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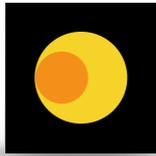


ERIA//Team Photo



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ERIA//Design Concept Overview

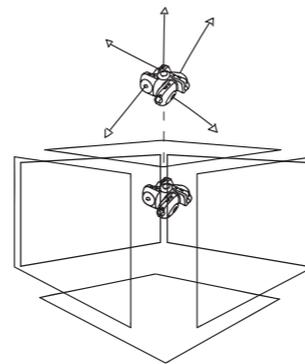
The impact on our climate, through carbon emissions, increasing populations, and other factors, has led to a growing epidemic marked by overconsumption. We consume natural resources at an alarming, and unsustainable rate. We currently use the resources of 1.6 earths. It takes the Earth 1.5 years to regenerate what we use in 1 year. We only have 1 earth.

ERIA brings consumption to the forefront.

Our concept mimics the earth's strategies for maintaining balance by aggregating data from multiple weather and energy usage data centers to create a visually compelling representations of data. ERIA (Environmentally Responsive Impact Apparatus) gathers data from the existing NOAA National Weather Service, atmospheric sensors, satellites, and a series of local based nodes that attach to various man-made and natural meters. The nodes are sensors that give information to ERIA for analysis and display. They attach to electric meters, gas meters, automobiles and other sources of energy, movement and usage to paint a real-time picture of what is happening in our homes and cities, and ultimately what is happening to the earth. ERIA works with ESO to create a connected display of real-time information.

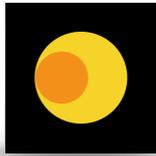
ESO, (Earth's Systems Overview), is a display system made up of a 360 degree, 5-head internal projector, and a housing made of 5 interactive touch displays and a wireless, self-charging base. Each infographic would represent one of the following categories:

1. Individual Resource Consumption
2. Overall Resource Consumption
3. Carbon Emission Levels
4. Sea Level
5. Global Decay Model

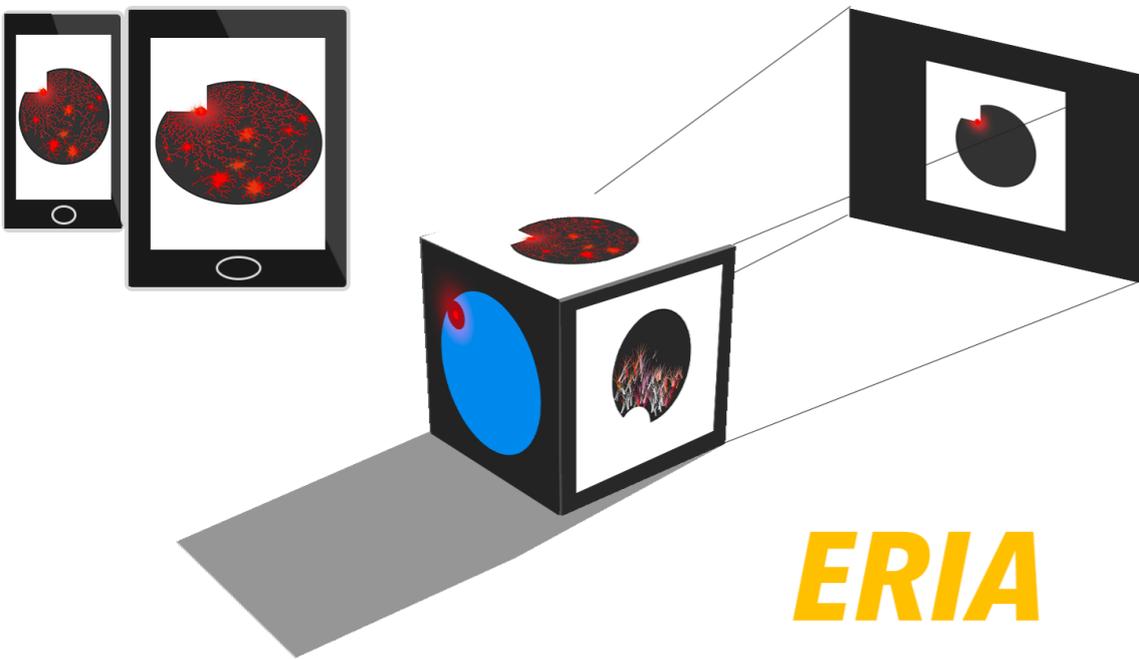
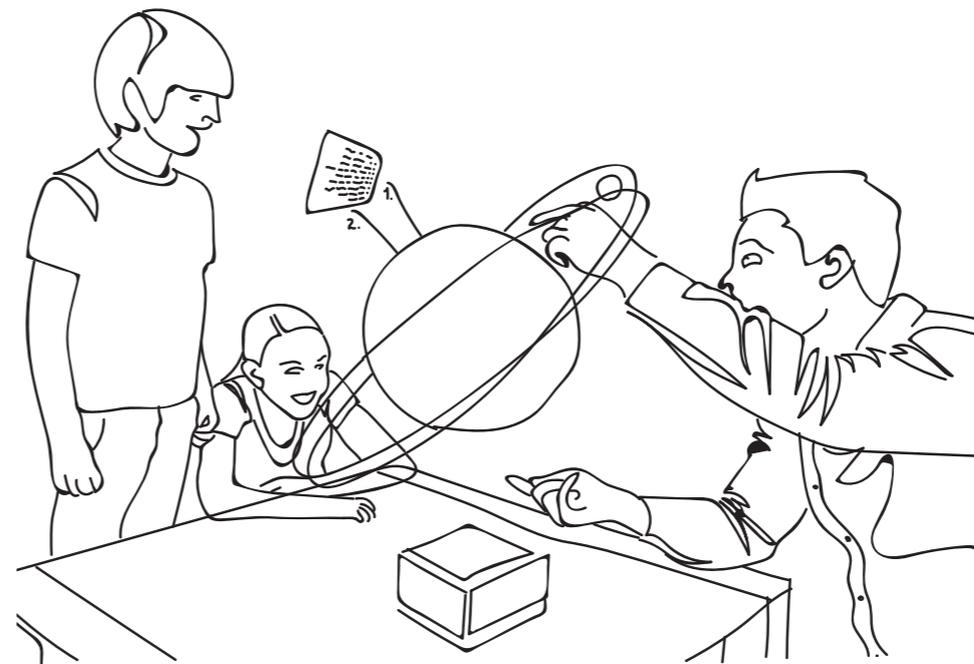
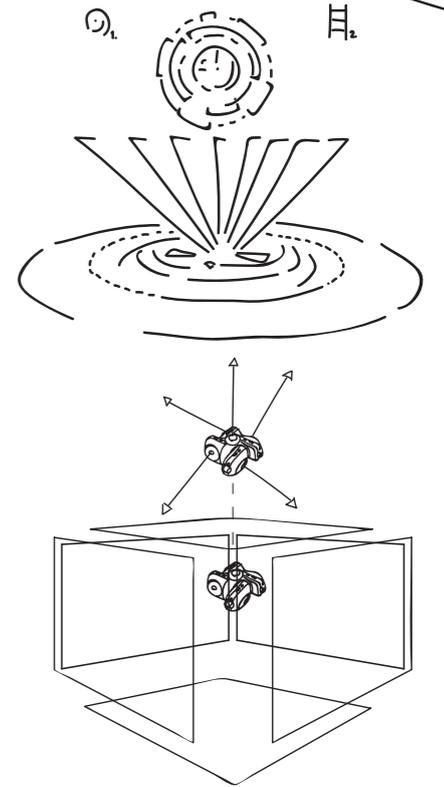


By using simple icons and meters, the system would be able to generate daily, monthly and annual usage reports and recommendations.

Intention for the user: Once the user receives a report that shows their consumption we hope that they will strive to seek balance in their energy usage and act to minimize their carbon footprint to counter-balance the impacts on the earth. The user will be able to visually connect their own energy action with things that are impacting the earth decay model.



ERIA//Design Concept Imagery

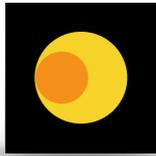


ERIA

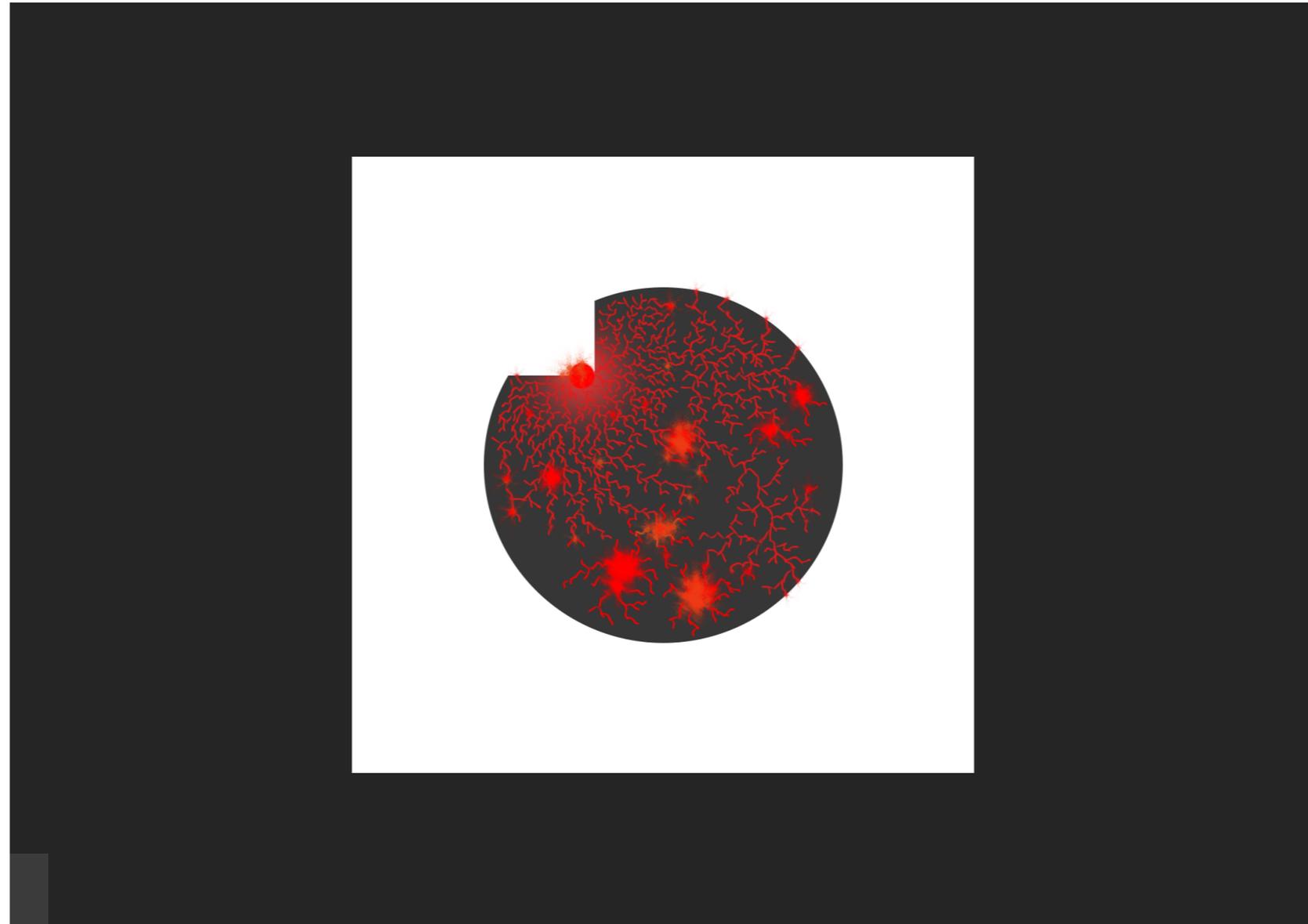
ERIA System Diagram

ESO System Diagram





ERIA//Video Pitch



ERIA VIMEO



BIOMIMICRY
GLOBAL DESIGN
CHALLENGE





ERIA//Scoping Process

What can ERIA do for you, and how will she do it?

Human & Environmental Needs

1. Individual Resource Consumption
2. Overall Resource Consumption
3. Carbon Emission Levels
4. Sea Level
5. Global Decay Model

The simple goal for ERIA is to collect usage data from our electronic devices. These devices, which we use in our daily lives, range from handheld electronics to motor vehicles, and even include items as large-scale as weather monitoring systems. The average individual is probably unaware of how many electronic devices and how much data collection is currently happening. According to Cisco, global mobile data traffic grew 63 percent in 2016, 429 million (almost half a billion) mobile devices and connections were added in 2016, By 2021 there will be 1.5 mobile devices per human being on the planet, nearly 75% of these mobile devices will be smart phones, and more than 75% of mobile data will be video. Video is the most resource-heavy form of data, requiring the most energy to transfer, requiring the most stable data transfer, and relying heavily on graphics and high resolution displays.

ERIA and ESO Functions

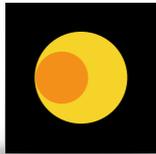
Individual Consumption will be monitored by a small, passive in-home desktop device, named ERIA, and would collect the following data based on energy and movement: individual energy usage (electricity, gas, water), data usage, types of data used, transportation, and human expended energy (or personal activity).

Overall Consumption will look at how much energy and natural resources we are consuming in aggregate. These aggregated groups start at the household level, then move up to city, regional (state), and national levels. This data could be compiled to display various usage trends. Overall Consumption would be monitored by connecting multiple ERIA modules and a system of data nodes that Overall Consumption will collect data from Individual Consumption to paint a larger picture of global, real-time energy usage behavior and trends.

Greenhouse Gas Emissions would be collected from existing monitoring infrastructure including NASA's satellite-based Orbiting Carbon Observatory (OCO) and the sea and ground-based Integrated Carbon Observation System (ICOS). It will collect the following data: atmospheric carbon levels, carbon emission hotspots, carbon emissions migratory patterns, and results of carbon reduction measures.

Sea Level data would be collected from the Global Sea Level Observing System (GLOSS), UNESCO / ICO Sea Level Monitoring Stations, and NOAA. We will include the following data: sea level rise and fall, mean sea level, global sea level, historical sea levels and projections.

The Global Decay Model would collect Individual and Overall Consumption, Greenhouse Gas Emissions, Sea Level and other environmental data to create a visual composite of all known impacts to the earth's overall health and natural balance. The Global Decay Model would be a live 3D map of the damage, restoration, and self-regulation processes occurring globally. This model would offer absolute transparency of all current research and monitoring and allow for the next generation of sustainability advocates and professionals to the most accurate, unbiased, and up-to-date information for making decisions to bring balance and health back to our planet.

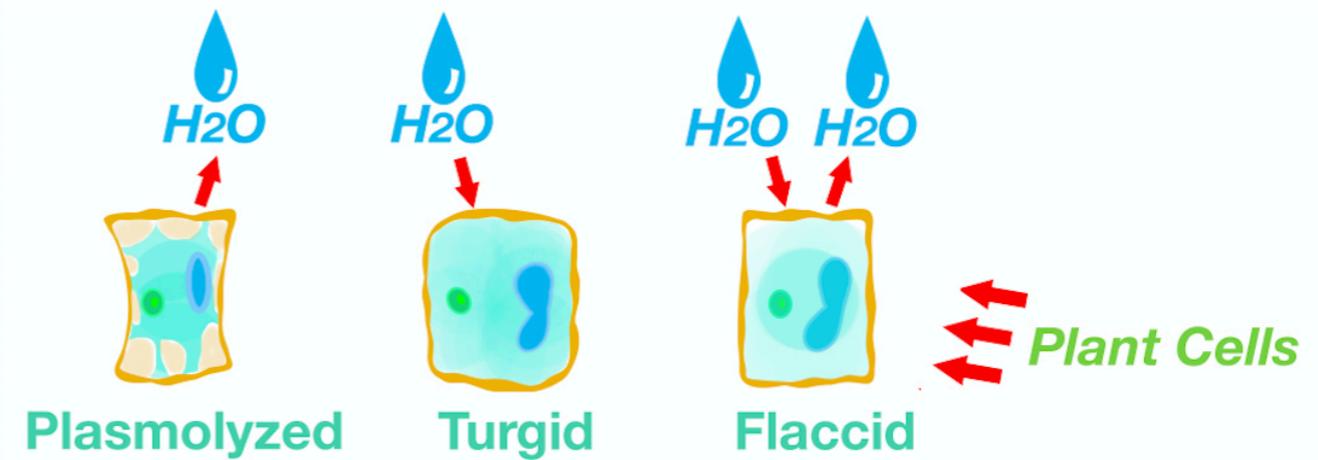
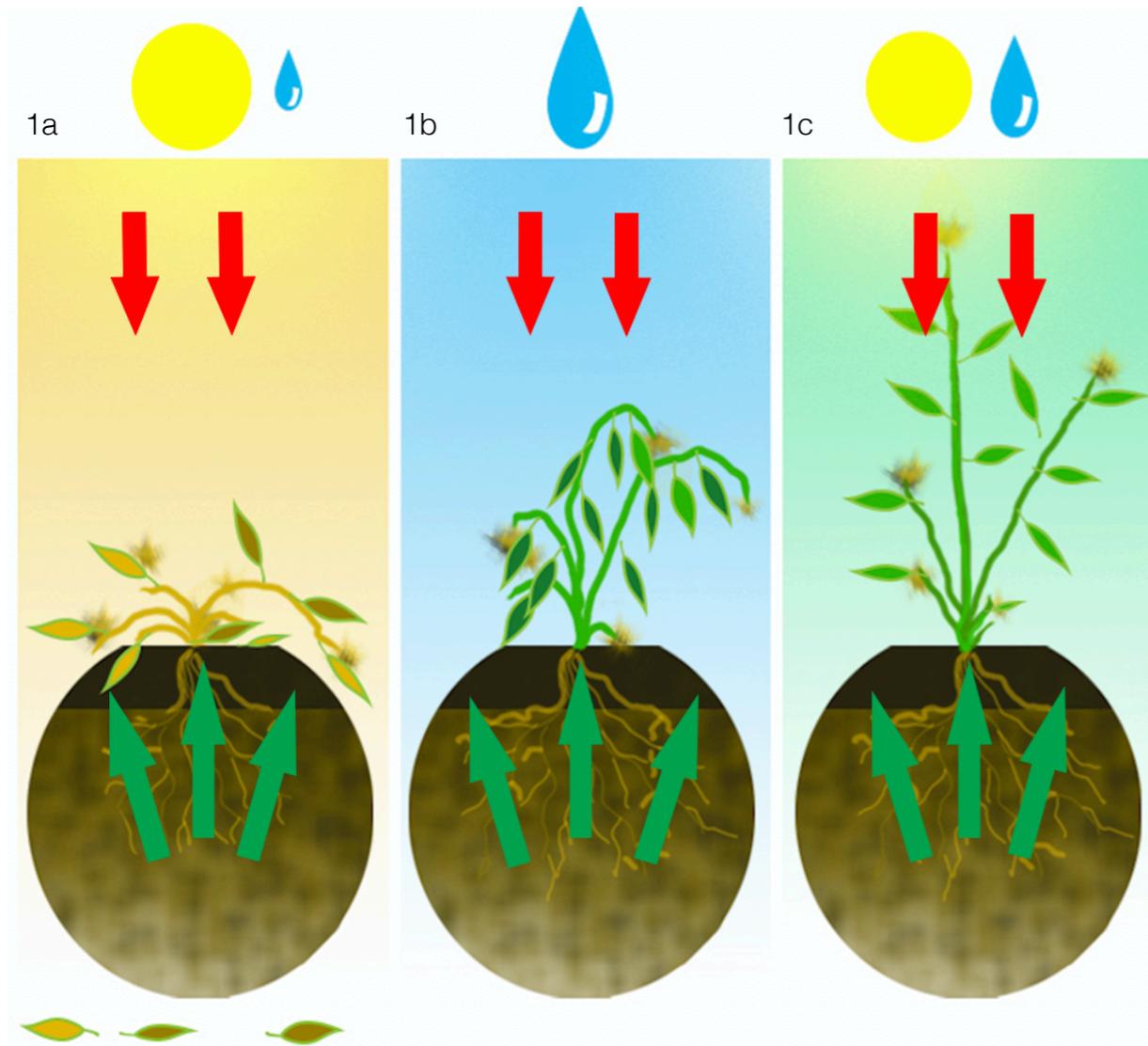


ERIA//Biological Inspiration

Organism	Strategy Considered	Feedback Loop
 <p>Cattail (<i>Typha latifolia</i>)</p>	<p>The cattail molts with the seasons and spreads its seed to create new areas of habitation.</p>	<p>Action: Spreading its seed through wind and animals. Effect: The plant expand's its foot print' Emulated in Design: Reaction to aggregated data to display the impact on the earth.</p>
 <p>Lichen</p>	<p>Lichen is a compound organism in a small or large but continuous footprint. It has the ability to attach itself to other living organisms.</p>	<p>Action: Multiple organisms create one piece of lichen. Effect: The lichen thrives and is resilient in many climates. Emulated in Design: ERIA uses multiple faces to display information to users.</p>
 <p>Clover</p>	<p>The clover plant is reactive to both sunlight and water. When it does not have enough of each, it wilts. If given water, its cells are rehydrated and the plant returns to a state of nutrient equilibrium.</p>	<p>Action: Absorbing sunlight and water. Effect: The plant displays the amount of nutrients it is getting in a physical form. Emulated in Design: ERIA uses the feedback from numerous forms of data to create a reaction.</p>
 <p>Garter Snake</p>	<p>Garter Snake's winter hibernation.</p>	<p>Action: Garter Snakes hibernate in cold temperatures. Effect: The snake survives by balancing extreme environmental conditions. Emulated in Design: ERIA reacts to data. When there is an extreme on one side it will suggest to the user a balance.</p>
 <p>Boa Constrictor</p>	<p>Boa Constrictors constrict their prey to kill them. Emulating the muscle structure of the snake by mimicking the tendon arrangements we can show the impact we have on our earth.</p>	<p>Action: Muscles on a snake contract and expand when its prey breathes. Effect: The snake uses its muscles to kill its prey and eat it. Emulated in Design: The design of the feedback loop image contracts and expands or constricts and destroys to represent the impacts of the data.</p>
 <p>Oxpecker</p>	<p>The oxpecker keeps the water buffalo clean by removing ticks and other parasites. This symbiotic relationship allows for the host creature to be healthy and parasite free, while the bird gets food.</p>	<p>Action: The oxpecker cleans the buffalo. Effect: The buffalo is healthier because of the removal of parasites. The bird gets a food source. Emulated in Design: ERIA emits a warning system through fractal design. It shows the user events and results of data. This gives the user the chance to benefit from the data received.</p>
 <p>Howler Monkeys</p>	<p>When a predator enters an area, the howler monkey warns its fellow monkeys of the danger. The troop will then escape the danger or ward it off by collectively screaming together.</p>	<p>Action: Howling when danger is present. Effect: Animals in the vicinity can escape the danger. Emulated in Design: ERIA generates a report at the end of the day or week to show the user what their consumption is. This report contains recommendations for how users can change their habits. There is also a feature that gives ERIA control of the house and allows for small changes to happen - like auto light shut-off, device power down at night, and other self-regulation options..</p>



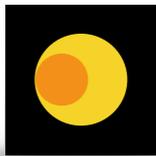
ERIA//Biological Inspiration - Feedback Loop



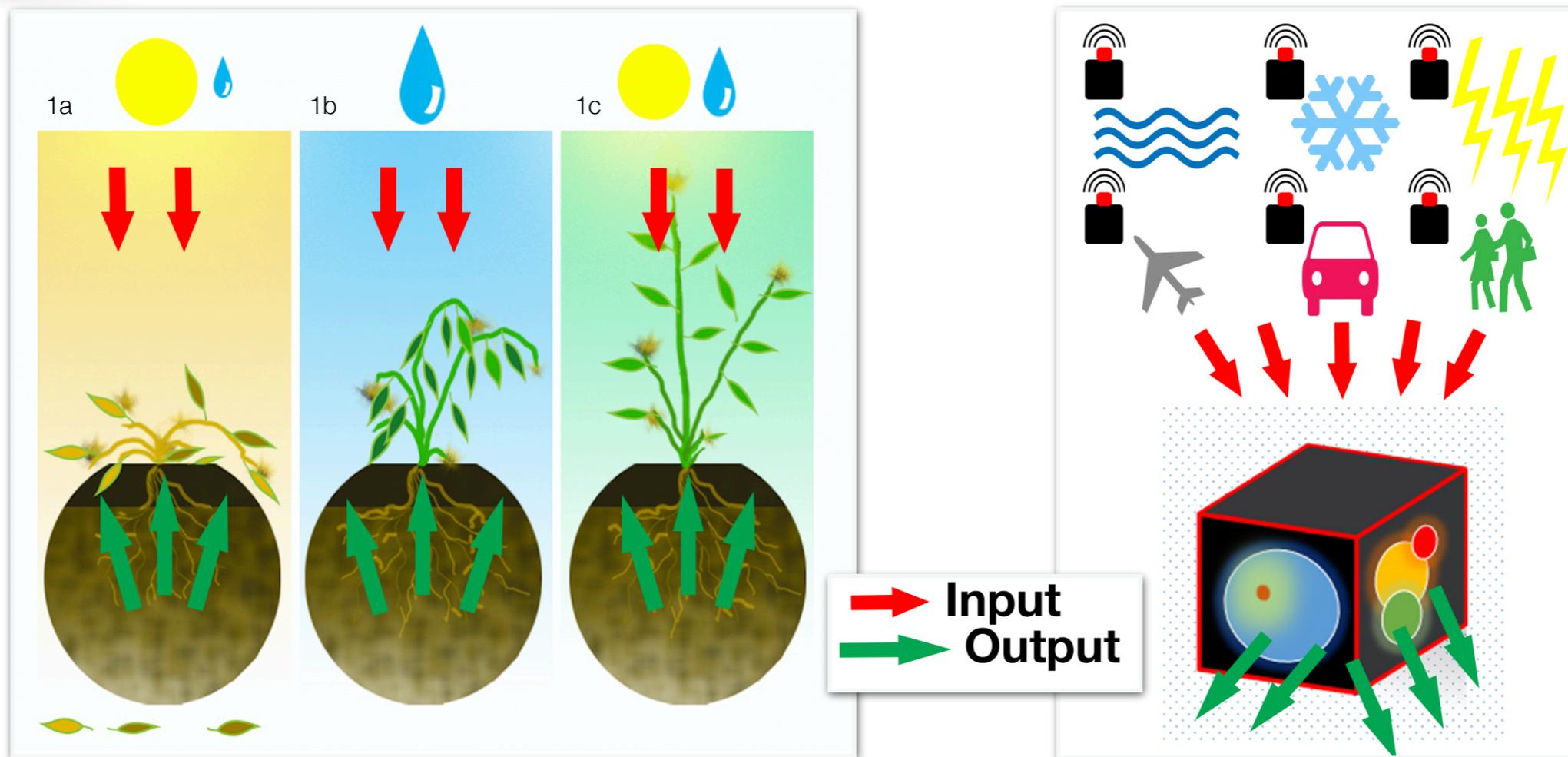
Feedback Loops

In the images above there is a plant displaying osmosis. One has not enough water, too much water, and just the right amount of water. The plant is reactive, it's output or way the plant reacts to an abundance or lack of nutrients is shown in how rigid the plant is. The plant cells constrict when there is not enough water making the plant wilt (1a). When the plant cells have too much water it becomes saggy and flaccid (1b) and finally when the plant has just enough water it is bright and rigid (1c).

The feedback loops of the plant physically shows what happens when there is a lack of water(input) and shows this in different forms of color and rigidity.



ERIA//Biological Inspiration - Design



ERIA is also reactive by mimicking feedback loops that the plant uses. The plant cell's reaction to water (osmosis) gives the viewer a chance to see the impact in a real time situation. Much like the plant cell's reaction to water and sun, **ERIA** uses aggregated data from around the world like; NOAA weather system, atmospheric measuring systems, aggregated automobile data, fitness trackers, aviation, house hold energy meters and other sources of metadata to show increasing impact on the earth visually. **ERIA**, does this by using the input to create a visual element where output is measured by different forms of impact. The way **ERIA**, shows the result of input by using a lighting system that reacts to different forms of input. Using a proprietary algorithm, **ERIA**, interprets and combines data to show how activities from around the globe impact the earth's atmosphere. Ultimately, the user will be able to offset some of the impact by using a weekly report that shows them their carbon footprint and suggestions with how to reduce it. Simply monitoring one's energy use has been shown to reduce energy usage. The awareness created by **ERIA** helps reduce usage, which reduce emissions and resource use, making users aware of their overall and global consumption. This results in a meaningful, global positive impact to combat effects of climate change.



ERIA//Biological Inspiration - Nature's Unifying Patterns

Nature's Unifying Patterns

ERIA uses wireless charging from other devices in your home, office or vehicle. When these devices are idle or fully charged, plugged into a power source and nearby, ERIA is able to passively charge herself.

ERIA adaptively re-uses waste products from disposed electronics. High-resolution smartphone screens and functioning processors are re-used when mobile devices like phones, tablets and laptops are upgraded and discarded by users. ERIA incentivizes electronics recycling by taking old devices and using their parts, and technologies, for a more streamlined device.

ERIA learns from users through their discarded devices which components are most desirable, most functional and most sustainable.

ERIA can mitigate the rise of multiple mobile device ownership per capita by providing a single device for individual or household use, the reducing the number of devices a person uses, which end up in landfills in 1-3 years after purchase.

ERIA is recyclable and ERIA units can be refurbished and reused. Degrading materials from the recycling program will be responsibly disposed of and new, sustainable materials will be up-cycled.

When you buy an ERIA, you may also elect to provide one to someone in need.

ERIA uses a sturdy bioplastic casing made of a corn and sugar cane composite and her internal electronic components are separated so that they can be disposed of responsibly without causing unnecessary and unwanted ecological harm.

ERIA is a small, long-lasting device and offers new value to the home electronics market. ERIA is able to replace multiple home and personal devices by assimilating data and technology from other devices.

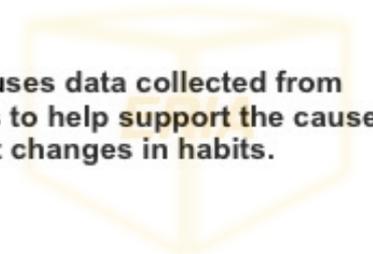
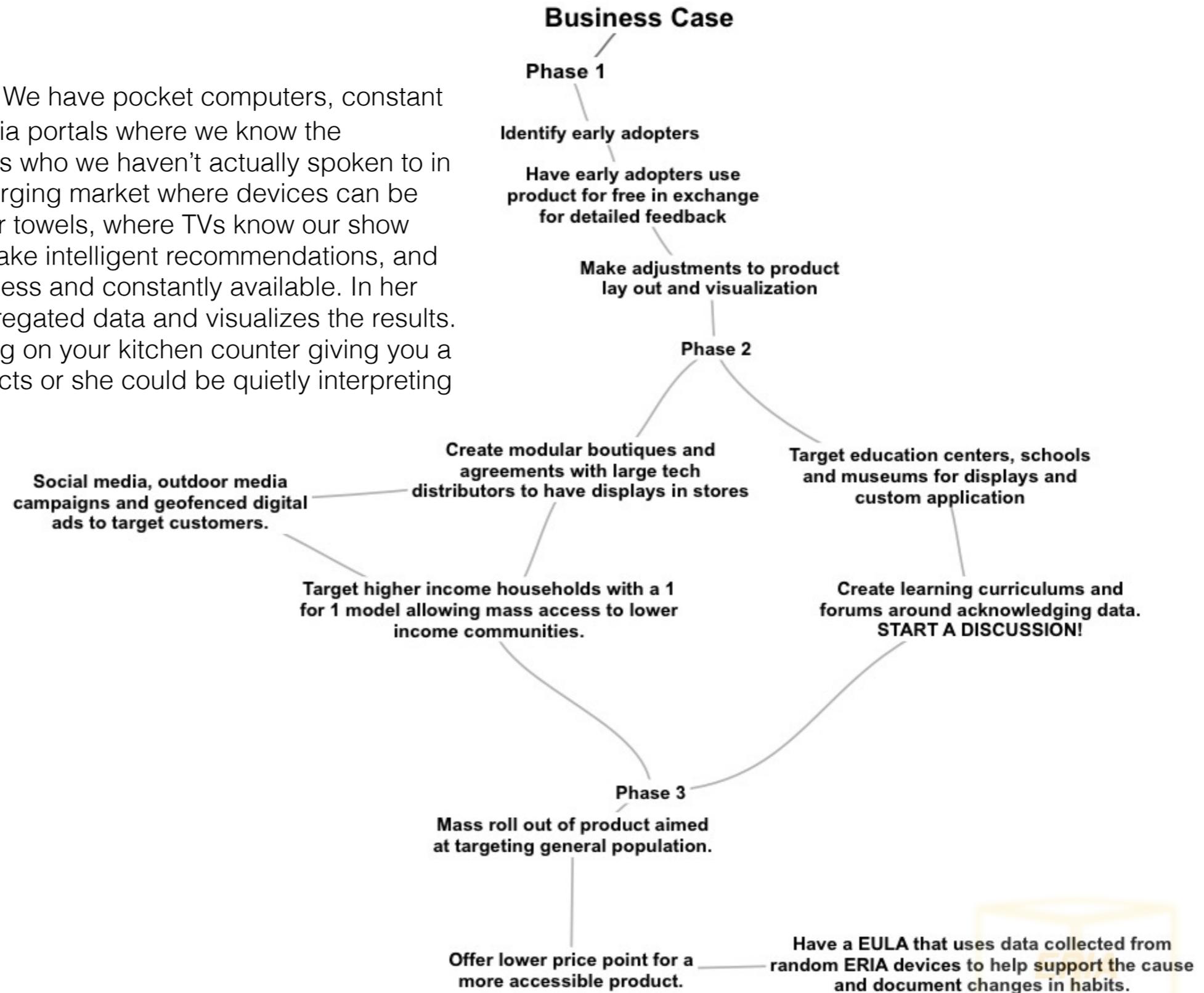
ERIA runs on information, connects and cooperates with humans and other devices, and is a small, unnoticeable addition to your environment.





ERIA//Business Case

We are always connected. We have pocket computers, constant news feeds, and social media portals where we know the happenings of distant friends who we haven't actually spoken to in years. We also have an emerging market where devices can be spoken to for ordering paper towels, where TVs know our show viewing patterns and can make intelligent recommendations, and this type of data seems endless and constantly available. In her purest form, ERIA uses aggregated data and visualizes the results. In action, she could be sitting on your kitchen counter giving you a daily update on global impacts or she could be quietly interpreting your water usage.





ERIA//Next Steps

The next steps are exciting.

Our current limitations are around data visualization and creating a product that can interpret aggregated data. We have challenges with collecting data and gaining permissions (privacy rights) around using data that is currently available. We have started to connect with data scientists and data visualizers to form a collaborative study around visualization and display of data models.

This is not a deterrent because where there is an idea, there is the possibility of generation and creation. Being passionate about climate change and starting a conversation is what led us to create ERIA. ERIA brings to light our consumption of materials and this topic is important because our resources are not infinite.

One other major obstacle that we have is creating an algorithm that will be able to digest the numbers provided. As a beginning concept, our goal is for ERIA to be present in every home. We imagine a constant notification center that changes its display according to the user's goals and habits. ERIA could also serve as a piece of art and as a tool for awareness, education, and activism,

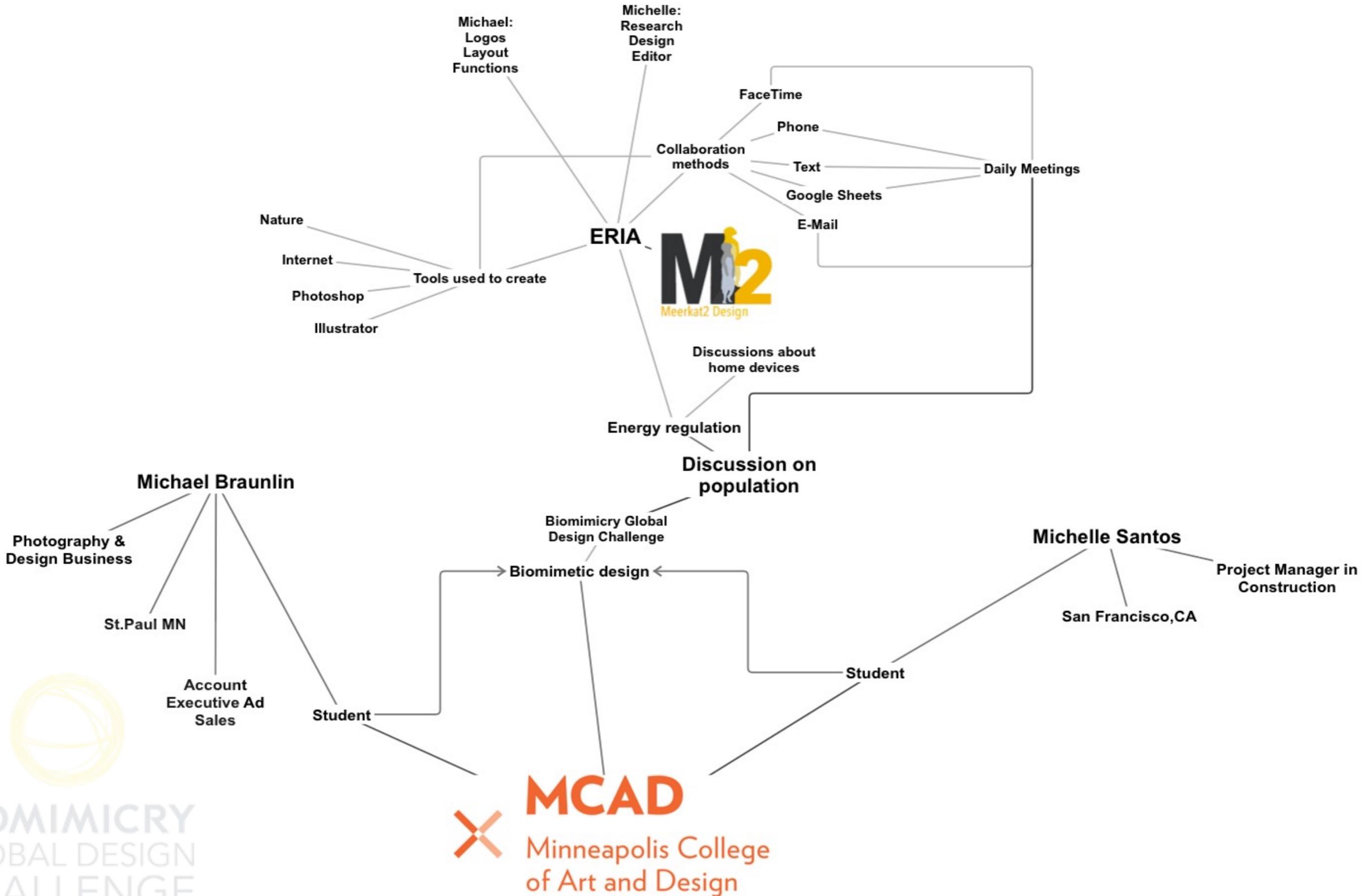
The physical structure of the apparatus will come from reusable materials. The internals and ever-changing touch displays will have to be long-lasting, low-impact and energy efficient. By absorbing electricity through wireless charging from idle devices, ERIA will not be reliant on wires or constantly connected to power sources.

ERIA represents a new era of intelligence and awareness in technology and in users.

ERIA gives consumers options and opportunities for change.



ERIA//Collaborative Design Process





ERIA//References

- ICOS Carbon Portal | Carbon Portal. N.p., n.d. Web. 12 Apr. 2017.
- Carboscope. N.p., n.d. Web. 12 Apr. 2017.
- Sea Level Station Monitoring Facility. N.p., n.d. Web. 12 Apr. 2017.
- Sea Level Trends - NOAA Tides and Currents. N.p., n.d. Web. 12 Apr. 2017.
- Snake Muscles. N.p., n.d. Web. 12 Apr. 2017.
- Sharnoff. *Lichen Biology and the Environment*. N.p., n.d. Web. 12 Apr. 2017.
- "Cattail Facts." *CATTAILS*. N.p., 07 Feb. 2007. Web. 12 Apr. 2017.
- Centre, British Oceanographic Data. "Global Sea Level Observing System (GLOSS)." *Global Sea Level Observing System*. N.p., n.d. Web. 12 Apr. 2017.
- "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021 White Paper." *Cisco*. N.p., 29 Mar. 2017. Web. 14 Apr. 2017.
- "Home Page - Deep Space Network." *NASA*. NASA, n.d. Web. 12 Apr. 2017.
- Linz, George M., and H. Jeffrey Homan. "Use of glyphosate for managing invasive cattail (*Typha* spp.) to disperse blackbird (*Icteridae*) roosts." *Crop Protection* 30.2 (2011): 98-104. Web.
- "NASA Reviving Effort To Put Spare Orbiting Carbon Observatory Sensor on ISS." *SpaceNews.com*. N.p., 17 Dec. 2015. Web. 12 Apr. 2017.
- "Search." *Systematics, biodiversity and ecology of lichens — Schweizerbart science publishers*. N.p., 25 May 2012. Web. 12 Apr. 2017.
- Szalay, Jessie. "Garter Snake Facts." *LiveScience*. Purch, 10 Dec. 2014. Web. 12 Apr. 2017.
- "UNRAVELING EARTH'S GREENHOUSE GAS BALANCE WITH MEASUREMENTS." *ICOS EU*. N.p., n.d. Web. 12 Apr. 2017.
- Animofan. "Alouate Roux." *Le Monde Animal*. N.p., n.d. Web. 20 Mar. 2017. <<http://monde-animal.over-blog.com/article-451340.html>>.
- "Boa Constrictor." *Kids' Games, Animals, Photos, Stories, and More*. N.p., 01 Mar. 2014. Web. 20 Mar. 2017. <<http://kids.nationalgeographic.com/animals/boa-constrictor/>>.
- "CaliforniaHerps.com, Reptiles and Amphibians of California." *California Herps*. N.p., n.d. Web. 20 Mar. 2017. <<http://www.californiaherps.com/identification/snakesid/gartersnakes.id.html>>.
- "Clover." *Wikipedia*. Wikimedia Foundation, 24 Apr. 2017. Web. 25 Apr. 2017. <<https://en.wikipedia.org/wiki/Clover>>.
- "Join Us in Unleashing Data for a Sustainable Future." *Global Footprint Network*. N.p., n.d. Web. 20 Apr. 2017. <<http://www.footprintnetwork.org/>>.
- "Lichens Can Be Made Of Three Organisms, Not Just Two." *Popular Science*. N.p., n.d. Web. 20 Mar. 2017. <<http://www.popsci.com/new-research-finds-lichens-are-not-just-two-organism-marriage>>.
- N.p., n.d. Web. 12 Mar. 2017.
- N.p., n.d. Web. 12 Mar. 2017. <<https://www.gardeningknowhow.com/ornamental/water-plants/cattails/controlling-cattails.html>>.
- "Real-time Monitoring Is Key to Reducing Energy Consumption." *Electricity Today T&D Magazine*. N.p., n.d. Web. 20 Apr. 2017. <<http://www.electricity-today.com/marketplace/real-time-monitoring-is-key-to-reducing-energy-consumption>>.
- Reducing Energy Consumption*. N.p., n.d. Web. 20 Apr. 2017. <<http://revelle.net/lakeside/lakeside.new/steps.html>>.
- "Yellow-billed Oxpecker." *Wikipedia*. Wikimedia Foundation, 24 Apr. 2017. Web. 24 Apr. 2017. <https://en.wikipedia.org/wiki/Yellow-billed_oxpecker>.