

**luxexecutivesummit 2018**

Boston • April 9-11

# The 6 Technologies You Can't Succeed Without

Bringing Innovations FOR Consumers TO Consumers | April 10, 2018

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Gihan Hewage

Analyst, Lux Research



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# Consumer Product Innovation

Bringing Innovations FOR Consumers TO Consumers | April 10, 2018

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# Agenda



- 1 | **The Problem with Consumers**
- 2 | How do we help consumers?
- 3 | Putting it together



Snack  
Time



# What am I eating?



What am I eating?

clover



What am I eating?

clover



What am I eating?

clover



IMPOSSIBLE™



What am I eating?

clover



IMPOSSIBLE™



# What's So Great About the Impossible Burger?



Source: Impossible Foods, Lux Research

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Source: Impossible Foods, Lux Research



# What's So Great About the Impossible Burger?



**YOU SAVE WATER  
EQUIVALENT TO A  
10-MINUTE  
SHOWER.**



**YOU SPARE 18  
DRIVING MILES-  
WORTH OF  
GREENHOUSE  
GASES.**



**YOU SPARE 75  
SQUARE FEET OF  
LAND FOR  
WILDLIFE.**

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**YOU GET MORE  
FAT & PROTEINS  
AND LESS  
CALORIES &  
CHOLESTEROL.**

## Reviews from Clover have been mixed

**jpazos** @jpazos · Mar 30

I know @cloverfoodlab has the parsnip thing going right now but this Impossible Meatball sandwich is still a must-eat!!!!



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1 2



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Bc vegan version doesn't taste as good. We want carnivores to fall in love with this. Has to be pitch perfect.

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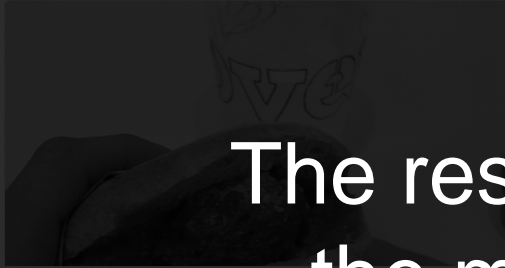
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Try harder?

3



The restaurant collects customer feedback about the meatless meat at its locations, and some customers are against genetically modified food.

- Ayr Muir, Clover Founder, CEO



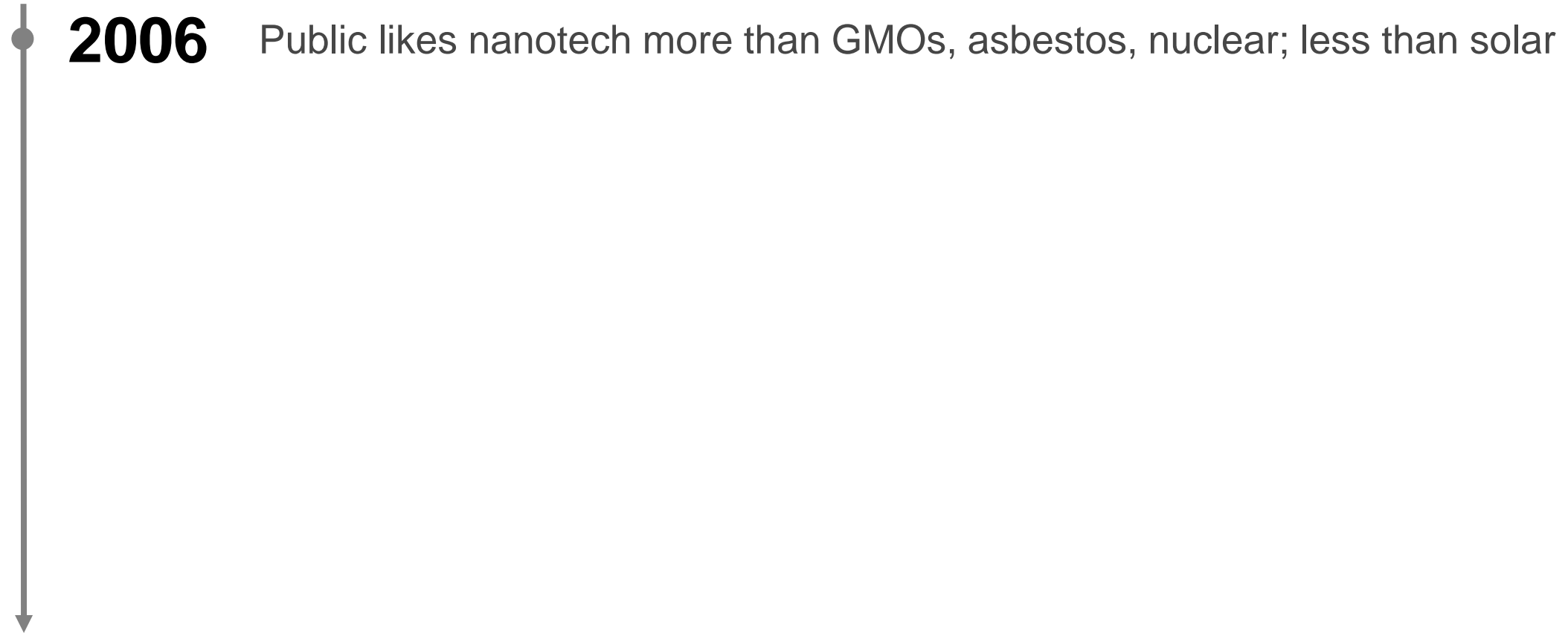
## We've seen this before...

Lux tracks how consumers challenge transformative innovation like GMOs




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  - 2017** What GMO crops can learn from Papaya

# Agenda

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- 1 | The Problem with Consumers
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# Key Strategies

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- 1. Proactively educate consumers on technology**
  - 2. Emphasize clear benefits to consumers**
-



# 18 for 2018

**Executive Summary:** Top technologies Lux is following in 2018, using data from the Lux Intelligence Engine and analysts' insight

A ranking of the most important technologies to watch, given their potential to transform the world in the next decade

- 1 Machine Learning and Deep Neural Networks**  
30% annual increase in machine learning patents
- 2 3D Printing and Additive Manufacturing**  
Lux expects 3D printing to be a \$20 billion market by 2025
- 3 Genome Editing**  
\$1.2 billion in VC funding to impact industries from food to health care
- 4 5G Networks**  
Over 70,000 patents set the stage for 5G network launches in 2018
- 5 Microbiome**  
Harnessing the power of microbes for nutrition, agriculture, and more
- 6 Solid-state Batteries**  
Safer and better batteries, pursued by start-ups and giants like Toyota
- 7 Synthetic Biology**  
A recent \$275 million round for Ginkgo Bioworks highlights the potential
- 8 Augmented Reality (AR)**  
Enterprise applications are coming now, on heels of \$4.4 billion in funding
- 9 Smartwatches**  
Patents soar from near zero to over 23,000 in less than five years
- 10 Wireless Charging**  
Here now for consumer electronics, with R&D pushing for EV uses
- 11 Materials Informatics**  
Using IT and AI to break out of slow material development cycles
- 12 IoT Security**  
Patents are up 13x as connected devices proliferate
- 13 Edge Computing**  
When milliseconds matter, analytics can be local, not in the cloud
- 14 Energy Distribution System Monitoring**  
Growing demand and renewables require tech to balance the grid
- 15 Polyethylene Furanoate (PEF)**  
Innovation has grown at an 87% annual rate to improve on PET
- 16 Sugar Reduction**  
Over 162,000 patents to combat health ills from too much sugar
- 17 Neural Interfaces**  
Tech to read and stimulate the brain will see growing validation in 2018
- 18 Syngas and Power-to-Gas**  
Producing fuels from CO<sub>2</sub> to drive the energy transition

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# Genome Editing

Using genetic tools like TALENs and CRISPR to make specific changes to a cell's DNA

## Lux Take:

Holds promise for advances like cancer cures and more nutritious crops.

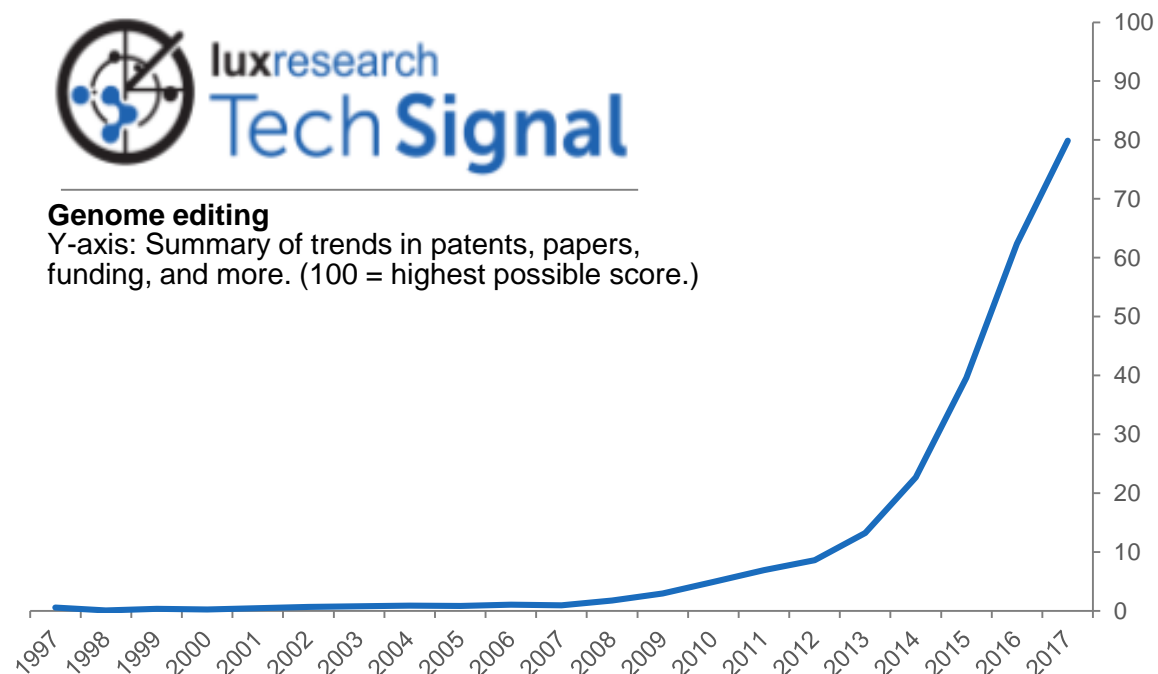
Genome editing can be faster, cheaper, and offers an easier regulatory path.

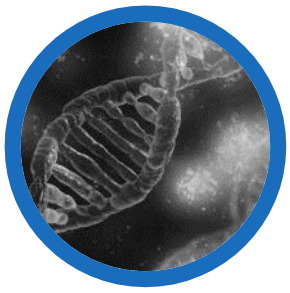
Its impacts will be felt everywhere.



### Genome editing

Y-axis: Summary of trends in patents, papers, funding, and more. (100 = highest possible score.)





GENOME EDITING

## Okanagan Specialty Fruits (OSF)

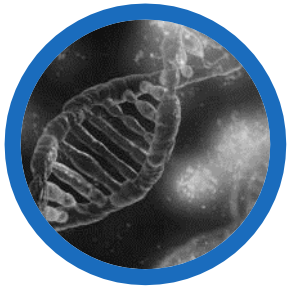
**Technology:** Genetically Engineered Non-Browning Apples, silencing the genes for polyphenol oxidase (PPO)

**Conventional  
Apple Variety**



**Arctic®  
Apple Variety**





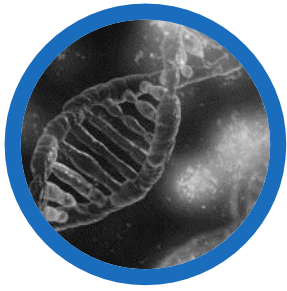
## GENOME EDITING OSF – Case Study

### Advantages

Apples do not brown

### Challenges

“Fears and misconceptions regarding biotech foods”  
- Neal Carter, OSF



GENOME EDITING

## OSF – Transparency and Outreach



We have found in our experience that **transparency and enabling the public to experience Arctic® apples firsthand are very impactful in educating consumers and gaining their support.**

- Neal Carter, OSF



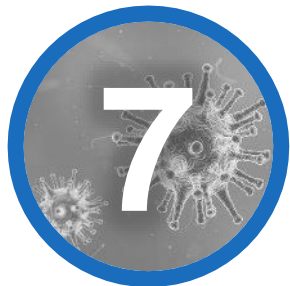




# Key Strategies

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-





# Synthetic Biology

New organisms with industrial applications

## Lux Take:

New leaders successfully raise funds

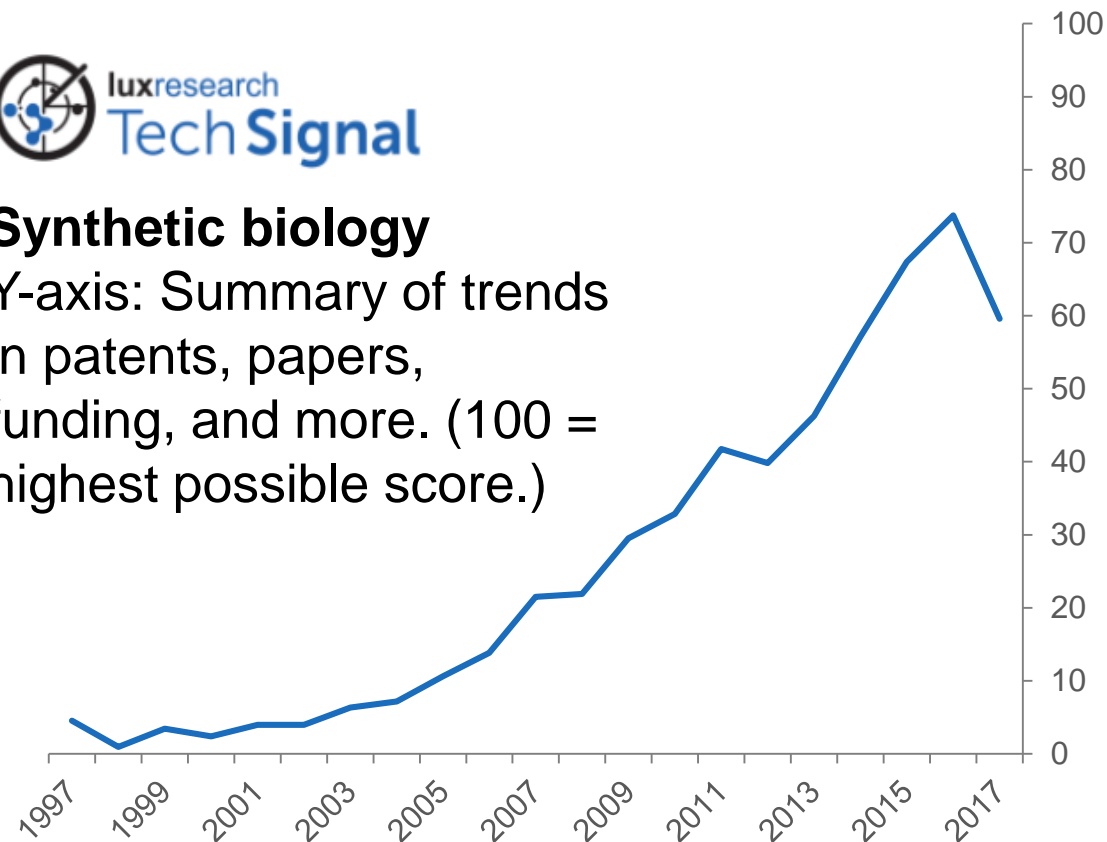
Developing technologies accelerate organism development timelines

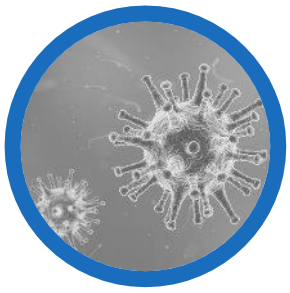
Commercial relevance coming soon



## Synthetic biology

Y-axis: Summary of trends in patents, papers, funding, and more. (100 = highest possible score.)





# SYNTHETIC BIOLOGY

## Ginkgo Bioworks

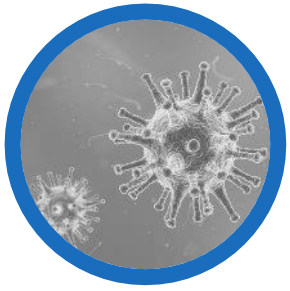
### Technology:

Automated, high-throughput synthetic biology platform

Uses digital tools to optimize microorganism strain design

Applies Synbio Platform to consumers





SYNTHETIC BIOLOGY

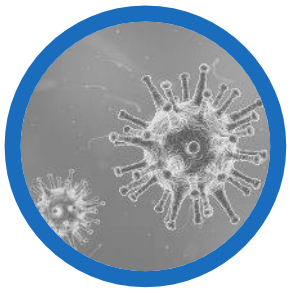
# Ginkgo Bioworks – Case Study

## Advantages

Efficient & Scalable  
Microorganism Development

## Challenges

Consumer Perception  
of GMOs



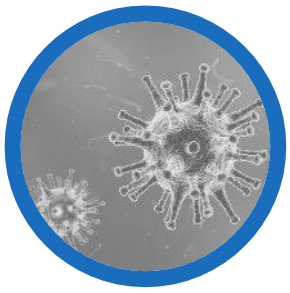
SYNTHETIC BIOLOGY

# Ginkgo Bioworks – Transparency and Outreach

## Proactive education on the specific benefits of GMOs

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Modified plant microbiomes enable nitrogen fixation, reducing greenhouse gases & pollution traditionally caused by fertilizers.



## SYNTHETIC BIOLOGY

# Ginkgo Bioworks – Transparency and Outreach

Fri 3/2/2018 7:03 AM

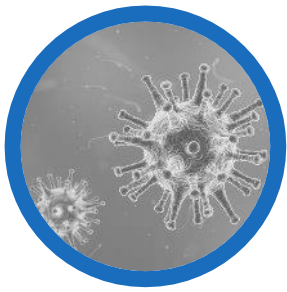
J Jason Kelly

I ♥ GMOs

# I ♥ GMOs

I think people should love GMOs. Genetic engineering is vital in medicine, where it's used to make everything from insulin—the first medicine made with recombinant DNA—to the biologics that make up more than a quarter of the pharmaceutical market today, to the next generation of living medicines like CAR-T. There are GMO yeasts helping to produce hamburgers and leather without cows, and spider silk dresses without spiders. There are GMOs improving sustainability in consumer products, manufacturing, and agriculture.

I'm proud of the GMOs that Ginkgo is making, and I've [written](#) before about how as an industry we should welcome GMO labeling as an opportunity to celebrate the technology rather than hide it. Last month, Ginkgo was featured in a [story in The Atlantic by Sarah Zhang](#) about our love for GMOs and how perceptions are slowly shifting as more companies make more exciting new GMO products.



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# Key Strategies

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# Smartwatches

Mobile wrist-worn devices offering connectivity and sensors with touchscreen displays

## Lux Take:

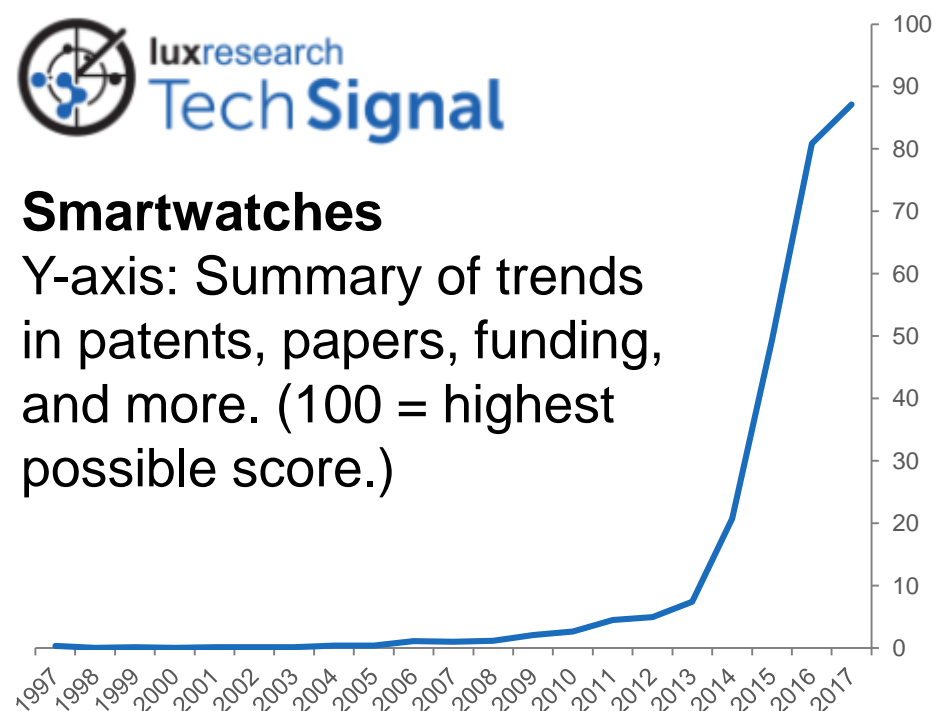
New capabilities in enterprise, consumer, and medical applications

Need to distinguish themselves from fitness trackers



## Smartwatches

Y-axis: Summary of trends in patents, papers, funding, and more. (100 = highest possible score.)





## SMARTWATCHES

# Distinguishing smartwatches from fitness trackers

## Challenge with Fitness Trackers

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Low Compliance: ~6 month lifespan





SMARTWATCHES

## Transparency and Outreach

### **Educating consumers**

---

Integration into daily life

Bring technologies from medical field to broader consumer

### **Benefit to Consumer**

---

Targeting Metrics that are more connected to health

Not “steps” – blood glucose levels



SMARTWATCHES

## Transparency and Outreach

Educating consumers

Benefit to Consumer

**Everyday integrations targeting health applications can more clearly impact consumers**



# Key Strategies

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- 1. Proactively educate consumers on technology**
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# Neural Interfaces

Technologies to read and stimulate the brain

## Lux Take:

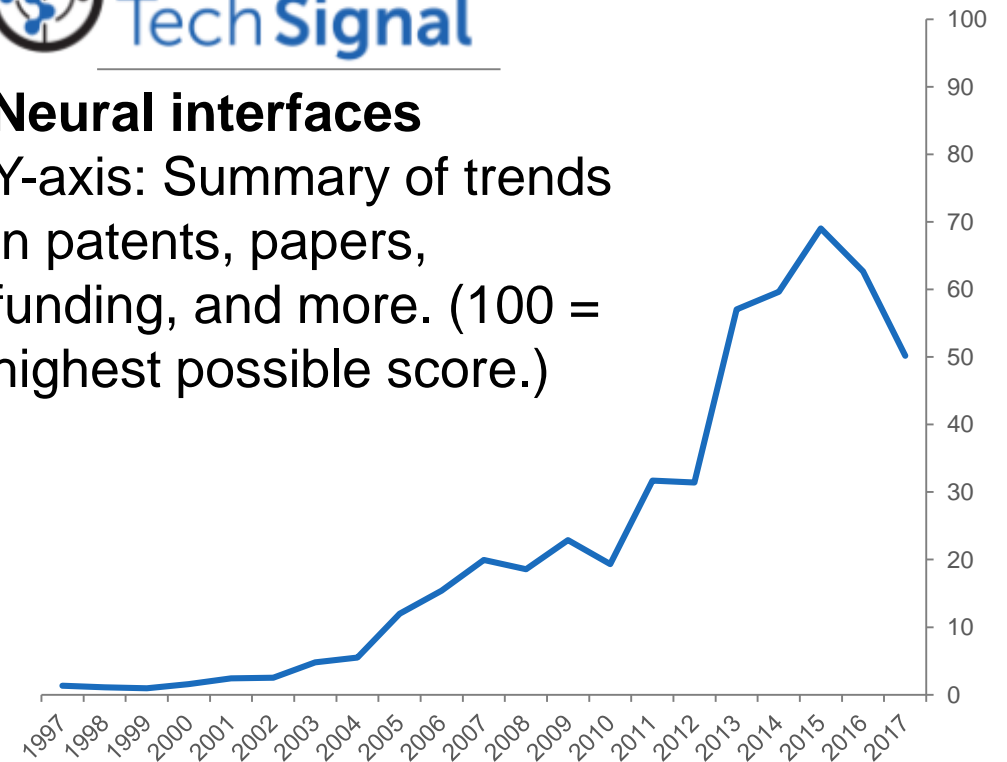
Increased focus on neurological health & technologies

Neural interface technology promises to come soon



## Neural interfaces

Y-axis: Summary of trends in patents, papers, funding, and more. (100 = highest possible score.)







## NEURAL INTERFACES

# Consumers have privacy concerns

## Facebook Literally Wants to Read Your Thoughts



Kristen V. Brown

4/19/17 6:32pm • Filed to: SCIENCE ▾



36.4K



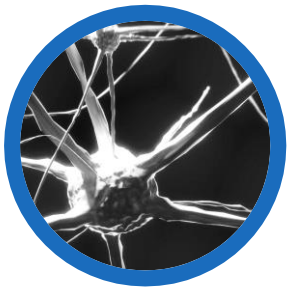
41



3





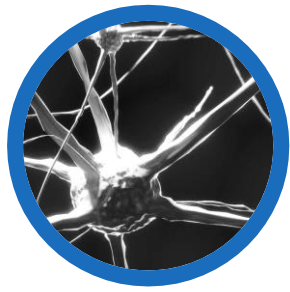


## NEURAL INTERFACES

# Neuralink

**Technology:** “Ultra high bandwidth brain-machine interfaces to connect humans and computers” – Elon Musk

What does that really mean?



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What does that really mean?

Musk has suggested is that Neuralink aims to treat **neurological disorders** and **enable telepathy** over the next decade



# NEURAL INTERFACES

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What does that really mean?

Musk has suggested is that Neuralink aims to treat **neurological disorders** and **enable telepathy** over the next decade

The screenshot shows the Neuralink website in a browser window. The address bar displays "https://www.neuralink.com". The page features the Neuralink logo, a description of their mission, and a list of job openings.

Neuralink is developing ultra high bandwidth brain-machine interfaces to connect humans and computers.

We are looking for exceptional engineers and scientists. No neuroscience experience is required: talent and drive matter far more. We expect most of our team to come from other areas and industries.

- Electrical Engineer
- Laboratory Manager
- Mechanical Engineer
- Microelectronics Packaging Engineer
- Process Engineer
- Software Engineer, Backend
- Software Engineer, Robotacist
- Technical Recruiter



NEURAL INTERFACES

## Neuralink – Case Study

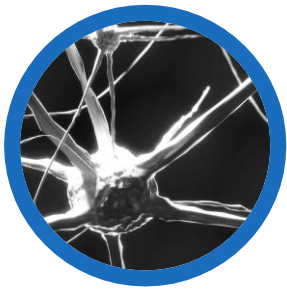
### Advantages

Elon Musk?

Telepathy?

### Challenges

Consumer acceptance of  
the technology & its  
ramifications



## NEURAL INTERFACES

# Neuralink – Transparency and Outreach

**Neuralink**

@neuralink

Developing ultra high bandwidth brain-machine interfaces to connect humans and computers

Tweets	Following	Followers	Likes
1	3	4,949	2

**Tweets**   **Tweets & replies**

Neuralink Retweeted

**Tim Urban** @waitbutwhy · 20 Apr 2017

It's finally here: the full story on Neuralink. I knew the future would be nuts but this is a whole other level. [waitbutwhy.com/2017/04/neural...](http://waitbutwhy.com/2017/04/neural...)



# Key Strategies


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# Agenda

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- 1 | The Problem with Consumers
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How should  
Impossible  
Foods market its  
plant-based  
meat?

# Proactively Educate Consumers on Technology

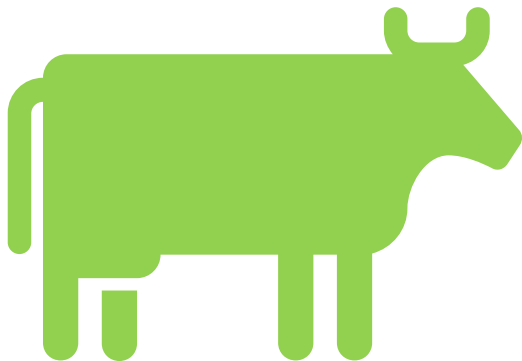
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# Proactively Educate Consumers on Technology

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**DO YOU PRODUCE HEME  
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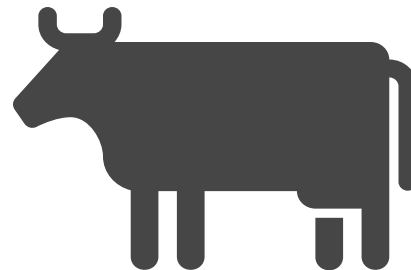


# Proactively Educate Consumers on Technology

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**DO YOU PRODUCE HEME  
BY GENETIC  
MODIFICATION?**

**HOW DO I KNOW PLANT-  
BASED HEME IS SAFE?**



# Emphasize Consumer Benefits

---



# Emphasize Consumer Benefits

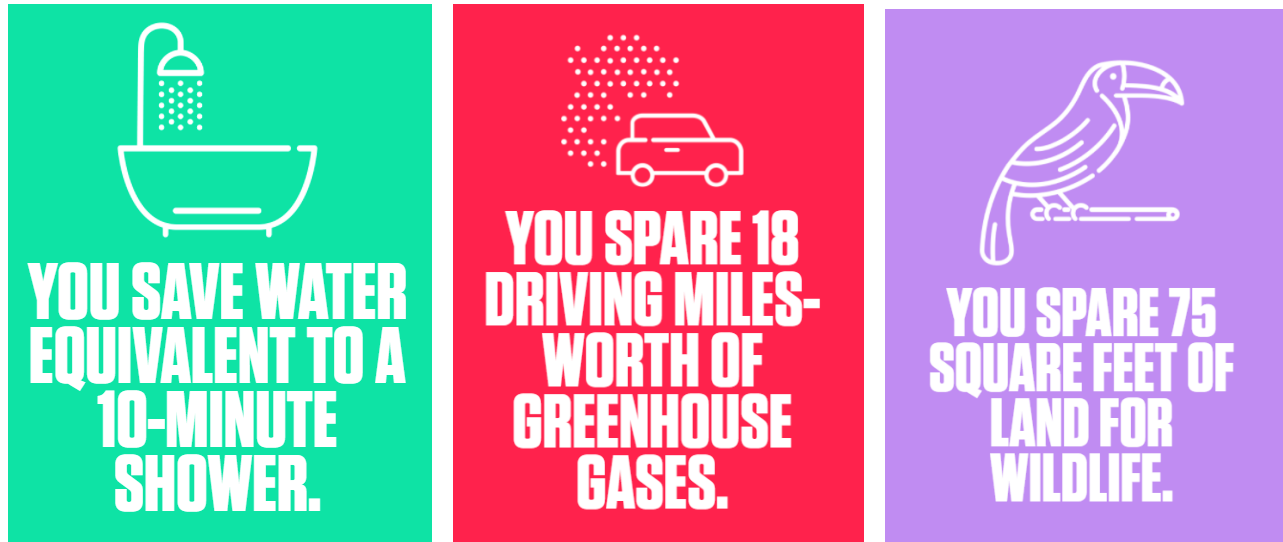
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Impossible Foods Marketing = Sustainability

# Emphasize Consumer Benefits

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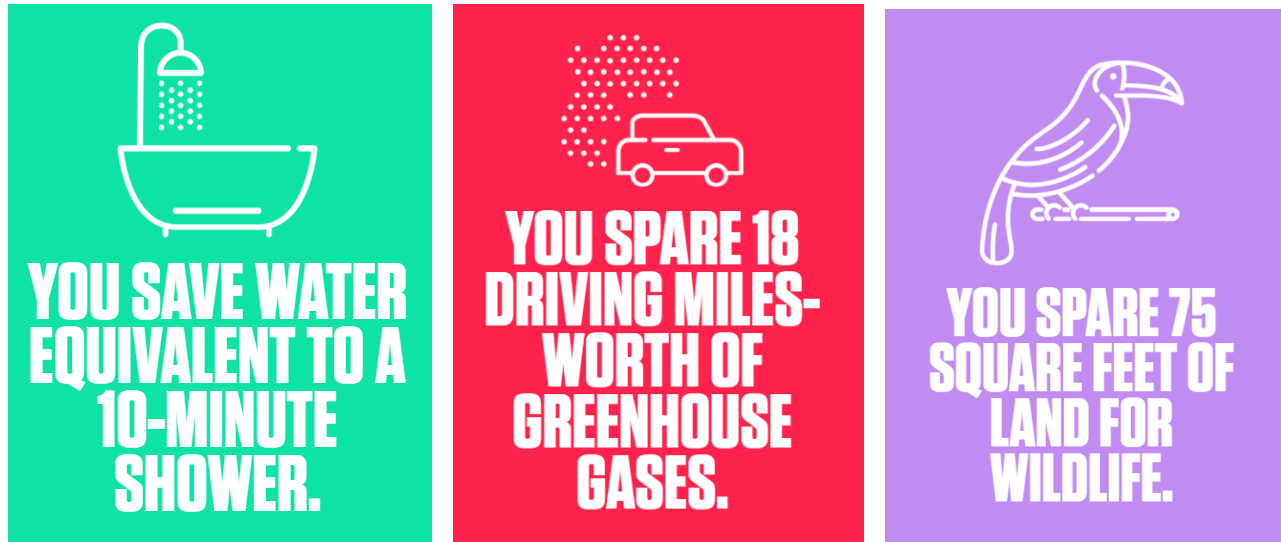
Current marketing by Impossible Foods



# Emphasize Consumer Benefits

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Current marketing by Impossible Foods

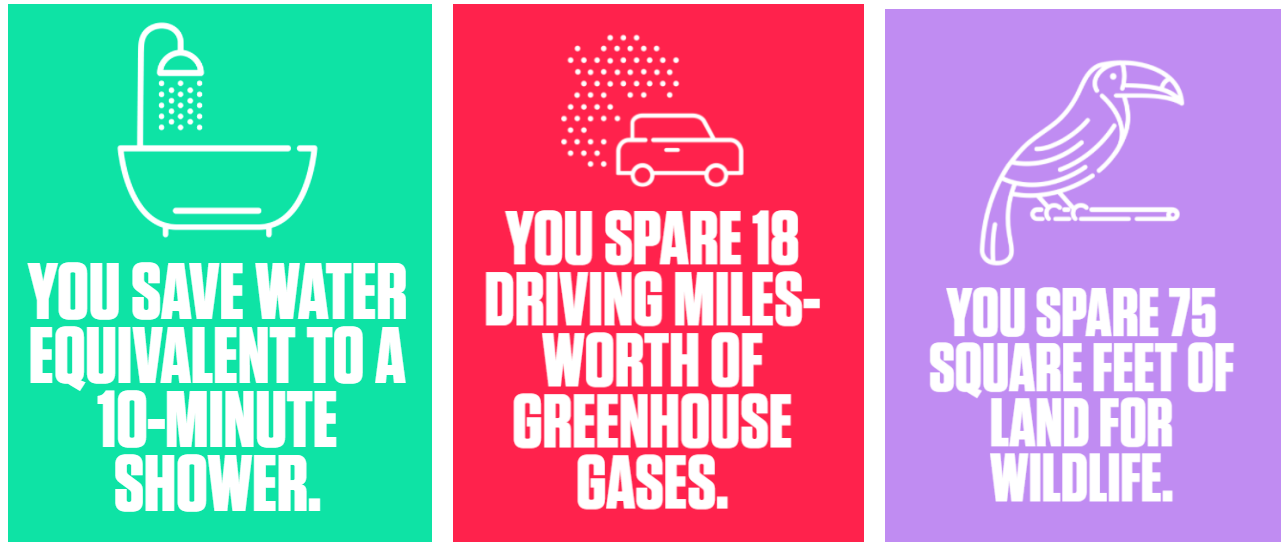


How they should be marketing based on their FAQs

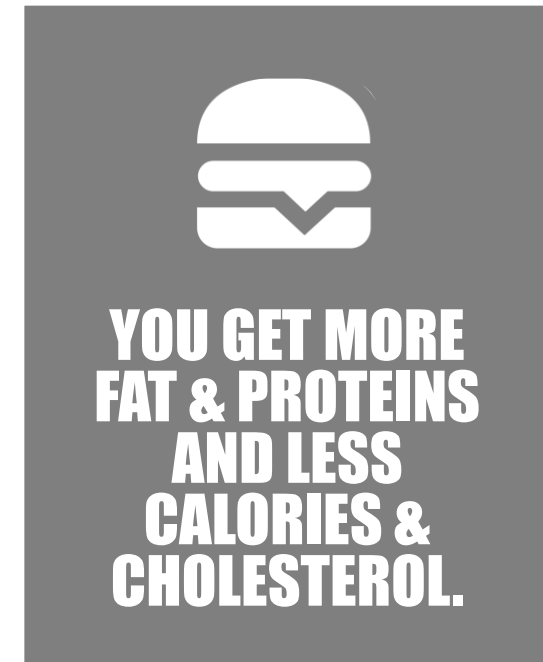
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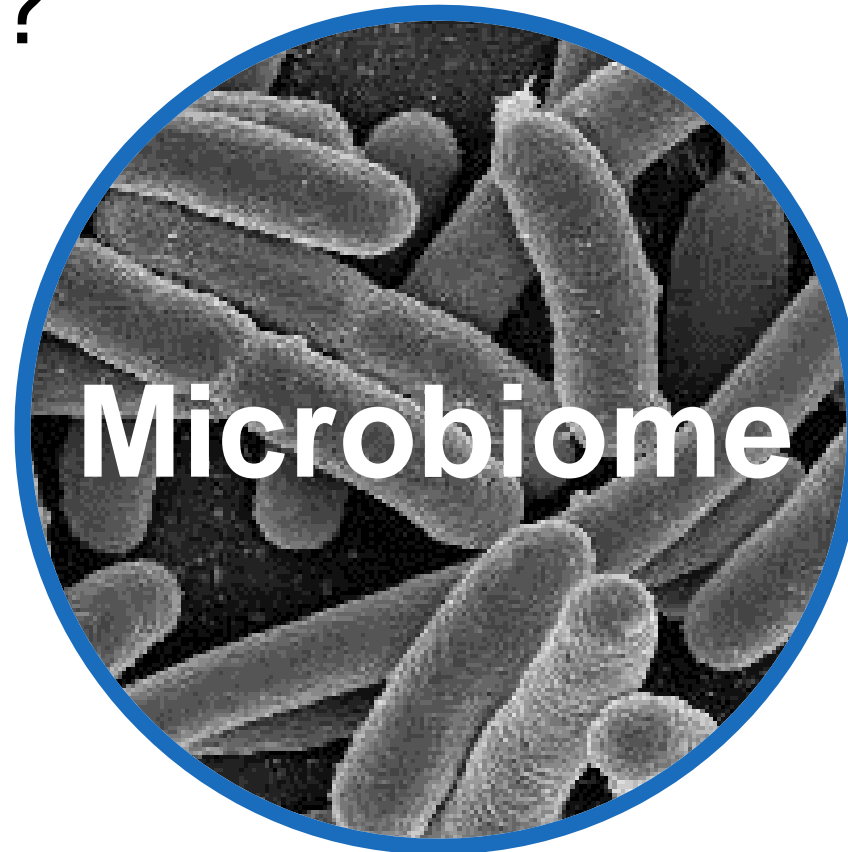


How do you  
implement this  
for future  
innovations?





What is an up and coming transformative innovation for consumers?





# Microbiome

Microbes as ingredients, therapeutics, and diagnostics

## Lux Take:

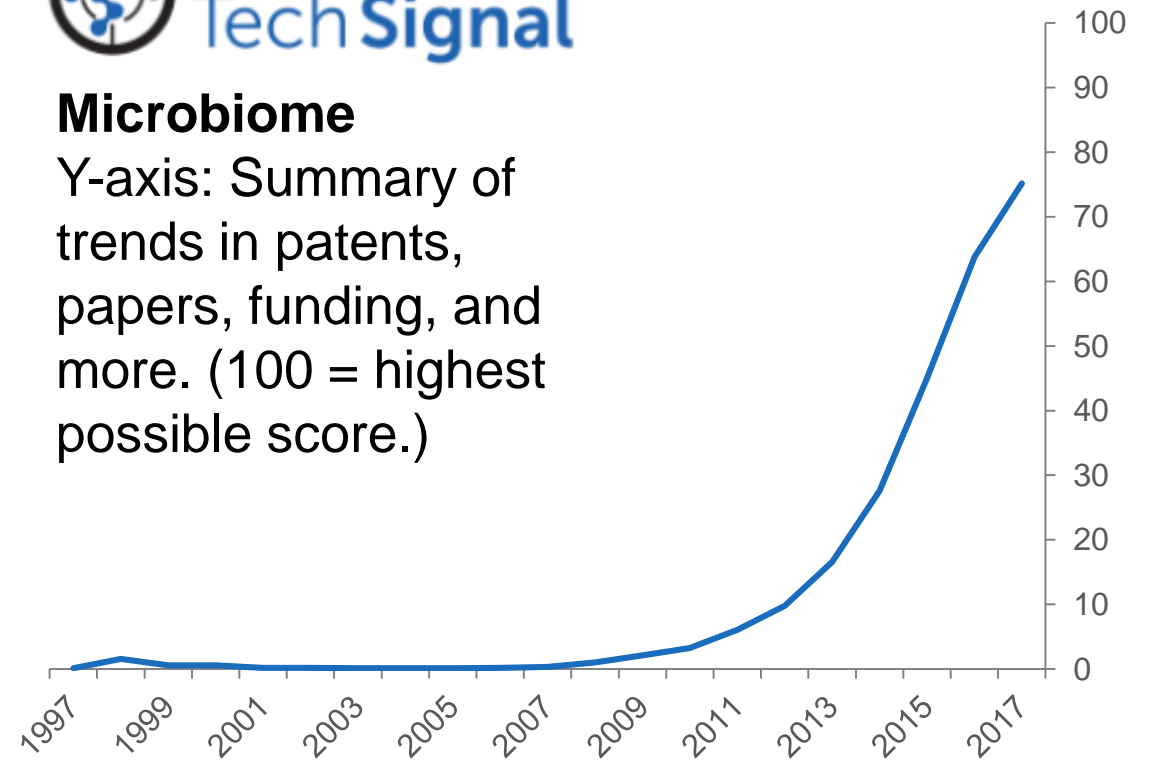
New layer of personalization in consumer products

Underlying science is still a work in progress



## Microbiome

Y-axis: Summary of trends in patents, papers, funding, and more. (100 = highest possible score.)





# Key Strategies

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# MIRCOBIOME Probiotic Supplements

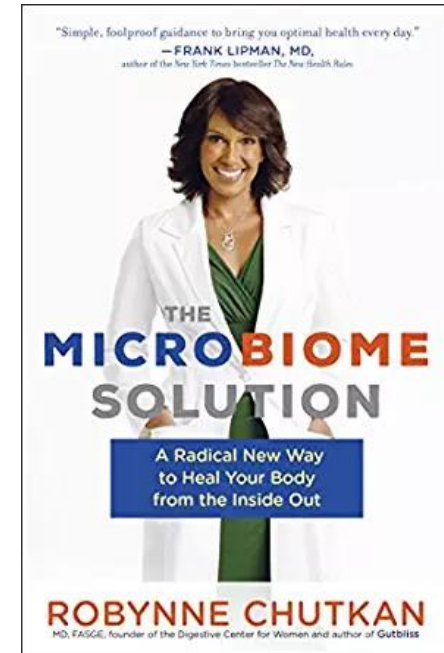
## Challenges

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Risk of over promising  
but under delivering

## Solution

Target “weight loss” instead  
of “health” or “wellness”





## MIRCOBIOME **Probiotic Supplements**

### **Challenges**

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Risk of over promising  
but under delivering

### **Solution**

**Benefits need to be  
clinically proven**



MIRCOBIOME  
**GMO Microbiomes**

## Challenges

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Consumer fear of  
GMO technologies

## Solution

Target clear benefits to  
consumers (like disease)





## MIRCOBIOME

# Personalized Nutrition

### Challenges

Consumers sticking to their diets based on microbiomes

### Solution

Recommendations must be shown to be effective



# MIRCOBIOME Personalized Nutrition

## Challenges

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Consumers sticking to their diets based on microbiomes

## Solution

**How do we prove them?**

# Bringing Innovations for Consumers to Consumers

**1** Consumers often reject transformative innovations

**2** This can be addressed with *transparency* and *clearly outlined benefits*

**3** Highlighted several success stories and cautionary tales



# 2018 luxexecutivesummit

Boston • April 9-11

*Thank you for joining us.*





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A stethoscope is laid out on a wooden surface. In the background, a bowl contains fresh vegetables including a purple onion, a yellow onion, a tomato, and a head of green broccoli. A black circle with a white border is centered over the image, containing white text.

What  
transformative  
innovation has  
already  
impacted you?



A stethoscope is laid out on a wooden surface. In the center, a white bowl contains fresh vegetables, including a purple onion, a yellow onion, a red bell pepper, a head of green broccoli, and some green herbs. A black circle with a white border is superimposed over the center of the image, containing white text.

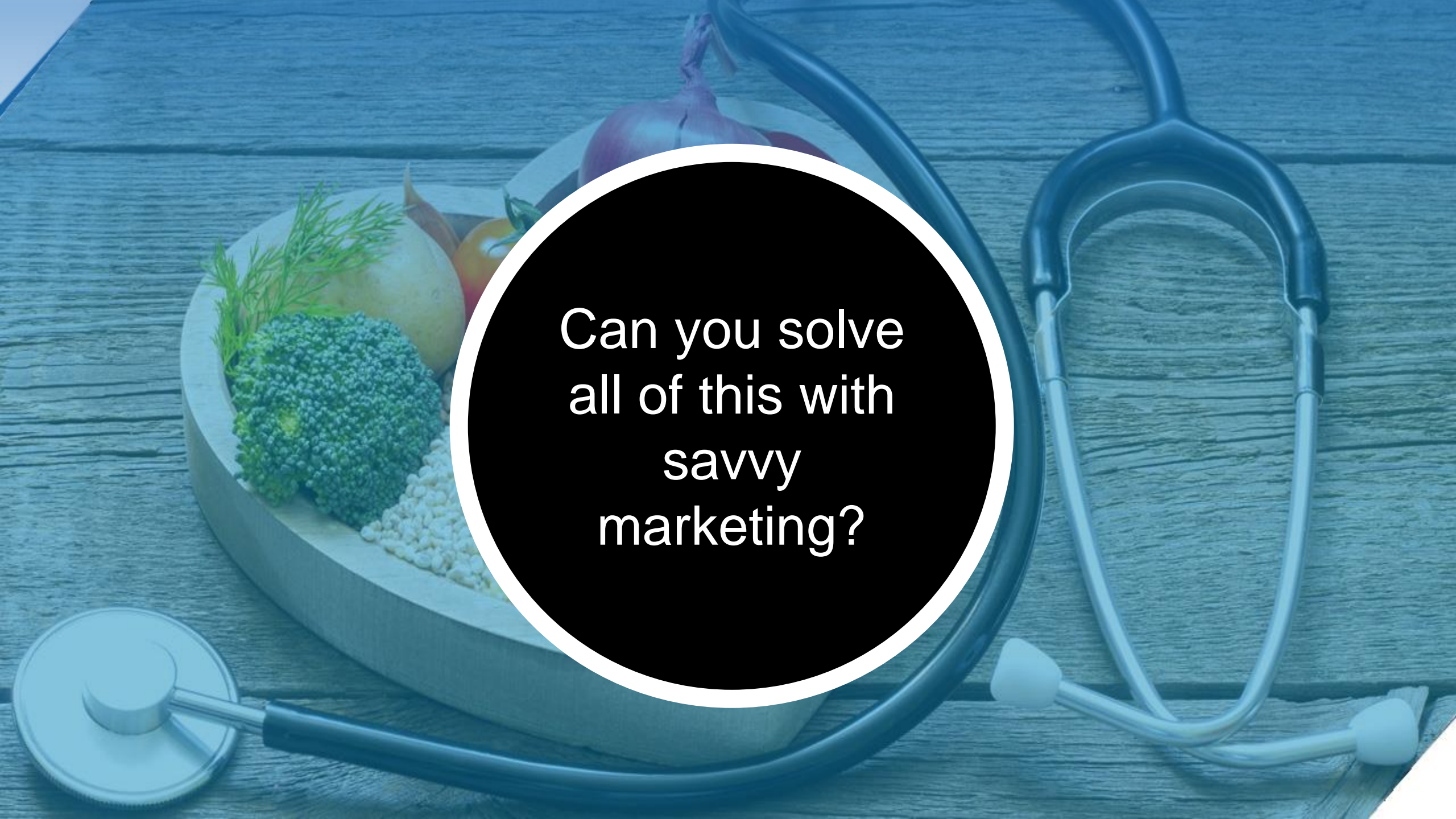
What  
transformative  
innovation will  
be next?



A stethoscope is laid out on a wooden surface. In the background, there is a bowl filled with fresh vegetables, including broccoli, cauliflower, and onions. The entire scene is overlaid with a semi-transparent blue filter.


Do you have a  
strategy for  
how you  
communicate  
about  
technology?




A blue-tinted photograph of a stethoscope and a bowl of fresh vegetables on a wooden surface. The stethoscope is positioned diagonally across the frame, with its chest piece on the left and its earpieces on the right. The bowl, which is light-colored, is filled with various fresh vegetables including a purple onion, a yellow onion, a red bell pepper, a head of green broccoli, and some green leafy vegetables. The background is a wooden surface with a visible grain. A large black circle with a white border is centered over the image, containing the text.

Can you solve  
all of this with  
savvy  
marketing?




A stethoscope is laid out on a wooden surface. In the center, a white bowl contains a variety of fresh vegetables, including a purple onion, a yellow onion, a red bell pepper, a head of green broccoli, and some green leafy vegetables. A black circle with a white border is superimposed over the bowl, containing the text.

Does anyone  
do this well  
today?

- 
- 2011: acquired Agarigen
  - 2012: acquired AquaBounty
  - 2014: acquired TransOva Genetics
  - 2015: acquired Okanagan Specialty Fruits
  - 2015: acquired Oxitec
  - 2017: acquired GenVec

**INTREXON**®



A stethoscope is laid out on a wooden surface. In the center, a white bowl contains a variety of fresh vegetables, including a purple onion, a yellow onion, a red bell pepper, a head of green broccoli, and some green leafy herbs. A black circle with a white border is superimposed over the center of the image, containing the text.

What are you  
personally  
excited  
about?