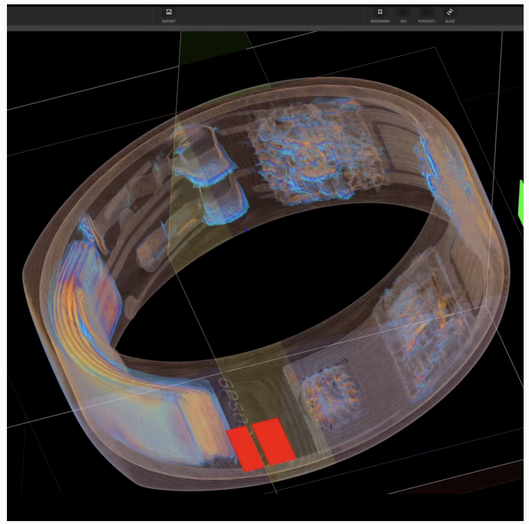
Boys Club

Wearables Exploration

Background

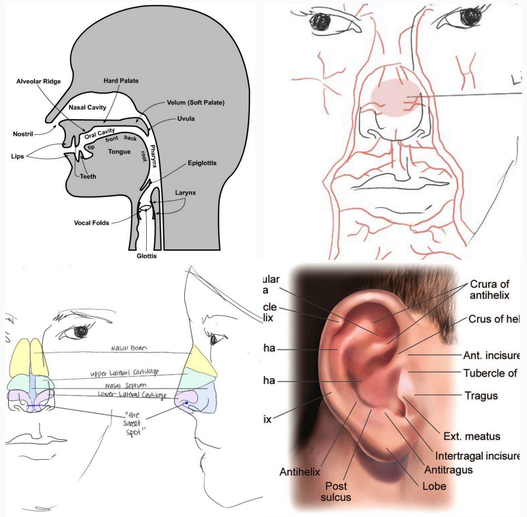
OURA Ring Basics



- OURA general components and sensors list
- Positioning implication (where can sensors be worn) based on component requirements

Background

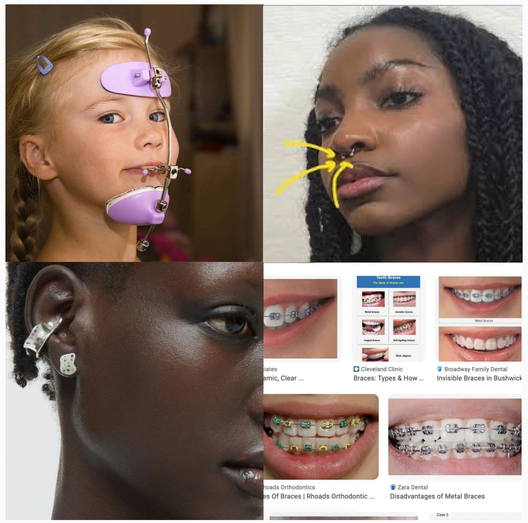
Facial Anatomy



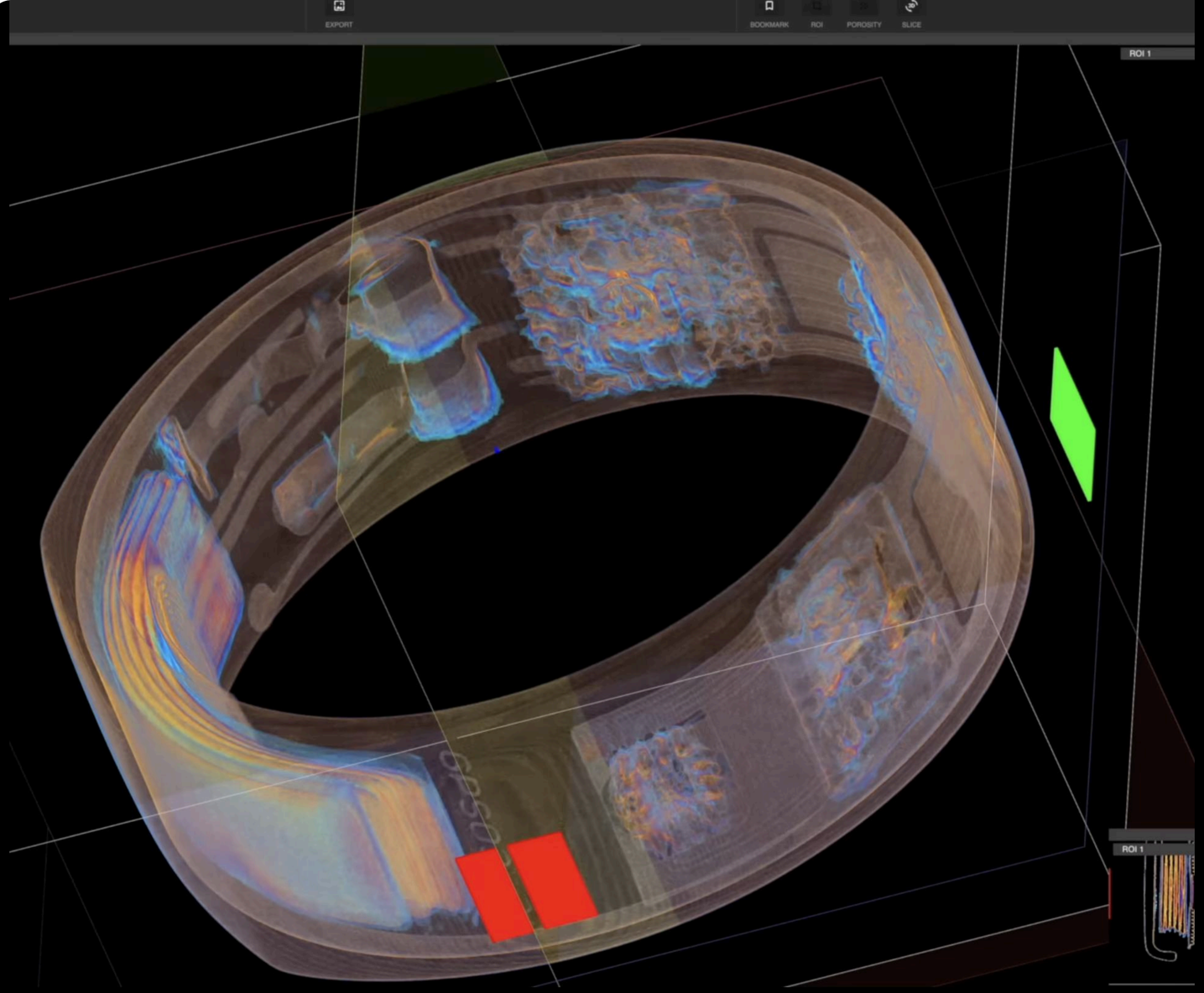
- Analysis of nasal cartilage and bone structure, septum piercing location
- Analysis of blood vessels to face and ears

Designs

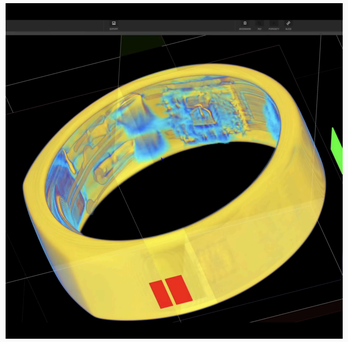
Wearables Explorations



- Septum Ring
- Ear Cuff
- Tooth Cap



Oura Ring Basics



Oura uses photoplethysmography (PPG) sensor technology, measuring blood volume changes (and therefore heart rate) under the skin using light.

- The PPG system sends light through LEDs and receives it with a photodiode that captures how pulses of light through your arteries reflect your heart's activity, sampling 250 times per second (and is 99.9% reliable compared to a medical-grade electrocardiogram (ECG)).
- Oura's PPG system is designed to maximize your data quality by leveraging sensor placement and infrared light: LEDs are positioned on either side of the finger to measure the clearest signal; better than a single-sided light source.

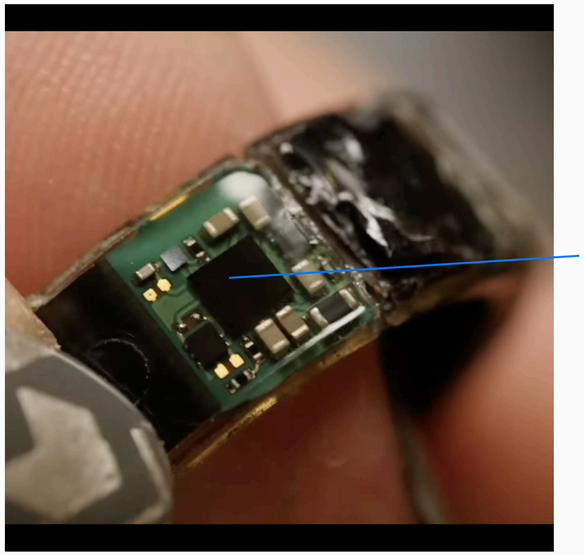
→ **Sensors in the septum and ear cuff can be designed for similar 2 sided-measurements. Grill will likely be single sided due to bones of the jaw.**

- 3D accelerometer captures your activity during the day, your restlessness at night, and helps to identify your sleep stages.

→ **Position on lower mandible *could* be problematic therefore opting for upper grill.**

3D accelerometer captures activity during the day and night

NTC temperature sensor monitors to 0.1° celsius, taken from directly against the skin



Micro controller

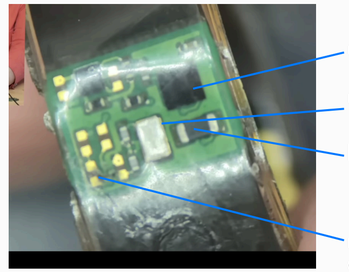
Accelerometer

NTC Temperature Sensor

Lithium Battery
3.75V 16mAh

PPG sensors use light to monitor blood movement under the skin

2 sided LED light source for greater accuracy; red, infrared & green

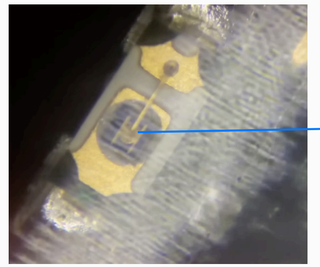


QFN micro controller chip

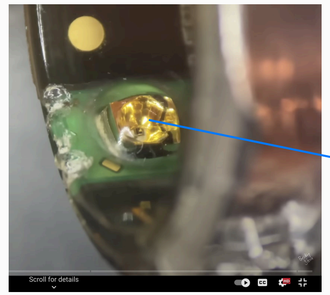
Crystal Oscillator

passive components:
- capacitors
- resistors

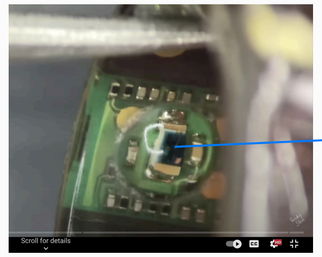
unpopulated ports (for testing) during manufacturing process



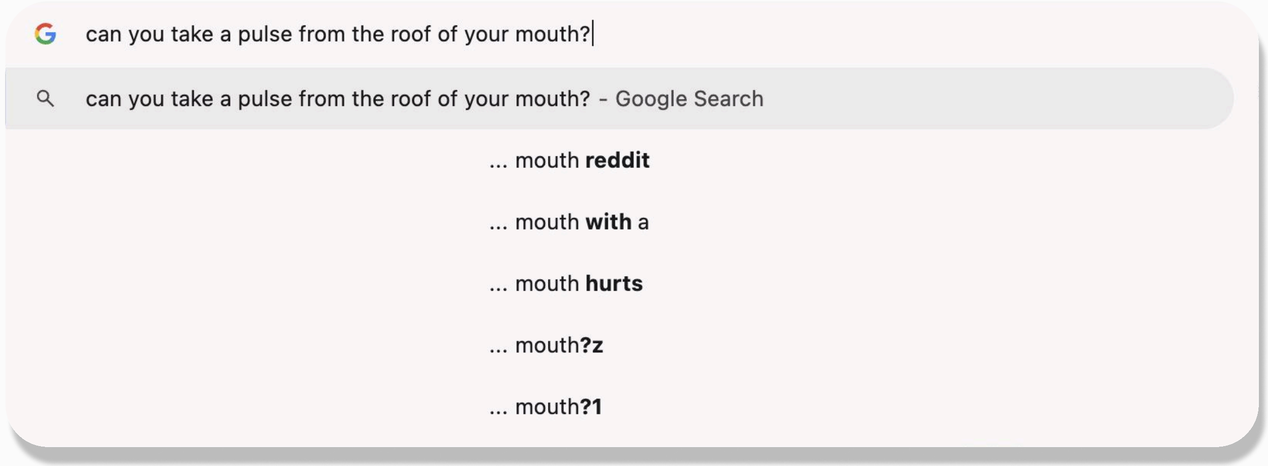
Green LED



Multi Chip LED:
Red, Infrared



Photodiode


can you take a pulse from the roof of your mouth?
can you take a pulse from the roof of your mouth? - Google Search
... mouth reddit
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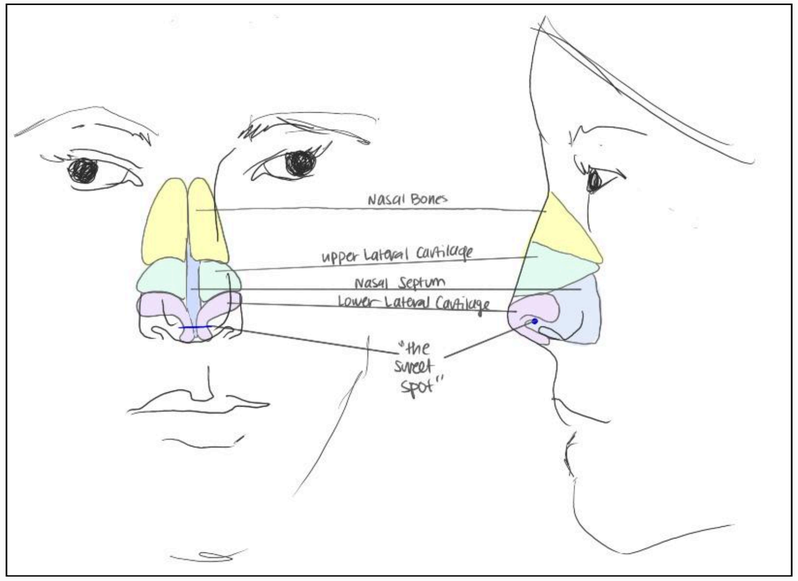


Figure 1. Anatomy of nasal bones and cartilage

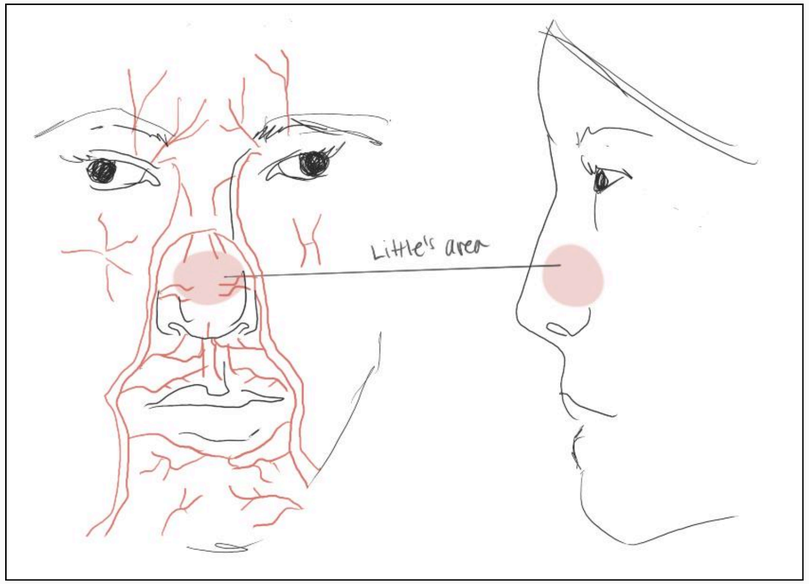


Figure 2. Anatomy of facial blood vessels

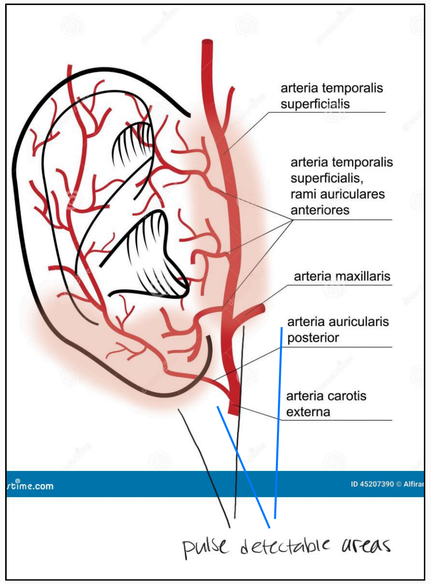


Figure 3. Blood vessels of the ear

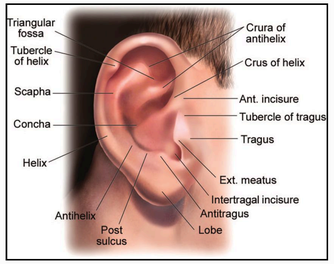


Figure 4. Anatomy of the ear

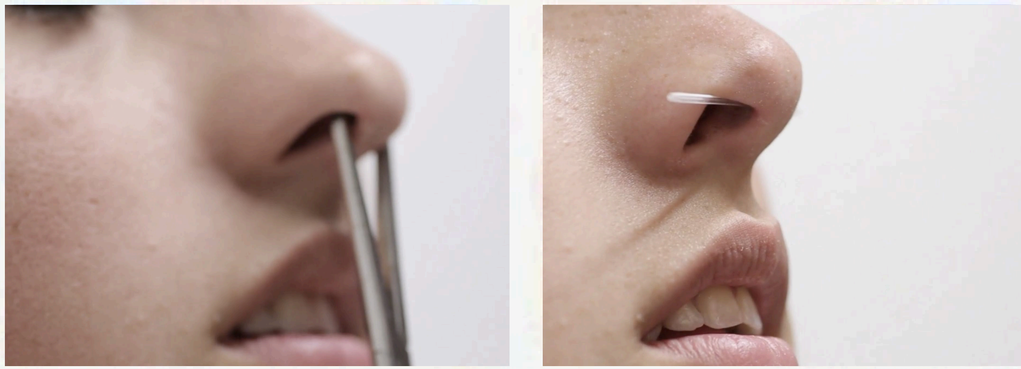
Sensors should be applied to areas with active blood vessels for most accurate readings.

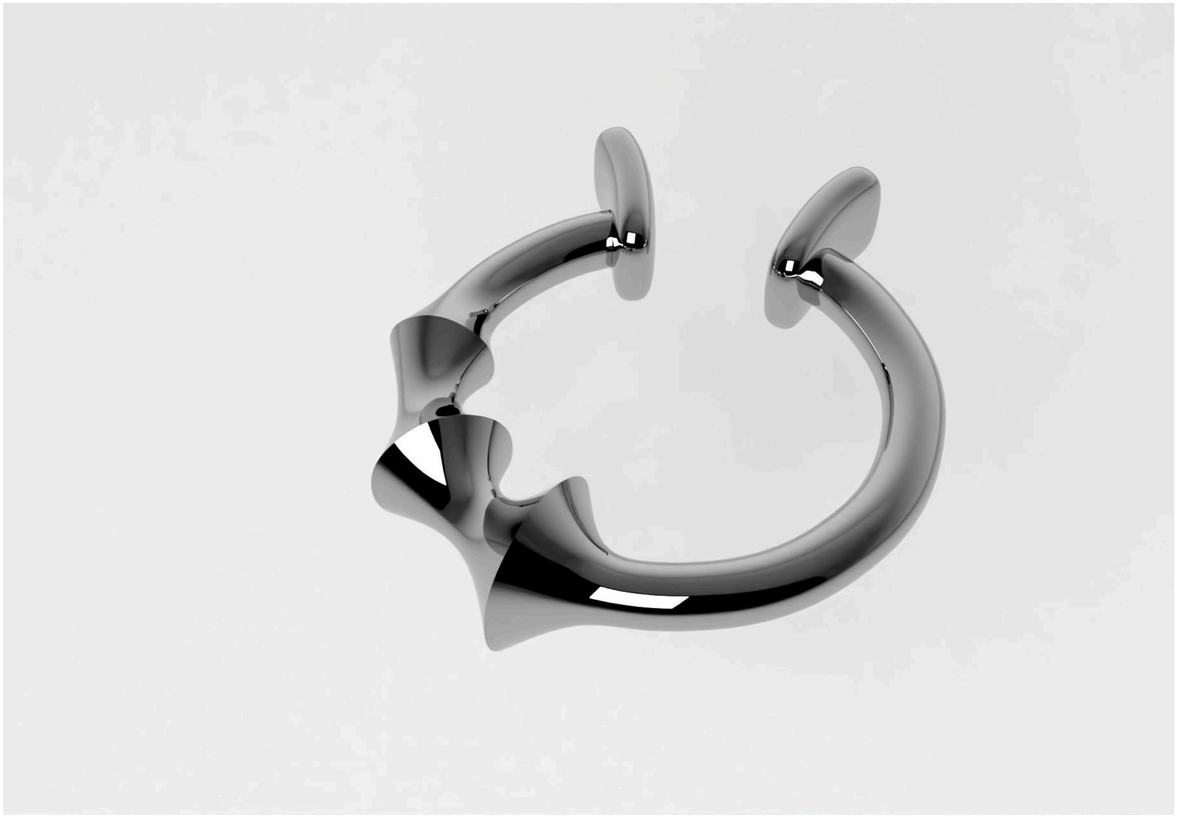
Nose: the area with the most blood flow in the nose is the anterior nasal septum, specifically a region called "Little's area", which is located near the front of the nasal cavity and has a dense network of blood vessels. The areas around as well as the interior of the septum piercing provides contact with this point.

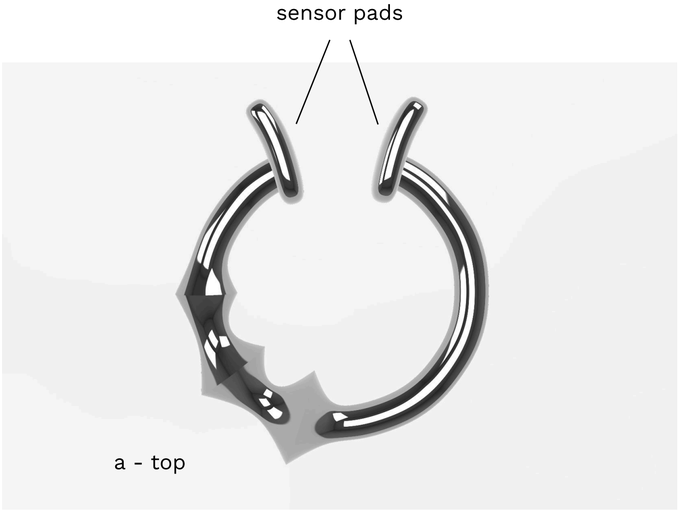
Mouth: Contact of sensors behind the upper lip will provide one-sided information.

Ear: Contact of sensors around the helix, helical trail/upper lobe, lobe will provide double-sided information.

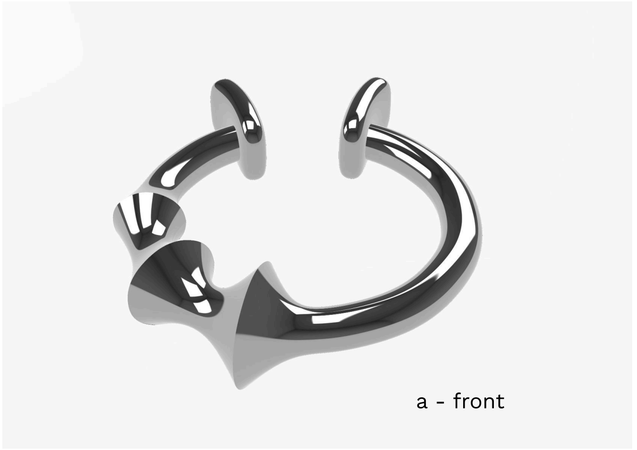
Septum Ring





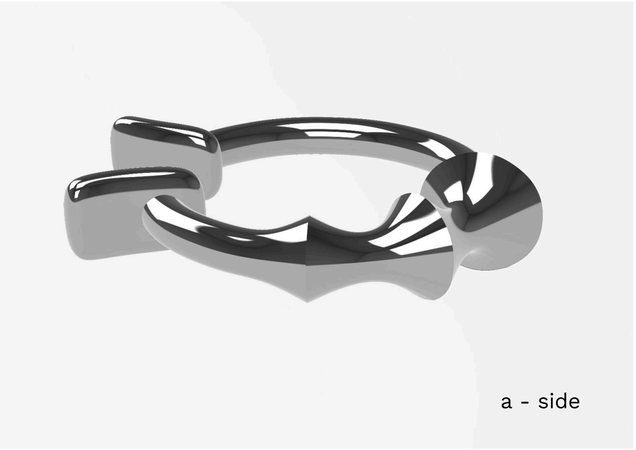


a - top



a - front

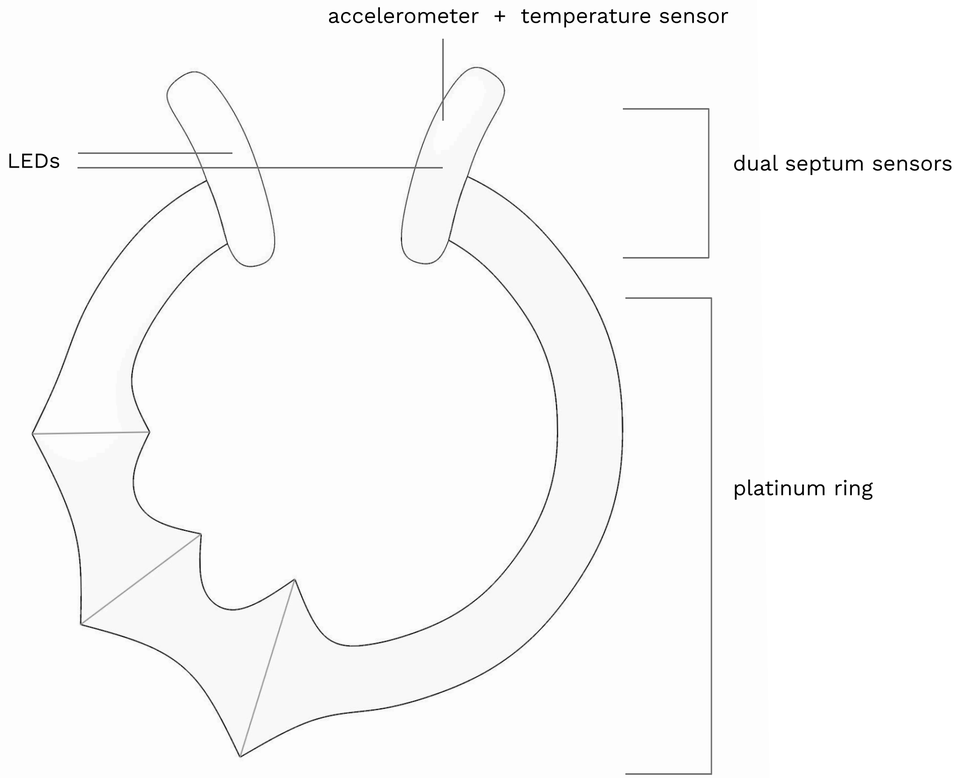
a - side

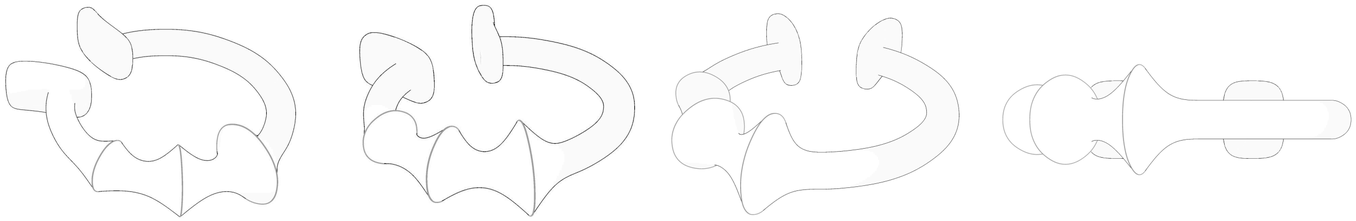


a - side

a - faux Septum Ring with dual sensors and triple bell detail

Septum Ring





Septum Ring sits inside the wearer’s nose. Sensor bars make contact on both sides of the nasal septum, and use PPG sensor technology to measure blood flow. In addition to red and green LEDs, sensor bars house an accelerometer and temperature sensor, providing accurate and continuous biometric data.

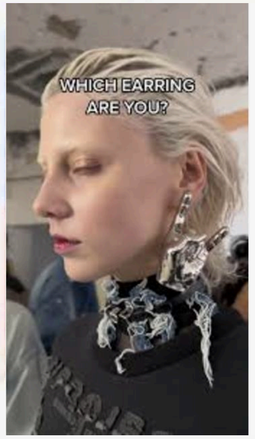
Dimensions: 16 gauge, 10.8mm w x 12.5mm h

Features: 2 LEDs, accelerometer, temperature sensor

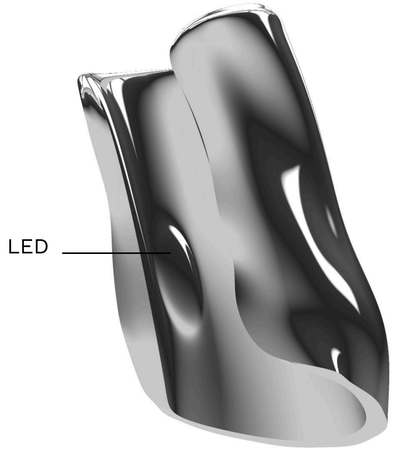
Materials: Platinum septum ring and sensor bars

**This is a conceptual product*

Ear Cuff

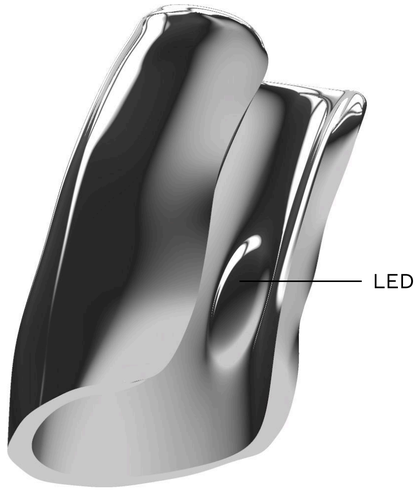


b - interior



b - interior side

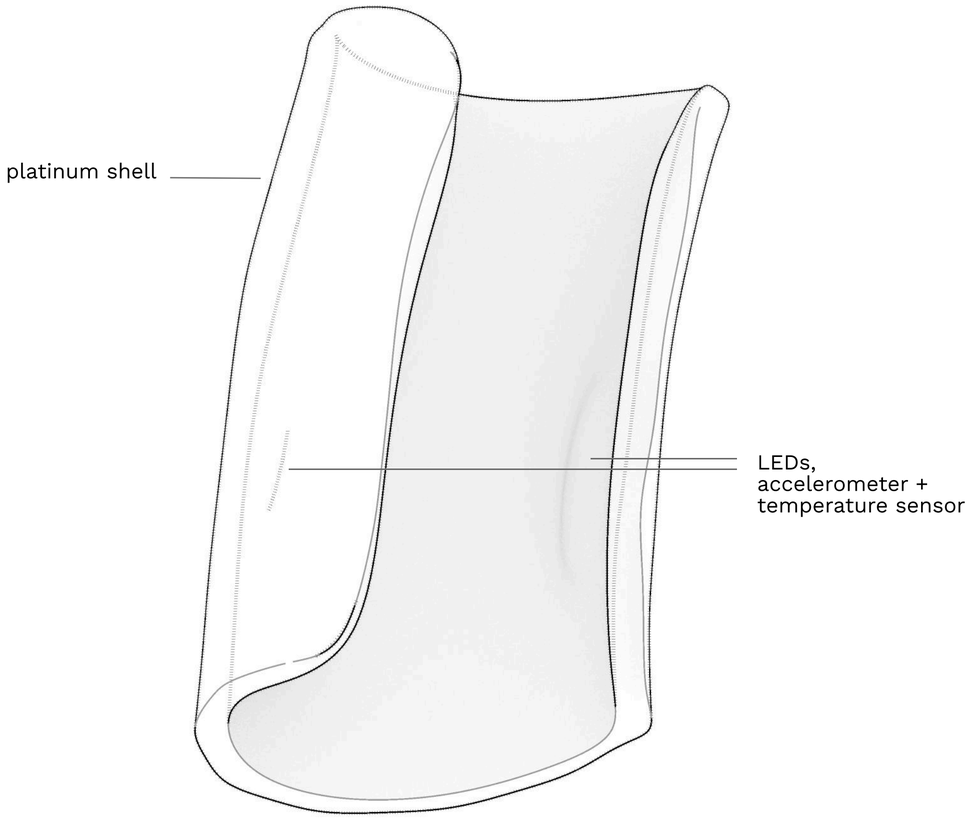
b - exterior

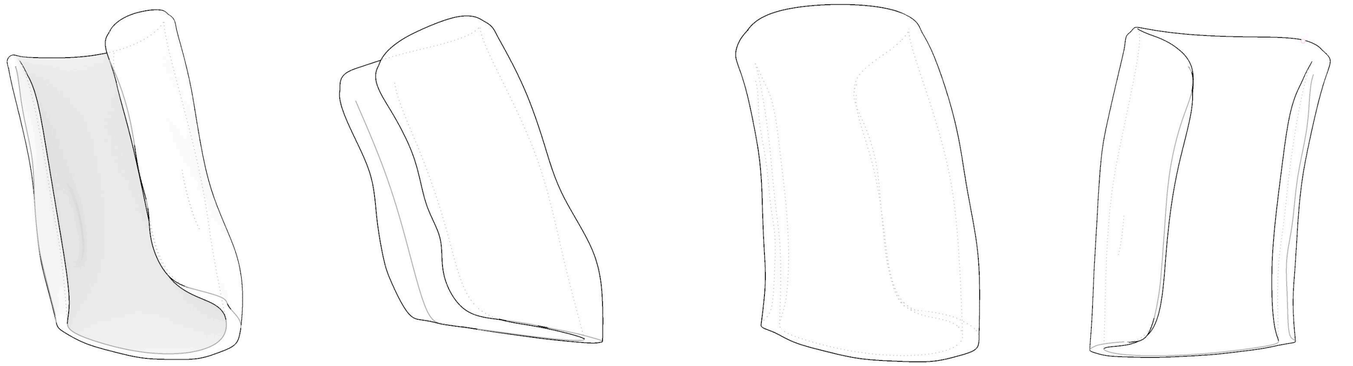


b - interior side

b - organic Ear Cuff with dual sensors

Ear Cuff





Ear Cuff sits on the wearer’s ear of choice. Interior LEDs rest against the inner and outer helix, and use PPG sensor technology to measure blood flow in the ear. Ear Cuff houses an accelerometer and temperature sensor, providing accurate and continuous biometrics data.

Dimensions: 5.8mm w x 10.7mm h x 6.1mm d

Features: 2 LEDs, accelerometer, temperature sensor

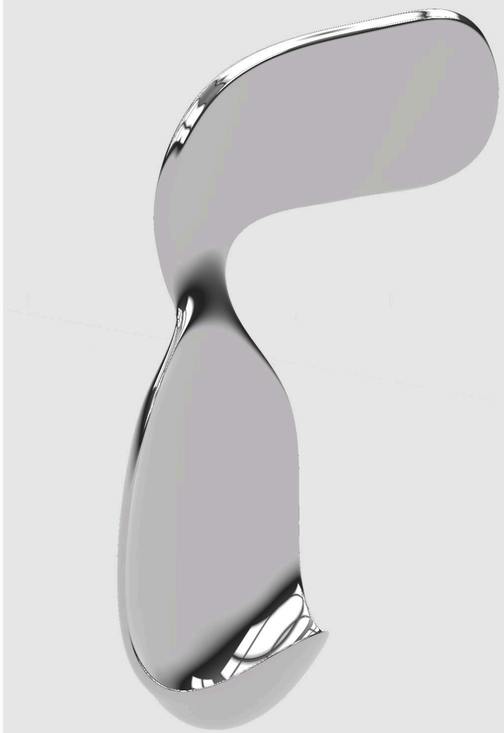
Materials: Platinum cuff and sensor encasement

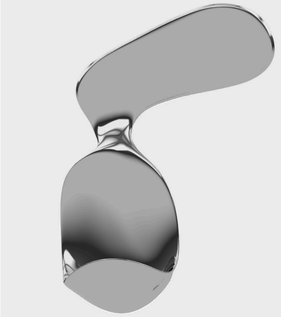
**This is a conceptual product*

Tooth Cap

c - front side

c - back side

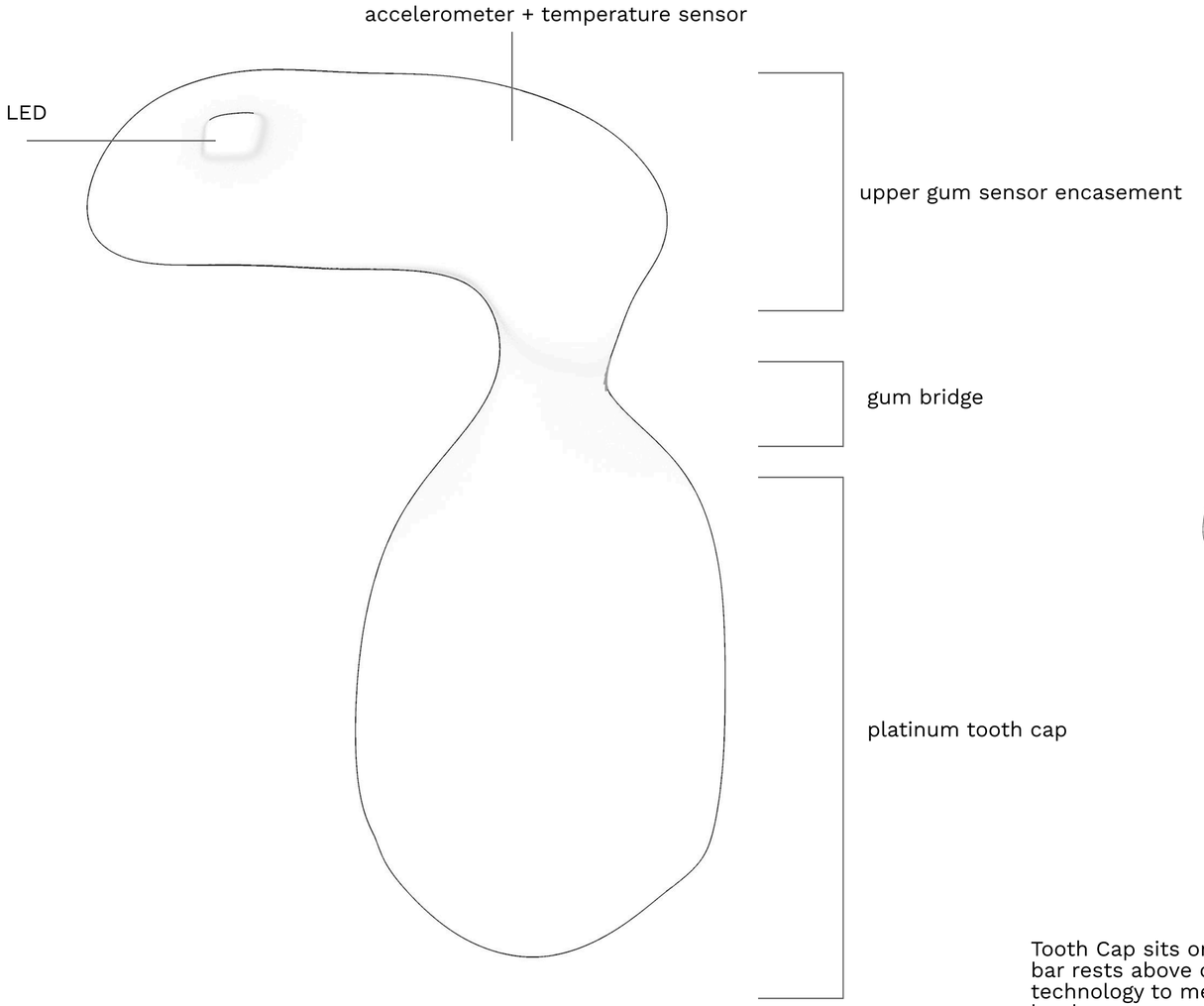


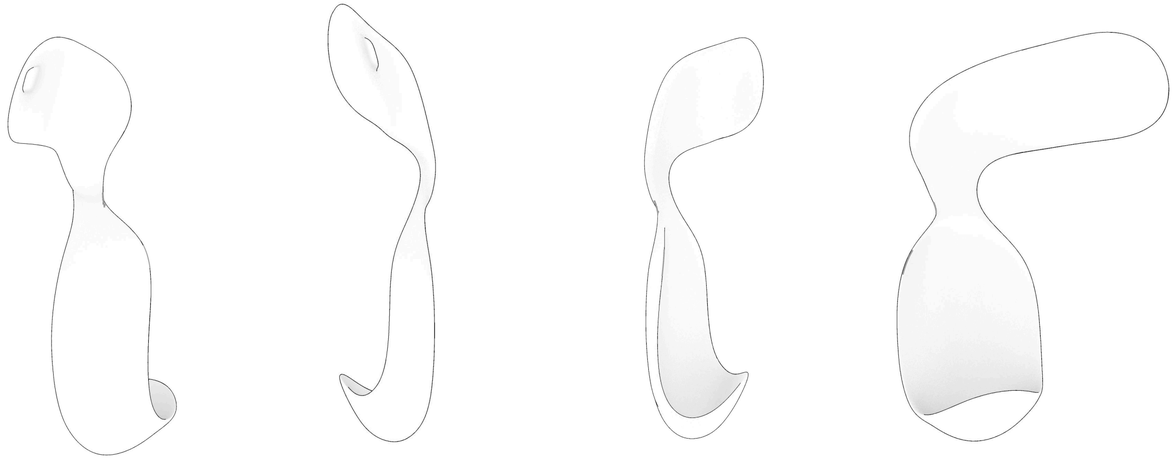


c - back

c - left canine Tooth Cap with upper lip sensor bar

Tooth Cap





Tooth Cap sits on the wearer’s left canine. A formed sensor bar rests above on the upper gum, and uses PPG sensor technology to measures blood flow in the upper lip. Sensor bar houses an accelerometer and temperature sensor, providing accurate and constant biometric data.

Dimensions: 8.6mm w x 12.2mm h

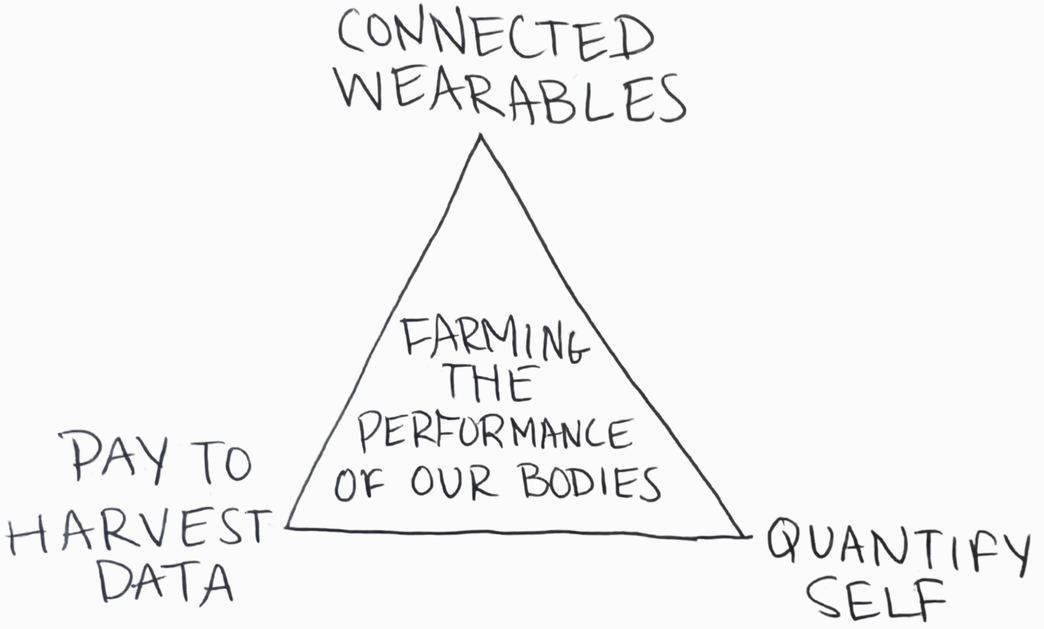
Features: 1 LED, accelerometer, temperature sensor

Materials: Platinum tooth cap and sensor bar

**This is a conceptual product*

The Data Manifesto

Connected wearable devices touted for the quantified self have long been an efficient conduit to harvest data from humans into corporate black boxes. We pay to rent our own data back from wearables brands through friendly interfaces — willing, digitally indentured servants, farming the performance of our bodies in service of someone else's opaque bottom line.



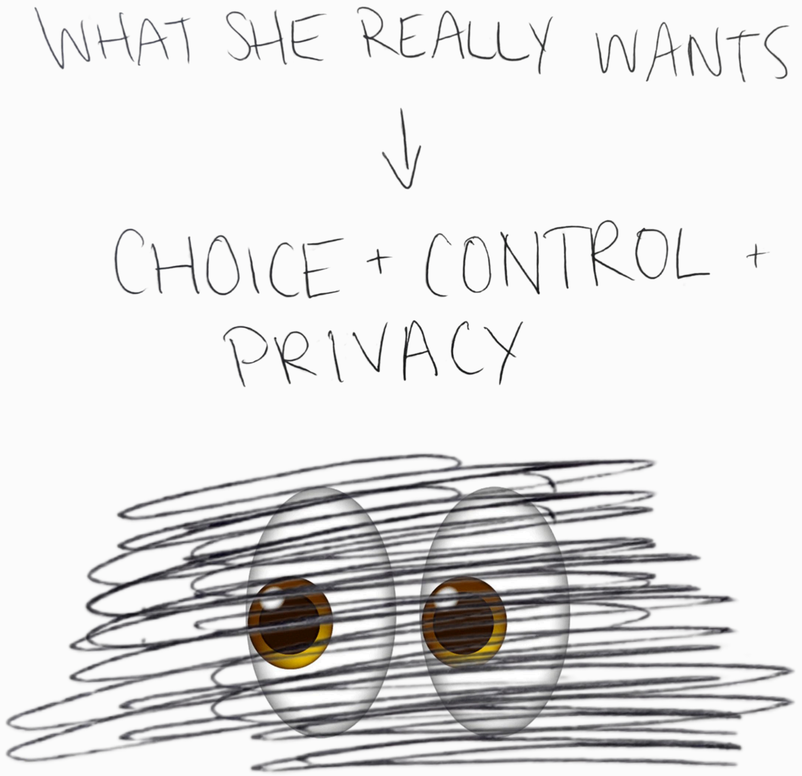
However, the second order effects of these closed systems have proven to get very weird, very fast. About a decade ago, the first connected toothbrush collected brushing data and rewarded users with points, prizes & lower insurance premiums in exchange for their brushing data. Soon thereafter, period tracking apps began selling data to advertising companies, who then optimized content based on users' menstrual cycles and even mailed physical "expectant mother" kits of coupons and formula to unwitting recipients — including many who did not plan to have children. Companies selling fitness trackers, and even vibrators, have been caught harvesting intimate personal data without user consent. Oh, and don't forget the 23andMe hack, and how data belonging to customers of Ashkenazi Jewish heritage was then found for sale on the dark web.

But now, the tech, the law and the people are smarter. Data is swiftly becoming the new digital oil, gold, water and lifeblood, and AI-enabled capabilities can quickly spin it into tangible, personalized value. Even Bryan Johnson has taken to posting screenshots of his own *ahem* Johnson connected wearables to inform betting markets on his nighttime routines.

The next generation of connected wearables is coming, and it doesn't demand that you abandon security and privacy to participate. Decentralized and zero knowledge, privacy-preserving technology will enable all of the delight and benefits of the surveillance device currently on your wrist, with none of the ick that it currently entails. The ability to extrapolate insights from your data into clearer self-knowledge, recommendations and even financial benefits will no longer require you to forfeit yourself to unknown overlords, with increasingly efficient mechanisms to derive meaning from your data in an anonymous way. Data created by your body can remain private from prying eyes; you can choose how much you want to share (or not!) while still accessing the understanding and opportunities that you seek, and you don't need to sell yourself off to some creep farming body parts in Silicon Valley to do it.

As the aesthetics of wearables improve to better suit our tastes and styles, so too will the orbit of meaning and capability around them.

By Evin McMullen, Co-founder Privado ID



Okay thanks!