

# Capstone Design

## ME/MSE/ID/BME/ECE

Common Studio Session #1

Date: 01/08/2024

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# REMINDERS



- ALL Links and Slides are posted here: <http://mecapstone.gatech.edu/students>
- Update your profile on Capstone Marketplace: <https://projects.gatech.edu/>
  - How to guide: <https://mecapstone.gatech.edu/howto>
- Common MS Teams Support Network: <https://mecapstone.gatech.edu/support>
- Attend the 1<sup>st</sup> Lab on Wednesday, 10<sup>th</sup> January at 12:30pm in **Exhibition Hall Midtown Ballroom** to:
  - Present your own project idea (if any)
  - Find team members

# Course Expectations

- **CAPSTONE** – Synthesize knowledge & skills acquired in UG curriculum
  - Identify & apply relevant topics from **earlier courses**
  - Critically **evaluate** designs
- **DESIGN** – Address broad range of requirements
  - *Identify and specify design **requirements***
  - *Apply **systematic design process** to develop a design from problem to a detailed, proof-of-concept design meeting all of the specifications*
- **PROFESSIONAL EXPERIENCE**
  - *Clearly **communicate/document** design ideas and information*
  - *Work collaboratively and responsibly as a **team***
  - *Demonstrate ability to facilitate own learning by identifying design issues and questions that require additional investigation beyond basic undergraduate curriculum knowledge, then formulating appropriate courses of action.*

# Welcome by Dr. Devesh Ranjan

Eugene C. Gwaltney, Jr. School Chair and Professor  
George W. Woodruff School of Mechanical Engineering



# What is Capstone Design all about?

## Goals for the course:

**1. Identify an unmet need**

**WHAT'S THE PROBLEM?**

**2. Invent/design something useful**

**CREATIVITY, INNOVATION**

**3. Apply your analytical knowledge to design it**

**ANALYTICAL SKILLS**

**4. Prove it will work (Simulate it, build it, test it, virtually, physically)**

**MODELING AND HANDS-ON**

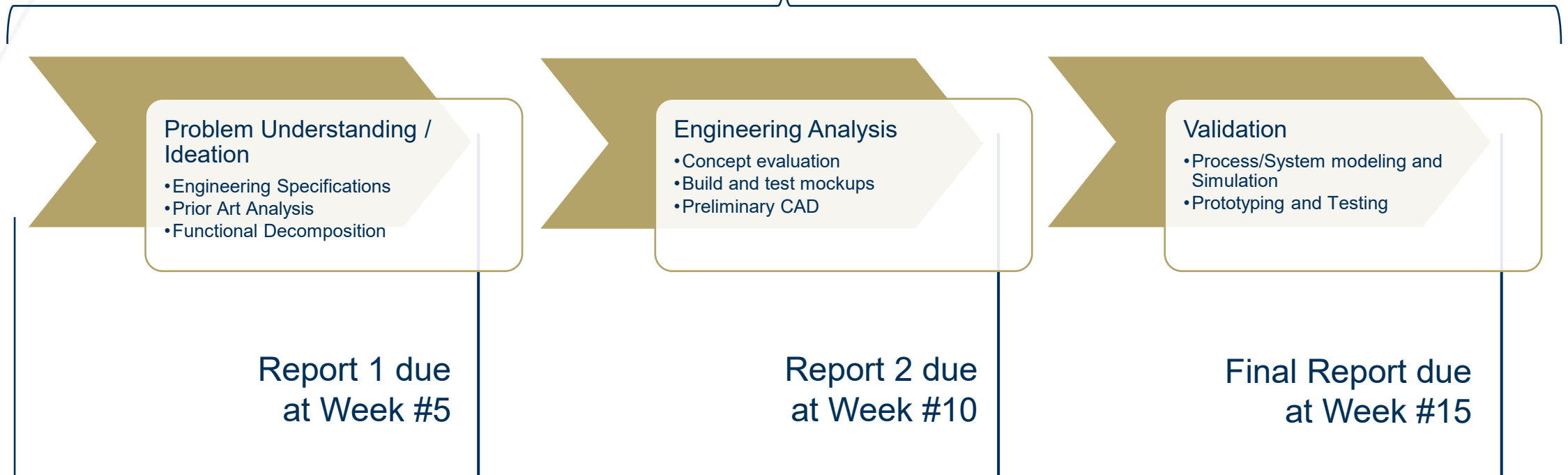
**5. Document your process (reports, presentations)**

**6. Demonstrate it at the Expo**

**7. Give to sponsor for use or patent it and start company**

# Capstone Design Process Timeline

15 weeks | Teams update faculty and sponsors once per week

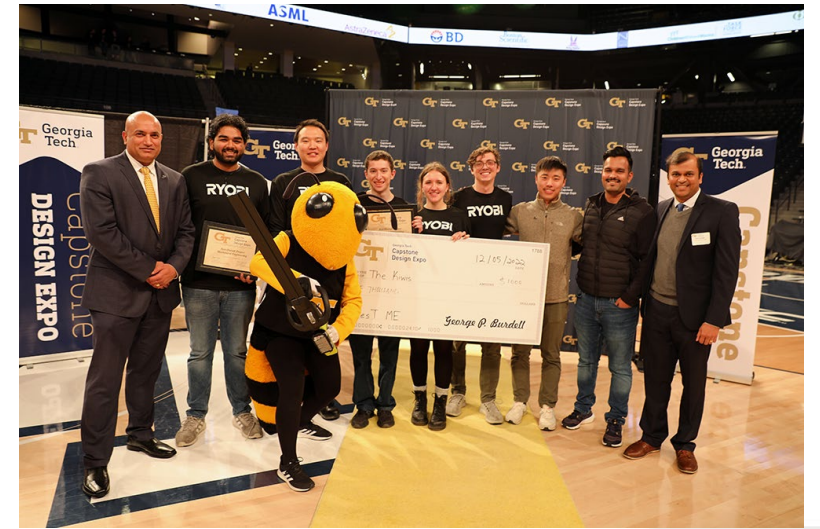
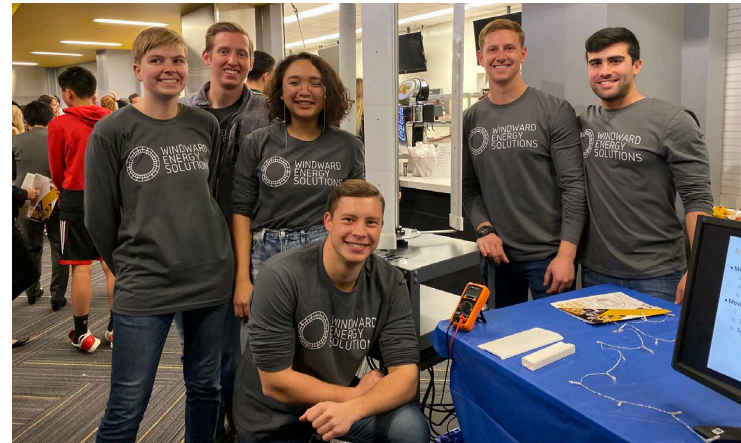


Projects are awarded to the teams and teams are assigned to faculty and expert consultants during first week of the semester



# Georgia Tech Capstone Design Expo

Video from past Expo: <https://youtu.be/G47o7SFTn7o>



**Tuesday, 23<sup>rd</sup> April 4-8pm**



List of Past Projects since Summer 2020:  
[https://capstone.gatech.edu/past\\_projects](https://capstone.gatech.edu/past_projects)

## Course Logistics (starting next week)

- **Studios** on Mondays 12:30 – 2:25pm in CULC #152
- **Labs** on Wednesdays 12:30 – 3:15pm at location TBD
  - Labs are scheduled to work with your team AND discuss your project progress with your team's advisor.
  - Typically, teams meet with their advisor 30-60 minutes per week during this time slot
  - Specific plan (meeting time, date and activity) MAY VARY based on the Instructor assigned to your team



# Capstone Design Topics

- Self Awareness and Team Formation
- User Needs, Stakeholders & Engr. Specifications
- Systematic Engineering Design Process
- Market Research & Marketing
- Prior Art Search and Intellectual Property
- Industrial Design – Ergonomics and Aesthetics
- Risk, Liability, Codes and Standards
- Prototyping Process
- Project Management
- Sustainability – Societal and Environmental Considerations
- Design for X – Assembly, Manufacturing, Service, etc.
- Intrapreneurship/Entrepreneurship



## Course Deliverables – Submit to your *assigned* team advisor

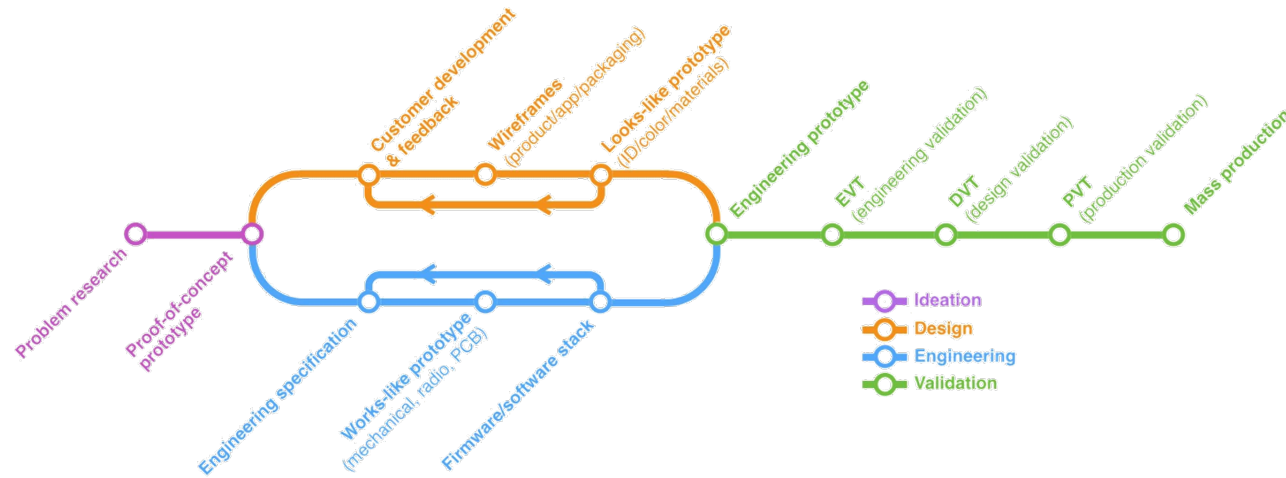
- Team Deliverables (75%)
  - Interim Report and oral presentations around week #5 and #10
  - Final Report, Final Presentation, Fab package after the Expo
  - Weekly lab deliverables (at the discretion of your assigned team advisor)
- Individual Deliverables (25%)
  - Class participation
  - Individual presentation on behalf of team
  - Peer & Instructor evaluation
- ***All team members need not receive the same grade!***
  - Check with your assigned team advisor for specific grading policies

Faculty may assign a higher weightage to later written reports if they notice a substantial improvement.

# Design your *product*... ... not your *prototype*



Cardboard iPhone Scanner made by designer Kyle A Koch. Credit Image: [Kyle A Koch](#)



A typical Product Development Timeline (<https://blog.bolt.io/ideation>)



***Prototyping is a means to an end and not an end in itself!***

- *Prototypes are used for refining, exploring, communicating ideas and active learning.*
- *Design of the product can be **validated** by a combination of physical prototypes and analyses (engineering calculations, simulations, etc.)*

# Team Formation & Registration

1. Find team members or call for team members:
  - Based on project interest on <https://projects.gatech.edu/>
  - Based on skills and experience on <https://projects.gatech.edu/>
  - Introduce yourself using common MS Teams: <https://mecapstone.gatech.edu/support>
  - Self-identified/assembled during lab meeting on 10<sup>th</sup> January
2. Team sizes are **4-6** students per team.
3. Create your “Group” on the marketplace website before **5:00pm on Wednesday, 10<sup>th</sup> January**. You can change your group name for the expo at a later date!
  - Refer HOW TO guide for the marketplace here: [https://mecapstone.gatech.edu/marketplace\\_howto](https://mecapstone.gatech.edu/marketplace_howto)

# NDA and IP

## NDA:

- In rare circumstances, a Company's proprietary information must be shared with Georgia Tech, such as with the faculty coordinators and/or Project Team's faculty mentor. In such cases, a confidentiality agreement with the Georgia Institute of Technology (GIT) might have been executed. Student teams working on such projects will be required to accept the GT NDA form (which will be sent after the project is assigned to the team)
- Some projects might only need an NDA between the student team and the company. In such cases, the student team would be required to accept an NDA directly with the company. The students will have to make sure to not disclose any company confidential information to anyone other than their own team (not even their faculty advisor).

## IP:

- For the course, students working on the project typically own the resulting IP that they create, and not Georgia Tech. Hence, students (and not GT) can assign any resulting IP to the company.
- Most **sponsors prepare an IP assignment document** for students to accept at the start of the project.

# Project Types

1. External company sponsored
2. Faculty (**F** prefixed projects)
3. Student idea (**S** prefixed projects)

- For types #1 and #2, check out currently available projects (more are being added) here: <https://projects.gatech.edu/>
- For guidance on how to use the online portal, see this: <http://mecapstone.gatech.edu/howto>
- Examples of past projects are here: [https://capstone.gatech.edu/past\\_projects](https://capstone.gatech.edu/past_projects)

# Elements of a Good Student Project

- What's the problem?
  - NOT "We're going to design a better mousetrap"
- Creative/Innovative - not just an assembly of off-the-shelf parts (room for concept exploration and evaluation)
- Lends itself to analysis
- Sufficient scope for senior design
- Team should have or acquire the skills to complete the project.
- Produce a proof-of-concept and learn from it
  - Design revisions
  - Validate design decisions
- Submit your project idea on the marketplace website before **5:00pm on Friday, 12<sup>th</sup> January**
- You can present your project to the class during this Wednesday's lab
  - Submit your project idea on the [projects.gatech.edu](https://projects.gatech.edu) site. NOTE that it takes a few hours before the project is made visible to the entire class, including yourself AND
  - Prepare a slide about the PROBLEM you are trying to solve

# What is a Good Bid?

**CONVINCE us that you are the best group for the project.**

- What is your understanding of the project?
  - Why do you want the project?
  - What are your skills, talents, and experiences relevant to the project?
  - Anything else that is relevant
- 
- Your team can...
    - Only assign one priority rank per project bid. A rank of “1” means your first choice
    - Submit bids for as many projects as available for your team
    - Your team will be required to work on the project for which a bid was submitted and was awarded by the faculty
    - You are required to submit a bid for your project idea as well
    - Create/Edit/Cancel bids anytime until **5:00pm on Saturday, 13<sup>th</sup> January**
    - Add/remove team members anytime until the same deadline as above



# How are teams matched to projects?

- Two avenues
  - Bid for a sponsored project
  - Propose your own project
- Teams are matched to projects and to faculty (see the FAQ [here](#))
- Even if you plan on bidding for sponsored projects, should have a “Plan B (C, and D)” project idea of your own

# Plan for 1<sup>st</sup> lab on Wednesday, 10<sup>th</sup> January 2024

1

Pick a name tag that corresponds to your **major** per below, write your name and wear

ME

ECE

BME

MSE

ID

2

If you are not in a team, then please seat on the round tables in rows corresponding to your topmost **strength/interest**

CAD Modeling

Analysis/Simulations

Electronics/Circuits

Fabrication

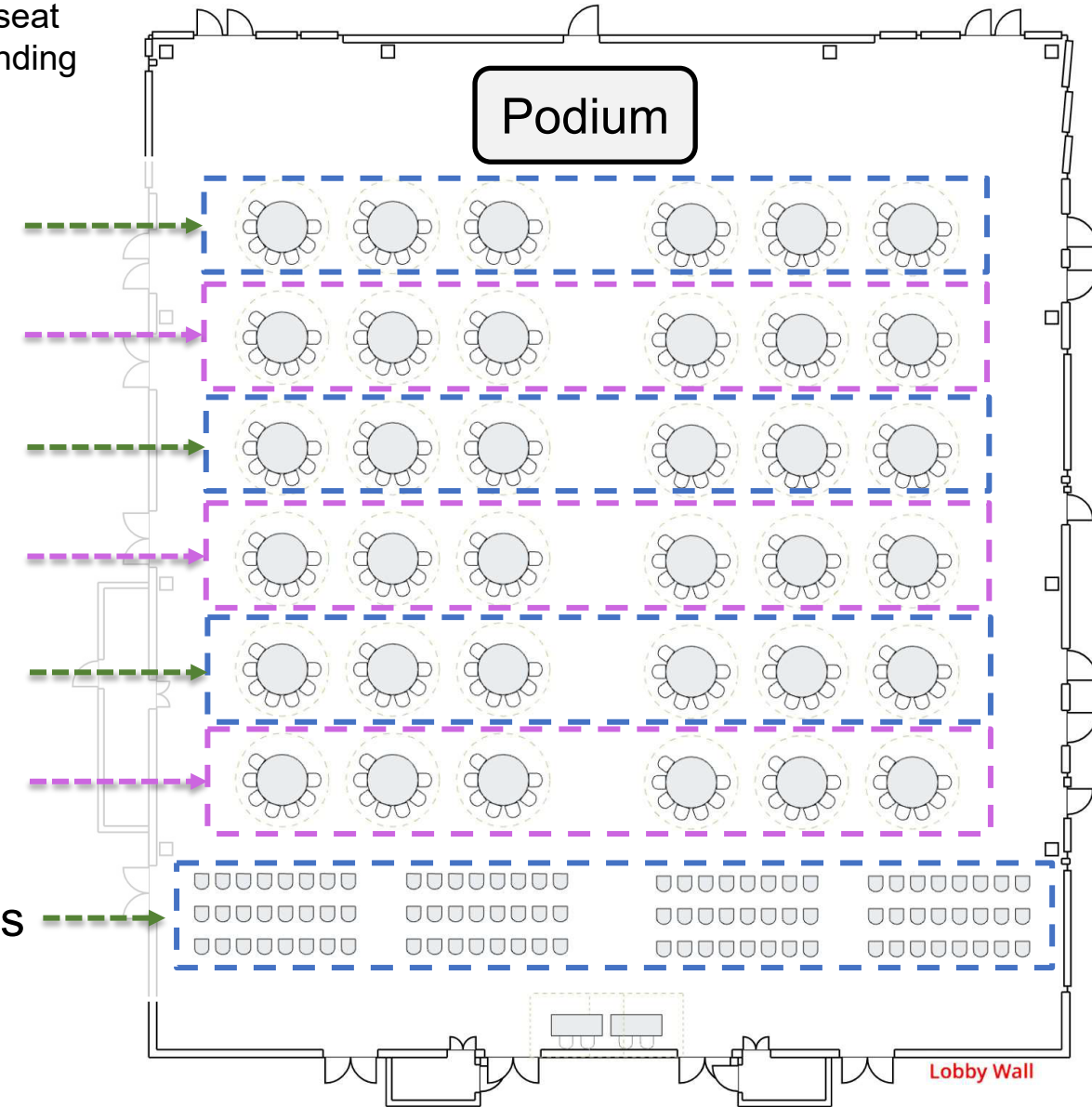
Programming

Any/open

Partial or full teams

Podium

Lobby Wall



# External Projects' Presentation by Sponsors: [LINK to folder with Slides](#)

Sponsor name	Project Title
Vernay Laboratories	01-Elastomer-based Micro-electro-mechanical (MEMS) Pump
Kawneer	02-Develop an Innovative Corner Connection Design & Efficient Assembly Method for Facade Glass Doors
Kawneer	03-Design a Mechanical Connection for High Shear Performance of Composite Profiles
American Baitworks	04-Automated/Robotic Clam/ Bag filling for soft plastic fishing baits
U.S. Army / Marine Innovation Center	05-Cooling Server Stacks
Volvo	06-Vibration Energy Recuperation
Sandia National Laboratories	07-Design of 3D printed soft mechanical metamaterials for energy absorption applications
restor3d	08-Total Shoulder Arthroplasty Retractor Set
Second Sunrise Farm	09-WingWatch - Automated Defense of Poultry from Aerial Predation
Presso	10-Automated Garment Fabric Detection System
Georgia Tech Pediatric Technology Center	11-Get Violet mobile!
Tie Down	12-Easily Installable Piles for Housing Foundations
MeatMaster	13-Safe and effective ways to measure the temperature or doneness of grilled meat
KLA	14-High Performance Imaging Computer Rack - Thermal Design Improvement
KLA	15-Optical Table Cleaning Device
ASML	16-Water phase change plate cooling for magnetically levitated nano-precise scanning stages
ASML	17-High acceleration reticle stage simulator and test rig
Steve Datnow	18-ProjectQ
Woodward 1	19-Arbor Press Safety Improvement
WoodWard 2	20-Pilot Controls Tactile Feedback
Crystal Group	21-Automation Challenge in Crystal Socks Manual Packaging
Prof. Weitnauer (Georgia Tech)	F01-Cappy the Gesturing Caterpillar
Prof. Weitnauer (Georgia Tech)	F02-Dancing Monkey Orchid
Prof. Weitnauer (Georgia Tech)	F03-Hip Hop Sloth
Prof. Li (Georgia Tech)	F04-Mobility Transport - HMI Lab (GM)
Prof. Li (Georgia Tech)	F05-Accessible Vehicle - Hyundai
Prof. Li (Georgia Tech)	F06-Third Rail Theater
Prof. Li (Georgia Tech)	F07-Agrivoltaic Vineyards: Mitigating Climate Change, Developing Sustainable Energy
Prof. Smith	F08-RF Interference of Implantable Medical Devices
Prof. West	F09-Nekton-Autonomous Under-ice Vehicle
Prof. Tinskey	F10-Solar Roof Alternative (Solar Appliance)

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