embr labs

One person's experience creating a wearable

Mike Gibson, Girls Who Build 2014

What we'll talk about

Selecting a problem:

Concept generation and ideation

You have a problem, so solve it:

Applying technical know-how to solve problems

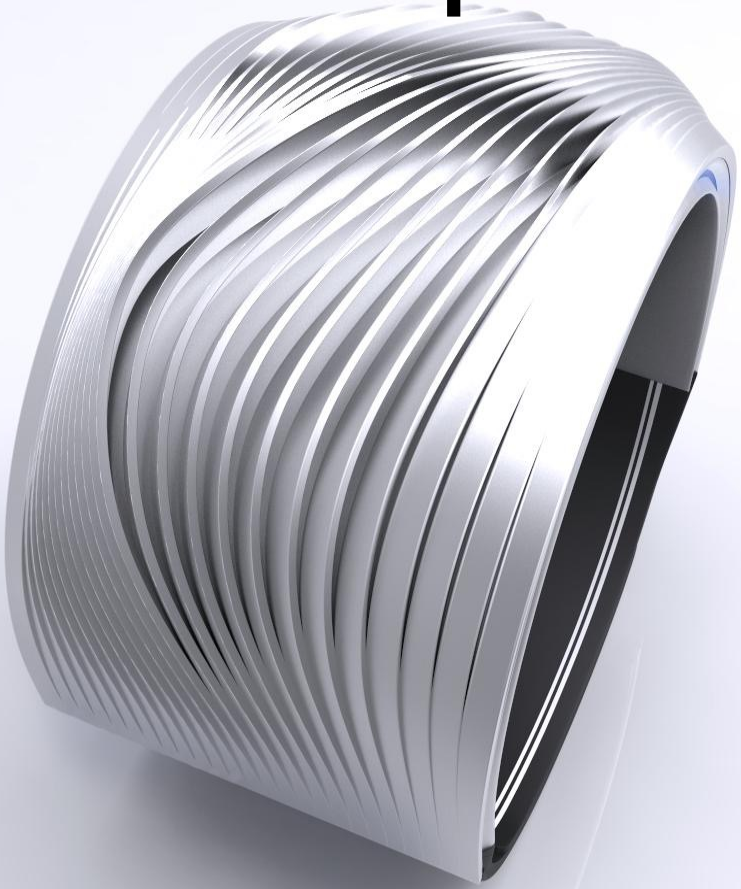
Making a solution into a product:

The iterative, engineering process

The journey of starting a small company

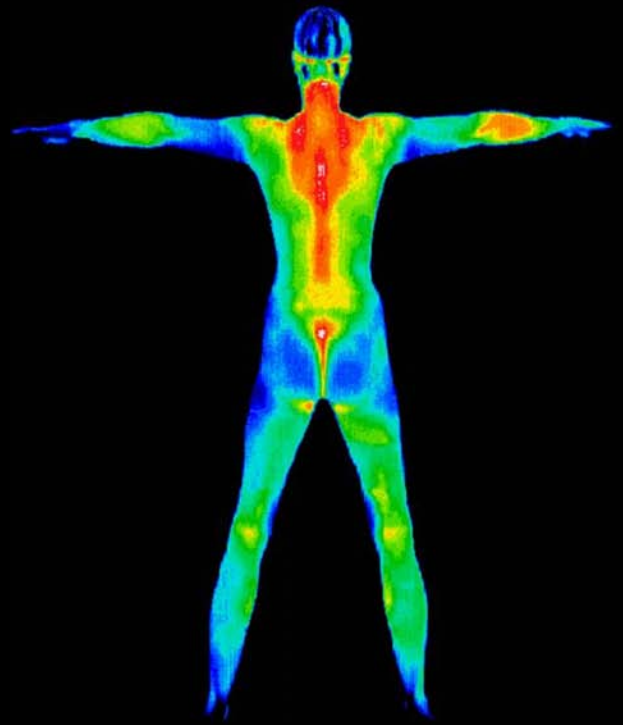
the problem: **thermal** is **personal**

the solution: a **personal thermal** wearable



Our wristband is an **intelligent**, **connected** and **personal** heating and cooling solution.

the challenge

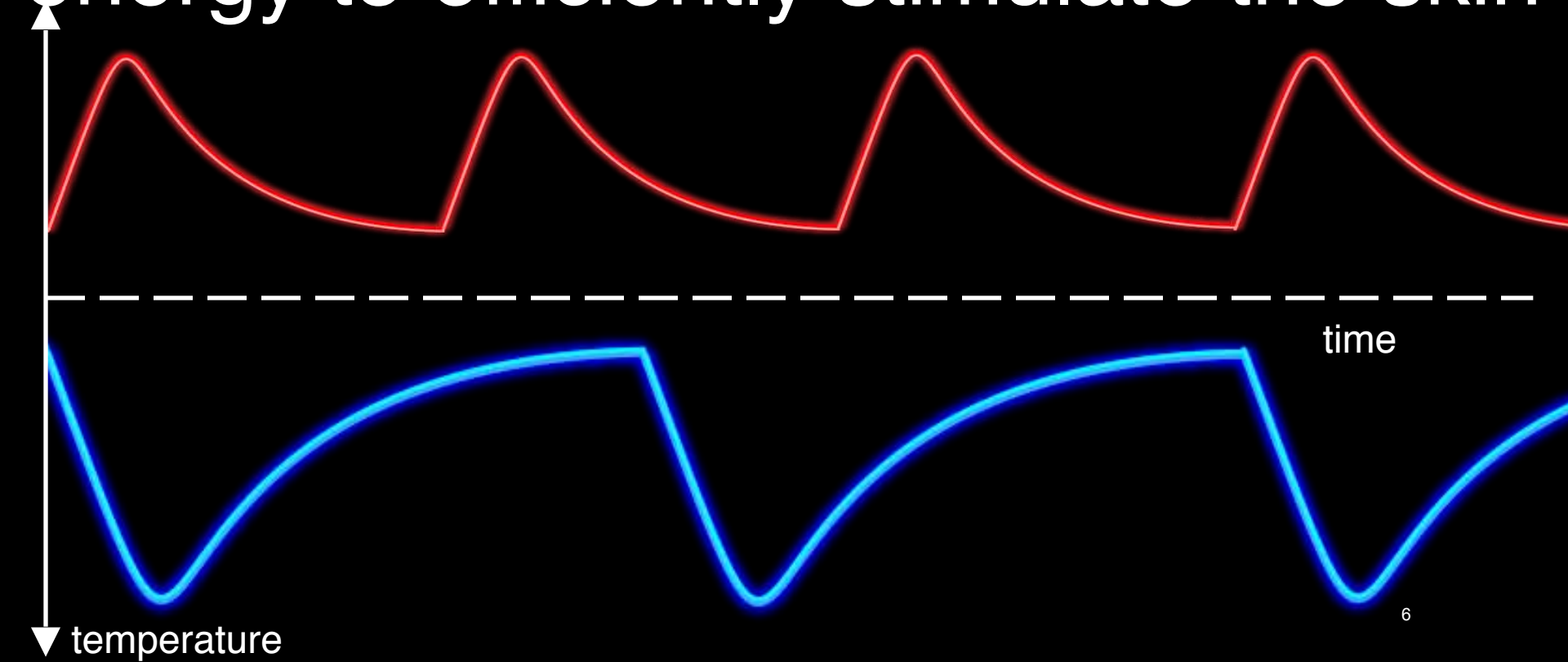


the opportunity:
our skin

comfort depends on both core and **skin temperature**

our skin responds strongly to **temperature changes**

Pulsed heating and cooling uses less energy to efficiently stimulate the skin



Technology selection: how to generate pulsed heating and cooling in a small form factor?

	Fan	Pumped water	Phase change	Evap. water	Peltier cooling
Tunable ΔT	✓	✓	X	X	✓
ΔT rapid and reversible	X	X	X	X	✓
Quiet	X	X	✓	✓	✓
No moving parts	X	X	✓	X	✓
Lifetime	?	?	X	X	?

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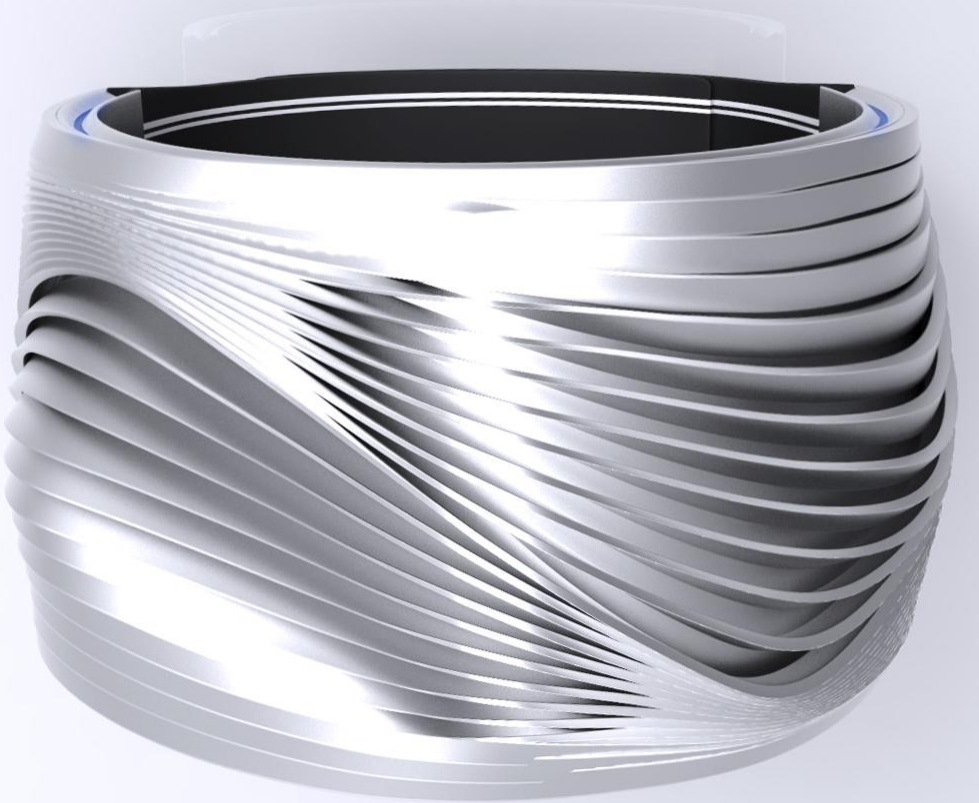
an **energy-efficient** personal thermal solution



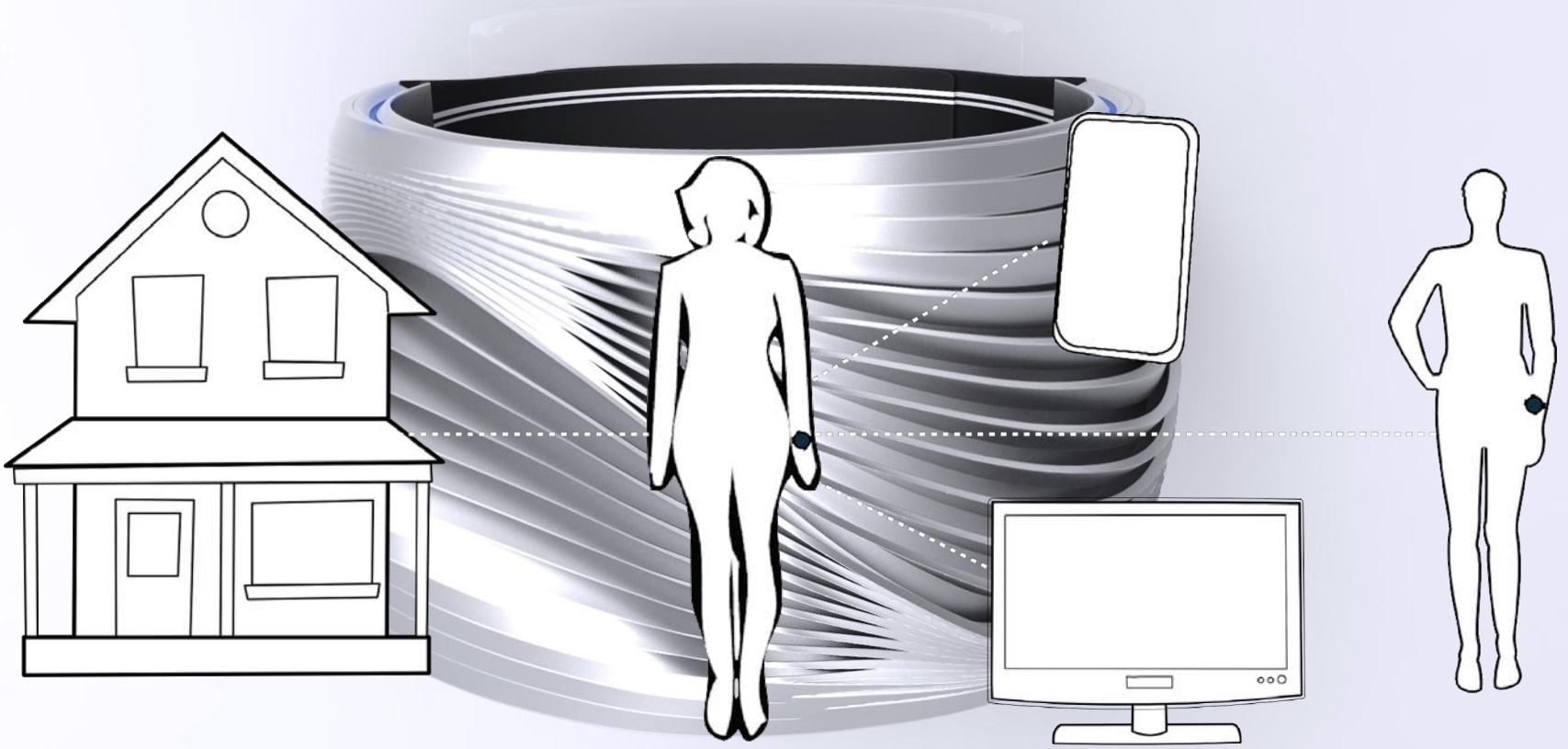
an **intelligent** personal thermal solution

temperature monitoring

adaptive learning

predictive operation

a **connected** personal thermal solution



The iterative engineering process

Keep in mind: never try to do everything at once! It’s too hard.

Engineers break projects into **steps**, representing testable **hypotheses.**

The iterative engineering process

Hypothesis 1: People will like pulsed heating and cooling

Step 1: Building something that pulses heating and cooling.

So… we made a heating and cooling box!

The iterative engineering process

Hypothesis 2: People want wearable heating and cooling

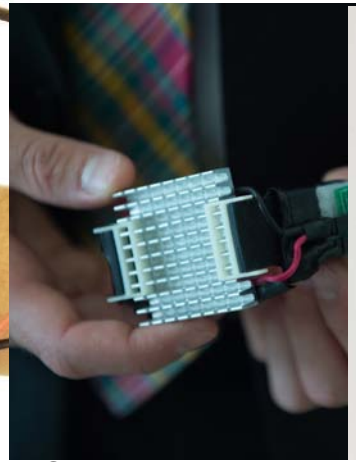
Step(s) 2: Building something wearable. (Note: many steps)

Making it more wearable with each iteration

Not wearable.
Is a box...

Not wearable.
Has a cord.

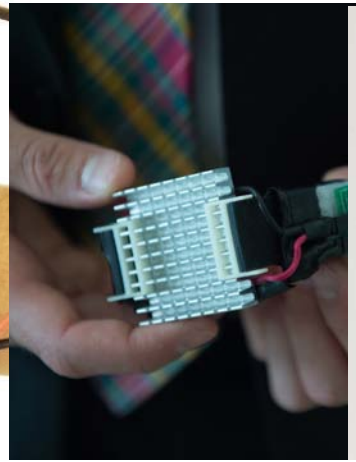
Hacked together
wearable (gross)

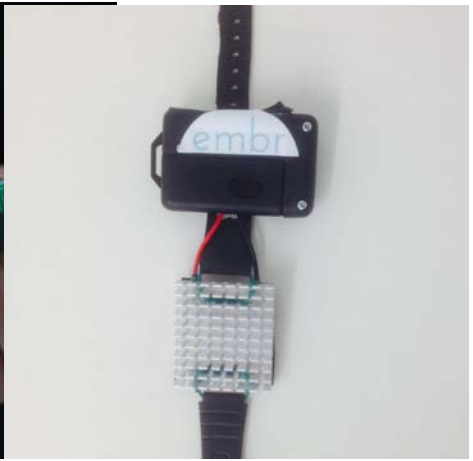


Cleaner wearable, but
circuit is exposed

Circuit is enclosed,
has buttons, but ugly

The iterative engineering process

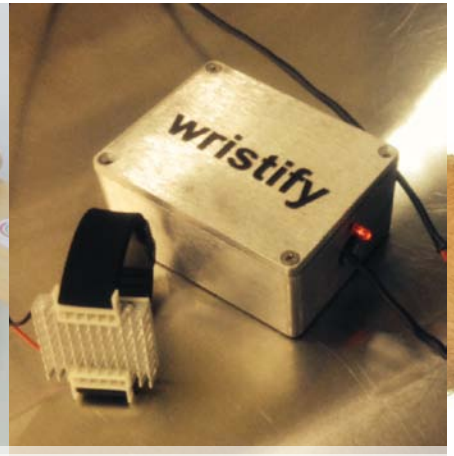


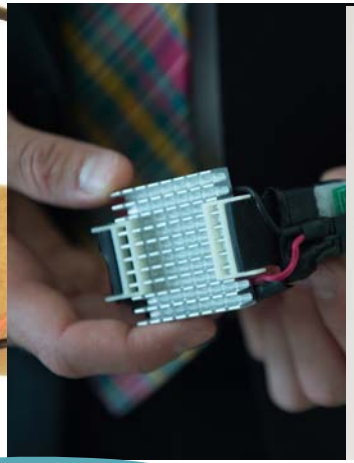


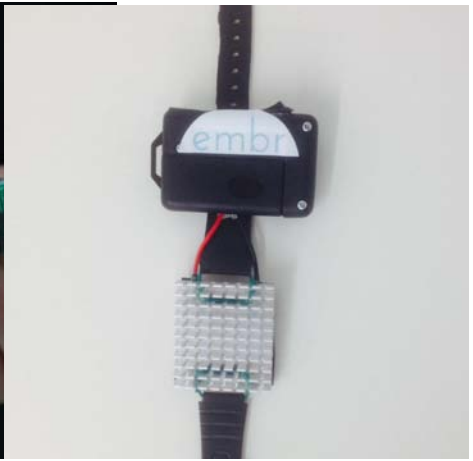
Hypothesis 3:
It can't be ugly.

Step 3: Make it prettier.

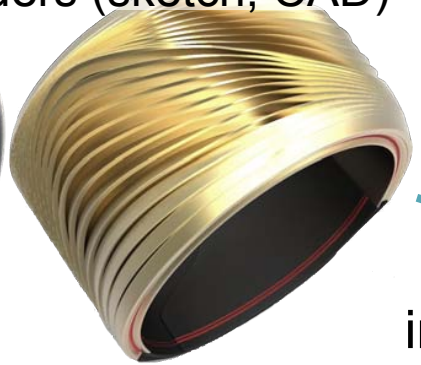
The iterative engineering process







Make concept renders (sketch, CAD)



Making prototypes informs new concepts

Make prototypes

personalized for comfort

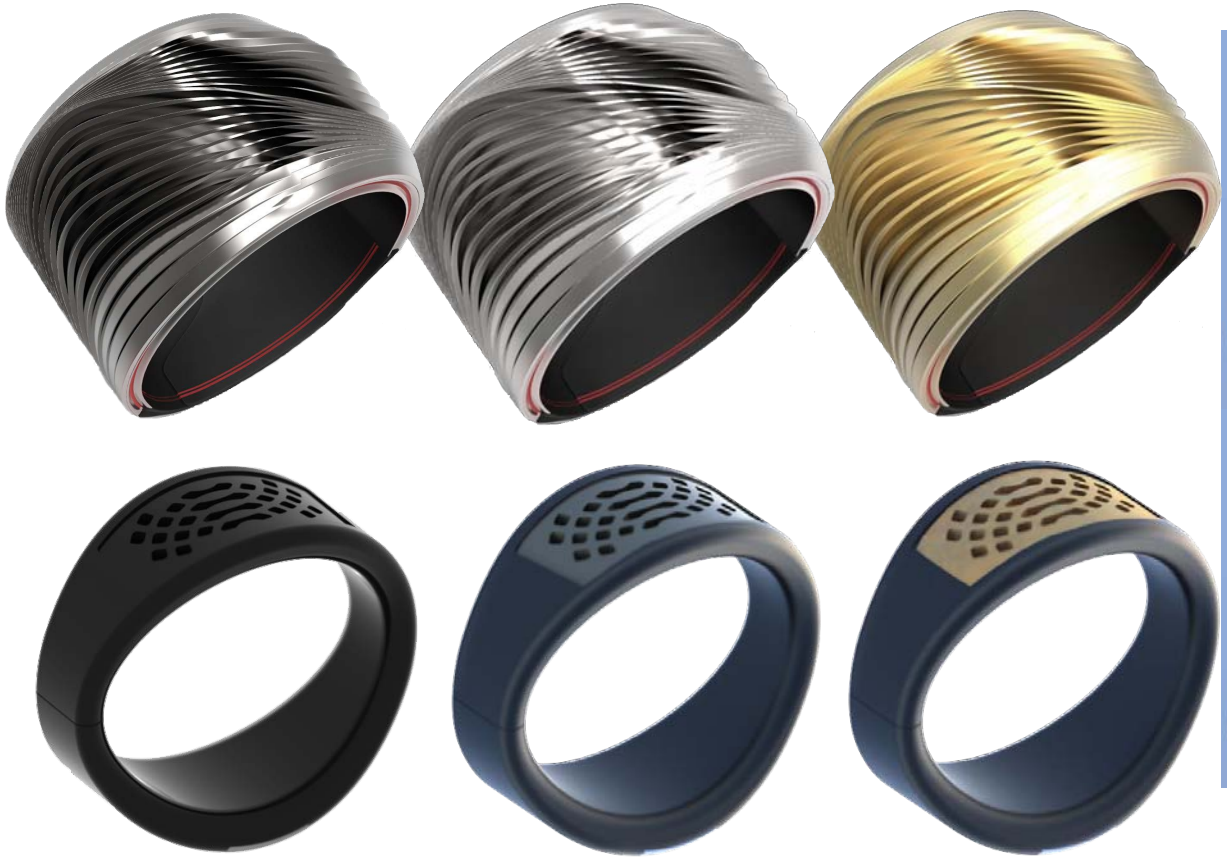
user interface

heat sink

heat pumps

power + electronics

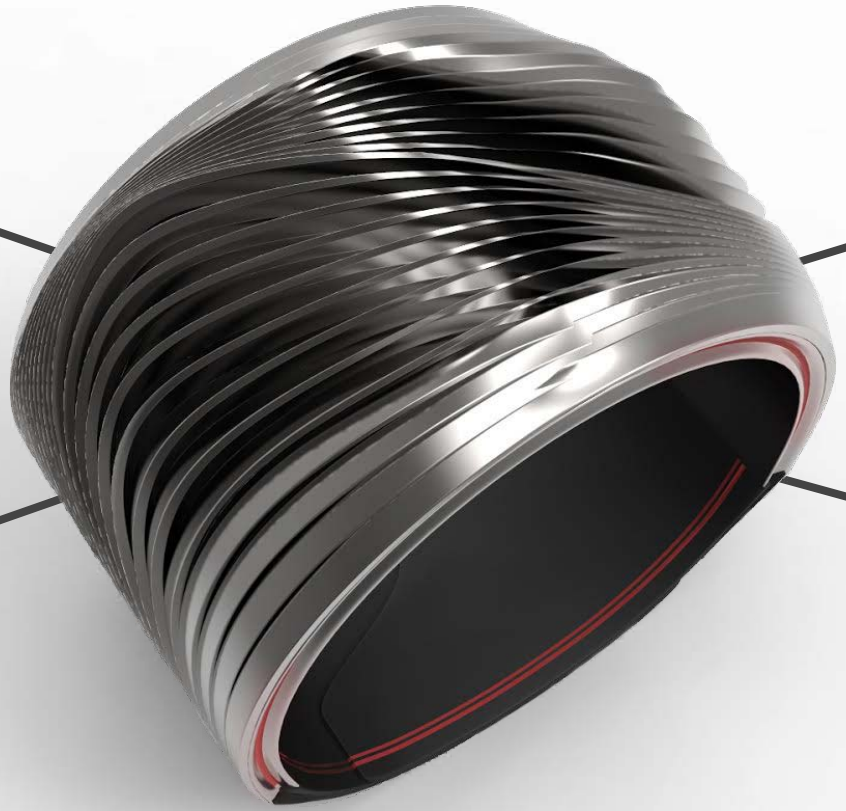
Why CAD is fun: It lets you make art, fast.



wristify & intel Edison

comfort on demand

personal & environmental sensing



predictive & adaptive

a connected & efficient world

our journey so far

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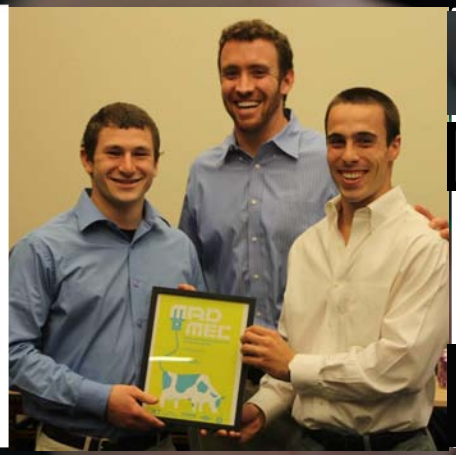
our journey so far



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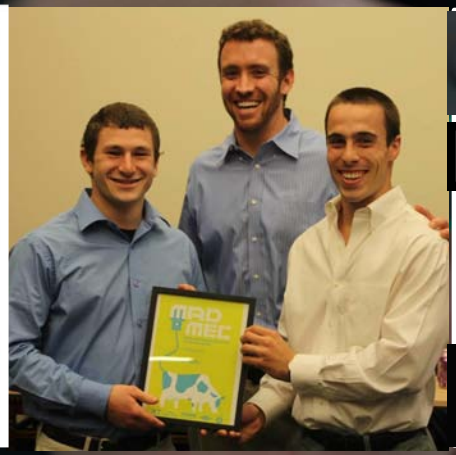
our journey so far



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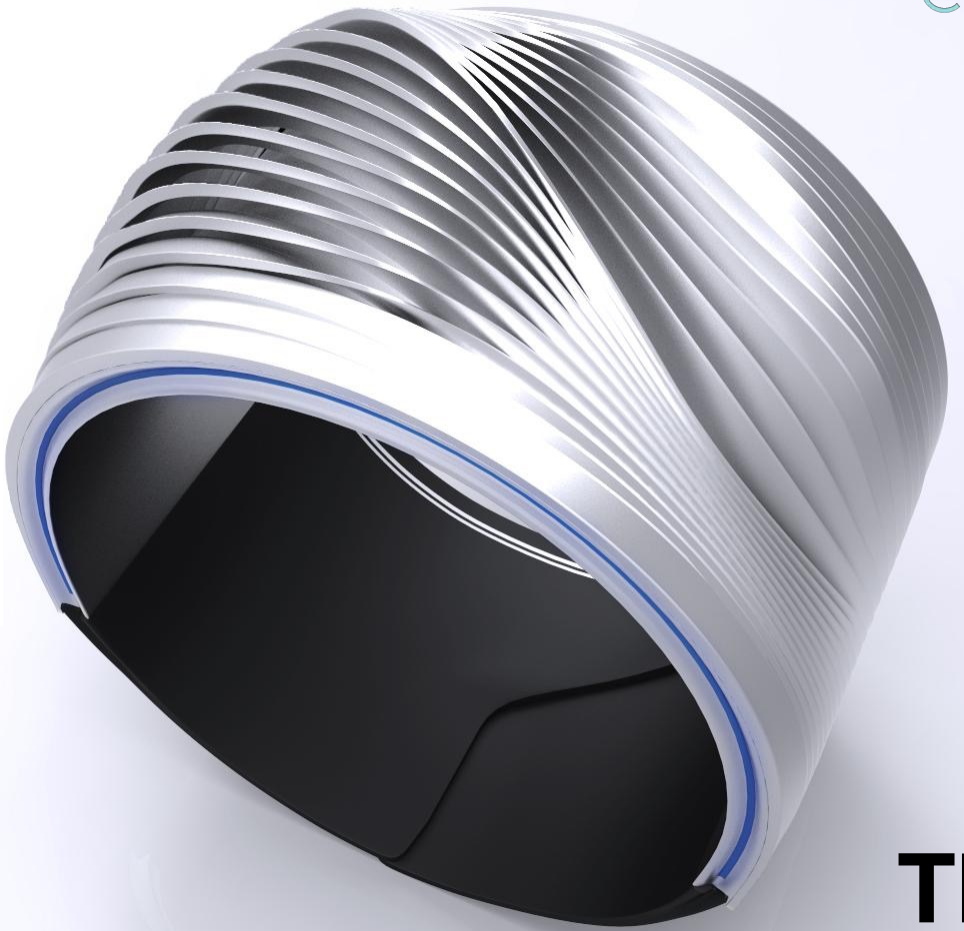

Thanks!

RES.2-005 Girls Who Build: Make Your Own Wearables Workshop
Spring 2015