



SKIN COLOR MONITOR

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POINTS OF INTEREST

- Problem Statement
- Physiology of Hot Flashes
- Current Devices
- Previous Semester's Work
- Design Alternatives
- Final Design
- Testing Methods
- Summary
- Questions?



PROBLEM STATEMENT

- A skin color monitor that records color changes that occur during hot flashes, which could be used to **provide the objective measurement needed for therapeutic drug testing for menopausal women**. The device is to be capable of discerning color changes while remaining **small and at a low cost**. The device **adheres to the skin in the upper chest region**. An LED will shine light onto the skin and a photodiode will register the change and that will affect the output voltage. The changes in the voltage are **recorded every 10 seconds**.



PROBLEM STATEMENT

- Records color changes during hot flashes
- Provide objective measurement for therapeutic drug testing
- Small and low cost
- Adheres to upper chest
- Readings recorded every 10 seconds



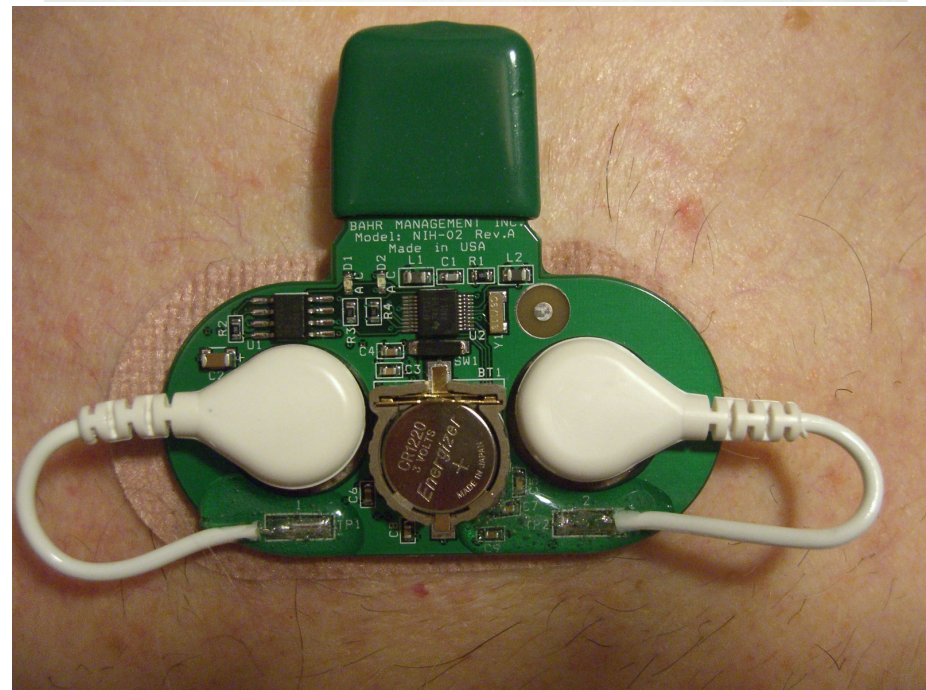
WHAT IS A HOT FLASH?

- Sudden onset of body warmth including flushing and sweating
- Low estrogen levels
- Hypothalamus registers high body temperature
 - Increased heart activity
 - Blood vessels dilate
 - Blood flow increases
 - Blushing
 - Heat loss from surface of skin
- Socioeconomic influences



CURRENT DEVICES

- Journals
 - Unreliable, subjective
- BIOLOG
 - Device by UFI
 - Too heavy, bulky
 - \$4200
- Temperature Sensors
- Professor Webster's Skin Conductance Device
 - Analyzes different data



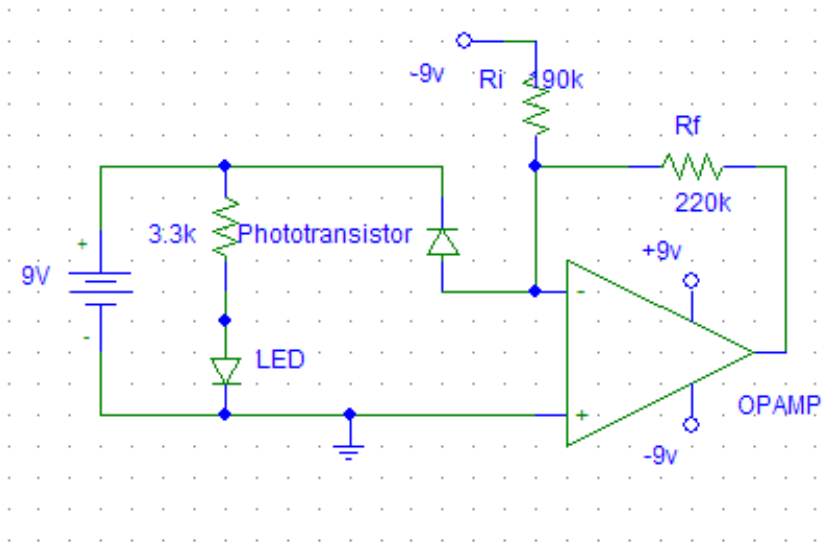
FALL 2007 PROGRESS

- Blue LED
 - Researched to discover wavelength best in region of red light
 - Blue suggested by Kevin Eliceiri – showed greater difference than red light
- Housing
 - Black polycarbonate case with acrylic shield
 - 3.8 cm x 1.4 cm
- Future Work
 - Develop method of attachment
 - adhesive
 - band



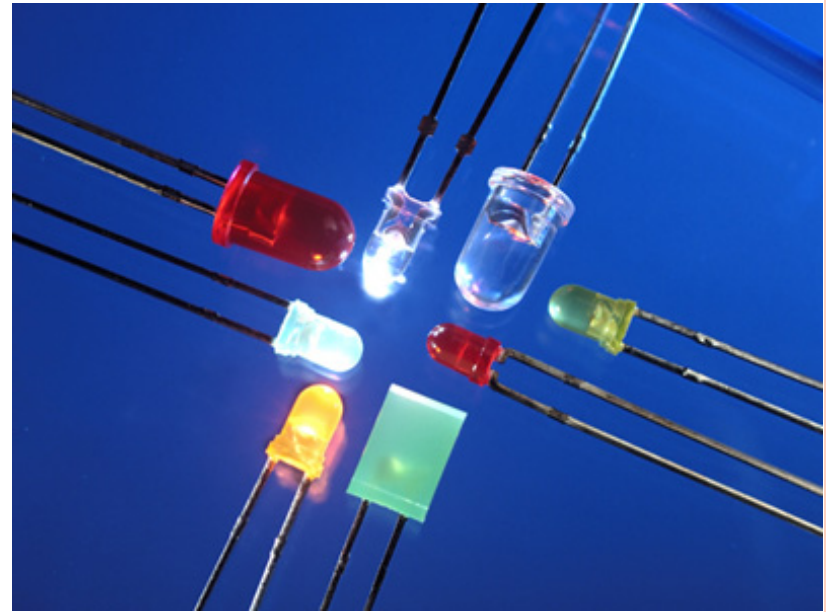
SPRING 2008 PROGRESS

- Modified Housing
 - Dome shape (aesthetics), small acrylic clear plate (safety and weight)
 - Maintained similar size aspects
- Designed more complicated circuitry
 - Differential amplifier
 - LED, phototransistor, and op-amp branches
- Blue LED
 - Tested to pick up color changes
 - Recommended more testing for different colors, ethnicities, and purchasing different brand

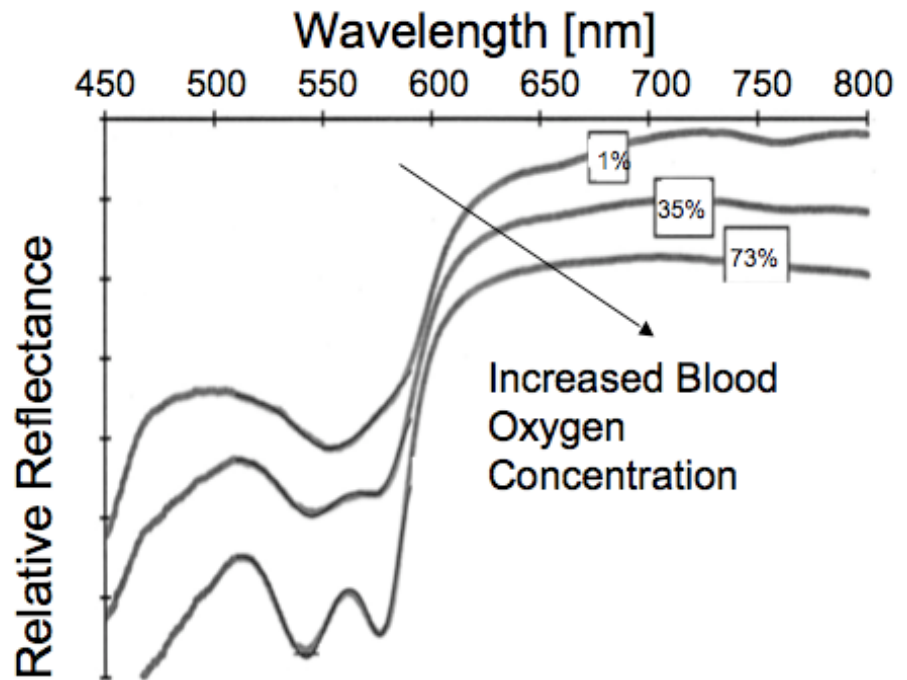
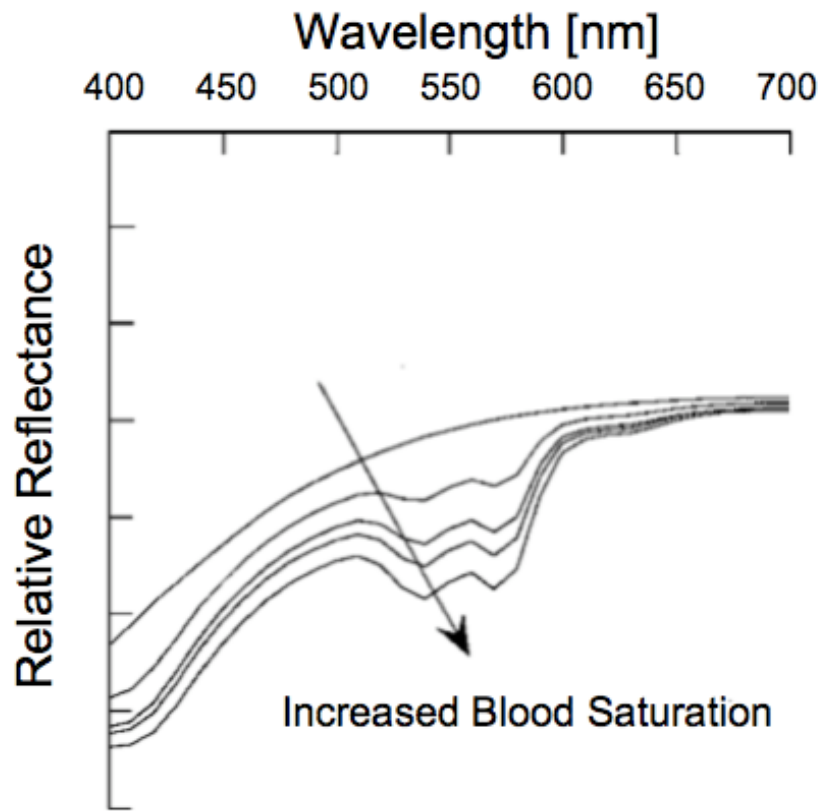


DESIGN ALTERNATIVES

- Different LED Colors/
Wavelengths
- Multiple LEDs and sensors
- Lasers, gratings,
other light emitters
- Smaller sensor housing
- Acrylic shield sunken into housing
- Variable gain circuit with potentiometers



BIOLOGICAL RATIONALE



FINAL DESIGN

- Continue with single LED design
 - Simplicity
 - Previous testing shows promising results
- Smaller sensor housing
 - Sunken in acrylic plate
 - Possible rapid prototyping



TESTING METHODS

- Test response of various colors of LEDs
 - Controlled intensity
 - Test on skin
- Circuitry
 - Low pass filters
 - Correct gain
 - Correct offset
- Reliability
 - LED and circuit lifespan



SUMMARY

- Want to detect hot flashes using skin color
- Two semesters of progress already
- Main approaches this semester
 - Circuitry
 - New housing
 - LED selection
 - Testing



QUESTIONS?

