Communication of Design

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Updated Fall 2015, (Lulay)
University of Portland
Shiley School of Engineering

ME 481 Announcements

- 12/11 – Poster presentations
- 12/11 – Final Project Design Memo posted to your website and emailed to all appropriate parties (all stakeholders). Hard copy to faculty advisors (unless otherwise noted).
- No final exam. Have a great break!

Design Process Stages

1. Defining the problem
2. Concept Development
3. Exploration of Design
4. Prototyping
5. Generation of Design
6. Refinement of Design
7. Communication of Design

[3] Fake Science

7. Communication of Design

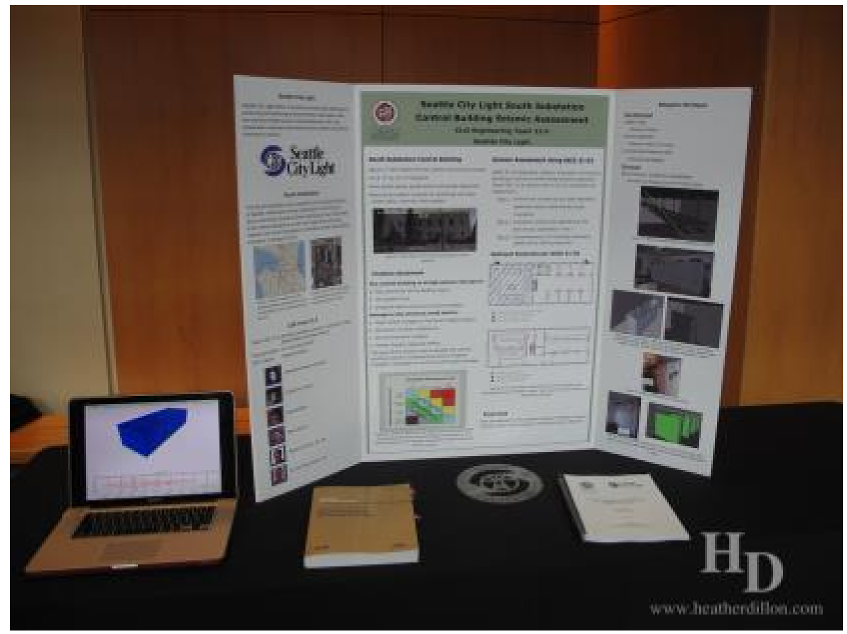
- Goal: Show off your design and highlight key features.
- Review all engineering drawings and clarify/enhance.
- Review all computational and analytical modeling work. Document each assumption and provide concise tables summarizing design alternatives. Make your professors proud of all the physics you know.
- Review and document all experimental testing work. Make it clear what the purpose of each test was and how the design(s) performed. What design objective or constraint did you test?
- Write a report that clearly explains all your design decisions. Use engineering criteria for decisions, not "My Mom thought this was a good idea."

7. Communication of Design - Posters

- Goal: Communicate key design features and preliminary work. Get feedback and insights from professors, industry, and interested strangers.
- Your poster should showcase key insights from Fall semester efforts.
- Your poster should highlight key aspects of the planned design.
- Your poster should capture key questions you are still working on.

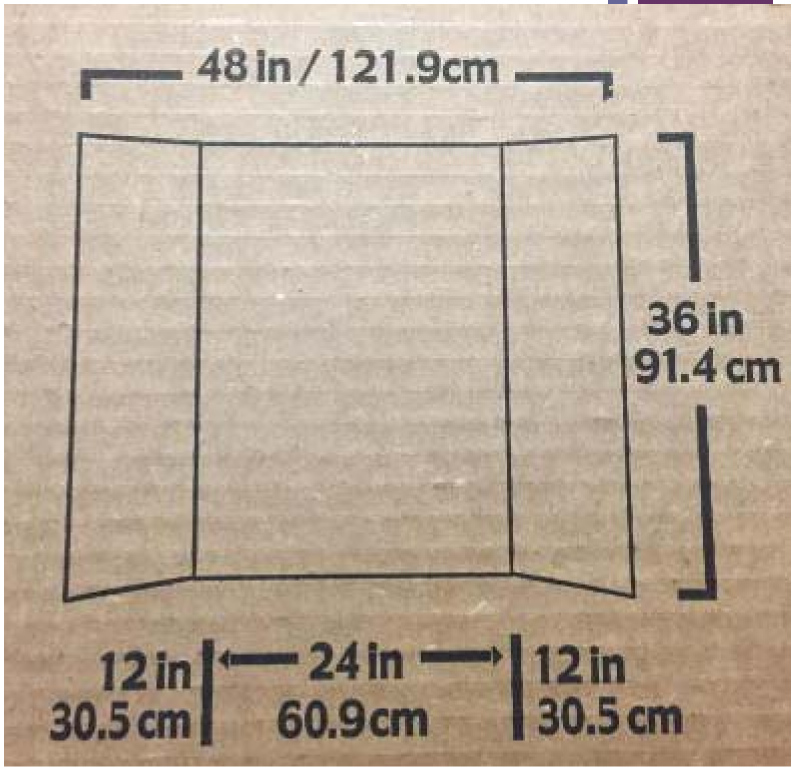
7. Poster Show Logistics

- Setup occurs starting at 2:30pm on Friday.
- Each team will be assigned a number and you need to set up at your designated table.
- Professors and industry advisors will circulate from 3-5pm. At least one member of your team must be at your poster at all times.
- **Before next Tuesday (11/24) you need to invite your industry advisor in a professional, but understand they may not be able to come. <u>cc' instructor on the invetation!</u>**
- If your industry advisor is planning to attend please let your course instructor know so we can get them a parking permit.



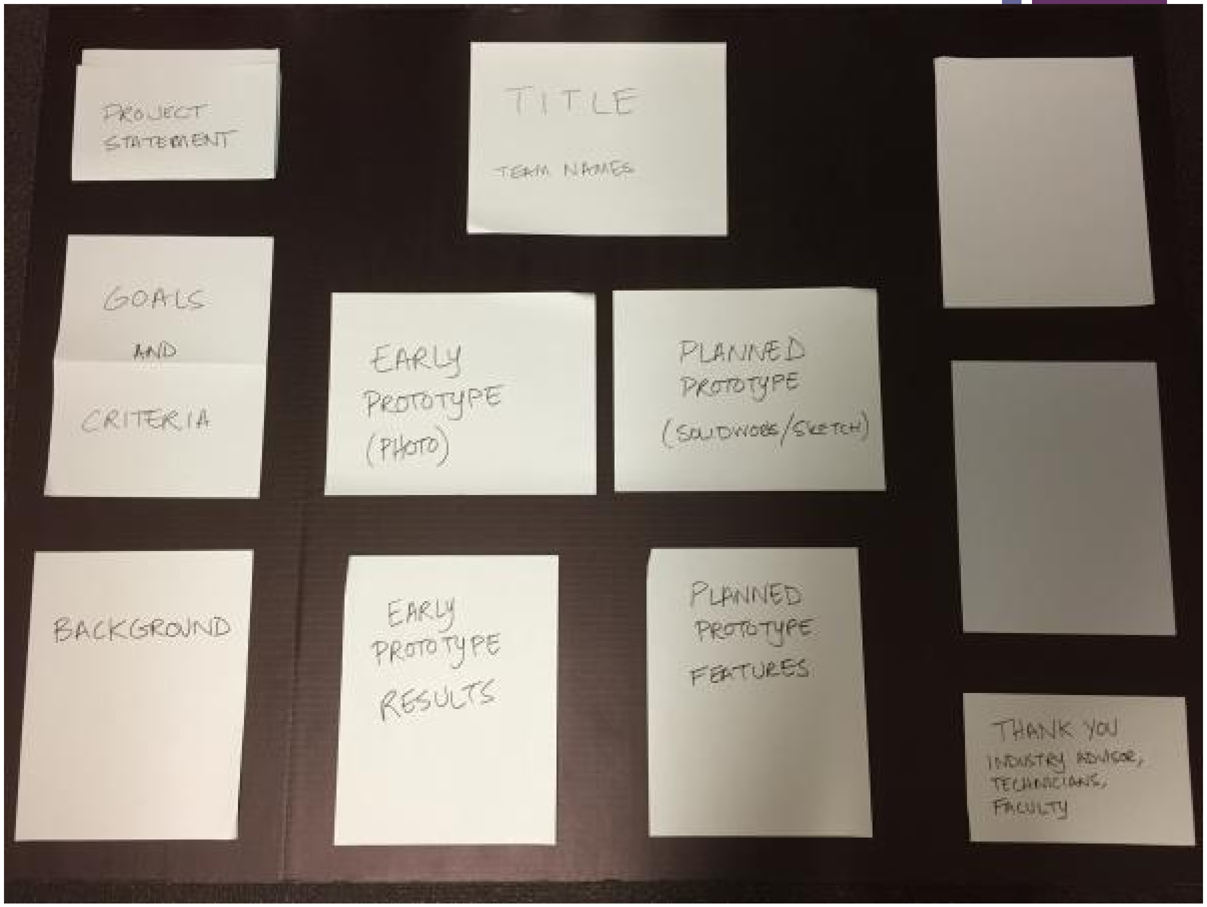
7. Poster Format

- Tri-fold poster board with dimensions shown (larger is ok as long as it fits on table). Buy at staples, office max, michaels, Fred Meyers, etc.
- Each team will be assigned a table. Put your poster on the table and place your preliminary prototype on the table in front of the poster.
- Consider adding additional visual components like a video or slideshow on a laptop or tablet.
- One member of your team must stay with the poster at all times. Take turns so everyone can circulate.



7. Communication of Design - Posters

- Each element of your poster must be composed of standard 8.5x11 pieces of paper. May be color or black and white.
- You are encouraged to compose the papers in power-point or word.
- You are NOT authorized to use the plotter for the December posters. Ink is expensive. If you want to plot you may pay for offsite printing on your own.



7. Required Poster Elements

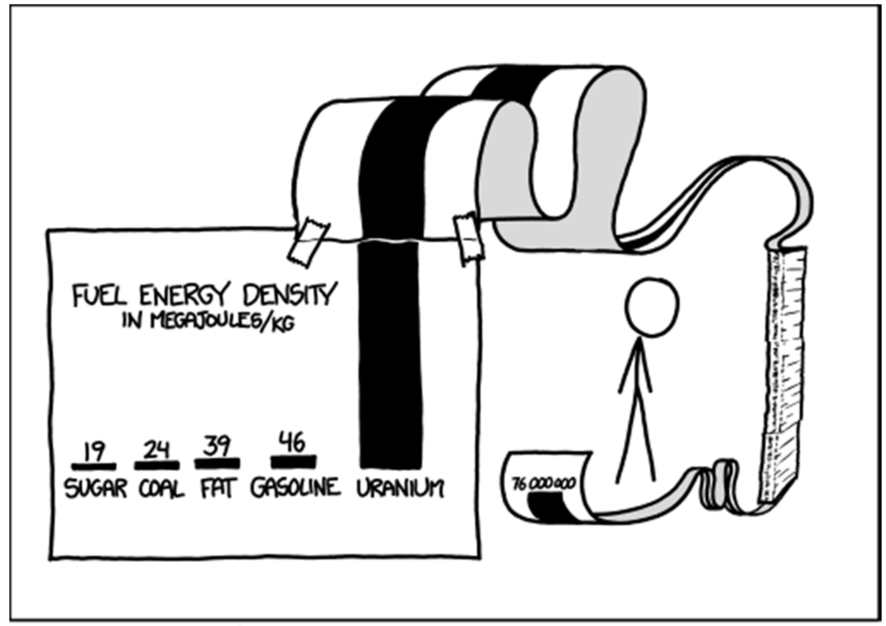
- Project statement.
- Goals and Criteria
- Background. Include professional citations from literature, patents, etc.
- Photo of early prototype. If your team does not have a prototype some other elements of testing or proof of concept should be provided.
- Early prototype results. Discuss key insights from your work, present findings and data.
- Planned prototype. Sketch or engineering drawings that show the vision for the spring semester.
- Planned prototype features. List key features and explain how awesome your project will be.
- Optional elements. Include other project pieces you are proud of. Pose questions you would like input on. (house of design would be good)
- Acknowledgements. Include a short thank you to your industry advisor, your faculty advisor, other faculty that helped you, your technicians, anyone who donated materials/parts, your mom, etc.

Team ICE

1. Discuss the poster requirements. What will you put in each box on the poster? What optional elements will you include? Can you include a video or multi-media element on the table?

2. Assign responsibility for each poster element to a team member. Assign one member responsibility for purchasing the poster board. Make a reasonable deadline for each element. DO NOT glue the poster together Friday morning, every poster board in north Portland will be sold out.

3. What is the one thing you want everyone who looks at your poster to remember about your project?

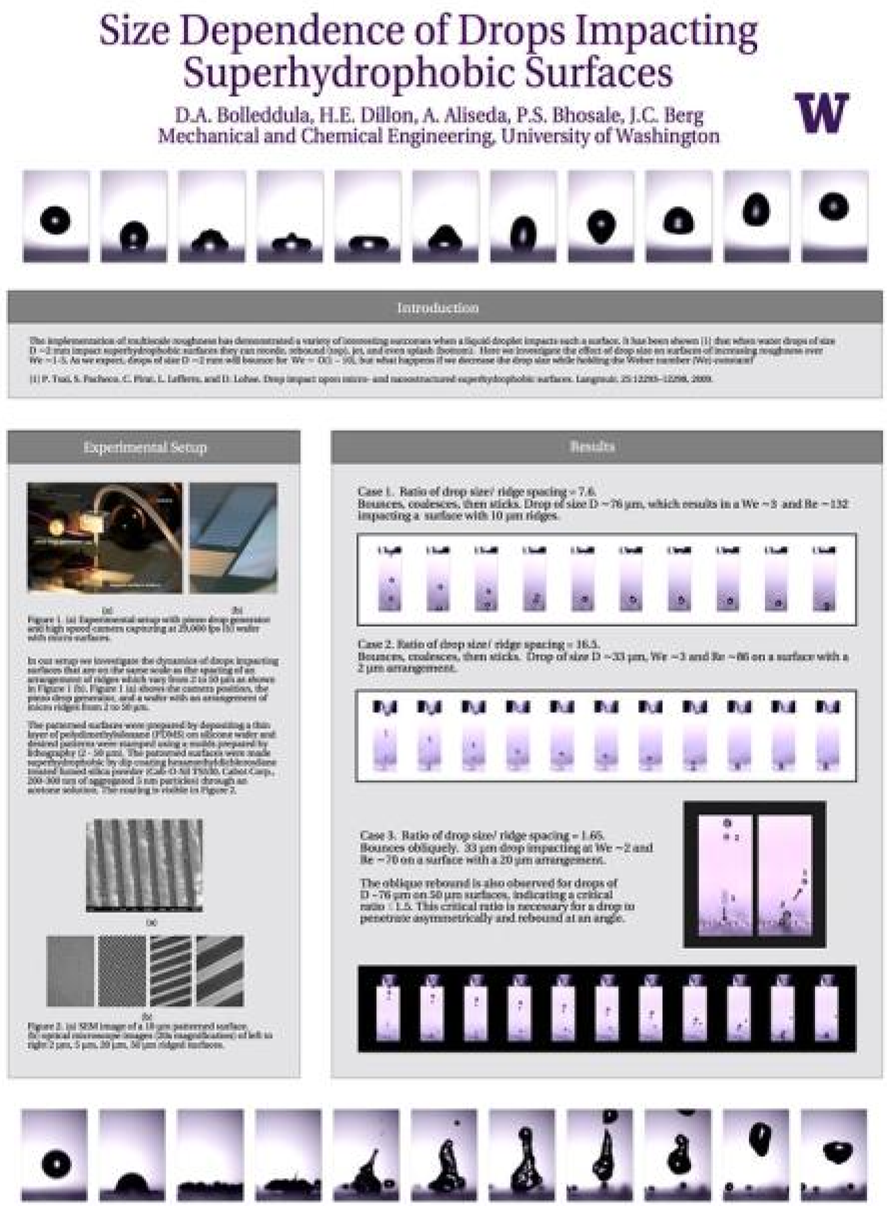


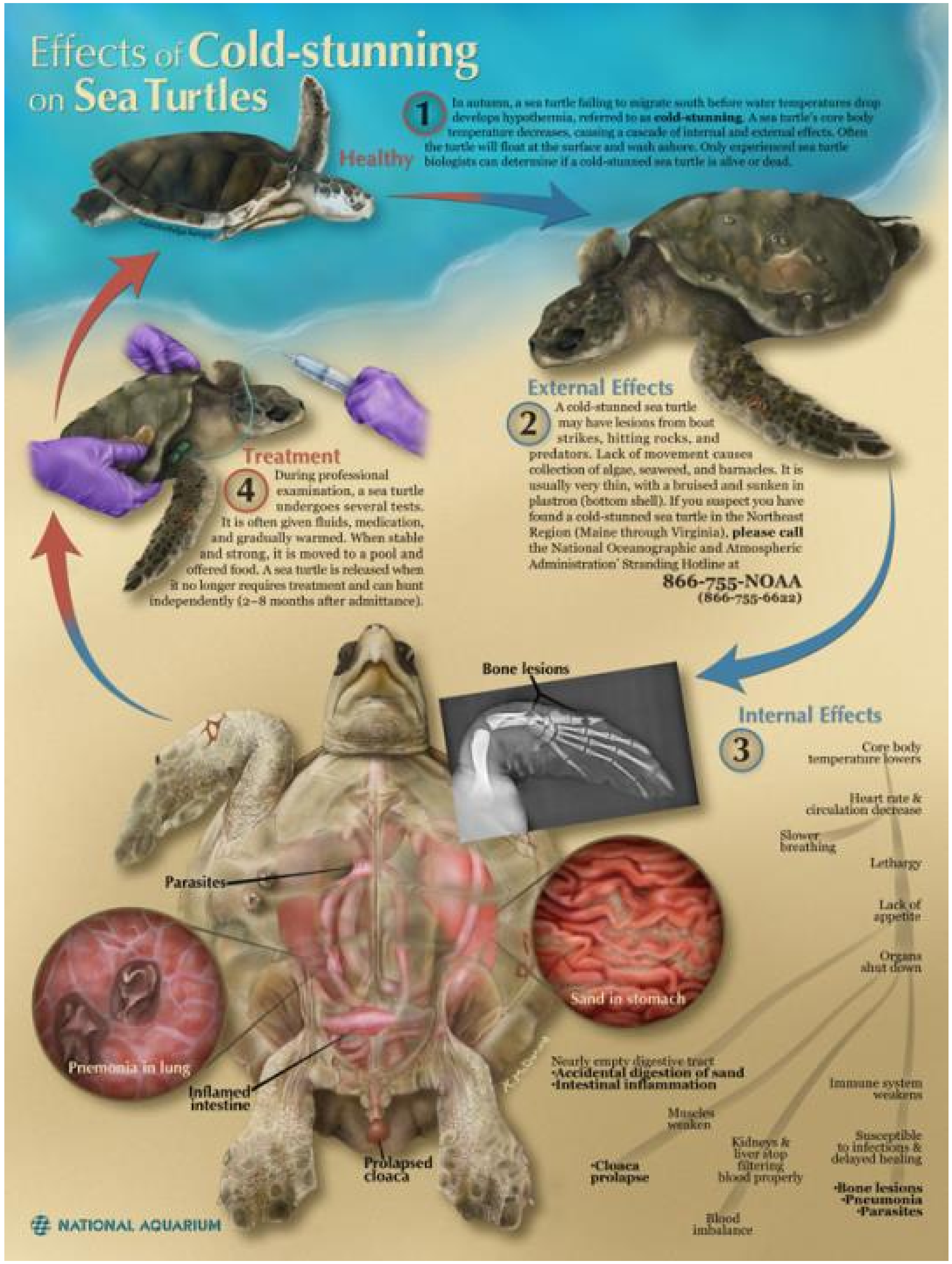
SCIENCE TIP: LOG SCALES ARE FOR QUITTERS WHO CAN'T FIND ENOUGH PAPER TO MAKE THEIR POINT *PROPERLY*.

How to make your poster the best

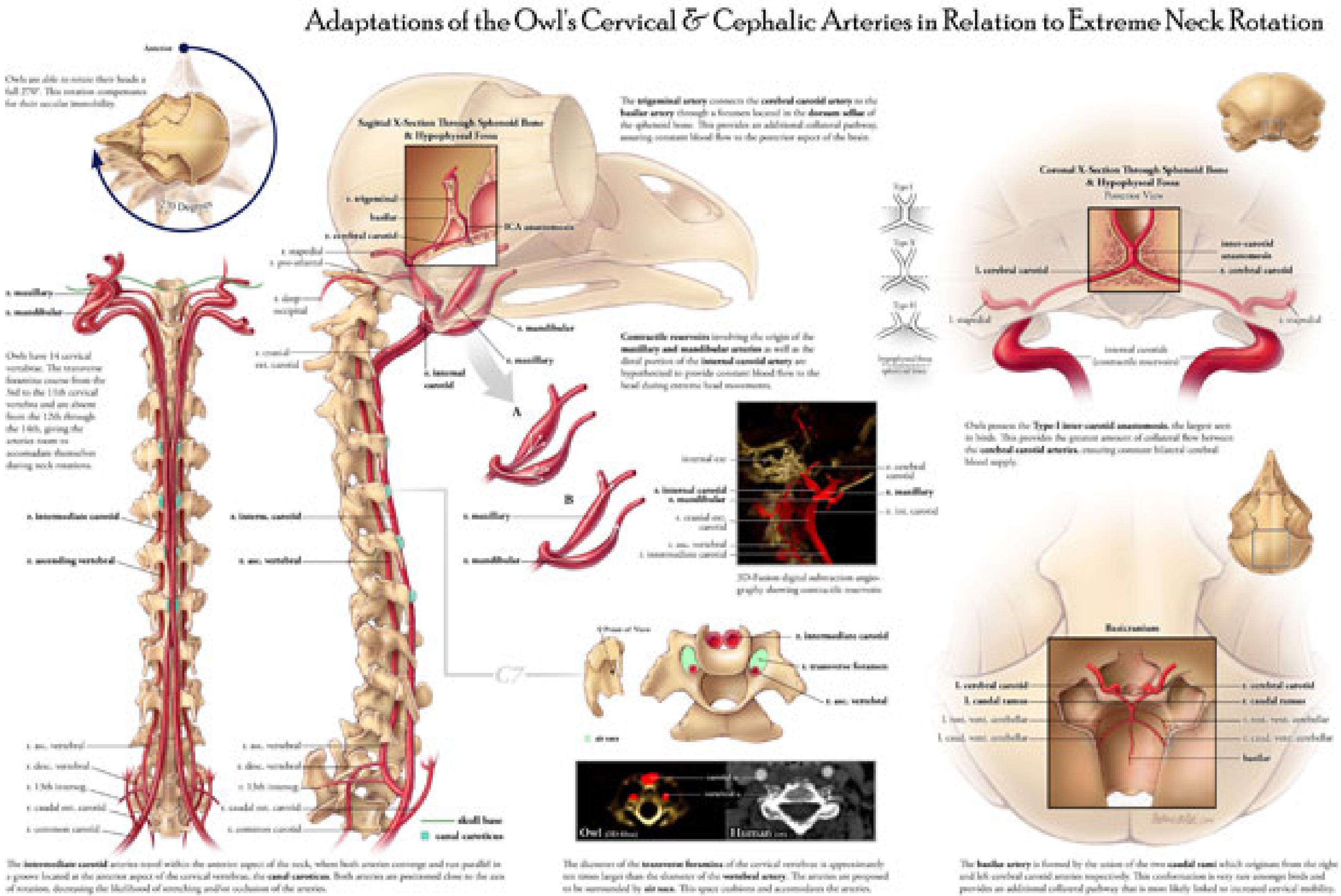
- Limit the use of words. Big blocks of text are hard to read on a poster. Instead use figures, sketches, and bullets whenever possible.
- Take time to make the font and colors of each page match and be attractive. Orange and blue do not match.
- Look at examples of great posters. Be inspired and try to mimic what they did.
- Brainstorm: What is the one thing you want everyone who looks at your poster to walk away thinking? Now plan your poster to make that a reality.

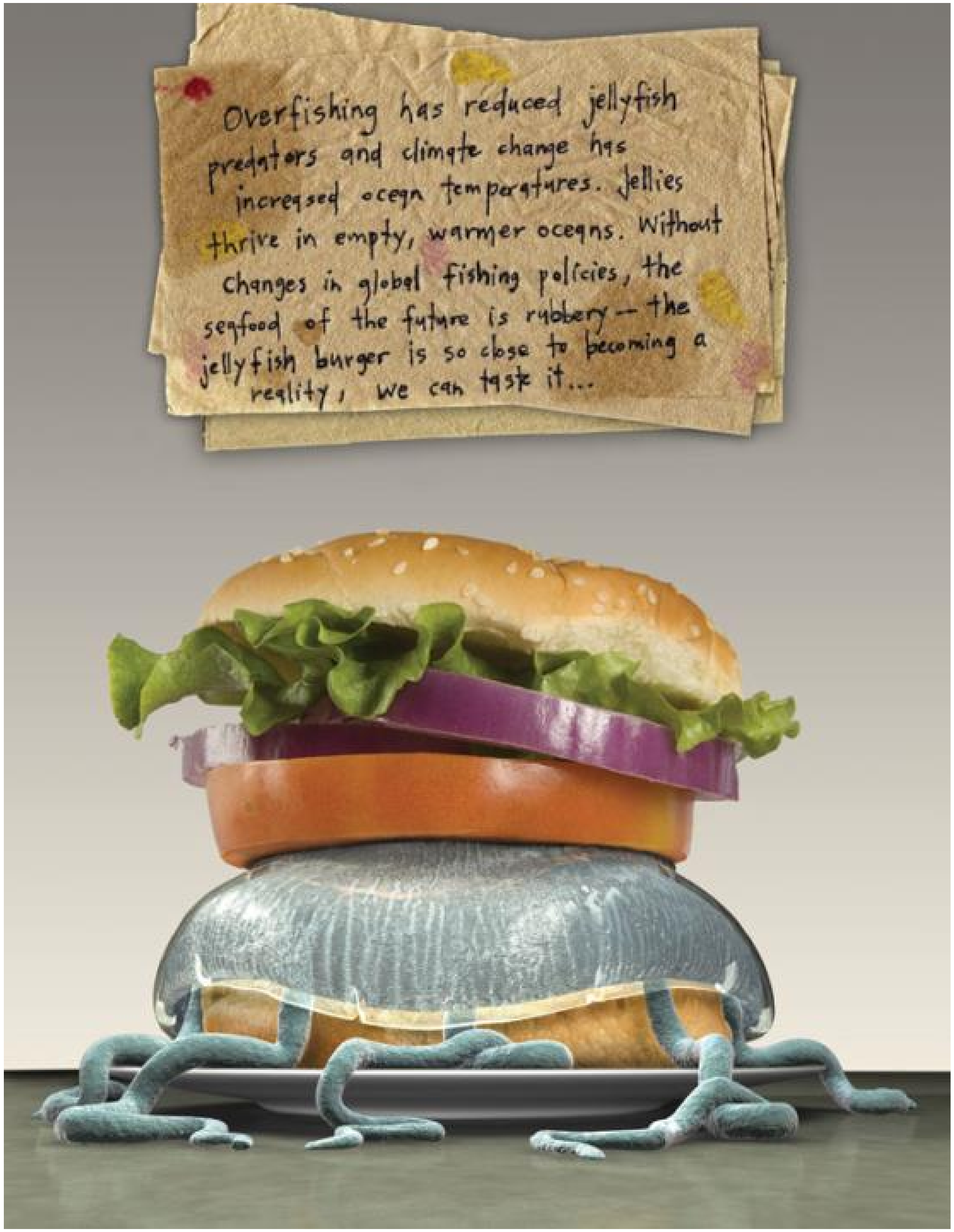

SEATTLE UNIVERSITY
Small Hydro Electrical Generation Using a Water Wheel as a Prime Mover
Problem Statement
System Design
Testing
Power Characteristic
Electrical Schematic


Size Dependence of Drops Impacting Superhydrophobic Surfaces
D.A. Bolleddula, H.E. Dillon, A. Aliseda, P.S. Bhosale, J.C. Berg
Mechanical and Chemical Engineering, University of Washington
Introduction
Experimental Setup
Results
Case 1. Ratio of drop size/ ridge spacing ~ 7.6.
Bounces, coalesces, then sticks. Drop of size D ~76 μm, which results in a We ~3 and Re ~132 impacting a surface with 10 μm ridges.
Case 2. Ratio of drop size/ ridge spacing ~ 16.5.
Bounces, coalesces, then sticks. Drop of size D ~33 μm, We ~3 and Re ~86 on a surface with a 2 μm arrangement.
Case 3. Ratio of drop size/ ridge spacing ~ 1.65.
Bounces obliquely. 33 μm drop impacting at We ~2 and Re ~70 on a surface with a 20 μm arrangement.
The oblique rebound is also observed for drops of D ~76 μm on 50 μm surfaces, indicating a critical ratio ≥ 1.5. This critical ratio is necessary for a drop to penetrate asymmetrically and rebound at an angle.



Effects of Cold-stunning on Sea Turtles
Healthy
1 In autumn, a sea turtle failing to migrate south before water temperatures drop develops hypothermia, referred to as **cold-stunning**. A sea turtle's core body temperature decreases, causing a cascade of internal and external effects. Often the turtle will float at the surface and wash ashore. Only experienced sea turtle biologists can determine if a cold-stunned sea turtle is alive or dead.
External Effects
2 A cold-stunned sea turtle may have lesions from boat strikes, hitting rocks, and predators. Lack of movement causes collection of algae, seaweed, and barnacles. It is usually very thin, with a bruised and sunken in plastron (bottom shell). If you suspect you have found a cold-stunned sea turtle in the Northeast Region (Maine through Virginia), **please call** the National Oceanographic and Atmospheric Administration' Stranding Hotline at
866-755-NOAA
(866-755-6622)
Treatment
4 During professional examination, a sea turtle undergoes several tests. It is often given fluids, medication, and gradually warmed. When stable and strong, it is moved to a pool and offered food. A sea turtle is released when it no longer requires treatment and can hunt independently (2–8 months after admittance).
Bone lesions
Internal Effects
3
Core body temperature lowers
Heart rate & circulation decrease
Slower breathing
Lethargy
Lack of appetite
Organs shut down
Parasites
Sand in stomach
Pnemonia in lung
Inflamed intestine
Prolapsed cloaca
Nearly empty digestive tract
•Accidental digestion of sand
•Intestinal inflammation
Immune system weakens
Muscles weaken
Kidneys & liver stop filtering blood properly
Susceptible to infections & delayed healing
•Cloaca prolapse
•Bone lesions
•Pneumonia
•Parasites
Blood imbalance
NATIONAL AQUARIUM


Adaptations of the Owl's Cervical & Cephalic Arteries in Relation to Extreme Neck Rotation
270 Degrees
A
B
C7
Owl
Human


Overfishing has reduced jellyfish predators and climate change has increased ocean temperatures. Jellies thrive in empty, warmer oceans. Without changes in global fishing policies, the seafood of the future is rubbery -- the jellyfish burger is so close to becoming a reality, we can taste it...

Thermal Performance of A-19 LED Products

University of Portland

Robin Rackerby, Thomas Storey, Lydia Gingerich, and Heather Dillon. Shiley School of Engineering, University of Portland

Abstract

Recent technological advances have made LEDs (light emitting diodes) available to the domestic replacement light bulb market. These bulbs use significantly less electrical power to produce an equivalent amount and quality of light as other available bulbs types: incandescent and compact fluorescent. Longer life, higher efficiency, and reduced environmental impact have motivated both government and industry leaders to invest in these lighting systems. While LED bulbs use significantly less power, operate at lower bulb temperatures, and do not contain mercury, they require a heat dissipation system that may not be optimized by current product manufacturers. This research uses modern heat transfer equipment and analysis to model the typical thermal performance for domestic A19 type replacement LED bulbs. Data collected on more than 20 typical LED products indicates that improvements to the current heat exchangers design could maximize convection heat transfer in the LED products.

Research Questions

- Quantify thermal performance of a broad range of products
- What type of heat exchanger performs best in present products, and how could we improve them?
- What are the characteristic temperatures in a worst case situation? Best case situation?
- How much energy is the heat exchanger transferring?

Testing Procedure

1. Local, commercially available products purchased off the shelf.
2. Products cataloged and manufacturer rated power, light output, and specifications recorded.
3. Infrared photography used to characterize "hot spots" and plan thermocouple placement.
4. Thermocouples placed to quantify radiation and convection heat transfer from the product.
5. Testing conducted for 5-6 hours, steady state operation in a specially designed thermal testing chamber that mimics worst-case recessed ceiling placement.
6. Data processing and analysis.

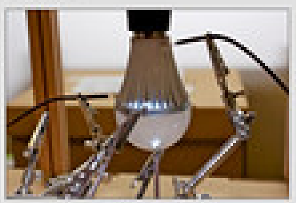


Figure 1: Thermocouple placement. Each thermocouple is fixed to the LED product with thermal epoxy.

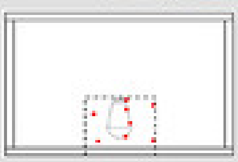


Figure 2: Conceptual placements of thermocouples and LED product in insulated lighting test apparatus.

Results

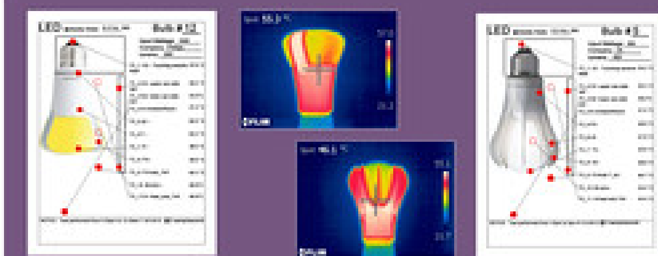


Figure 3: Example testing results and infrared images for two types of LED products.

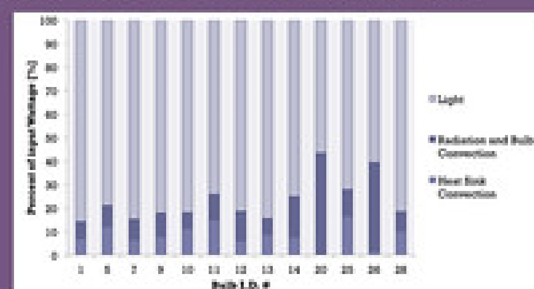


Figure 4: Summary of energy output of LED products tested. Most products are very efficient and produce primarily light, however convection should be increased to improve operation.

Data Analysis

- Temperature data is used to calculate radiation and convection leaving the product.
- Convection from the heat sink and the bulb area are calculated separately.

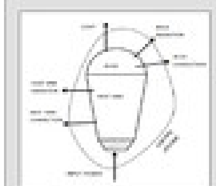


Figure 5: Control volume indicating transfer of energy to and from light product.

Preliminary Conclusions

- If convection is enhanced in products, the cost and weight of the heat exchangers will be reduced, making the products more environmentally and energy efficient.
- This research confirms that most A-19 products are not optimized for turbulent natural convection flows, although the temperature difference in the system would support them.
- Future research will focus on optimization of heat exchanger designs to enhance the performance of the products using several tools: computational fluid dynamics (CFD) models, advanced mathematical models for heat exchangers, and fluids visualization with the UP Schlieren system.
- For more information contact Dr. Heather Dillon, dillon@up.edu

Acknowledgements: Thanks to Dean Sharon Jones for the financial support of this project. Additional thanks to colleagues at the Pacific Northwest National Laboratory for discussion, brainstorming, and product details.