1. Brainstorm **keywords** that describe your invention
    a. Think of synonyms and related words
    b. Keep a list of keywords in your engineering notebook.
2. **Google** basic search
    a. Search for products similar to your invention that are already available to buy
3. **Patents** basic search
    a. Go to patents.google.com and search some of your keywords. Browse the patents to get a general idea of what exists.
4. CPC Scheme **Classification**
    a. Look at “Classifications” section of a patent that achieves a similar goal to yours. This will be a good starting point when classifying your own invention.
    b. Search “CPC Scheme” or uspto.gov/web/patents/classification/cpc/html/cpc.html.
    c. Click through and find the classifications(s) that best describes your invention.
    d. Record in your engineering notebook.
5. **In depth** patent search
    a. Search by keyword and search within your classification
    b. Read relevant patents
    c. Read the prior art that they cite
    d. Make a table like the one below and add in any patents you read

Patent number and title	**Similarities to my invention**	**Differences from my invention**	**Other notes**
Many titles are vague, you can add your own description	Is it too similar?	Is the difference an improvement or simply another class?	Ideas for how your invention could be adjusted / improved

6. Search **other sources**
    a. Google patents - patent applications that weren’t patented
    b. Google scholar - journals
    c. Websites
    d. International patents

Homework due next week:
-Finish prior art search
-Final decision on which invention you are going to make and how it will work
-Any questions you have for me so you can decide all the details

At the end of next week’s class your must know exactly how your invention will work!