# PRECISION CONSUMER

### WHEN DATA BECOMES INVISIBLE

sparks & honey



### PRECISION DATA IS CHANGING CULTURE.

### CULTURE IS CHANGING PRECISION DATA.

**Precision Consumer 2030** Table Of Contents

### TABLE OF CONTENTS

### Introduction

THE TENSION BETWEEN SCIENCE AND CONSUMER DEMAND	8
PRECISION DATA IS TRANSFORMING CULTURE	12
10 REASONS WHY PRECISION IS A C-SUITE PRIORITY	16

### Disruption

**WELLBEING NUTRITION** HEALTH **WELLNESS** 

COMMERCE **FASHION EMOTION RECOGNI TRACKING AND SO** 

**COLLECTIVE SPACES INFRASTRUCTURE ENVIRONMENTS** COMMUNITIES

**HUMAN PERFORMA** PHYSICAL **MENTAL** DIGITAL



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	28
	30
	36
	42
	46
	48
TION	54
URCING	60
5	64
	66
	72
	78
ANCE	82
	84
	90
	96

### **5** Critical Questions

EVOLVING RELATIONSHIPS WITH BIOHACKERS	10
MAKING BIODATA USEFUL	10
PRECISION AND SUSTAINABILITY	11
PROTECTING CONSUMER RIGHTS	11
INCLUSIVE PRECISION	12









5

### I INTRODUCTION



### **OUR APPROACH**

The Disruption Compass is sparks & honey's data-driven, expert-informed methodology, making change visible

### **HORIZONTAL ANALYSIS**

### **QUANTIFICATION**

### **STAKEHOLDER ENGAGEMENT**

### **PATTERN ANALYSIS**

### **FUTURECASTING**

1: sparks & honey's proprietary cultural intelligence platform Q<sup>TM</sup> A signal is a cultural data point, an article, video, research, patent, M&A deal, etc.

2: Quid, total article volume, Aug 2016-Aug 2019

2016-Aug 2019 4: Quid, total VC investment, Aug 2016-Aug 2019 5: See Contributing Thought Leaders, pages 126 - 129



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### 32M+ SIGNALS<sup>1</sup>

### **63M+ ARTICLES<sup>2</sup> 500K+ PATENTS<sup>3</sup>** \$1.1T+ IN VC INVESTMENT<sup>4</sup>

### **9 SPARKS & HONEY AB MEMBERS**<sup>5</sup> **12 CO-CREATION PARTNERS<sup>5</sup>**

**4 KEY SECTORS 34 CHANGE AREAS WHERE PRECISION TECH IS MANIFESTING** 

### **10 CEO MANDATES 5 CRITICAL QUESTIONS**

7

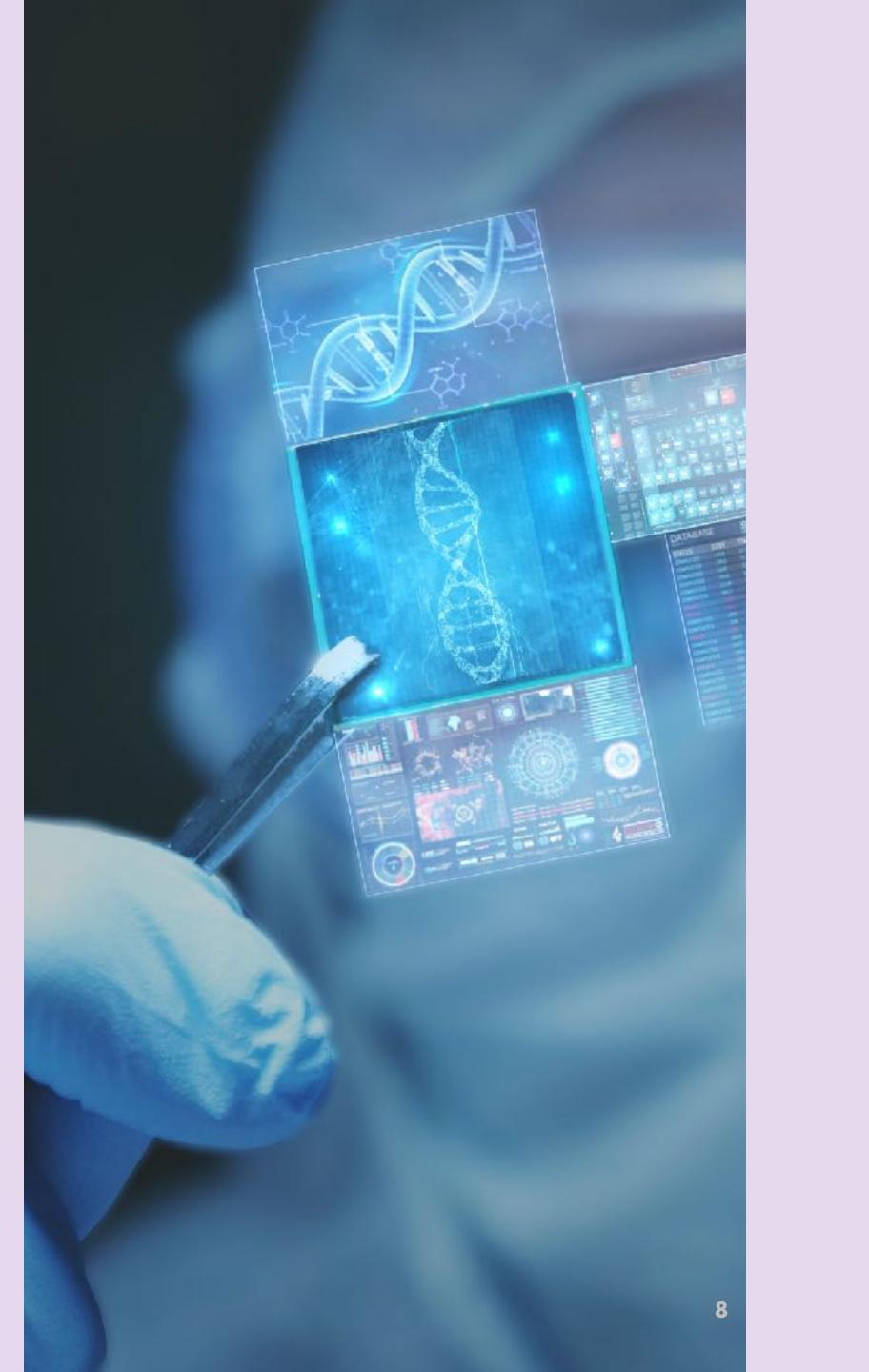
### THE TENSION BETWEEN SCIENCE AND CONSUMER DEMAND

### An introduction to precision

The cultural spotlight is on precision—and it's only set to get brighter. Our research has revealed that, sometimes, science is ahead of consumers, and sometimes, it's consumer demand driving science. Precision is a term that implies accuracy, technological advancement and deeply personalized solutions. Today, the scientific term "precision" is mainly associated with medicine or health, a thriving market: the <u>precision medicine industry</u> <u>will reach \$96.6 billion<sup>5</sup> by 2024</u>, with a compound annual growth rate (CAGR) of 10.7%. But it is also permeating nutrition, wellness, beauty, human performance, and even entertainment, agriculture and our very planet. As our human needs evolve in these deeply personalized spaces, the science and technology of precision follows.

The label of precision is associated with technologies that meet our human data, known as biodata. However, our thought leaders have pointed out that the precision label may not live up to its reputation without the accuracy and data backed by science.

From a semantics perspective, precision is following in the footsteps of labels such as vegan, gluten-free or free-from—precision is becoming an identifier that is freely applied to new concepts, products or services.





# "The term (precision) is being used very loosely. What I would love to see is, when someone presents a solution as a precision solution, we

- Sunita Singh Maclaren, co-founder of Metakura

should have some kind of way of saying: here are the things we do, but then here are the things that we don't do-for every product or service. So that there is a degree of consumer faith and reliability."

9

Precision is synonymous with the idea of a future defined by Deep Personalization, a trend tracked by sparks & honey. When an item is designed specifically based on an individual's data, it shifts consumer behavior and engagement with those products or services. The data gathered from us and fed back to us in real-time—has the potential to inform our decisions, tastes and experiences.

"Personalization is creating a lot more buy-in. When people do a personalized diet program, we've noticed that the adherence to that program over an eight-week period is around 60 percent—higher than when people get generic programs. The understanding of the person is that 'this is made for me'."

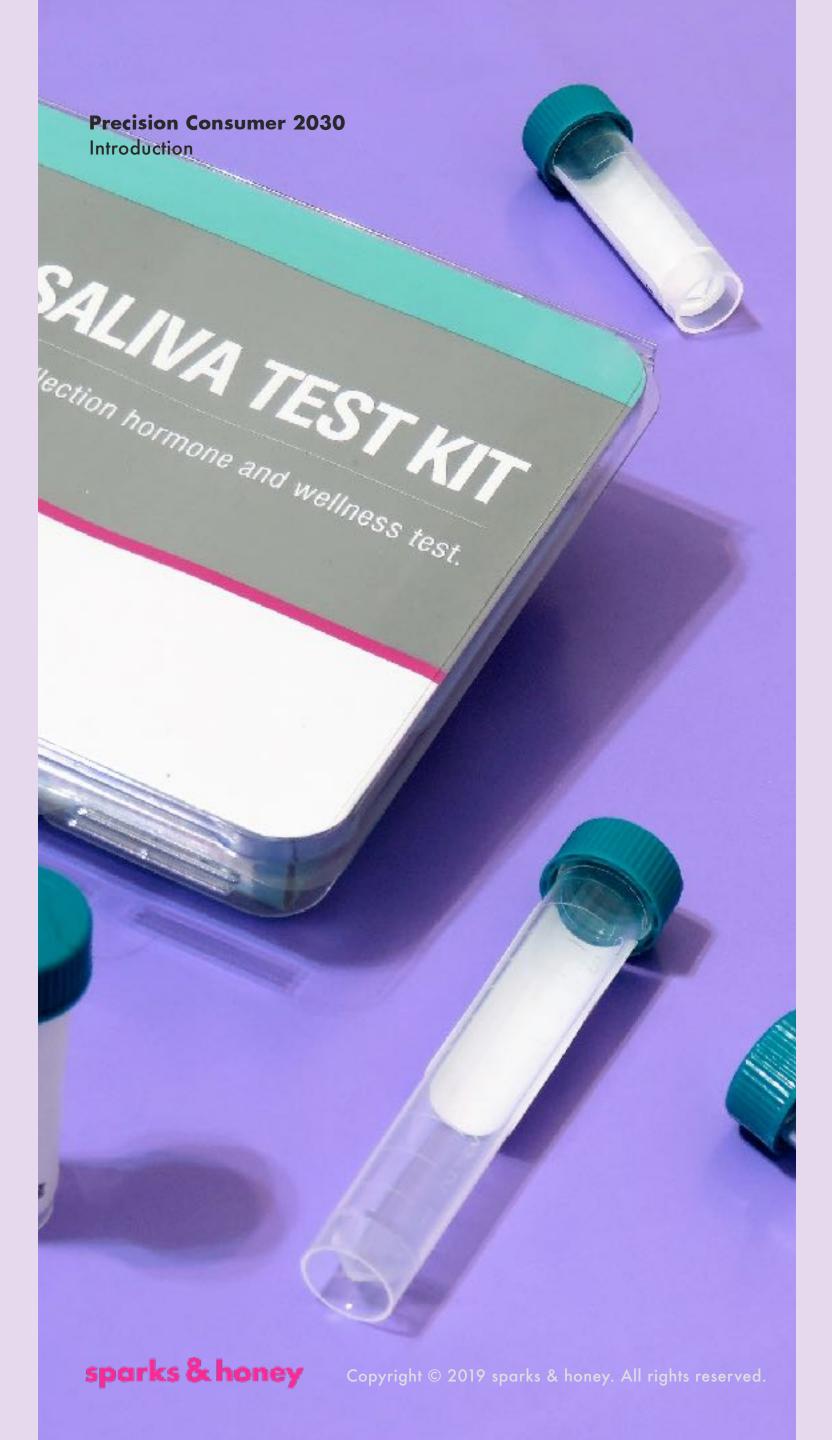
- Dr. Ali Mostashari, CEO and co-founder of Lifenome

# SECONSTRACTOR

Value of the DNA test kit market by 2025, with a 24% CAGR<sup>6</sup>

Source: <u>Medgadget</u>





Whether it's nutrition, health and wellness, or elevating our human performance, the blurring of precision labels puts the onus on consumers to do the detective work. Will this "precision" product or experience live up to expectations of deep personalization?

For others, the promise of precision trumps the science. Some experts say it simply isn't technologically possible, for example, to <u>match a</u> <u>wine to your DNA</u><sup>7</sup>, yet companies have successfully launched businesses on this premise. There's even an online platform, <u>DNA Romance</u><sup>8</sup>, for finding partners based on results from DNAtesting. "DNA" is as much a buzzword as it is a promise—of something deeper, more personal, designed with the individual in mind.

The idea of having products and services designed with your biodata is feeding consumer appetite for the precision space. The science is catching up to the cultural tide of the deep personalization inherent in precision, as much as it influences it.

> **CLEAR scans** your eyes for entry into Yankee Stadium





Meal plans designed for

### PRECISION DATA **IS TRANSFORMING** CULTURE



AI toilets analyze human waste for your health



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your microbiome

**Time Sense sensory** headband lets you "feel" the passing of time around your head



Alexa voice assistants to tell if you're sick or depressed





**Blood Cream**, a moisturizer made from your blood



**Kinova Robotics'** carbon fiber limbs open doors

These emerging shifts in human behavior offer a glimpse into the ways biodata—the biological data derived from individuals—is manifesting in the everyday. They may seem fringe today, but these cultural data points reflect a rapidly evolving story of precision in the future. They point to the possibilities of biodata meeting precision technologies, which offer a measurable and impact-specific approach to the way we live. Our analysis of precision across culture indicates that precision is cutting across not just medicine and health, but food, wellbeing, our environments, human performance and the very ways live in the future. Piqued by our curiosity, we dug deeper into this emerging space, interviewing many experts in precision in the process.

**DNA-based** predictors of taste and preference: wine or even a future partner



Developments in technologies, including sensors and wearables, emotion recognition, facial recognition, AI and voice assistants, are opening up a world of possibilities based on data. The ability to track our lives from the inside out—and outside in—is creating a knowledge base of unprecedented human behavior, from the way we eat to how we move, think, feel, focus and even experience our physical reality through immersive technologies like augmented and virtual reality. Still in its infancy, the **emotion recognition** industry alone is set to grow to <u>\$24.74</u> billion by 2024<sup>9</sup>, with a CAGR of 32.7%. Your very face is becoming one of the most valuable assets around: enough to buy a cup of coffee, read your health, or perhaps get you arrested.

Biodata is opening up a world of precision that is set to transform our lives, and the products, services and experiences we seek. Precision blends technological accuracy and deep personalization with a significant ingredient: you.

### "Biology is becoming the technology of the 21st century."

Victor Penev, CEO and founder, EDAMAM, sparks & honey Advisory Board member

BILLION

IoT devices online by 2020<sup>10</sup>, or nearly three for every person on Earth





### **PEOPLE ARE WILLING TO** PAY A PREMIUM OF 20% **OR MORE FOR CERTAIN PRODUCTS/SERVICES BASED ON DNA**

Weight loss plans, supplements, skincare products, fitness plans and routines, and haircare

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More than 50% of people are willing to pay such a premium, as of 2019

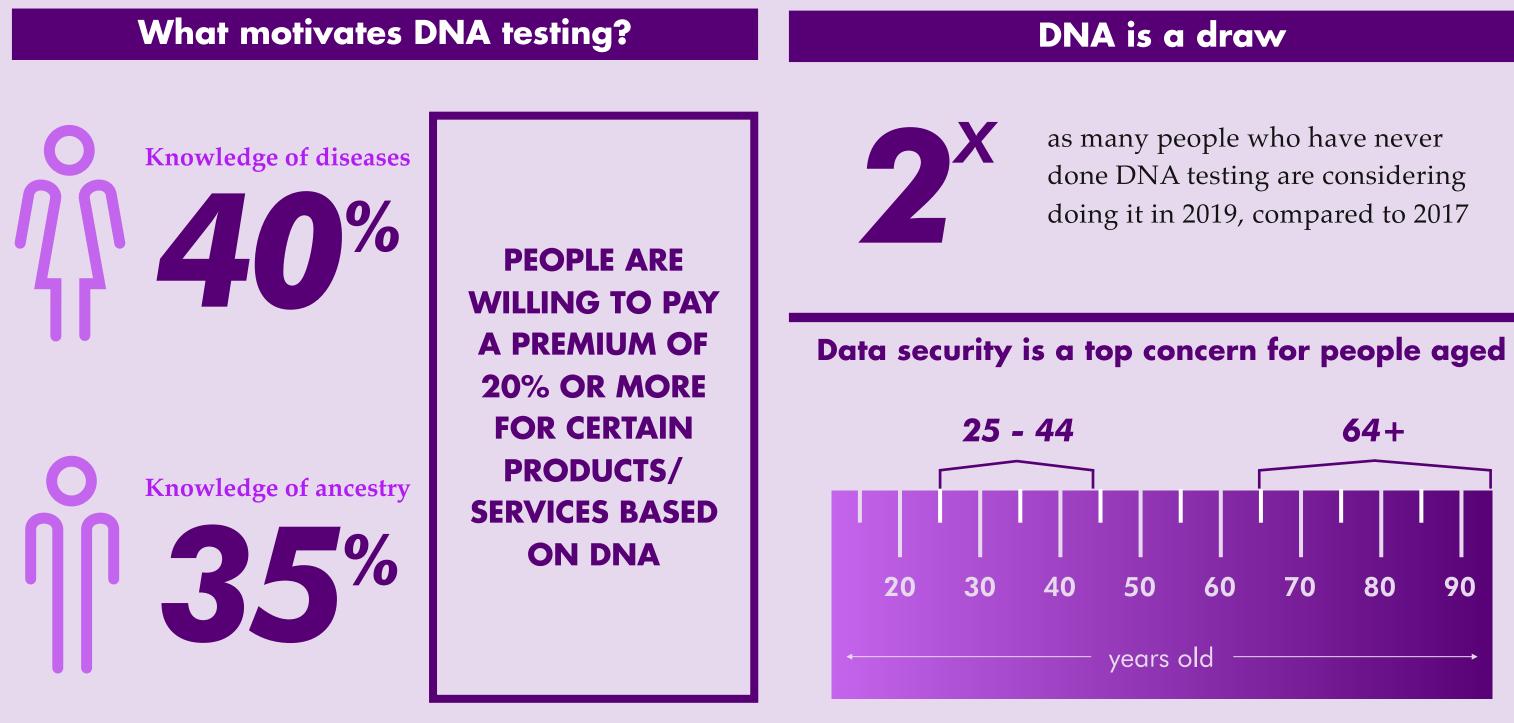
74% of people with a salary of more than **\$50K** are willing to pay a premium, as of 2019

Source: Lifenome<sup>11</sup>, 2019



### HOW DO WE FEEL ABOUT DNA-**BASED PERSONALIZATION?**

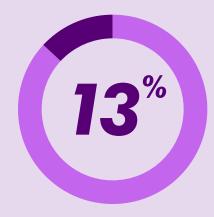
People will pay a premium for DNA-based products and services



### But we are willing to share data to advance scientific research



More than 60% of people were willing to share medical data; lifestyle, behavioral and family history data; and genetic info and wearable data



**13.1**% of people were not willing to share data



36.3% of people were not willing to share their data with a private company, if asked

Source: Lifenome<sup>11</sup>, 2019



### **10 REASONS WHY PRECISION IS A C-SUITE PRIORITY**



Industries will be transformed by precision technologies — total venture capital funding for Precision Technologies over the last three years: \$1,108,889,400,000 = **\$1.1 Trillion**<sup>12</sup>.

### **Precision is** explosive.

2

The promise of precision medicine IP, technology, and ideas will permeate many other industries. The precision medicine industry will reach \$96.6 billion by 2024, with a CAGR of 10.7%<sup>13</sup>.

innovation. **Biology** is the technology of the 21st century, an essential part of remaining competitive in any industry. The global biotechnology market will be valued at \$775 billion by 2024, with a **CAGR of 9.9%**<sup>14</sup>.

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### **Biology drives**

4

### **Precision is a right.**

By 2030, we can expect to see the costs related to precision technologies decrease, but access to the benefits of precision is set to escalate among organizations and policy stakeholders. **Organizations will** need to prepare for diversity in precision data and providing access to the benefits for all.

Consumer protections will escalate.

In the U.S., Congress has introduced a bill<sup>15</sup> to protect the dissemination of biological data over apps and devices. Data is a commodity, and consumers' shifting sentiment around data privacy will escalate the need for global consumer protections and regulations of precision data.





6

Wellness is your business.

**From work spaces** to public infrastructure, precision is dynamically adapting and manipulating our environments. Wellness tech around our environments is a budding industry, valued at \$333 million<sup>16</sup>.

7

Deep personalization is business critical.

People are willing to pay up to a 20% premium<sup>11</sup> on certain **DNA-based products** and services, a move that puts market pressure on all products and services to become deeply personalized.

8 **Reading emotions** will create unprecedented opportunities.

**Emotion recognition is** expected to grow to a **\$24.74 billion dollar** industry by 2024, with a CAGR of 32.7%<sup>17</sup>, and it's primed to upend retail design, services, and experiences into the hyper-personalized realm.

**Cognitive agility is** a growing focus.

The 20.6 billion venture capital funding of the cognitive management market<sup>18</sup>, over the last three years, will reshape how organizations tailor talent, create upskilling strategies, and serve consumers.

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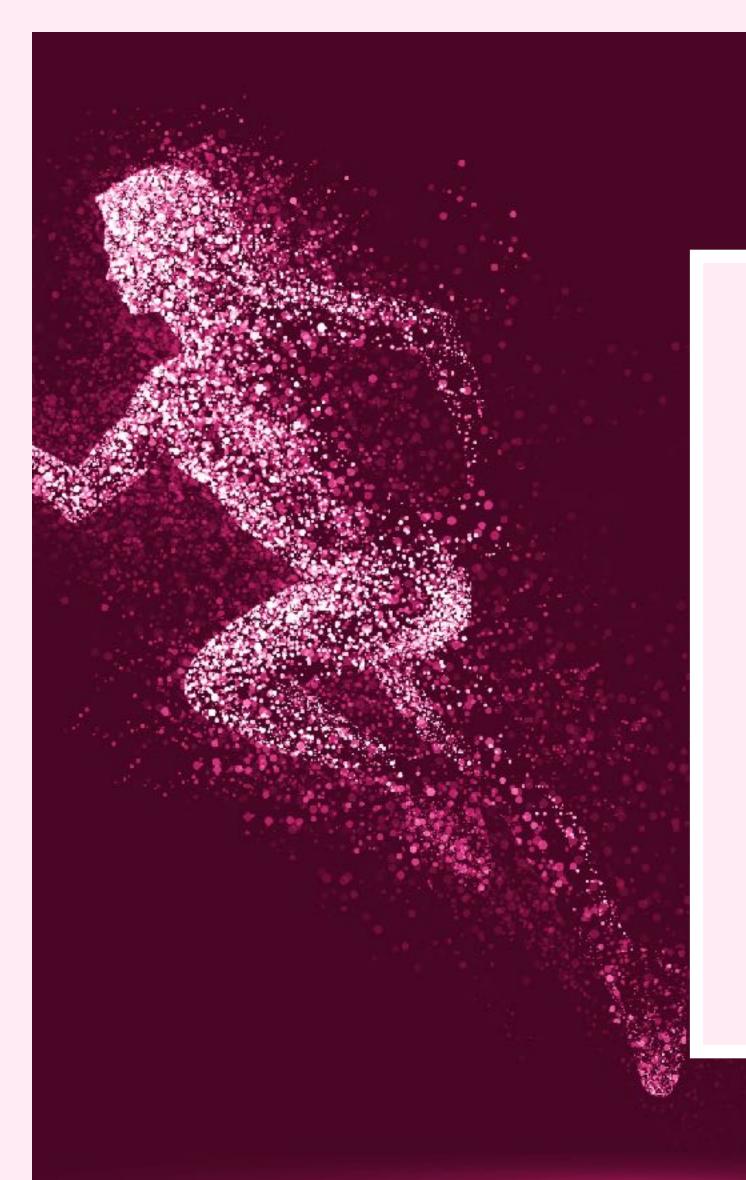
Longer lives will transform business strategies.

By 2030, longevity gains from precision nutrition will push healthy life expectancy into the 100s for those with access to the technology. Corporate strategy will need to adapt to longer lives across talent management, R&D, CSR, and marketing.





### II DISRUPTION



### MASS DISRUPTION

The consumer of 2030 will be entrenched in a world defined by data that is so pervasive in our lives that it becomes invisible: it cuts across the spaces we move through, the food we eat, our health and wellbeing and how we function and aspire to perform better as humans. In this world of deep personalization, industries will be transformed by precision data and technologies, which have grown in total venture capital funding to \$1.1 trillion<sup>13</sup> over the last three years.

sparks & honey's data-driven and expert-informed analysis of precision led us to four areas in which precision is set to disrupt industries, consumer behaviors and, yes, our future. The areas of change that we will be uncovering unearth innovation and edge opportunities across Wellbeing, Commerce, Collective Spaces and Human Performance.



### FOUR SECTORS LEADING **PRECISION CONSUMER CHANGE**



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### COLLECTIVE **SPACES**

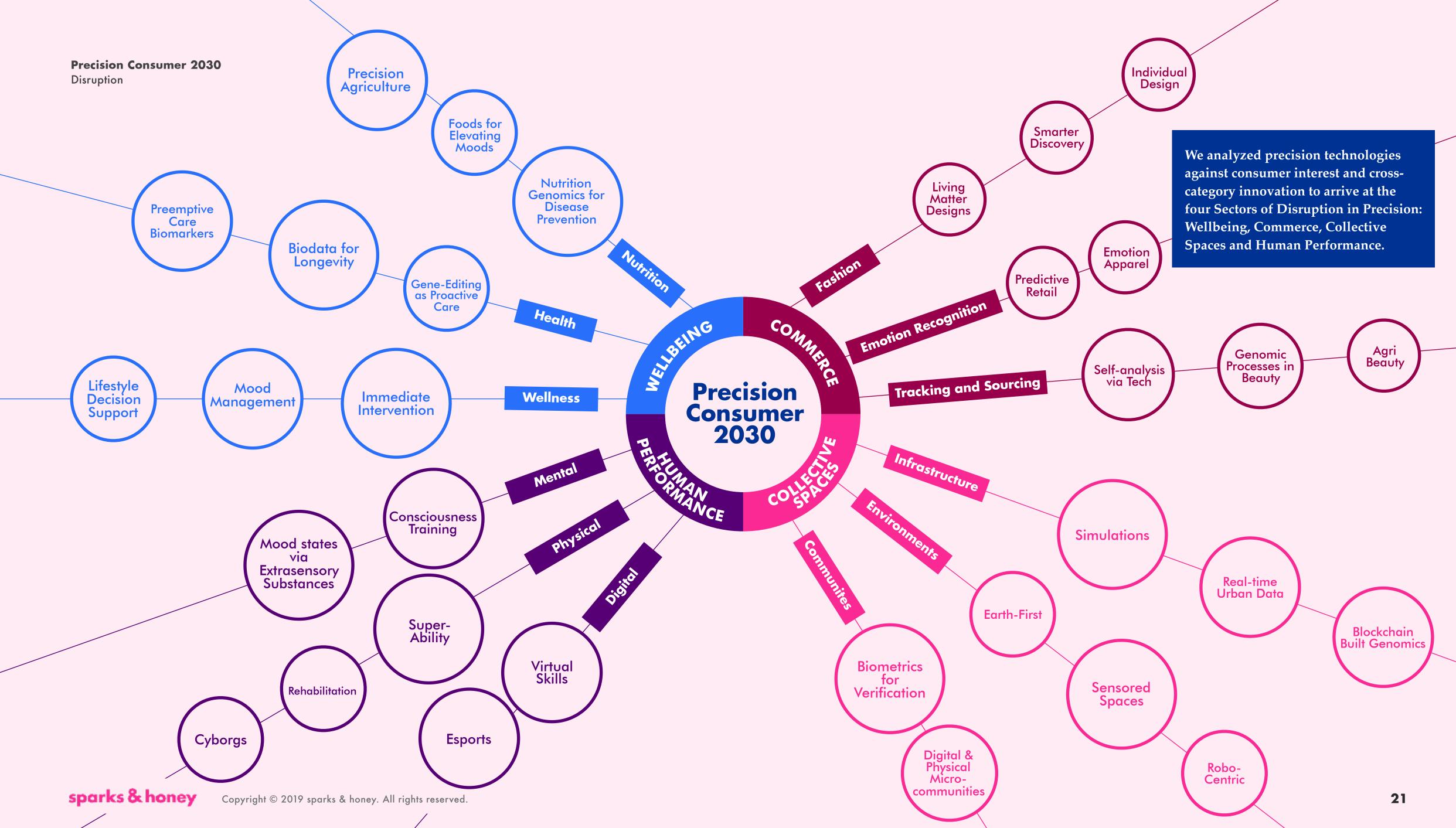
Infrastructure **Environments** Communities

### **HUMAN** PERFORMANCE

Mental Physical Digital











### **SCORING CULTURAL CHANGE**

We identified a range of resonant cultural change areas within precision, from products and services to digital and physical experiences. Each change area was scored using a proprietary methodology. These scores then determined the size of each change area, forming a visual of disruption.



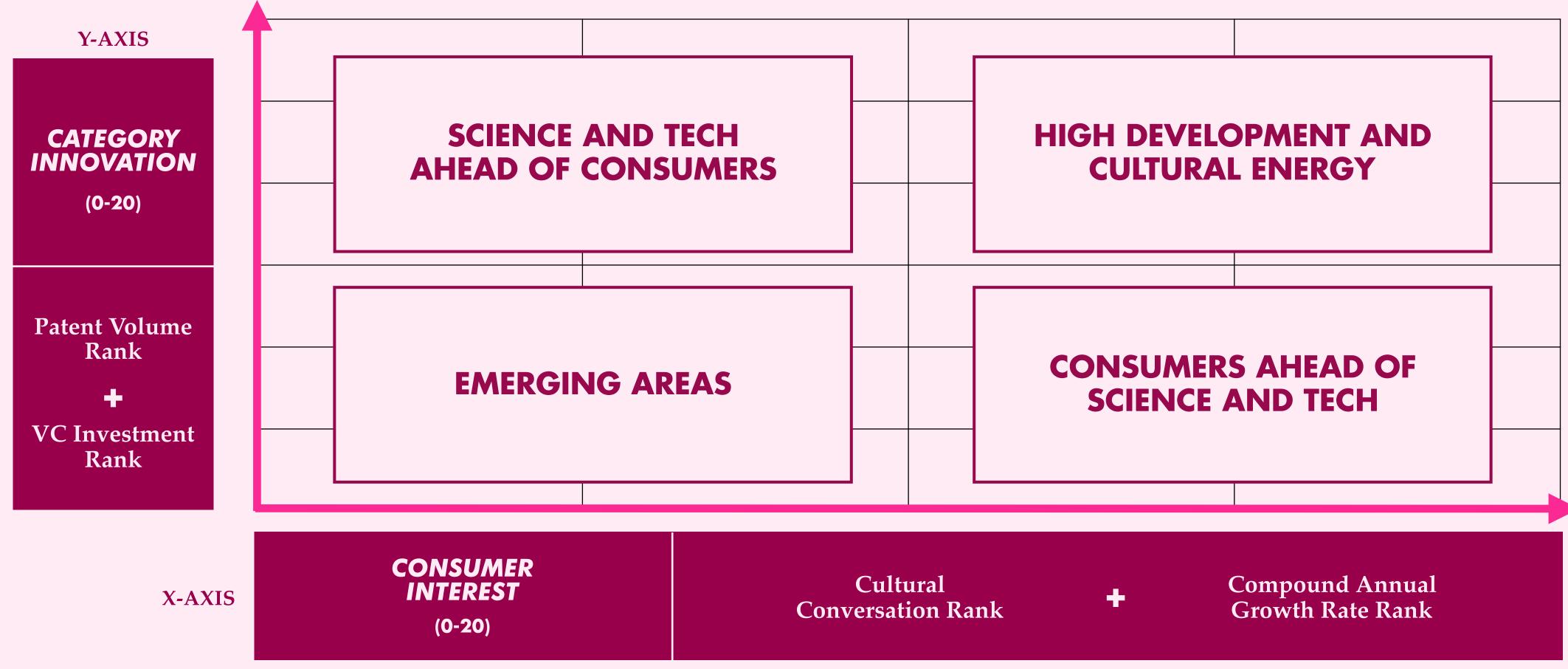


Each Change Area has been quantified to create a single Priority Score. These scores inform circle sizing for priority mapping.



### **SCORING CULTURAL CHANGE**

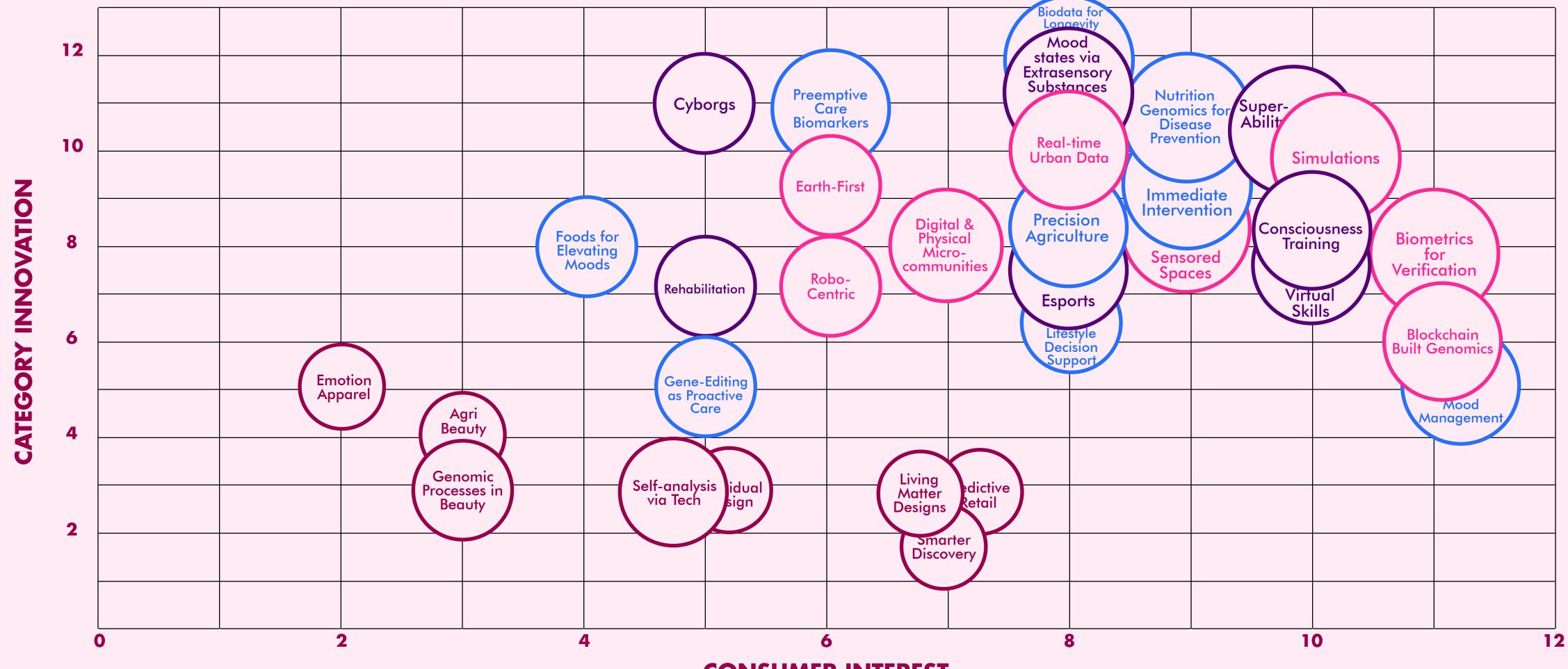
Once each change area was scored and sized, we mapped them quantitatively across category innovation and consumer interest, to determine which are the biggest opportunities for organizations in the years to come.



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### **A COMPASS TO NAVIGATE DISRUPTION**

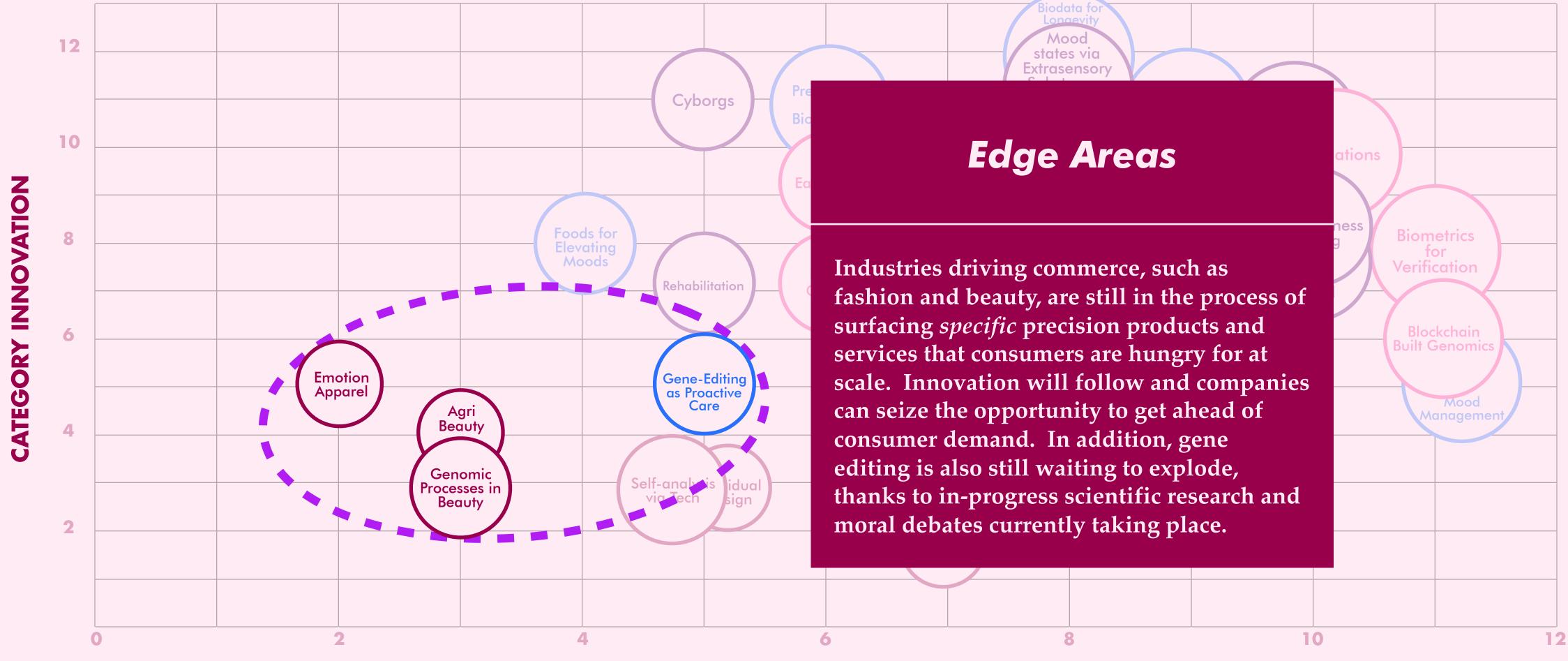


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### COMMERCE IS A PRECISION SECTOR JUST STARTING TO TAKE SHAPE

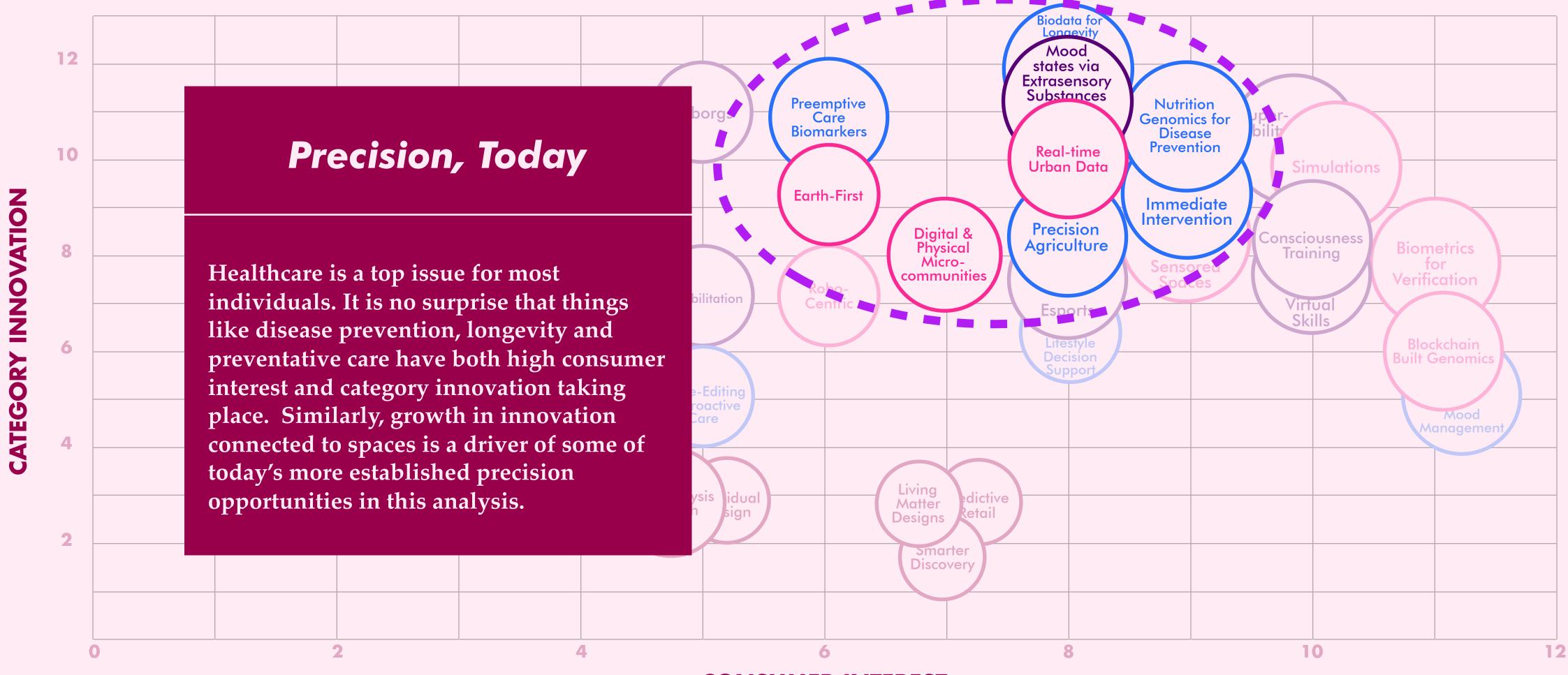
Dominated by Commerce in the Disruption Compass, the opportunity areas below have yet to truly capture the attention or demands of consumers, organizational innovation or M&A capabilities.



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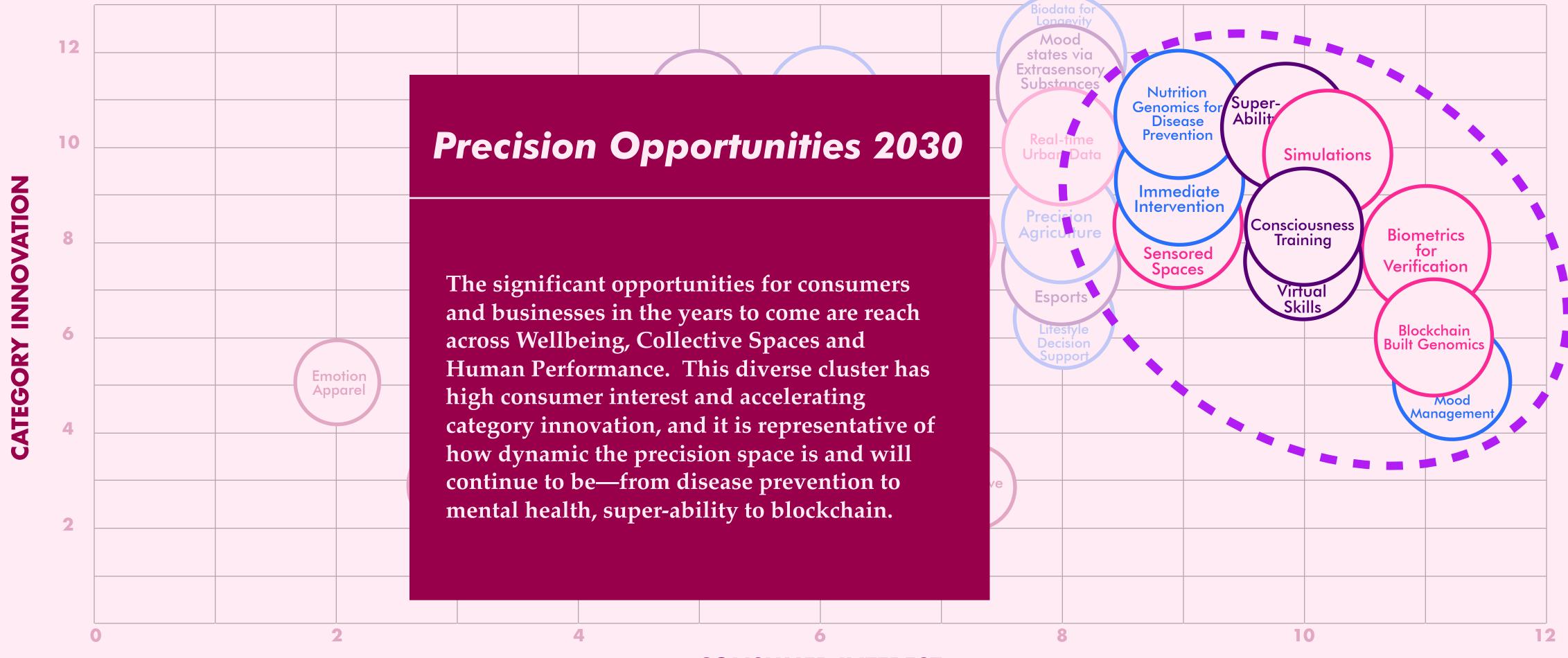
### HEALTH CARE AND SENSOR-POWERED INNOVATION DRIVE PRECISION TODAY

The Wellbeing and Collective Spaces sectors of the Disruption Compass represent the bulk of the opportunities with the highest levels of cultural energy today, as healthcare and sensor tech inform many of today's more tangible examples of precision.

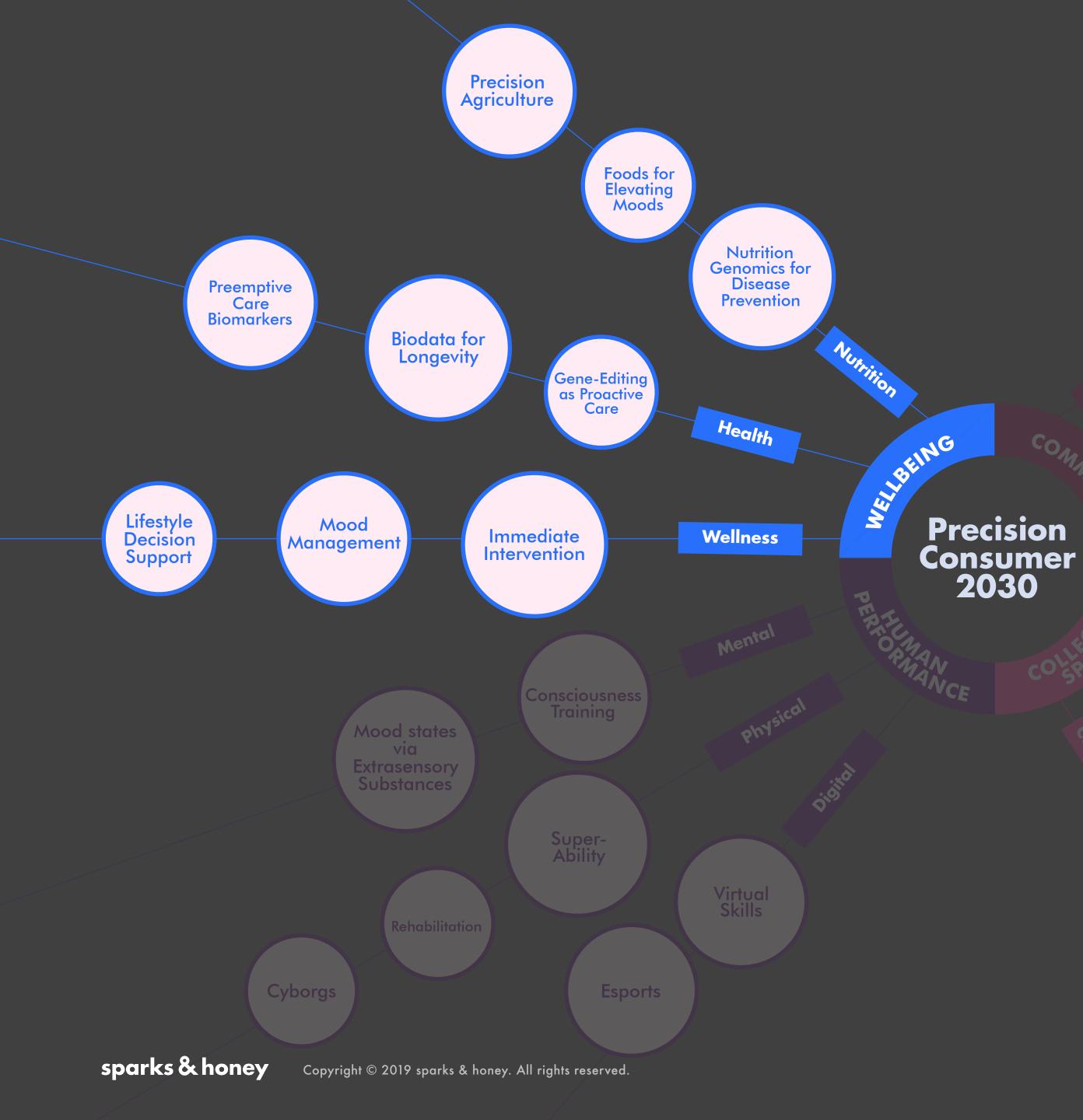


### **DIVERSE OPPORTUNITY AREAS POINTING TO EXPLOSIVE YEARS TO COME IN PRECISION**

These culturally catalytic opportunity areas for businesses and the public sector represent areas where organizations are under-engaged relative to consumer enthusiasm. They represent bets worth placing as we move forward to 2030.



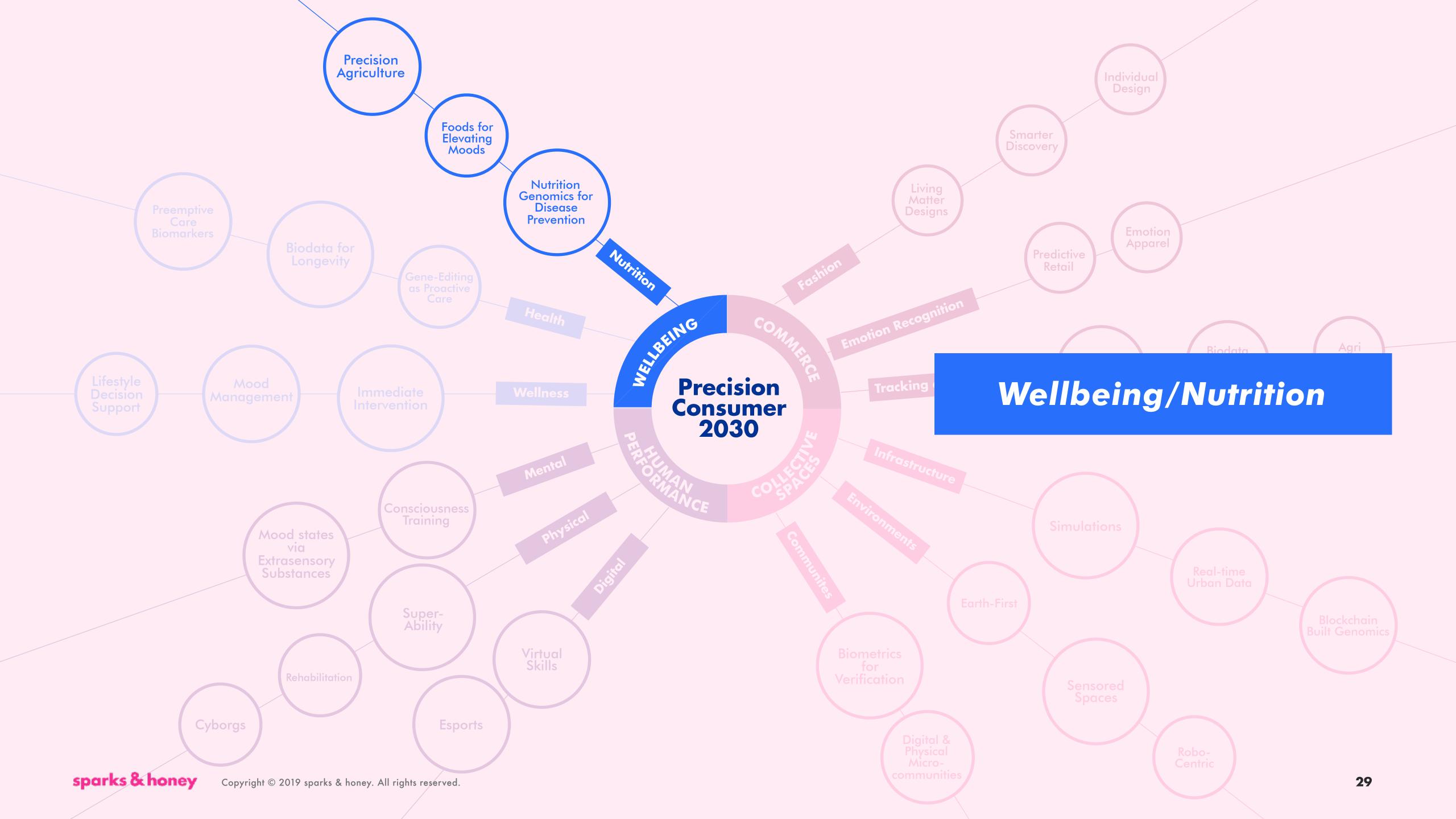












### **Precision Consumer 2030** Disruption | Wellbeing | Nutrition

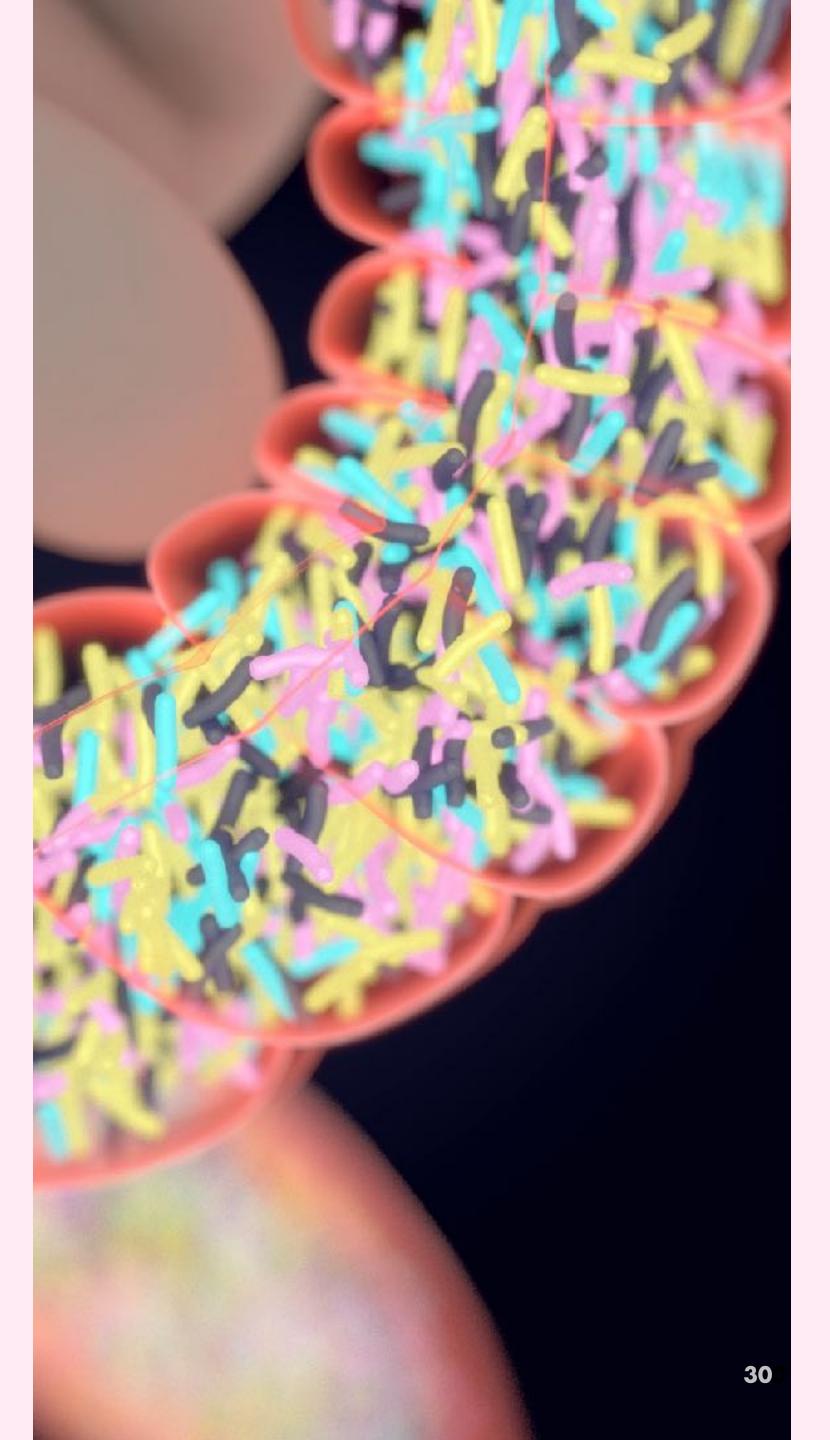
### PRECISION NUTRITION

By 2030, precision nutrition could add years to your life

How and what we eat will be a defining factor in the future of food — and our longevity on this planet. We are living longer than ever: in developed nations, people over the age of 65 are expected to live six years longer than their grandparents did, according to research from <u>Stanford University</u><sup>21</sup>. Experts anticipate that we could live into our 100s, as long as we eat food that is designed for the unique composition of our bodies.

The rise of deeply personalized nutrition plans and recommendations, and even meal kits, are being fed

by easier access to the understanding and manipulation of your genome via at-home DNA analysis kits and <u>clinical genome editing<sup>22</sup></u>. If the current pace continues, genetic databases could hold the DNA of more than 100 million people within the next two years, the <u>Technology Review</u><sup>23</sup> estimates. Nutrition genomics, or nutrigenomics, is emerging to help us track the connections between nutrition, genes and human development with the goal of both living longer, and living well, in the process.



Disruption | Wellbeing | Nutrition

Precision nutrition has the potential to radically shift the way humans think about the function of food, turning nutrition into an ingredient for longevity and prevention. Thoughtful consumption of food will be more acute than ever, as nutritional resources dwindle and obesity epidemics rise: more than 250 million children worldwide are expected to be obese by 2030<sup>24</sup>. The investments in this space point to a future in which nutrition becomes "medicine," an avenue to achieve an optimum state of wellbeing, potential and stave off illness—before it hits.

"I truly believe people will be able to live to 120 without any chronic conditions, without ever getting sick if they eat the right way. To do that, the microbiome is going to be the biggest game changer."

-Victor Penev, CEO and founder, EDAMAM, sparks and honey Advisory Board member

## BILLION

Venture capital investment in nutrigenomics, meals engineered based on your genes

Source: Quid



**Precision Consumer 2030** Disruption | Wellbeing | Nutrition



### say, this tomato was grown under humane conditions. That's a kind of power. It's not precision for humans but the precision tomato is...a powerful, positive thing."

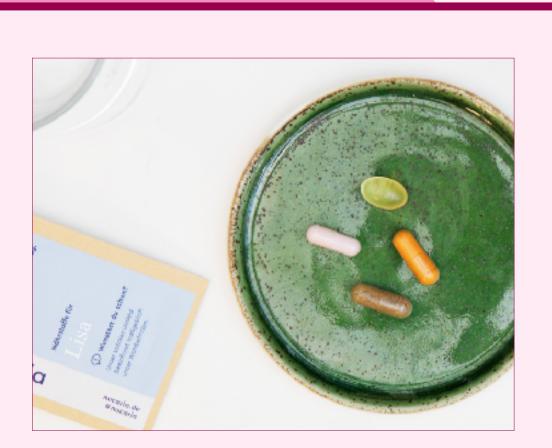
- Dr. Vivienne Ming, theoretical neuroscientist, founder and executive chair of Socos, sparks & honey Advisory Board member

"I'm working on a project to be able to tell which farm in the world a tomato came from, so we can actually check labor conditions there. So we can

**Precision Consumer 2030** 

Disruption | Wellbeing | Nutrition

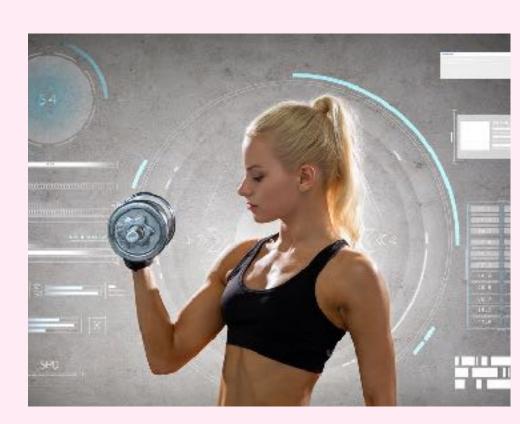
### **CHANGE AREAS**



### NUTRITION **GENOMICS FOR ELEVATING MOODS**

Nucaria is a German food startup that produces and supplies personalized nutrition supplements based on your genomics to elevate mood or provide specific nutritional needs.

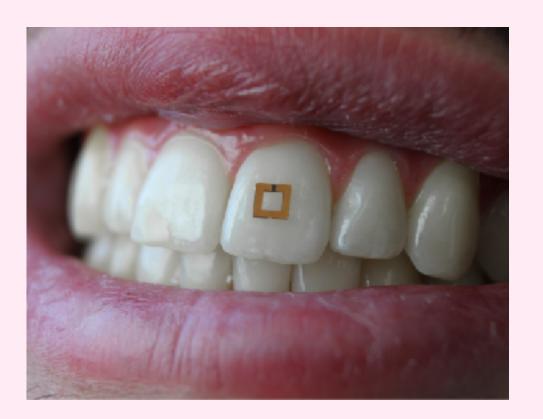
Source: <u>Foodbuzz</u><sup>26</sup>



### PATENT: GENOMIC WEIGHT LOSS **MANAGEMENT**

**GenoVive provides meal programs** designed with the best balance of nutrients and exercise based on DNA. In 2018, the company filed a patent for a nutritional genomic weight loss management algorithm that analyzes a person's unique DNA results in personalized diet and exercise plans.

Source: <u>GenoVive</u><sup>27</sup>



### **TOOTH FOOD** TRACKER

Monitoring the effects of food intake on our bodies in real time is easier said than done. That is set to change with new miniature sensors developed by researchers at the **Tufts University School of Engineering: mounted directly on** the surface of a tooth, the mini sensors relay direct data on glucose, salt and alcohol intake.

Source: <u>TuftsNow</u><sup>28</sup>

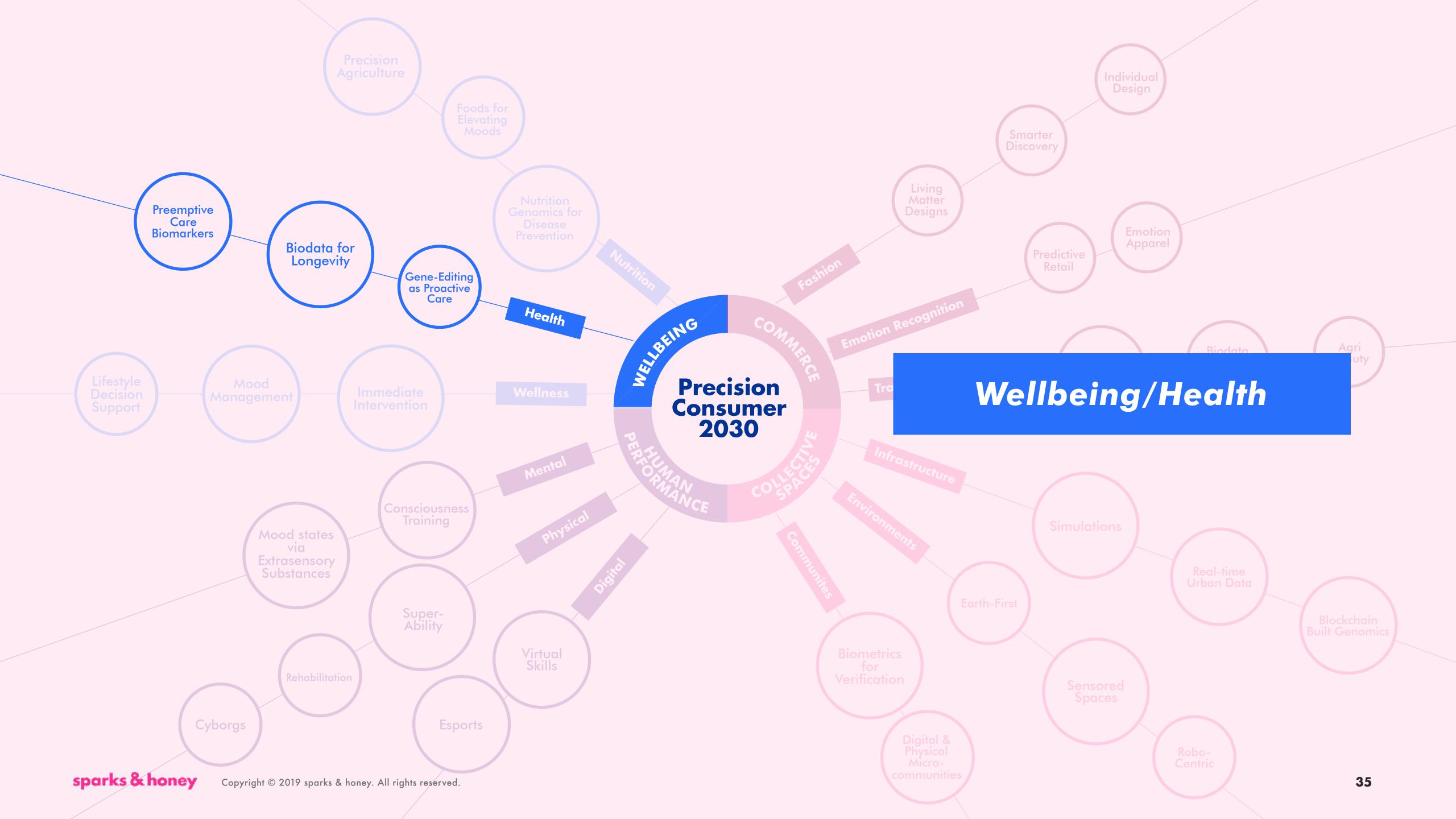


### **DNA DINNERS**

Nutrition and heritage find their roots in the Canada's Gusto original series, "DNA Dinners," a 16-episode show in which chefs are inspired to create ingredients based on participant's AncestryDNA test results.

Source: <u>The Loop</u><sup>29</sup>





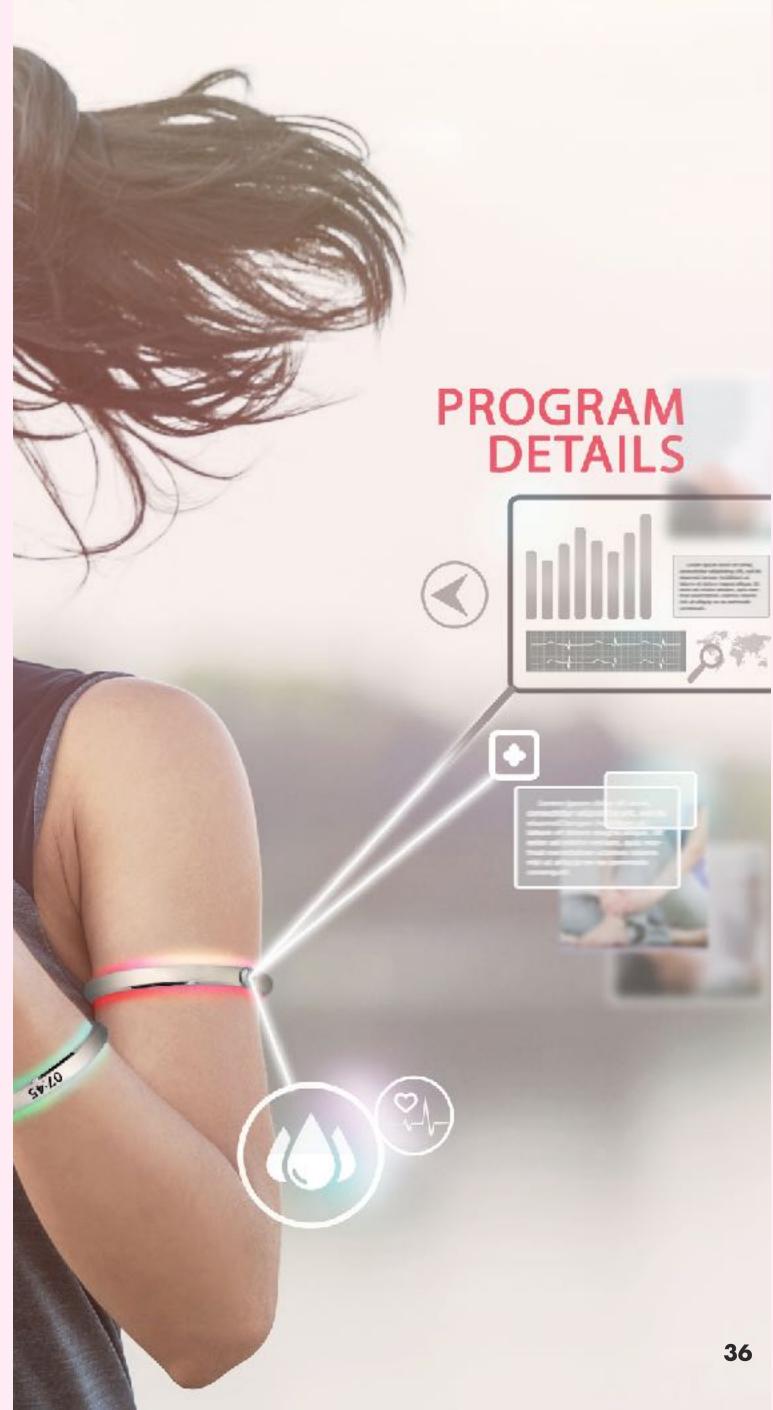
### **Precision Consumer 2030** Disruption | Wellbeing | Health

### PRECISION HEALTH

### By 2020, medical knowledge will double every 73 days

The answer to your health may lie within, in your biomaterials that can be harnessed for your own health and longevity. You could be around for a long time: the human lifespan could soon pass 100, experts anticipate. Advancements in precision medicine and the plummeting costs of sequencing the human genome are driving this shift. The change has been rapid. In 2020, medical knowledge will double every <u>73 days</u><sup>30</sup>—compared to 3.5 years back in 2010. Precision health offers precise technologies that are revolutionizing medicine, but also how we take care of ourselves. From the inside out.

Precision health is answering the cultural tide of holistic and preventative healthcare. Biomaterials are building blocks for deeply personalized health solutions, from implantables to ingestibles. "Within ten years, we'll see tissue engineering or bioprinters in hospitals—instead of doing a transplant from a donor, the bioprinter will grow skin based on the patient's stem cells," said Robin Farmanfarmaian, CEO and co-founder of ArO. And still in its infancy, microbiome science is evolving to show how the bacteria in our gut is affecting everything from mood to mental health and the way we absorb medications<sup>31</sup>.



The pairing of biodata with precision technologies has the power to tell untold stories of our health and wellness. Precision health is turning traditional symptom-based health on its head. Continuously measuring human biodata is at the core of precision health, like at clinics such as <u>Lab100<sup>32</sup></u> at Mount Sinai, which uses precision diagnostics to empower its patients. As healthcare costs and uncertainty escalate, precision is forging a new path of ownership over your own health — and wellbeing.

"The health care system starts with a symptom. It starts when you're not well, which is totally wrong because the minute you come in and you're not well, then that's where all the costs are being generated. We try to make you as well as we can with as few treatments and as few interventions as possible."

-Savi Glowe, director of operations, Lab100, Institute for Next Generation Healthcare at Mount Sinai Hospital

# MILLON

**Estimated value of genomic** testing company Veracyte which is developing a nasal swab for early lung cancer detection with Johnson & Johnson

Source: MarketWatch<sup>33</sup>



**Precision Consumer 2030** Disruption | Wellbeing | Health



### "Within ten years, we will have unlocked enough secrets of the microbiome to accurately personalize nutrition as the first line of defense against any type of disease: whether you have eye problems, heart problems or you're at risk of stroke."

- Robin Farmanfarmaian, CEO and co-founder, ArO, author, professional speaker, sparks & honey Advisory Board member

**Precision Consumer 2030** Disruption | Wellbeing | Health

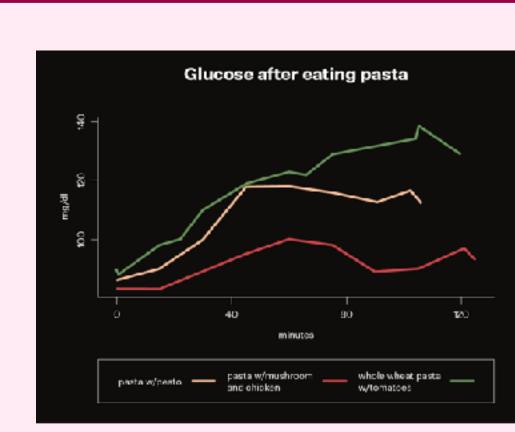
### **CHANGE AREAS**



### **DEMYSTIFING DOSAGE**

**Emerging formats of taking medication**, such as inhaling or ingesting exact dosages, are set to remove the guesswork involved in absorbing personalized nutrients, or taking prescription medication into the body. Nutriair is one such example, delivering complex nutrients via a simple inhalation device.

Source: <u>Emaxhealth<sup>34</sup></u>



### **HEALTH ADVICE EVERY 60 SECONDS**

Writer Richard Sprague details his experience of using a continuous blood-glucose monitor to gain personalized health advice—every 60 seconds—to hack his food intake based on his personal body chemistry.

Source: <u>Neo.Life</u><sup>35</sup>



### **MENTAL HEALTH MANAGEMENT**

**Startup Genomind's genetics-based** mental health test is helping clinicians make mental health medications or other treatment options for more than 11 mental health conditions, based on a patient's genetics.

Source: <u>Genomind</u><sup>36</sup>

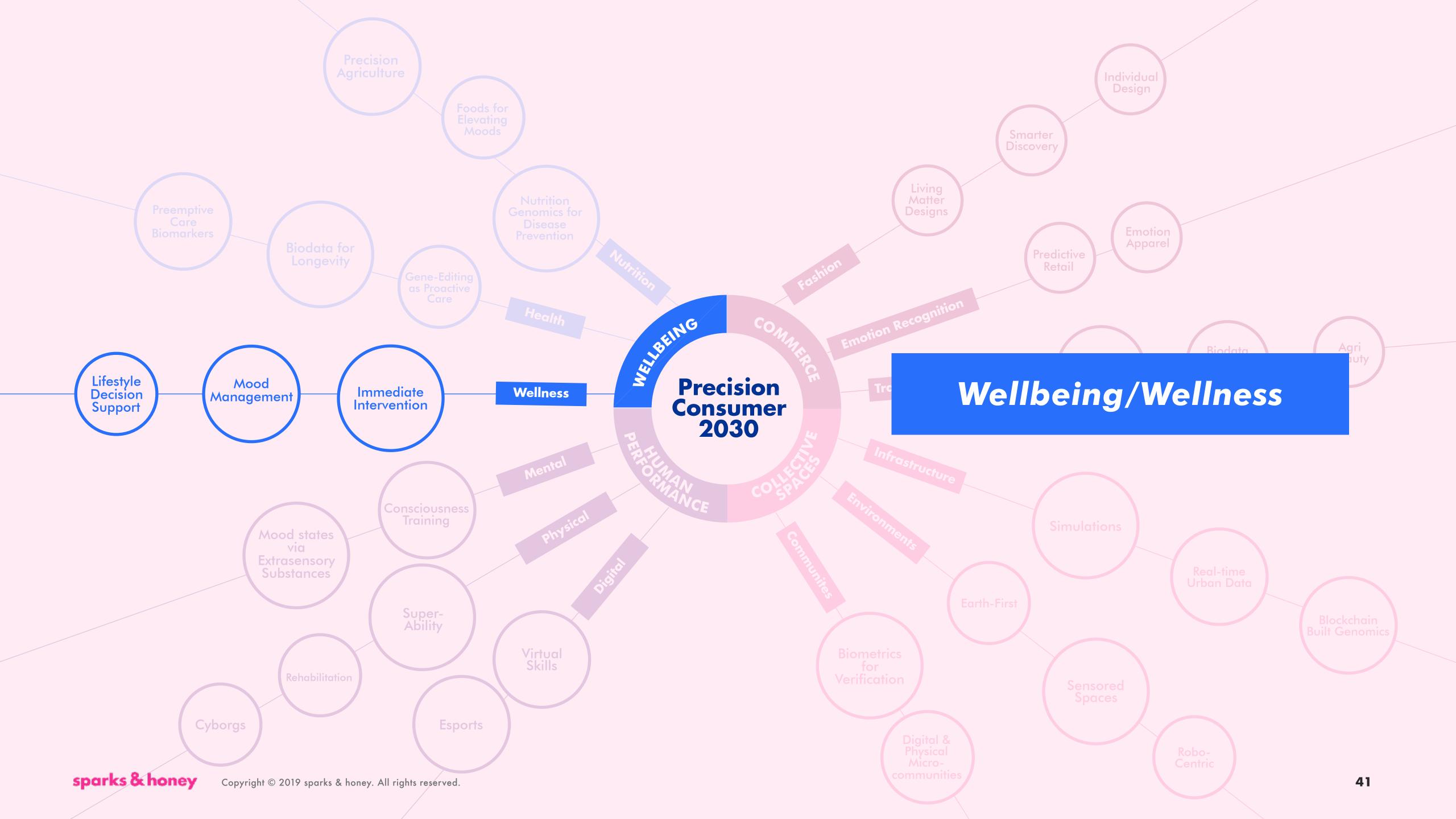


### **COMBATING HEALTH INEQUITIES IN RESEARCH DATA**

Precision medicine is at a crossroads. To address persistent health inequities, as it's meant to do, precision medicine will need to embrace populations in research that have been historically underrepresented in data.

Source: <u>ScienceMag</u><sup>37</sup>



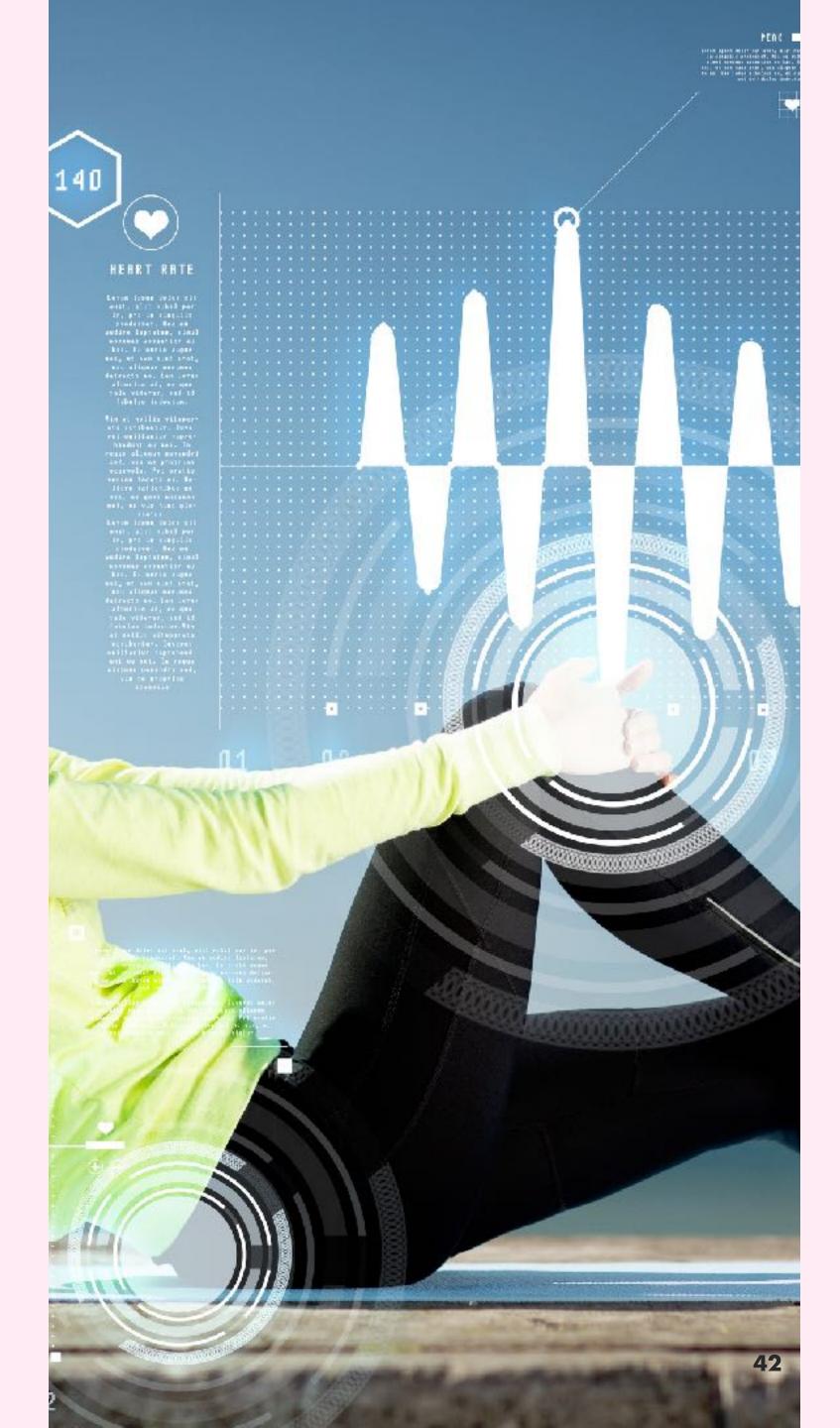


Disruption | Commerce | Wellness

# **PRECISION WELLNESS**

Behavioral changes fueled by cognitive agility

Precision wellness may be the antidote to help us cope and focus in an age of growing anxiety. We are more stressed out than ever: the <u>American Psychiatric</u> <u>Association reported<sup>38</sup> a five-point jump in this year's</u> national anxiety score—across all age groups, men and women, and people of different ethnicities. In this climate, our needs for comfort, escape and even a little help are elevated. We're seeking bottomless wellness in many pursuits and precision technologies are helping us get there. Precision wellness innovation is seen in the everyday, from managing our moods to helping us make choices or alter our mental states, whether through VR or a precise dose of the right nutrients, or data delivered in real time, even from your <u>baby's</u> diapers<sup>39</sup>. Guided and curated by precision technologies, the selection of activities like workouts or food or drink turns personalization into a practical part of your day or night.



**Precision Consumer 2030** Disruption | Commerce | Wellness

> "We can make very accurate predictions based on if you exercise, say, 45 minutes a day and if you eat a specific diet, then you will likely live this long. We can actually spell out for people what their path might be and we can be even more nuanced than that because we test biomarkers every three months."

- Dr. Noel Maclaren, endocrinologist, co-founder of Metakura, sparks & honey Advisory Board member

## MILLON

Valuation of Lumosity, a startup offering brain challenging games designed by neuroscientists to exercise memory and attention

Source: CB Insights<sup>40</sup>



**Precision Consumer 2030** Disruption | Commerce | Wellness



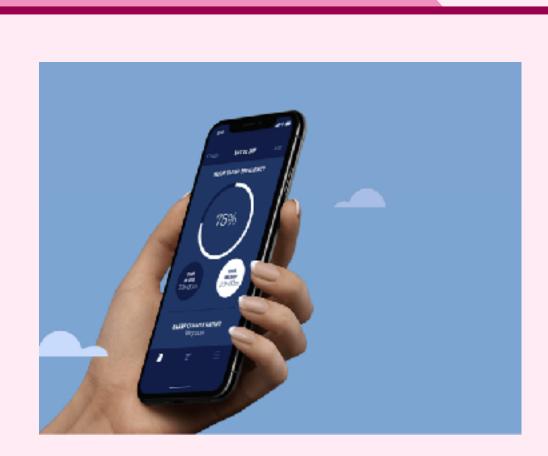
## the more likely we are able to personalize and anticipate needs, which will increase the engagement, adaptability and maintenance of behavior change."

-Andrew Renda, associate vice president, Population Health, Humana

"Whether it's about activity or eating better, we don't establish habits and we don't maintain those that we do. Behavioral change is one of those nuts that we have to crack: The more data we can get,

Disruption | Commerce | Wellness

### **CHANGE AREAS**



### **SOUND ASLEEP**

Startup Big Health's digital sleep improvement program, Sleepio, helps people overcome sleep disorders using deep personalization with cognitive behavioral therapy methods. Sleep-tracking precision is primed for our bedrooms: sleep is the foundation of health and wellness.

Source: <u>Big Health</u><sup>41</sup>



### PRECISION PARENTING WITH SMART DIAPERS

A data-collecting diaper armed with two activity sensors is designed to make an infant's first year as easy as possible. Lumi by Pampers will tell parents when their baby's diaper is wet and how the young one is sleeping, too. Lumi follows Huggies adoption of the smart diaper in South Korea earlier this year.

Source: Engadget<sup>39</sup>



### TELLTALE SWEAT FROM MICROFLUIDICS

Your sweat is about to tell you more than to cool off. Gatorade's sweat analysis patch measures your sweat rate and the electrolytes in your sweat through microfluidics, or the behavior, precise control and manipulation of fluids. Set for availability in 2020, the sweat patch can reveal how you should hydrate before, during and after a workout.

Source: <u>TED Blog</u><sup>42</sup>



### NURTURE RESILIENCE VIA VR

An immersive environment created by VR can reduce stress and improve mental wellness via meditation. The Research Institute at Nationwide Children's Hospital developed a VR platform to help children nurture resilience during appointments and recovery.

Source: <u>US News & World Report</u><sup>43</sup>

Precision Agriculture

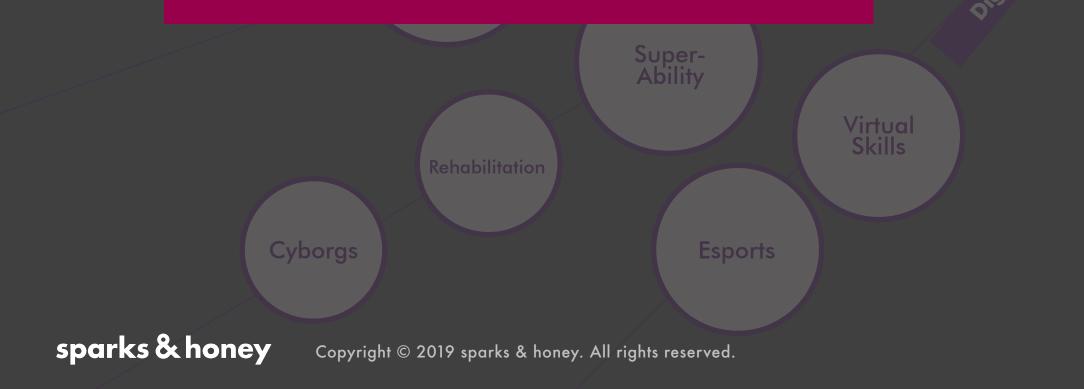
> Foods for Elevating Moods

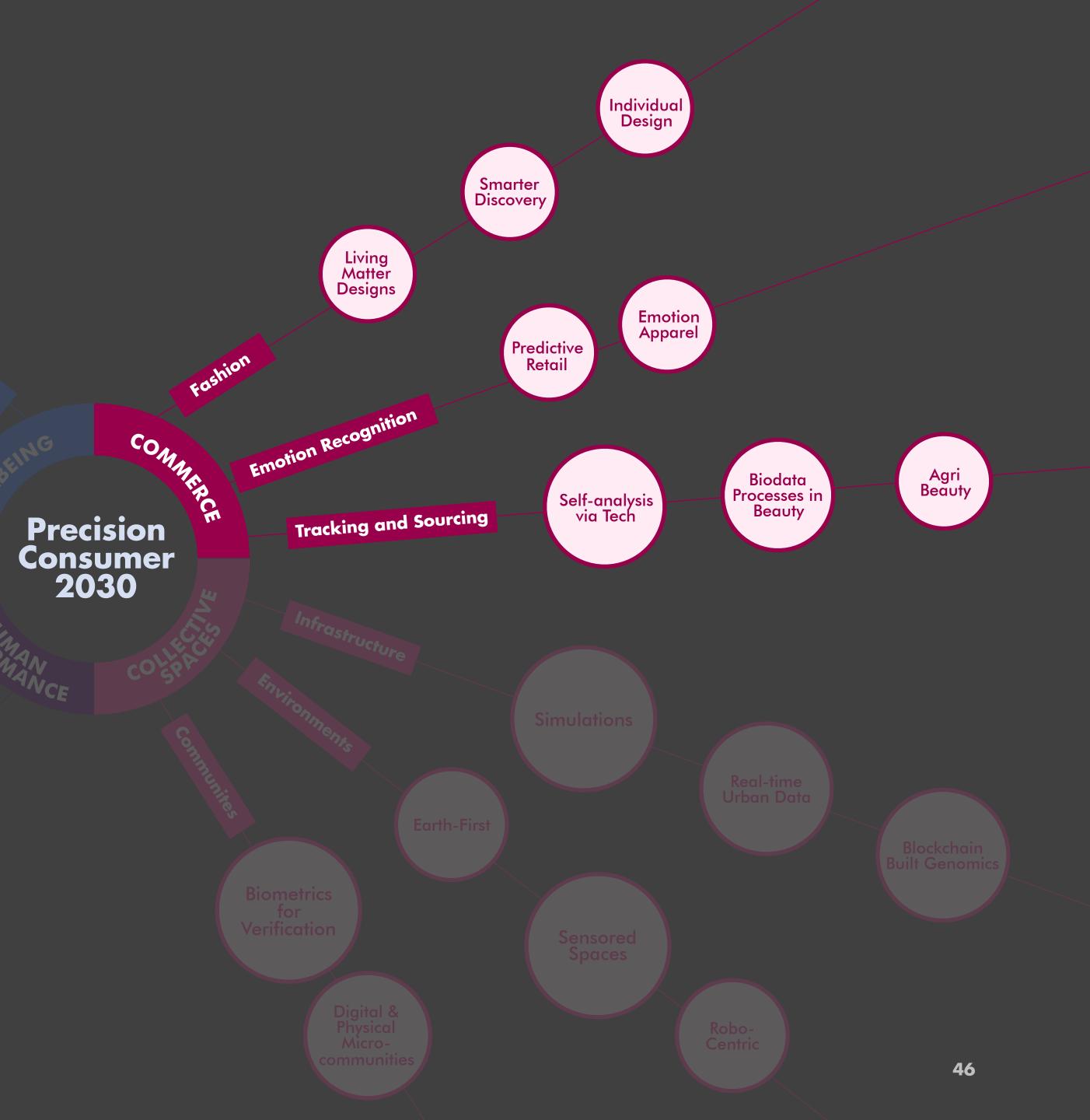
> > Nutrition Genomics for Disease Prevention

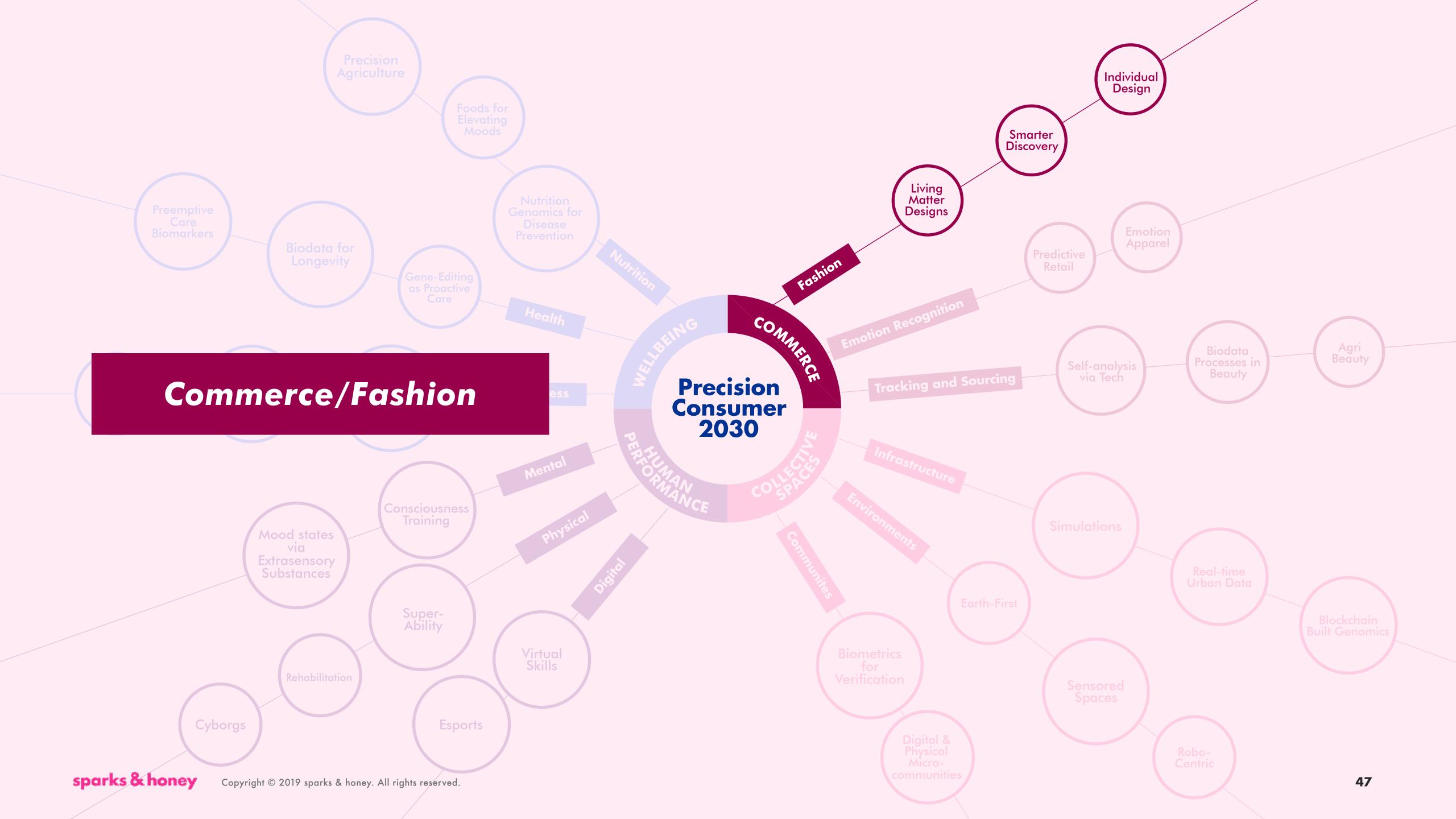
### Commerce



sparks & honey analyzed 1.7 million structured cultural signals<sup>44</sup> that pointed to the larger pattern of Commerce as a key sector of precision. The various areas of cultural change uncovered in the Commerce sector include Fashion (design, apparel, wearables), Emotion Recognition (predictive retail, emotion apparel), and Tracking and Sourcing using the example of beauty (ingredient sourcing and beauty sensor tech). Together, these tell a story of intense growth and innovation in the future of Precision Commerce, totaling nearly \$39.1 billion<sup>45</sup> in venture capital funding.







### **Precision Consumer 2030** Disruption | Commerce | Fashion

### PRECISION FASHION

Designed by human emotion and movement

The trend of Human Premium is woven into the fabric of the future of fashion in more intimate ways than ever. Fashion innovators are turning to human data to create fashion and wearables, using everything from your emotions to facial features and design tastes. From luxury to everyday items, precision fashion is turning your future closets into wearable assistants, with items like <u>Nadi X's smart</u> <u>yoga pants</u><sup>46</sup> that use sensors and haptic feedback to nudge its wearers into a correct yoga pose.

While the fashion industry continues to invest in AI, it's merging algorithms with more intimate biodata, such as analyzing a person's mood states via emotion recognition technology or even designing for the opposite purpose—smart textiles or makeup that mask the face from the prying eyes of recognition. The same processes are <u>shifting manufacturing into</u> systems of AI-powered fashion prediction and discovery<sup>47</sup>, and upending ideas of sizing with exactfit items. Companies like TruFit, which is valued at \$102 million after a Series C investment of \$55 million in 2018, are creating capabilities that power fashion discovery and exact-fit clothing from massive data platforms. In a deeply personalized future of fashion, the very idea of sizing according to former norms will be a thing of the past.





Open-source design technology is also arming consumers with the power to tailor their own designs, according to individual personalities, tastes and even moods. Project Muze, an experiment from online fashion platform Zalando and Google, turns your personality and interests into inspiration for unique designs. Based on Google's TensorFlow open source platform, Project Muze<sup>48</sup> mixes an algorithm based on the human brain with a set of aesthetic parameters. Further in the future, the textiles used to make our clothes could be made with very unique ingredients: living organisms.

"What we will see is clothing racks going away because you don't need to know small, medium or large. It's Tyler sized. It's Jeremiah sized. It's for us. Sizing itself will go away."

- Jeremiah Owyang, CEO of Kaleido Insights, sparks & honey Advisory Board member

**Decrease in return rates** in Japan's Virtusize, a smart-fitting company that is removing uncertainty around size and fit using AI

Source: CB Insights<sup>47</sup>



**Precision Consumer 2030** Disruption | Commerce | Fashion



## system works, so you can get someone to help and how you behave. People will understand how to manage and game the system they are operating within."

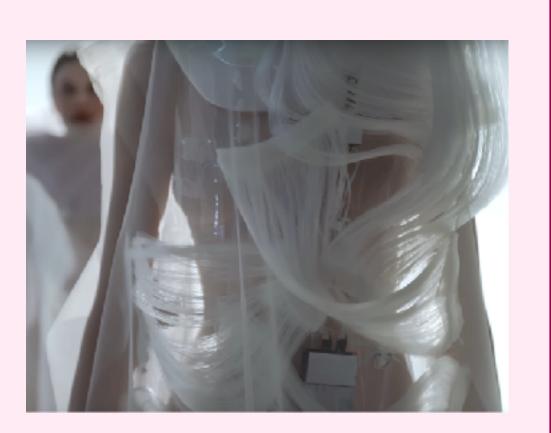
- Dan Salzman, global head of Media, Analytics and Insights, HP

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"When you have the ability to understand how a you make fashion choices that you are not really good at, it would totally change how you interact

Disruption | Commerce | Fashion

### **CHANGE AREAS**



### LIVING MATTER DESIGNS

Designer Ying Gao's interactive dresses mimic microbial life, using robotic actuators attached to the fabric that are connected to a facial recognition sensor. The dresses react to onlookers' emotions and continues to move if that person is stoic. The designs were created to ask viewers to consider the impact of human behavior on the environment.



### "ANTI-FACE" RECOGNITION FASHION

CV Dazzle is a company exploring how futuristic fashion can be used as camouflage from face-detection technology, using features like hairstyles that extend over and around the face to facial features decorated with bold shapes and accessories like rhinestones.

Source: <u>FindBiometrics</u><sup>50</sup>

Source: <u>Dezeen</u>49



### SENSING YOUR EMOTIONS

Startup MyFeel's wearable sensor tracks various physical conditions to monitor changes in the person's emotions, ranging from content, glad, joyous to distressed. The real-time tracking is designed to provide optimum states or mental health intervention when needed.

Source: <u>myfeel.co</u><sup>51</sup>

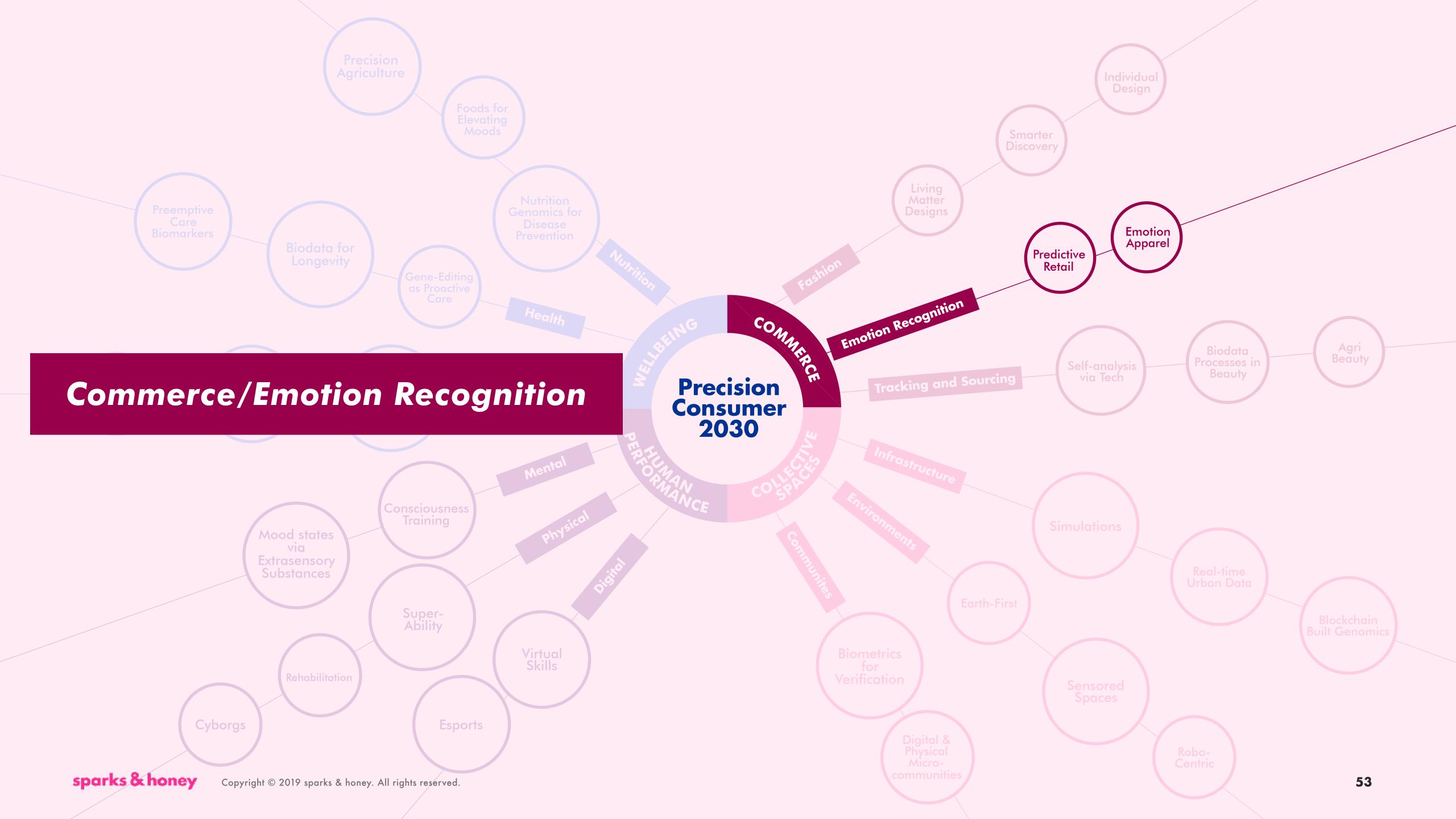


### A BIKINI GETS SMART ABOUT YOUR SUN DOSAGE

A smart bikini could cut your day at the beach short, or tell you to go in the shade. French fashion tech brand Spinali Design's Neviano UV Protect swimsuit collection includes medallion-like waterproof sensors that work with your skin type, sending out warnings if you stay in the sun too long.

Source: <u>Spinali-design</u><sup>52</sup>





**Precision Consumer 2030** Disruption | Commerce | Emotion Recognition

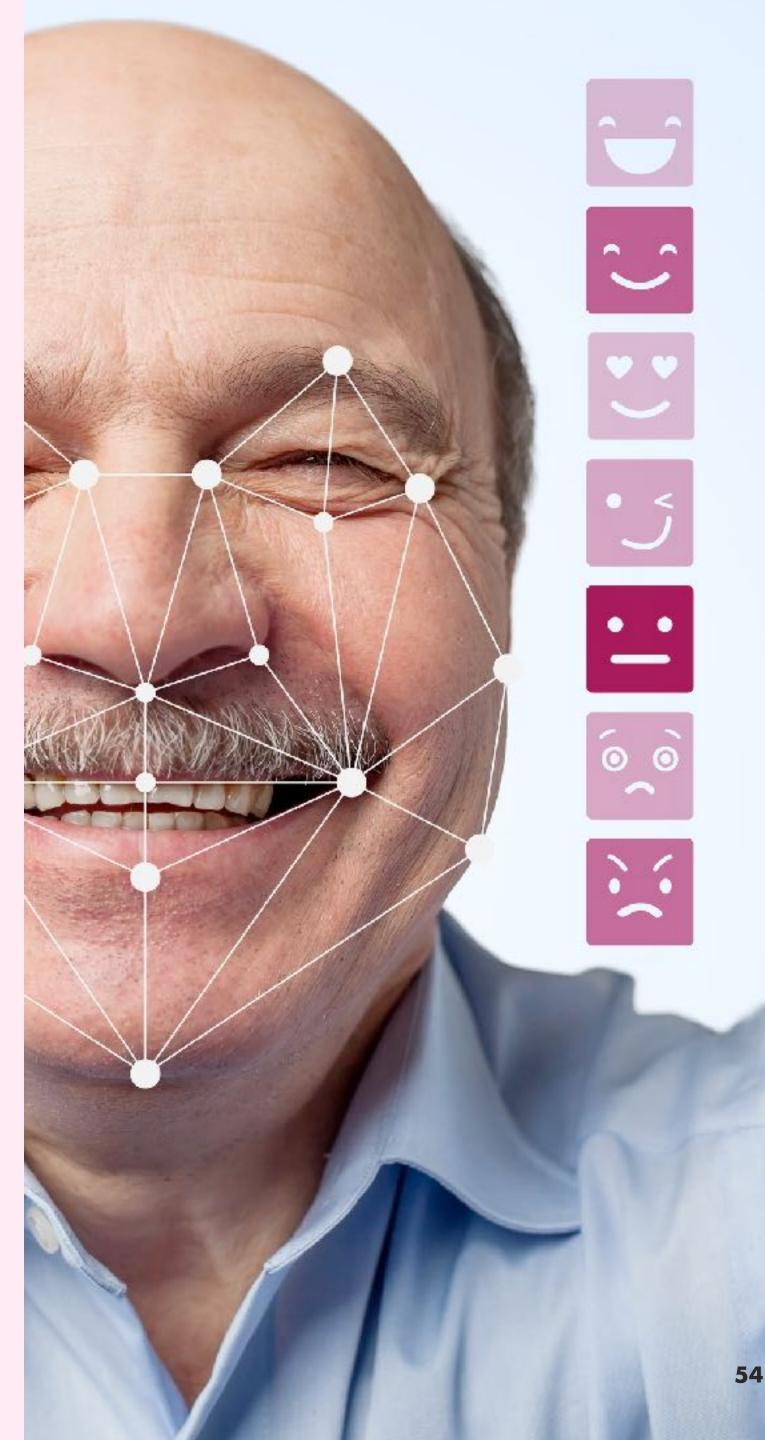
## PRECISION EMOTION RECOGNITION

Retail revamped by emotion AI that reads 109 microexpressions

The human body is an open canvas for brands and retailers: Emotion detection and recognition technologies are interpreting and predicting your next shopping habits, preferences and purchases based on a commodity of the future—the expression on your face. Retailers, brands and consumers are set to benefit from the rapid expansion of emotion AI. The global market for emotion analytics technologies has a <u>compound annual growth rate of nearly 83%</u> <u>between 2016 to 2022<sup>53</sup>.</u>

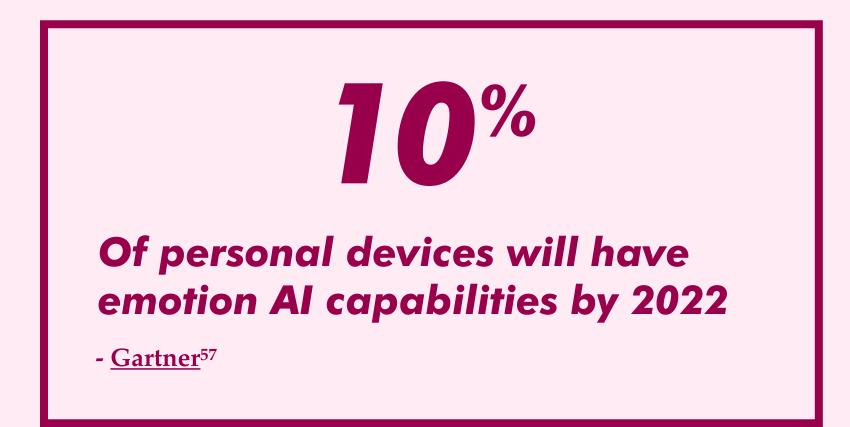
The ability of emotion-based precision technologies to analyze expressions turns a moment in time—an individual's expression—into a biomarker of future behavior and opportunity. It also signals where retailers can make improvements or <u>shift strategies</u><sup>54</sup> with everything from inventory to branding and packaging: If a consumer spends a long time reading a label, it may need a redesign. If they seem "happy" about certain items, increase inventory.

Emotion AI has yet to catch up to the range and nuance of human emotion, with technologies that may be bucketing the more complex behaviors and microexpressions of humans into a range of <u>eight</u> <u>emotions<sup>55</sup></u>: happy, sad, angry, surprised, fear, disgust, contempt or neutral.





As retail and other environments—and even our devices—are programmed to read our emotions, humans could begin to mirror their own emotional radar based on technology. Scientists are beginning to challenge the ability of emotion AI to infer human emotion. The way people communicate a range of emotions in facial expressions varies substantially across cultures and situations, according to a recent study published in <u>Psychological Science in the</u> Public Interest<sup>56</sup>.



# BILLION

Value of emotion detection and recognition technologies by 2020

Source: Orbis Research<sup>54</sup>



Precision Consumer 2030 Disruption | Commerce | Emotion Recognition



### "A company called Emotion Labs looks at over 109 microexpressions that can help identify the mood in spaces (like retail). If you're going to do sales or someone is walking up to your store, you need to know their mood biometrically in advance."

- Jeremiah Owyang, CEO of Kaleido Insights, sparks & honey Advisory Board member

Disruption | Commerce | Emotion Recognition

### **CHANGE AREAS**



### COFFEE IN EXCHANGE FOR YOUR PERSONAL DATA

Students at Japanese-owned Shiru Cafe, located close to Brown University in Rhode Island, can buy coffee in exchange for an asset that may be more valuable than money: their personal data. The cafe says it doesn't share individual data, but it does share aggregate data such as expected years of graduation.

Source: <u>NPR</u><sup>58</sup>



### EMOTION RECOGNITION COMPANY AFFECTIVA'S AI HEARS YOUR ANGER IN 1.2 SECONDS

A frustrating day can be interpreted by emotion detection technologies: Affectiva's neural network, SoundNet, is able to classify the emotion of anger from audio data in as little as 1.2 seconds — which is just over the time it takes a human to comprehend anger.

Source: <u>Venture Beat</u>59

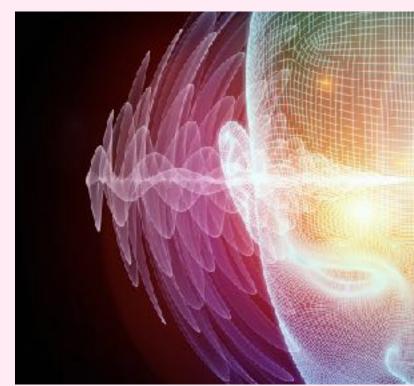
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### AMAZON'S PATENTED TECHNOLOGY WOULD ALLOW ALEXA TO READ YOUR EMOTIONS

Tech giant Amazon has patented a technology that would allow its smart speaker Alexa to monitor users' emotions by analyzing the pitch and volume of their voices in commands to the speaker. The device would then "respond" to how it interprets the person's feeling.

Source: <u>The Atlantic</u><sup>60</sup>

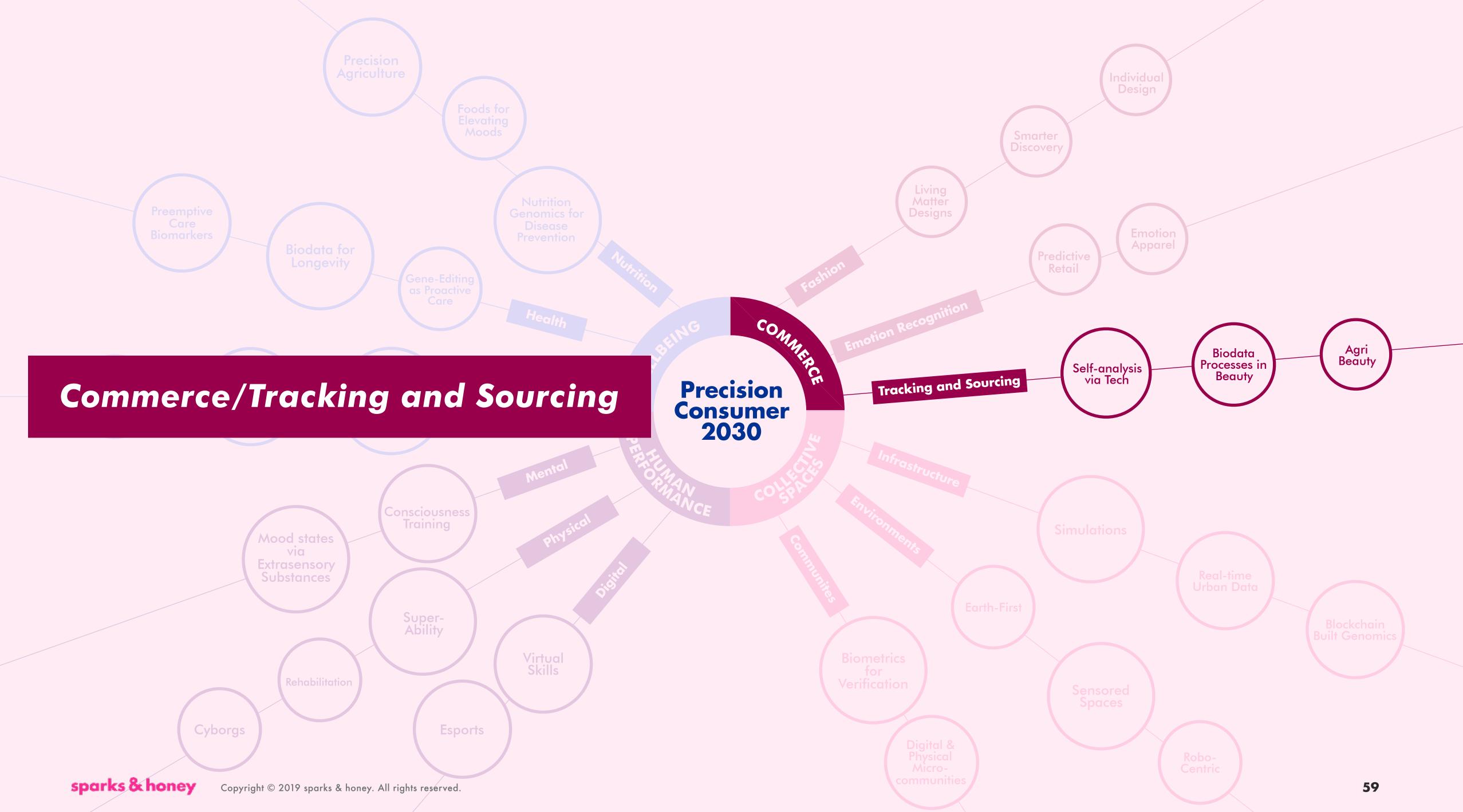


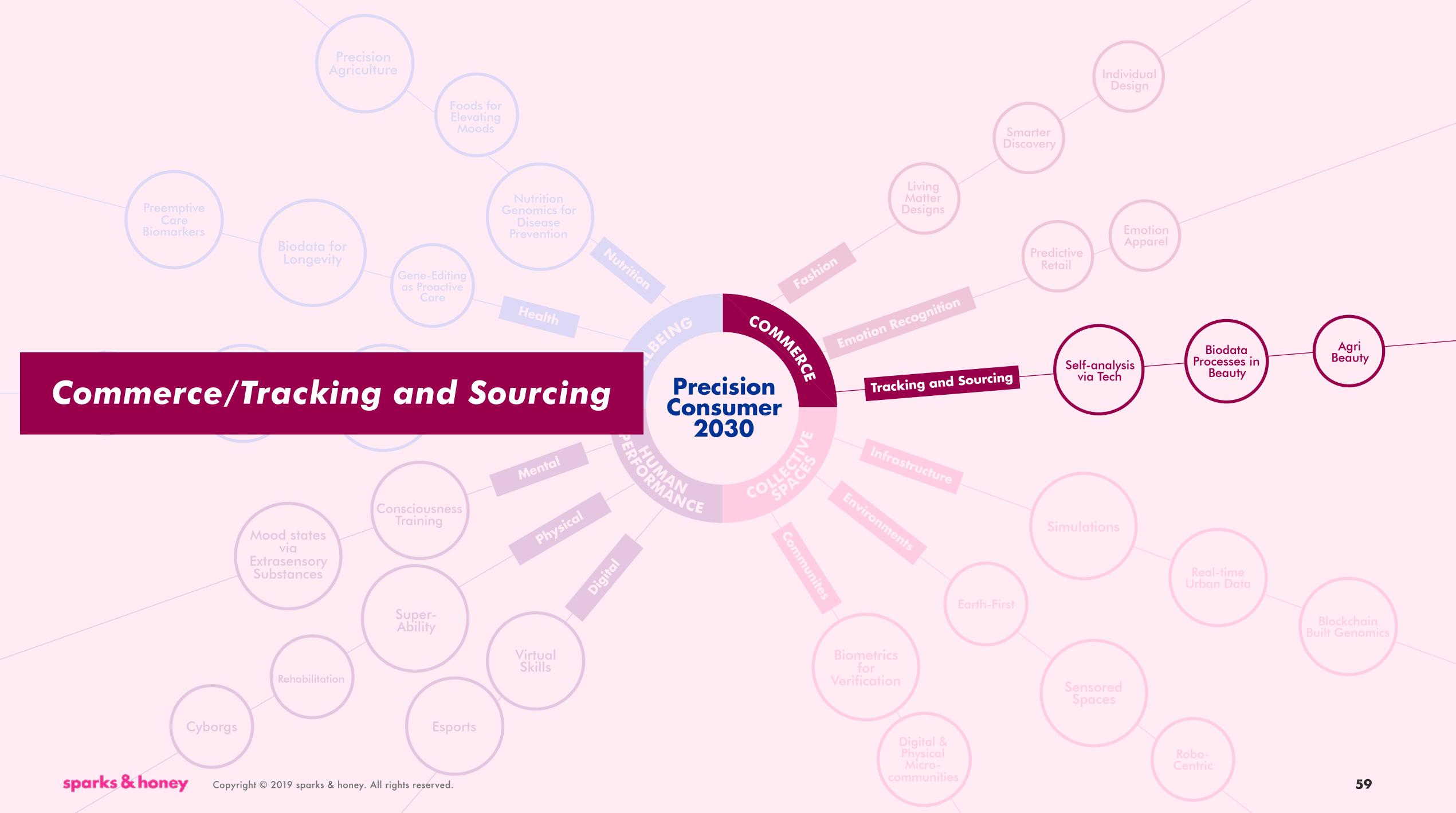
### MUSIC OF THE FUTURE WILL BE GENERATED BY AI TO MATCH YOUR MOODS

The tunes you listen to in the future will be deeply personalized, according to your moods and emotions. Venture capitalist Vinod Khosla customized songs designed for an individual by AI and tailored to their brain.

Source: <u>Techcrunch</u><sup>61</sup>







Disruption | Commerce | Tracking and Sourcing

## **PRECISION TRACKING** & SOURCING

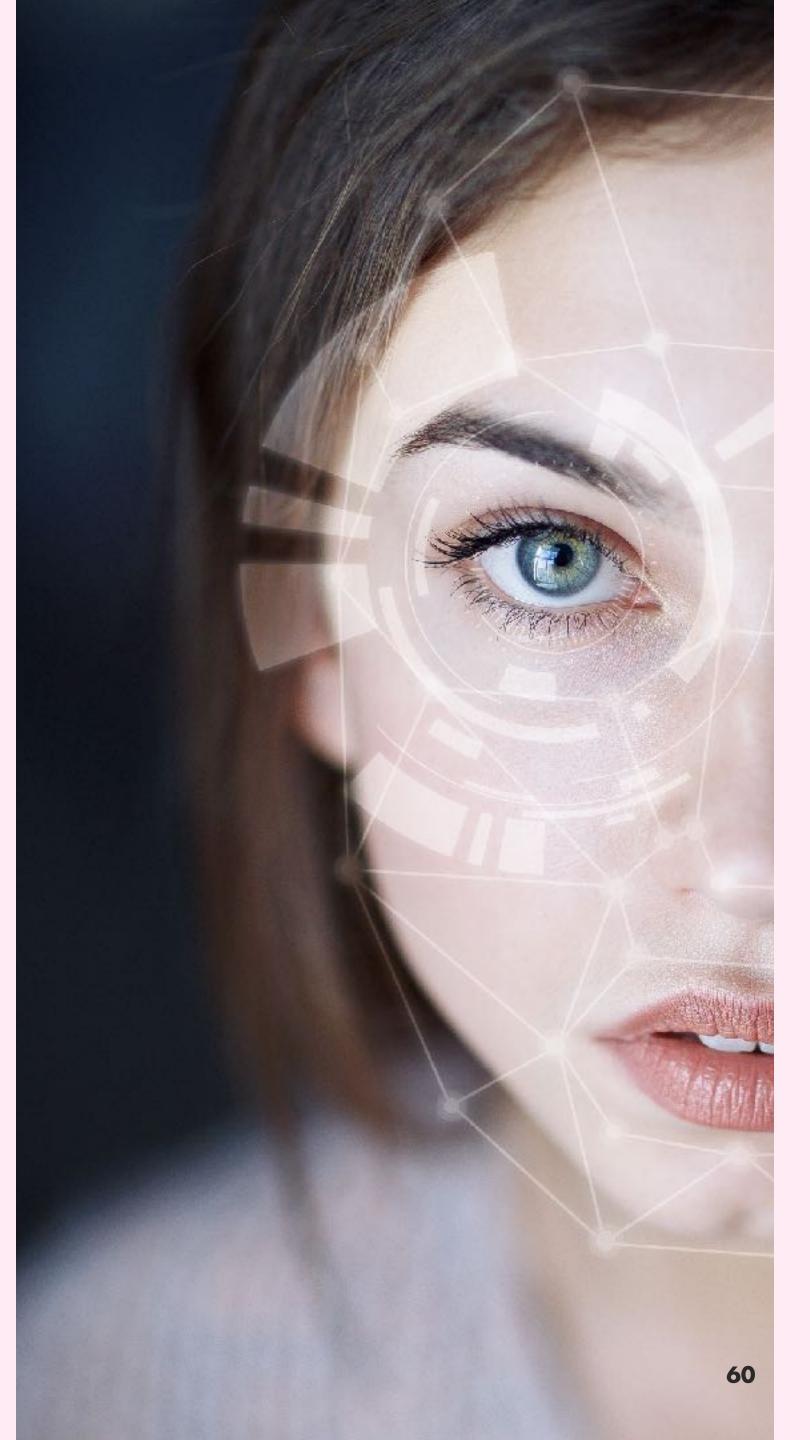
Beauty turns to agricultural, genomic and microbiological processes

The desire for deeply personalized beauty products and services is driving a marketplace in which beauty is synonymous with a key ingredient: you. Precision technologies such as facial recognition and 3D printing are becoming one with the future of beauty, with innovations such as <u>Neutrogena's 3D-printed face</u> <u>masks<sup>62</sup>, tailored to the shape of your face using AI.</u> Startups like Amareta are creating <u>products designed</u> for different stages of women's hormonal cycles<sup>63</sup>, a strategy that is bringing 60% of their customers to make another purchase. Genomic and microbiological processes are becoming a part of daily beauty routines with products that use our own blood platelets and agricultural processes. Our analysis points to the crossover between precision nutrition and beauty, driven by advancements in microbiome science, analyzing metabolism and the effects of environmental and genetic components.

The beauty industry will be turning to agricultural sources, typically associated with food supply, as the source of beauty products that are adaptable and versatile for the precision consumer. Edible collagen, <u>a newly touted superfood of 2019</u><sup>64</sup>, is one agricultural product that bridges both precision nutrition and beauty.

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The global appetite for this skincare-enhancing collagen is growing, and is expected to reach \$6.63 <u>billion by 2025</u><sup>65</sup>. And technologies such as virtual assistants, sensors and 3D printing are empowering consumers to explore and understand their individual beauty needs on a deeply personal and technical level.

"We need new ways of collecting and tracking biological specimens and storing that information. We need new ways of understanding the connection of microbiomes in individuals. What we really need to do is map out all of the steps to be able to track where are we on this journey, instead of just using these buzzwords and presenting this quick-fix-all."

-Sunita Singh Maclaren, co-founder, Metakura

# MILLON

Number of single nucleotide polymorphisms in a human's DNA, which can be mined to uncover skincare needs, such as sensitivity to sun, according to genomics researchers

Source: <u>MarketWatch</u><sup>33</sup>



Precision Consumer 2030 Disruption | Commerce | Tracking and Sourcing



"Through precision technologies, we will be able to tell very precisely where this bottle of water was extracted—what its certificate of analysis is, what it has in it and what it doesn't have in it, and even how the workers were treated in making it. The things that are physically and socially important to us. Consumers will have access to that information in ways they never have before."

- Mark Treshock, global blockchain solutions leader, Healthcare and Life Sciences, IBM

Disruption | Commerce | Tracking and Sourcing

### **CHANGE AREAS**



### **AGRI-BEAUTY**

The UK's largest commercial vertical farm, the Jones Food Company, may focus its current crops on food, but its future will be in products designed for cosmetics and beauty.

Source: <u>GrimsbyLive</u><sup>66</sup>



### **BEAUTY FROM BLOOD**

Blood cream is a personalized moisturizer that turns an individual's blood into the key ingredient for each unique formula, an innovation that nods to the prevalence of genomic processes in beauty.

Source: <u>wtop</u><sup>67</sup>



### **3D-PRINTED** FOUNDATION

The Opte Precision Skin System is a device that scans your face with blue light to pinpoint the specific age spots and blemishes on your face, using a facial recognition algorithm to determine the exact amount of foundation needed for the size, shape and color of each skin imperfection. It then 3D-prints that amount for the face.

Source: Opté<sup>68</sup>



### **TECHNOLOGY FOR SELF-ANALYSIS IN BEAUTY**

Schwarzkopf Professional's SalonLab is creating personalized products on site by measuring customers' hair moisture, quality and color.

Source: <u>Salon Lab</u><sup>69</sup>





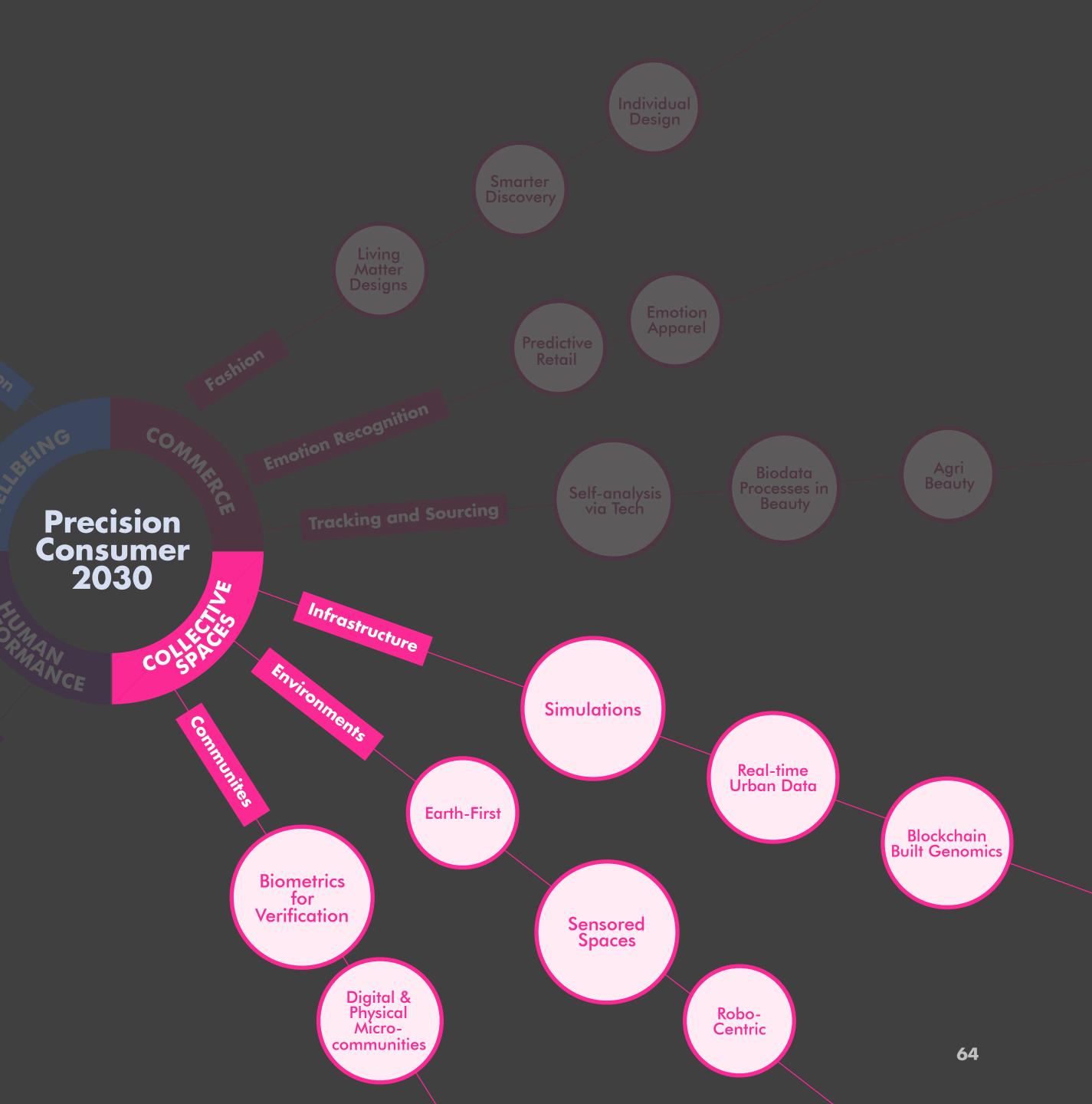


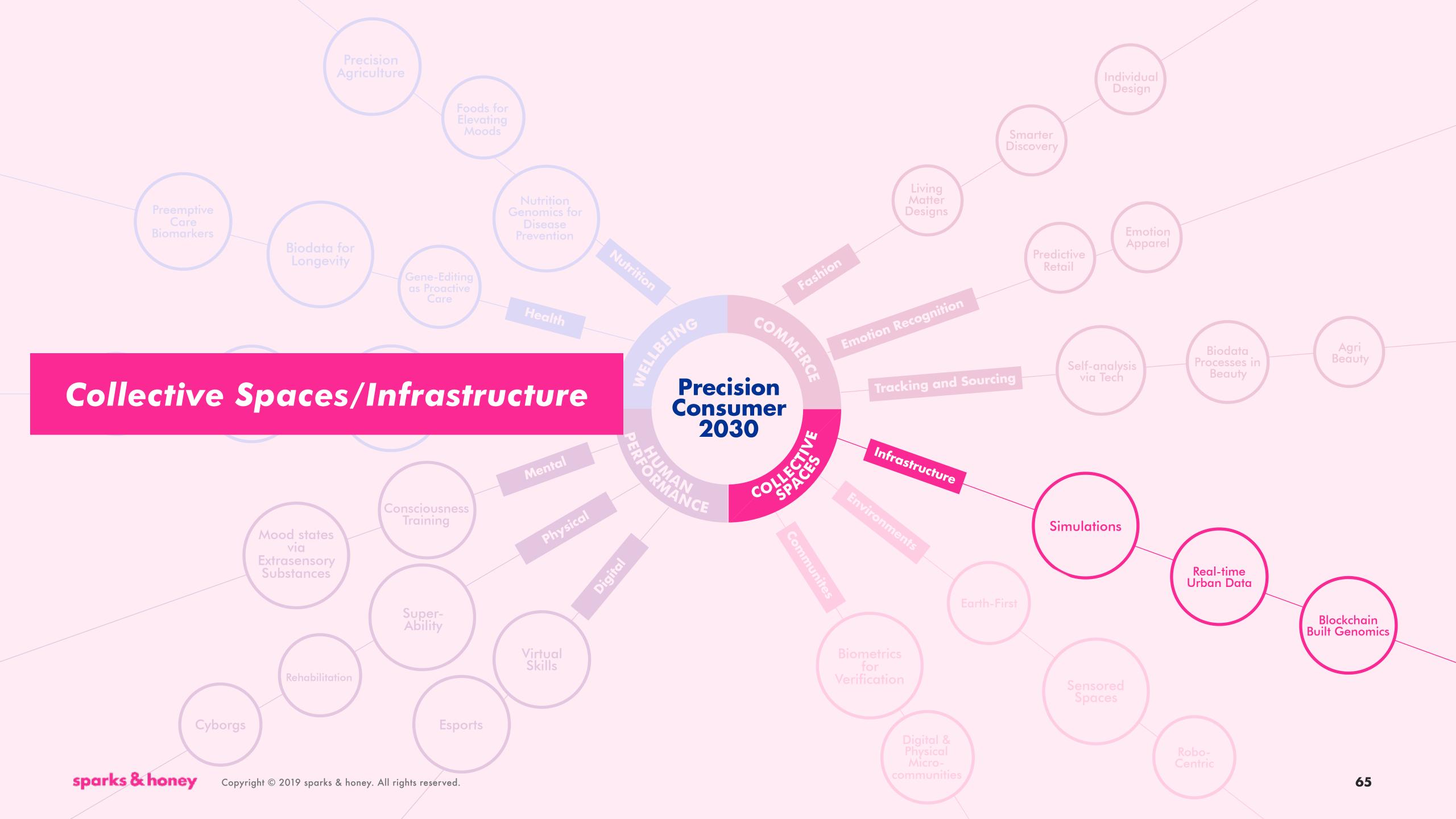
### **Collective Spaces**

sparks & honey analyzed 27.3 million
structured cultural signals<sup>70</sup> that pointed to
the larger pattern of Collective Spaces as a
key sector of precision. The various areas of
cultural change uncovered in Collective
Spaces include Infrastructure (real-time urban
data, simulations), Environments (sensored
spaces, Earth) and Communities (biometrics

for verification, micro-communities). Together, these tell a story of immense growth and innovation in the future of Precision Spaces, totaling nearly \$223 billion in venture capital funding<sup>71</sup>.







**Precision Consumer 2030** Disruption | Collective Spaces | Infrastructure

### PRECISION **INFRASTRUCTURE**

Biodata as a rising commodity in physical and virtual spaces

From public spaces to neighborhoods and even virtual environments, data is becoming an engine of infrastructure. The real-time gathering of data with sensors, cameras and surveillance technologies such as facial recognition are creating an unprecedented era of contextual data that powers the spaces, both virtual and physical, that we inhabit.

As consumers become more aware of the use of their data in our collective spaces, we can expect a growing urgency for transparency in the use of such biodata. Currently, biobanks tend to ask people to provide broad consent for open-ended research use and widespread sharing of their biosamples and data, as research published in <u>Science Direct<sup>72</sup></u> noted.

The blockchain is starting to penetrate genomics, creating new norms of potential transparency and accountability for consumers and entrepreneurs alike. Entrepreneurs are looking to vast biobanks containing individual genomes research purposes, anticipating that the decreasing costs of genomic sequencing will translate into more and more people sequencing their entire genome. The rise of blockchain-based genetic sequencing companies, such as <u>Nebula Genomics</u><sup>73</sup>, could facilitate the ownership of all data generated from sensors and other data sources.





It's only the dawn of biobank building. By 2024, the biobanking market is expected to generate \$36.8 billion<sup>74</sup> in revenue. Coupled with decreasing costs of sequencing the human genome and a growing population—by 2030, there will be some 8.6 billion people on the planet—we can expect the adoption of biobanking to accelerate.

In China, officials are using facial recognition to monitor the movement of people, in scenarios where the presence of cameras act as pre-policing measures. Among public housing neighborhoods in Beijing, facial recognition is tracking everything from illegal subletting to ensuring people manage their garbage disposal correctly.

Beyond physical infrastructure, immersive simulated environments designed by augmented and virtual reality are enabling people to learn and access skill sets, such as emotional resilience or communication skills, that are translated to their natural worlds.

Of people worried what would happen if their genetic data was misused by researchers, in a study of attitudes toward consent and data sharing in biobank research

Source: <u>Science Direct</u><sup>72</sup>



**Precision Consumer 2030** Disruption | Collective Spaces | Infrastructure



# of all these technologies together. It's not just of these profound technologies hit all at the same time."

- Mark Treshock, global blockchain solutions leader, Healthcare and Life Sciences, IBM

"It's not any single technology, it's the complements blockchain, it's blockchain and loT and analytics on top of all that data, and then doing things like **CRISPR** and added manufacturing and quantum computing. It's really that we're having so many

**Precision Consumer 2030** Disruption | Collective Spaces | Infrastructure

### **CHANGE AREAS**



### **IMMIGRANT DETAINEE DNA COLLECTION**

The Department of Homeland Security is planning on collecting **DNA** samples from hundreds of thousands of immigrants in federal detention facilities, and include those results in a national criminal database, a move that heavily extends the use of technology to enforce laws.

Source: <u>The New York Times</u><sup>75</sup>

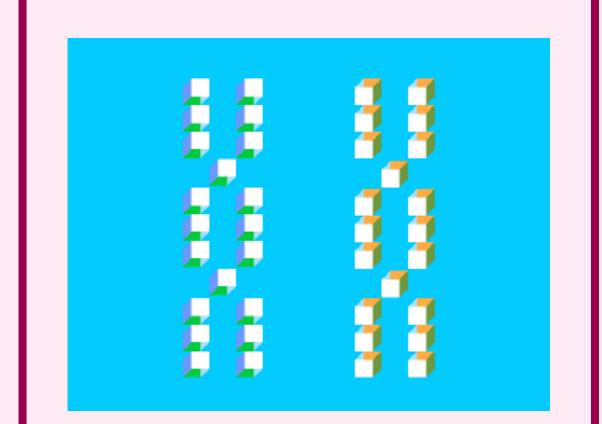


### **CHINA'S FACIAL** RECOGNITION **MONITORS TRASH DISPOSAL AND PUBLIC HOUSING SUBLETS**

China has extended its use of facial recognition technology to several residential neighborhoods in Beijing expected to total 59—to track a new garbage sorting program, on the heels of earlier efforts to stem illegal subletting of government-funded housing. The smart garbage cans are equipped with cameras to remind residents to properly sort their waste: the faces of those who do not properly dispose of paper, plastic and cans are reported.

Source: South China Morning Post<sup>76</sup>

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### **TRANSPARENCY IN GENOMICS VIA BLOCKCHAIN**

**Startups are turning to cryptocurrency** software to get and trade genome sequences for research purposes and profit. Companies such as Nebula expect that people will get their whole genomes sequenced, and that researchers will pay people for access to their genome data, using tokens purchased from Nebula. Blockchain could offer a decentralized system of scale and trust in genomic data.



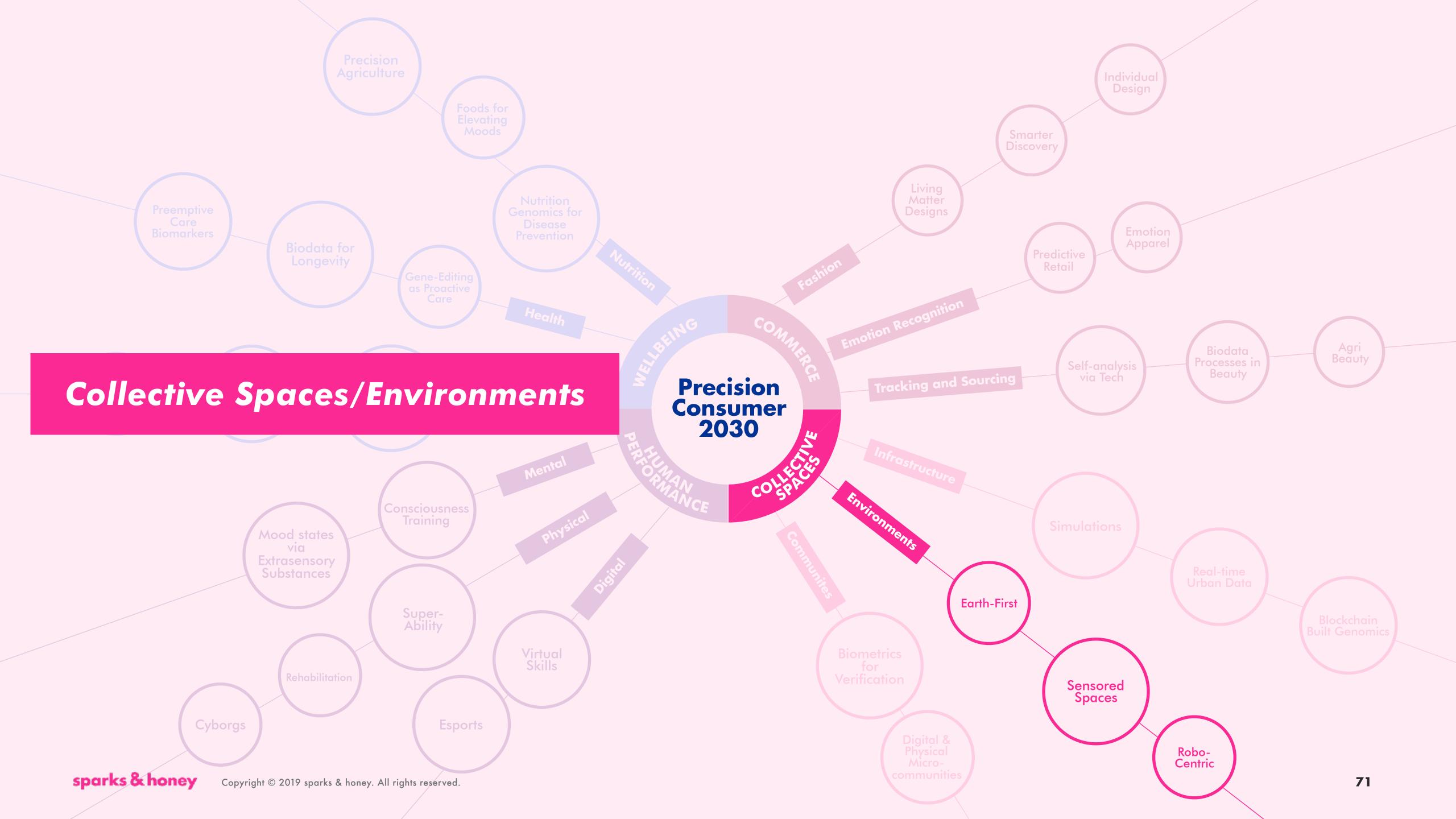
### SIMULATED LEARNING **ENVIRONMENTS FOR GAINING EMOTIONAL AND SOFT SKILLS**

Startup Oji Life Lab's digital learning system is a simulated environment designed to help individuals and teams build and gain essential emotional and soft skills, such as creativity and decision-making, for work and life.

Source: Oji Life Lab<sup>78</sup>

Source: <u>Wired</u><sup>77</sup>





### **Precision Consumer 2030** Disruption | Collective Spaces | Environments

## PRECISION ENVIRONMENTS

### Data powers our shared spaces

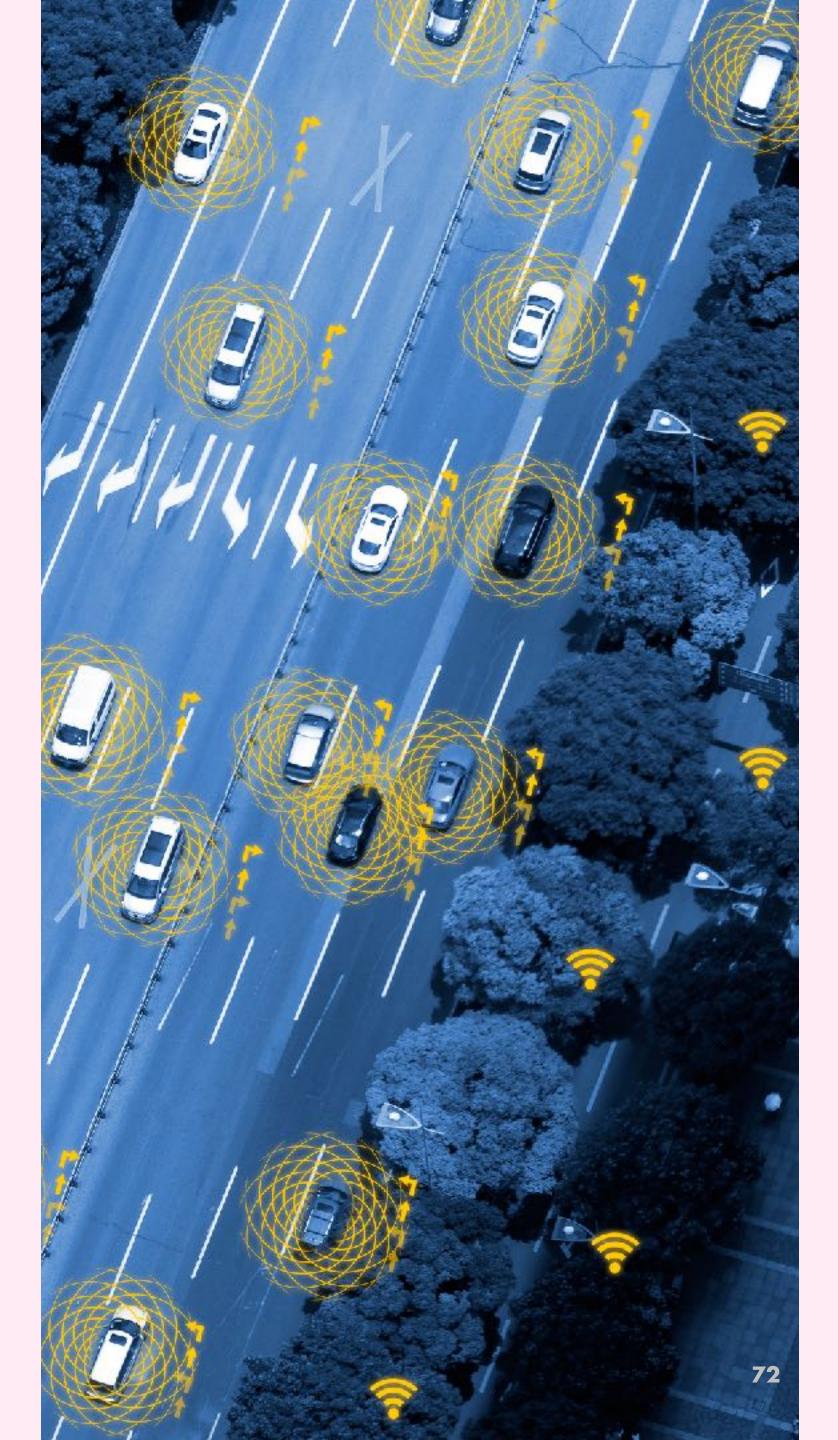
The spaces we occupy are the next frontier for precision: our home, sidewalks and streets, public spaces from parks to stadiums, workplaces, leisure environments like restaurants, airplanes, and our very planet. In our bedroom, we might have sheets that <u>analyze our sweat</u><sup>79</sup> to modify our body temperature. Outside, our rivers may provide realtime water quality updates via a floating, <u>illuminated</u> <u>data visualization</u><sup>80</sup>. With our biological and sensor data, we move through these spaces—and they are adjusting to accommodate our presence.

Developments in sensor technologies, AI and biometric data collection are set to create open environments in which our preferences and information are shared for mutual benefit, and for that of the Earth. Researchers are on the cusp of designing <u>sensors that are powered by bacteria</u><sup>81</sup>, bringing ecological benefits to our connected devices and data tracking.

Jeremiah Owyang, founder of Kaleido Insights, envisions what dinner at your favorite "intelligent restaurant" might look like—just one of many spaces that will be powered by precision data. The restaurant will analyze you, and then suggest what you might have for dinner.

Precision can tell the story of a specific individual in personal detail, but when the same technologies and data are gathered with a broader view of the environments we occupy, their inherent richness can reveal new stories of humans in given spaces.





In U.S. cities like Bergen County, for example, problems of homelessness<sup>84</sup> are being eradicated by tracking people in real-time or anticipating emerging patterns of specific communities.

The development of sensor technologies in our spaces, along with technologies that enable our biometrics, gestures and even breath to be analyzed are set to radically change our collective experience of space, whether it's a stadium you're entering, a city you're strolling through or having a dinner in the not-distant future.

At the same time, the collective wealth of our biodata poses a burning question: who owns and will own the protection of our data?

# MILLON

Funding of startups in wellness tech specifically around our environments, involving air, light, scent, sleep, sound, touch and manipulation of a whole space

Source: Kaleido Insights, March 201982



**Precision Consumer 2030** Disruption | Collective Spaces | Environments



# an Asian male in my mid-40s and it could tell from my body type that I like a certain type of food. It could look at my facial expression to

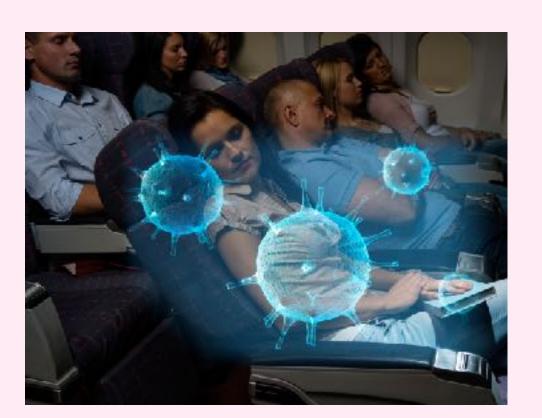
- Jeremiah Owyang, CEO of Kaleido Insights, sparks & honey Advisory Board member

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"A restaurant may not have a menu at all. It sizes you up biometrically as you walk in. It knows I am check my mood. All of that could be done already through camera systems if you have the right AI."

Disruption | Collective Spaces | Environments

### **CHANGE AREAS**



### **BONDED BY BACTERIA**

On a plane, you and your fellow passengers and crew form a collective community of unique bacteria at 30,000 feet in the air, derived from each individual. Aircrafts have their own microbiome, much like that of homes and offices, according to research from the Georgia Institute of **Technology and Emory University.** 

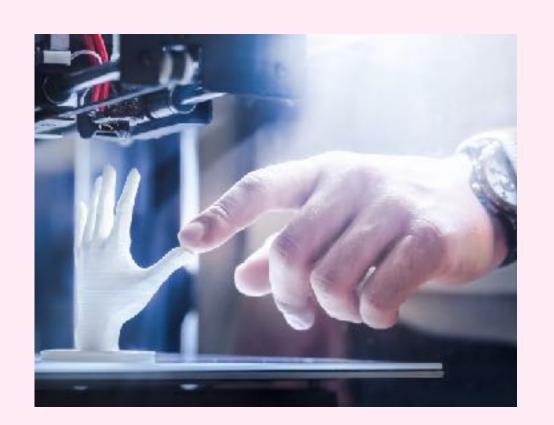
Source: <u>ScienceDaily</u><sup>83</sup>



### **SENSORED SPACES**

American cities like Abilene, Texas and Bergen County, New Jersey are tracking people experiencing homelessness in real-time with a data visualization program called Built for Zero, which helps agencies tackle homelessness issues collectively for good. The real-time data collection also exposes emerging issues, such as an increase in young people and seniors who are homeless.

Source: <u>FastCompany</u><sup>84</sup>



### **EARTH-FIRST TECHNOLOGY**

**Precision technologies that provide** zero waste solutions, such as the **Swiss Federal Institute of** Technology's Spectroplast, are putting **Planet Earth ahead of product** development. Spectroplast provides precision silicone 3D printing solutions — without the use of wasteproducing moulds — for everything from personalized accessories and fashion to medical devices.

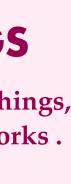
Source: <u>Spectroplast</u><sup>85</sup>



### **ECO-FRIENDLY INTERNET OF DISPOSABLE THINGS**

In the "disposable" internet of things, everything is connected to networks. **Researchers at Binghampton** University say they are close to creating a bacteria-powered miniature battery, which could be implanted into shipping labels and packaging for tracking and temperaturemonitoring in real time. The mini battery is uniquely charged through power created by bacteria, designed specifically to provide energy to sensors and radios in single-use connected devices.

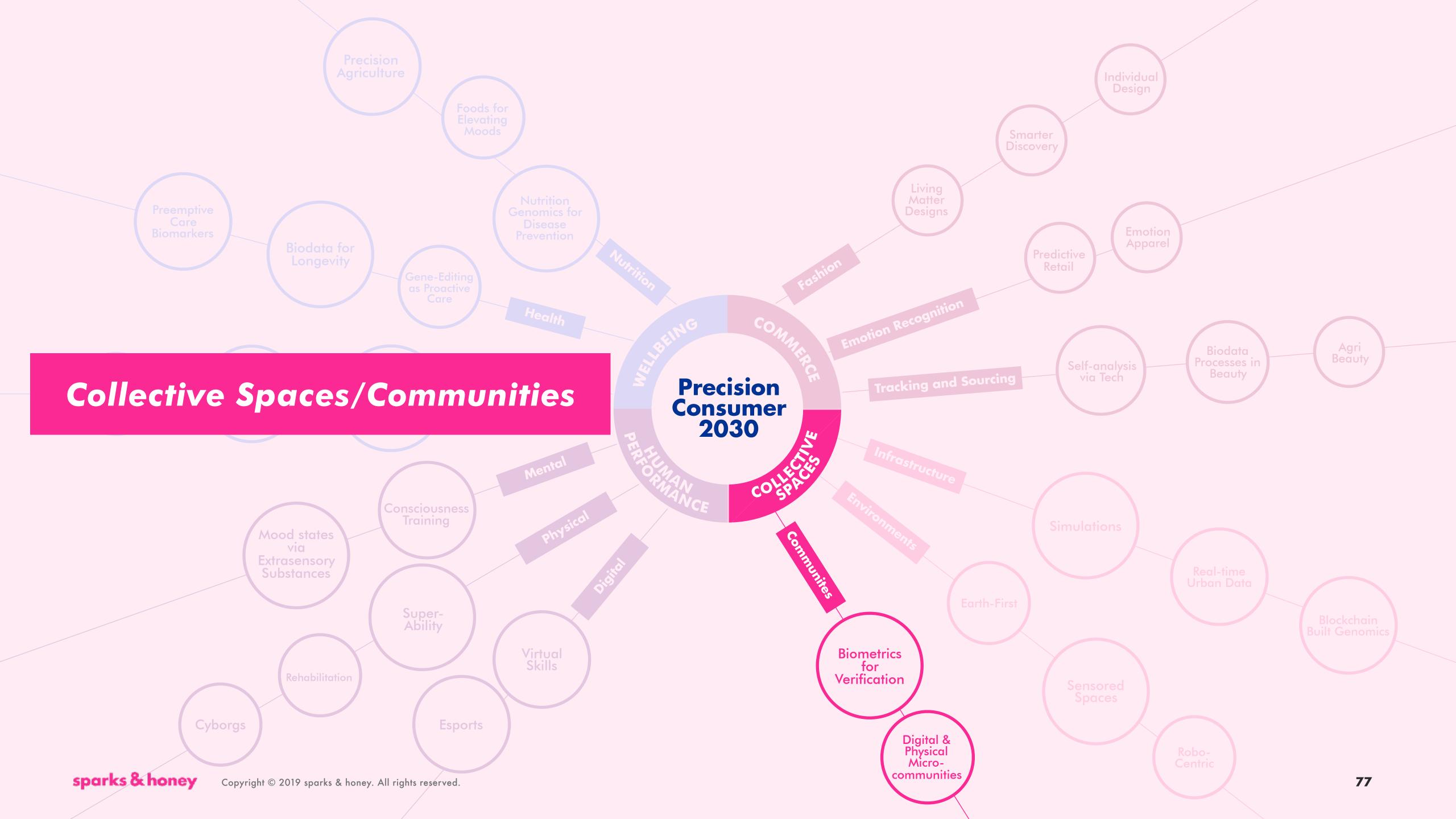
Source: <u>Network World, An eco-friendly</u> internet of disposable things<sup>81</sup>











**Precision Consumer 2030** Disruption | Collective Spaces | Communities

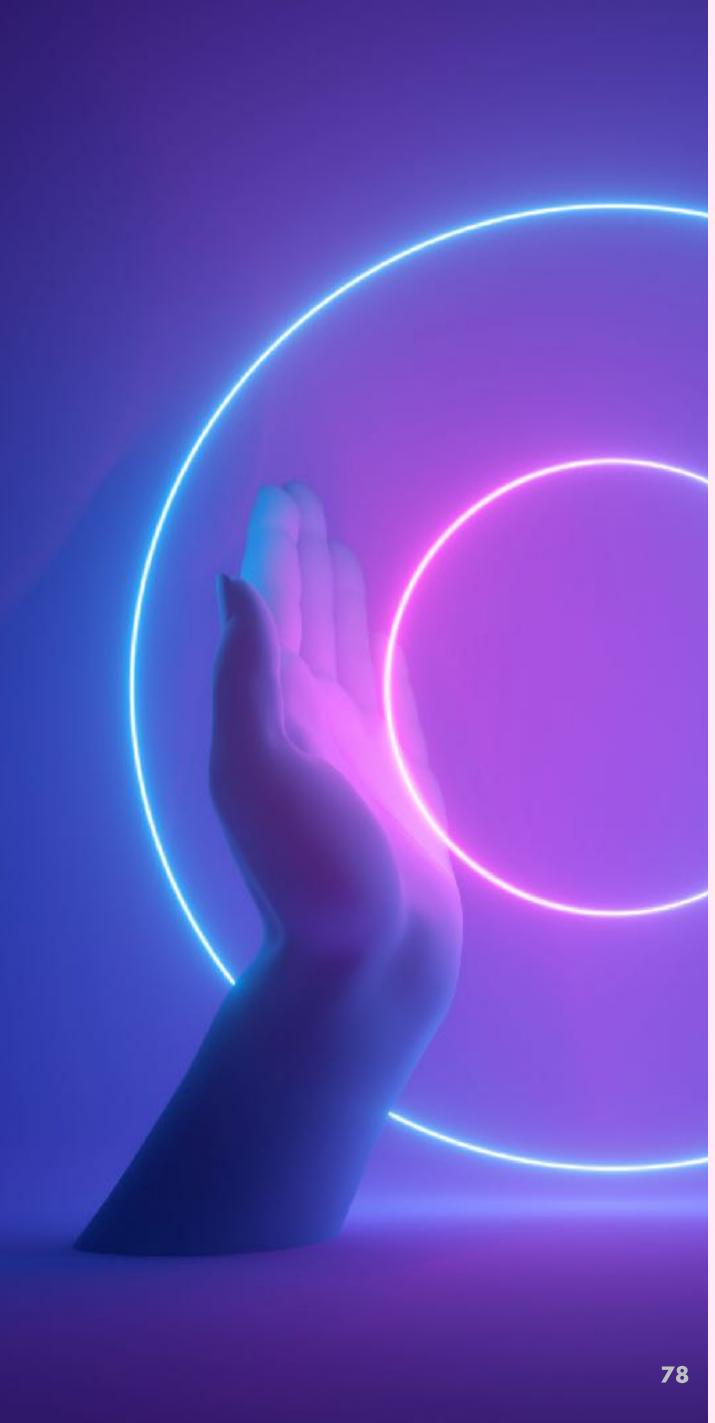
## PRECISION COMMUNITIES

Biometrics will be used to assess workplaces

In an era of post-truth, there is a growing need to validate and authenticate identity, conduct audits and confirm facts in real time with platforms and services designed for consumers, which can be powered by biometrics. It's a system that relies on the accurate recognition and identification by precision technologies of traits that are unique to individuals. By 2022, global revenue from biometric technologies is expected to reach over <u>\$30 billion</u><sup>86</sup>, an increase that we can expect to correlate with the adoption of biometrics. Such expansion turns fingerprints and other biometric data—such as iris or vein recognition, hand geometry or your voice—into increasingly valuable assets of not only identity, but access to

everywhere from our workplaces to venues to payment systems and age-restricted platforms.

Individuals will seamlessly harness data that is part of their very being into physical and virtual access. At the same time, biometrics have the potential to analyze the spaces we are in. Jeremiah Owyang of Kaleido Insights details how the health—and future success—of a business or workplace could be revealed by collective biometrics.



Jeremiah Owyang envisions a future workplace powered by biometrics: "Break rooms, places to sleep, quality of air, green living plants and fresh food—and I could rate your office. Biometrics could do that. It's being done by human analysts now, but in the future it could be done at a truly biometric level as well. At that point, we might see regulations to identify what is the right type of workplace."

-Jeremiah Owyang, CEO and founder, Kaleido Insights, sparks & honey Advisory Board member



### Global biometric market revenue by 2022

Source: Statista, Biometrics: market value worldwide 2017-2022, by technology<sup>86</sup>



**Precision Consumer 2030** Disruption | Collective Spaces | Communities



- Christopher Moose, partner, Life Sciences and Healthcare, IBM

"When you break that trust of either not delivering to a personalized outcome, or when consumers feel misled on how their data has been used—that's when they have a big problem. But if you protect their data and you deliver an experience that is to a category of one, then I think consumers are very tolerant and in fact expecting you to learn that."

Disruption | Collective Spaces | Communities

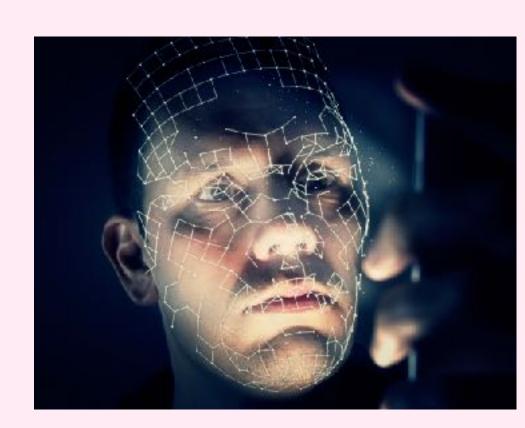
#### **CHANGE AREAS**



#### STARTUP: BIOMETRICS FOR AUTHENTICATING DIGITAL BANKING SECURITY

Vietnamese startup Wee Digital Company Limited provides biometric security technology and deep data analytics to authenticate an individual's digital banking security transactions.

Source: <u>WeeDigital</u><sup>87</sup>



#### SCAN YOUR FACE FOR ACCESS TO PORN SITES IN AUSTRALIA

Australian officials are planning to launch a new set of facial recognition and identity-matching systems, starting with access to porn. People who want to view porn sites will have to have their identities confirmed via facial scanning as a measure of verifying age. The deployment will have to wait until the Australian government has passed relevant biometric legislation first.

Source: <u>TechNadu</u><sup>88</sup>



#### GAMIFIED APP ALLOWS USERS TO OWN, VERIFY AND SELL ACCESS TO THEIR DATA

Social Reality's platform BIGtoken is a gamified app that hands the control of consumer data to its owners. Consumers can control access to their information and earn rewards in the process when their data is shared or purchased through secure, transparent transactions.

Source: Martech Advisor<sup>89</sup>

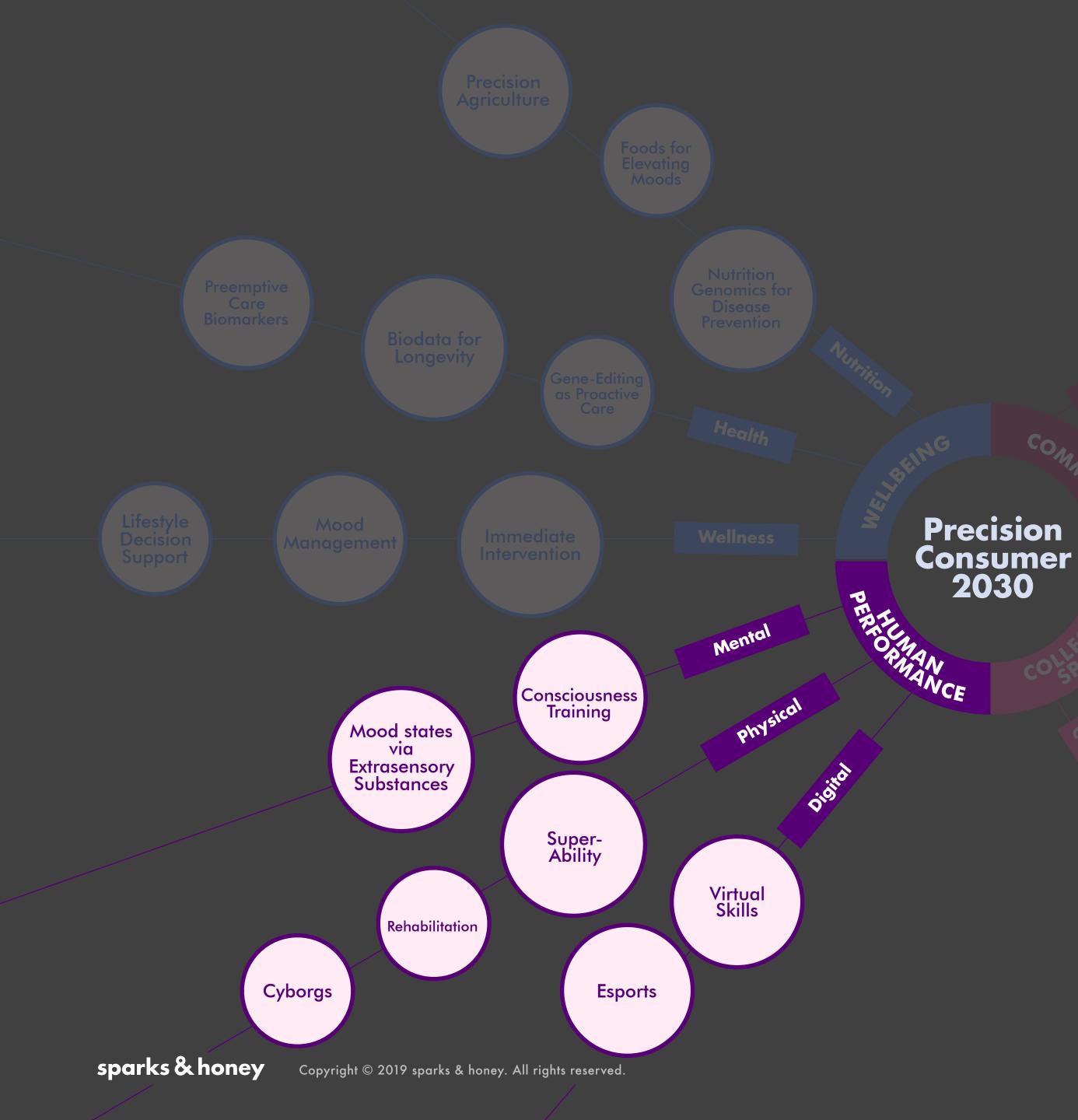


#### FINGERPRINTS AND FACES AS ACCESS TO GOOGLE PAY

Biometric security is coming to Google Pay. In version 2.100 of the app, authentication for access to Google Pay can be gained from a user's fingerprints or with a facial scan. For now, this biometric authentication only applies to sending money from the app.

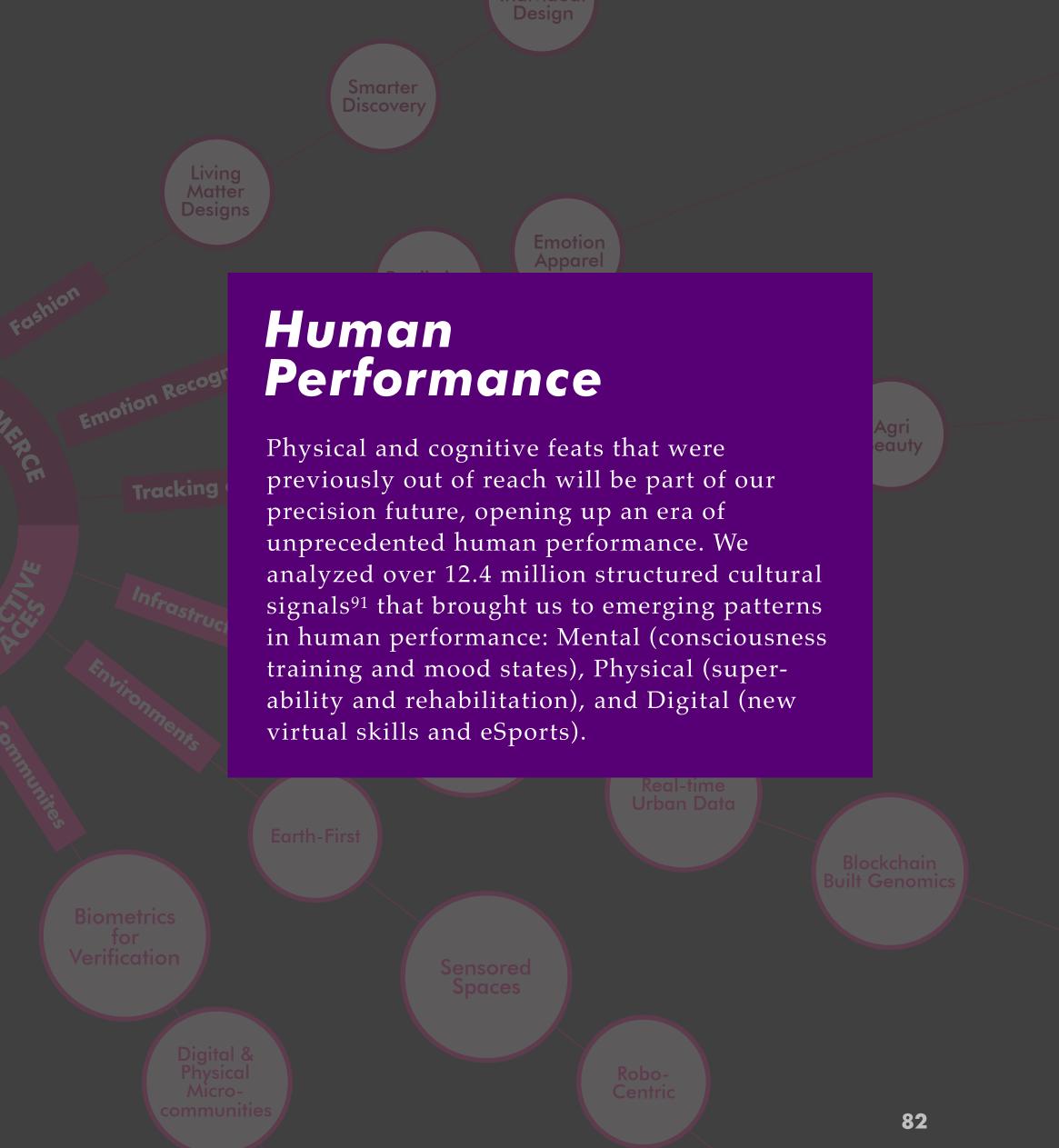
Source: <u>Tech Radar</u><sup>90</sup>

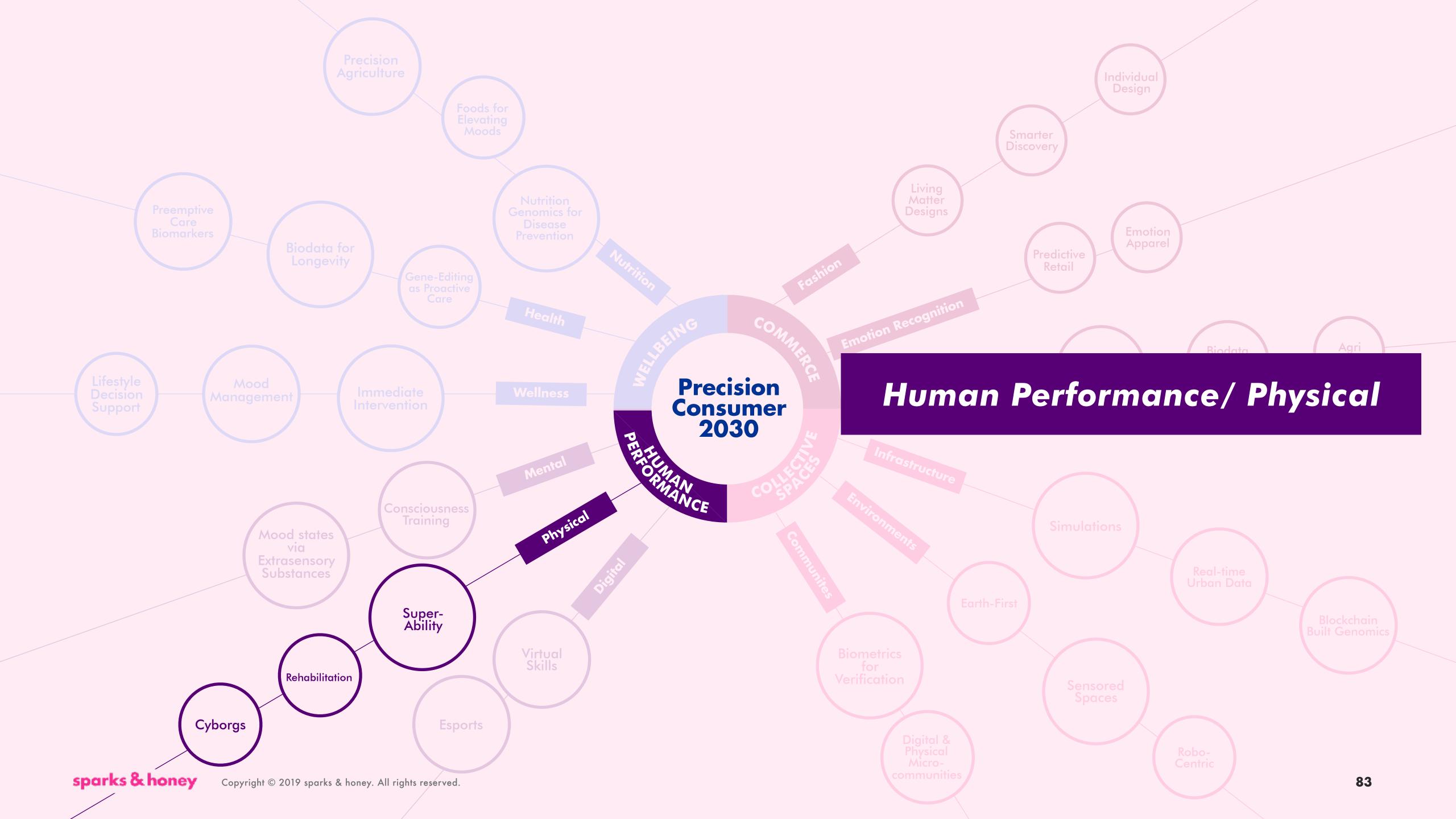












**Precision Consumer 2030** Disruption | Human Performance | Physical

## HUMAN PERFORMANCE PHYSICAL

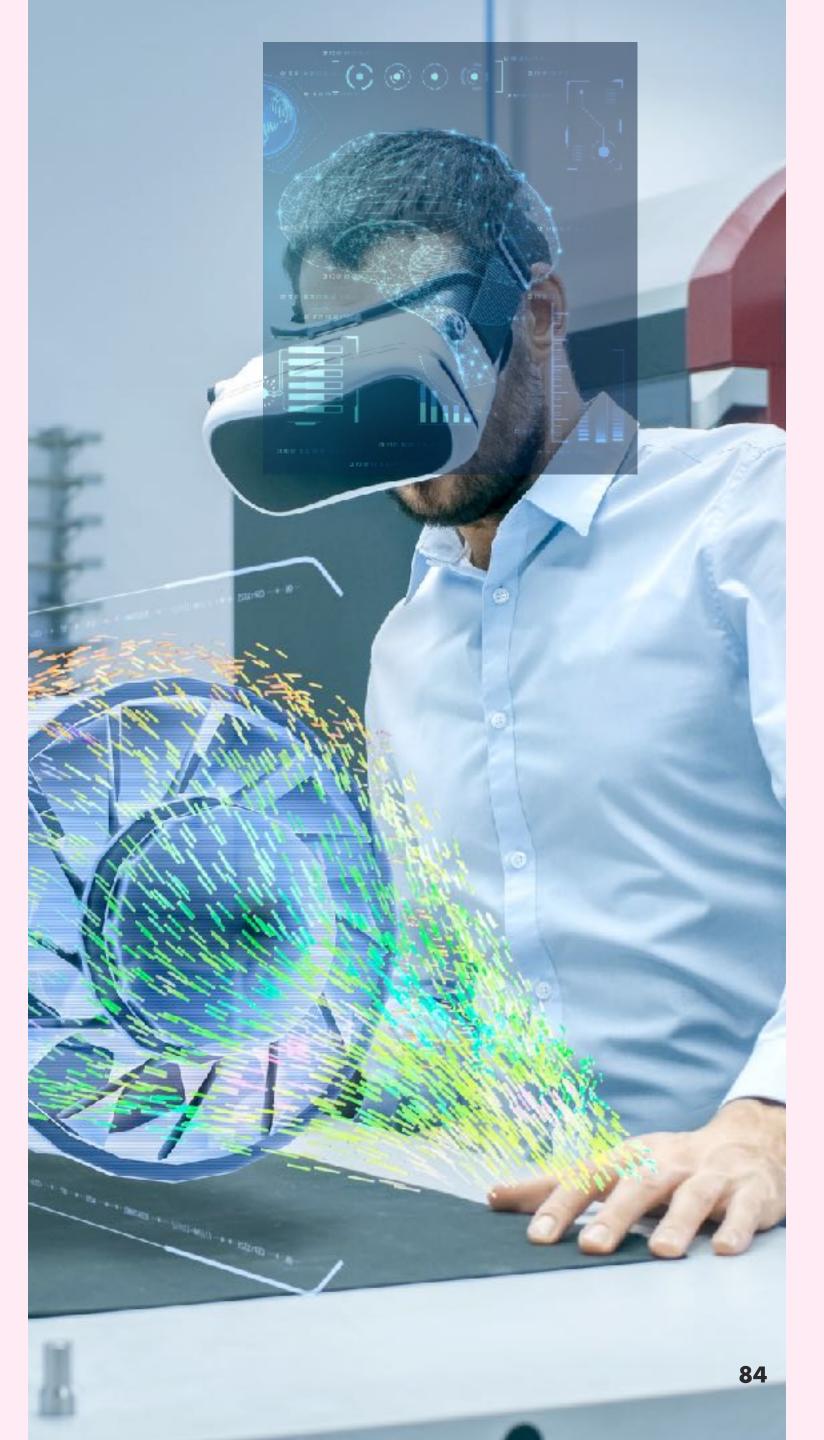
From brain to body, targeted boosts for super-ability

It's on our minds, in our brains and immersed in our body: precision technology. We welcome this intimate relationship that has the potential to propel our mere human abilities into the super-ability sphere, or enhance and rehabilitate our everyday lives.

Physical feats that were previously out of reach will be part of our precision futures. As facial recognition based payment methods are being hacked, your future coffee break could be paid with your eyes.

While we may be able to run faster or perform with more focus, precision will also allow us to alter our mood states, such as with <u>a scent created by AI that</u> <u>may trigger an emotional response<sup>92</sup>.</u>

Even the way we walk will be subject to emotion recognition methods, with implications for everything from law enforcement to retail and gaming.



At the same time, the ability of precision technologies to enhance our physical or emotional abilities is also advancing our human skill sets. Simulation-based learning via virtual reality or augmented reality are giving rise to the playstation professional, or a new generation of human skills guided by training simulations: the defense forces are using virtual skills from VR and gaming to hone their motor skills and reaction times.



## 

**Enhanced performance** of spring cycling by the brain-stimulating Halo Sport

Source: Frontiers in Physiology<sup>94</sup>



Precision Consumer 2030 Disruption | Human Performance | Physical



"We're looking directly at neurocognitive augmentation, how to make someone smart. Moving forward, we're really going to be looking at someone's unique pattern in the brain and how to augment it—not just give them a 20% boost of a working memory or function—but instead, give them a targeted boost to remember a specific thing they are focused on."

- Dr. Vivienne Ming, theoretical neuroscientist, founder and executive chair of Socos, sparks & honey Advisory Board member

Disruption | Human Performance | Physical

#### CHANGE AREAS



#### AN ARM THAT TASTES FOR YOU

A robotic gripping arm that can "taste" a specific chemical has been created by engineers at Carnegie Mellon University and the University of California, Davis. The long-term vision of the soft robotics project is building a "synthetic microbiota" for soft robots that can help with repairs, energy generation or biosensing the environment.

Source: <u>ScienceMag</u>95



#### HUMAN VOICE RECOGNITION — FROM YOUR NECK

A sensor that attaches to the skin can recognize a person's voice by examining the vibrations of the skin on the neck, without distortion from ambient noise or sounds in an environment. Developed by researchers at Pohang University of Science & Technology in Korea, the sensors are able to measure the velocity, displacement and acceleration of a voice via the neck.

Source: <u>News-Medical</u><sup>96</sup>



#### HUMANS TURNED INTO POWER GENERATORS

Humans assume super-ability with a body-worn electric generator that can power everything from wearables to medical devices. Developed by engineers at Rice University, the small and flat generator creates energy for internal body sensors or a recharge for a wearable battery by the triboelectric effect, which generates energy when two different materials are brought together and then pulled apart.

Source: Medgadget97

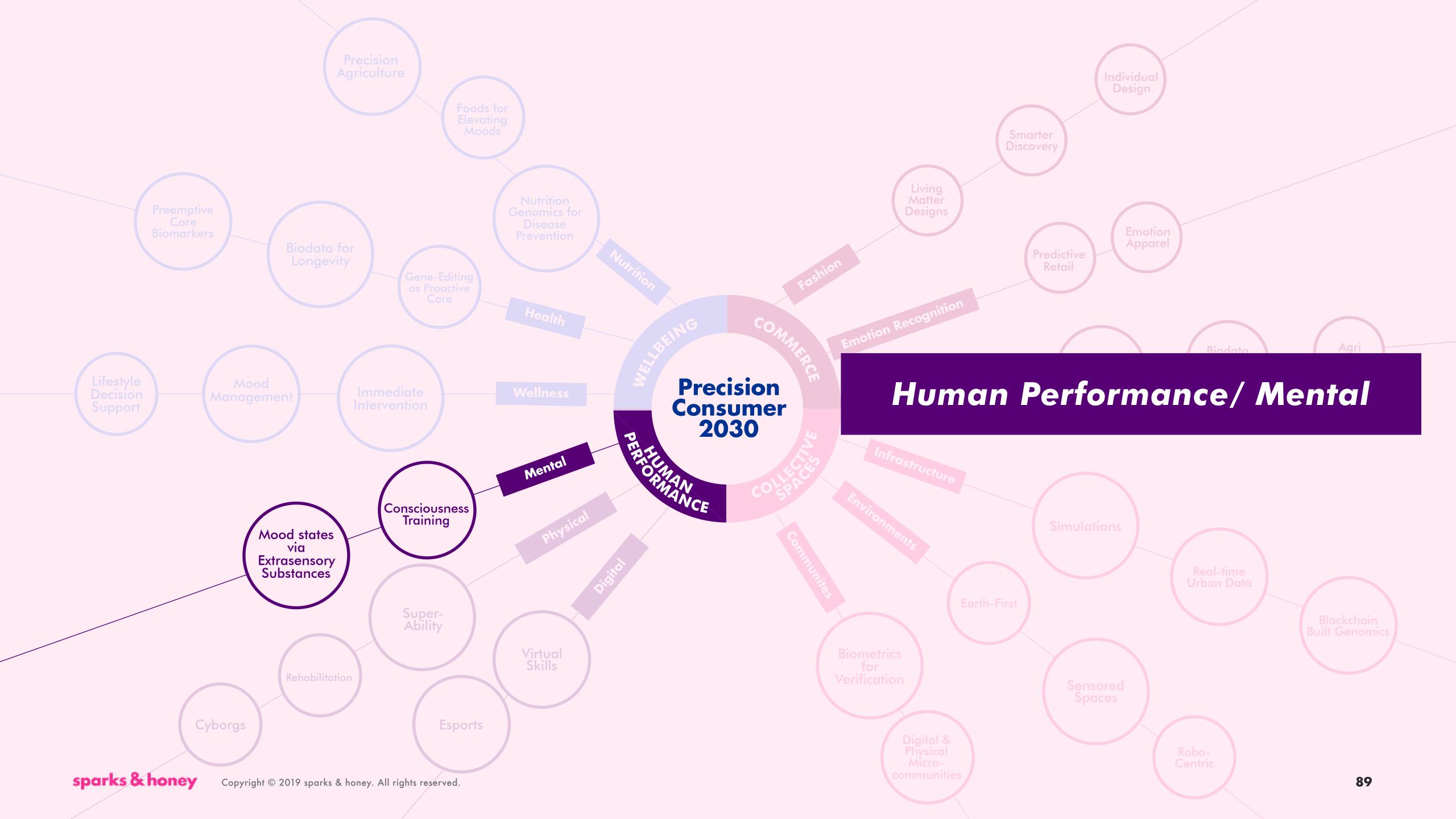


#### **BRAIN-STIMULATING PHYSICAL TRAINING**

Your brain's natural learning processes can be enhanced with a brain-stimulating device, Halo Sport 2, which sends weak electrical impulses into the user's brain to enhance physical activities like running or to accelerate the brain's natural processes, such as for learning music.

Source: <u>Halo Neuro</u>98





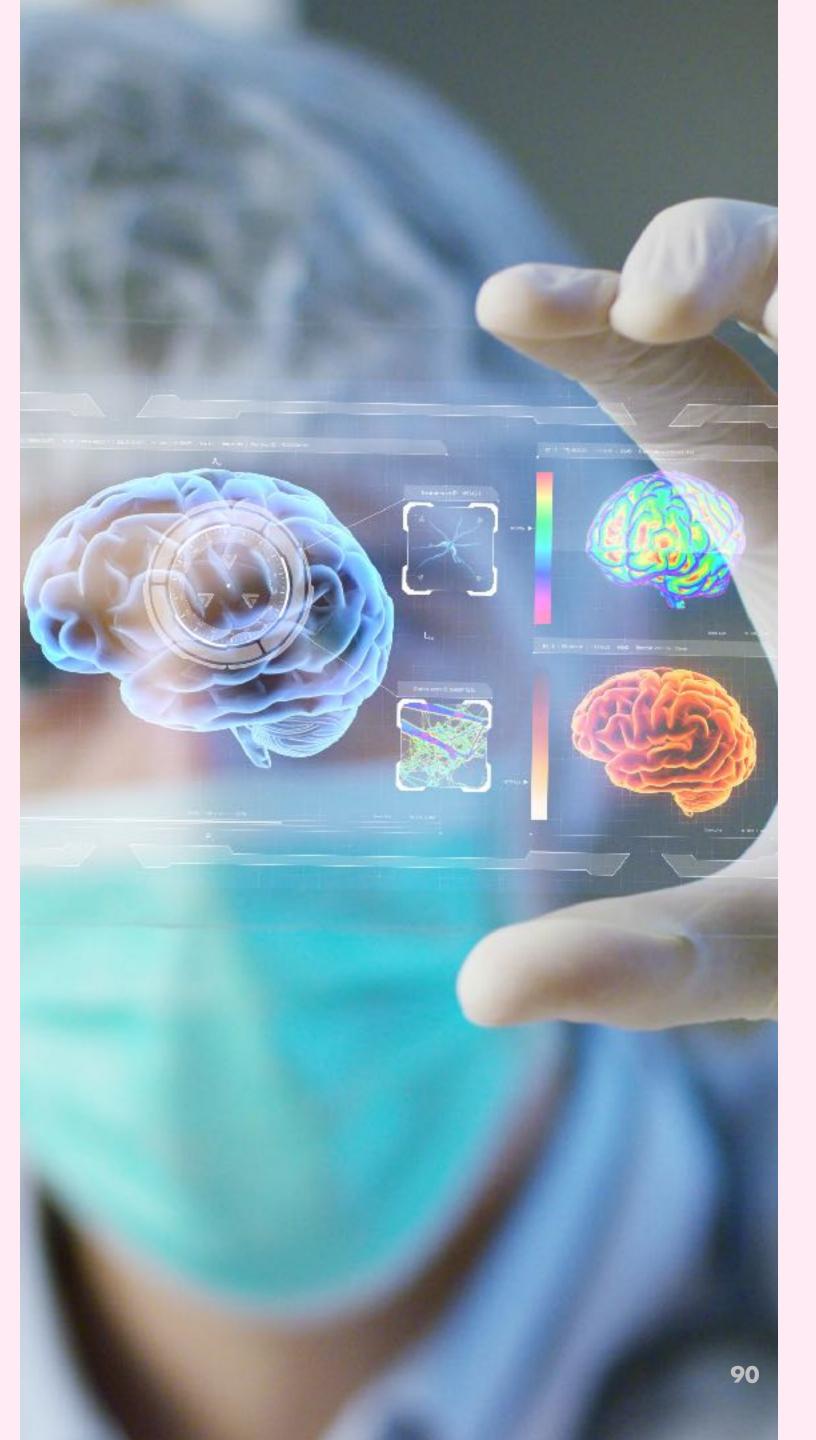
#### **Precision Consumer 2030** Disruption | Human Performance | Mental

## HUMAN PERFORMANCE MENTAL

Precision tech as cognitive therapy and management

The <u>age of anxiety</u><sup>99</sup> is fueling desire for enhancing human performance in cognitive ability and mental wellness. From algorithms that are designed to detect mood shifts to depression to <u>smart speakers that</u> translate a quiver in your voice to an emotion<sup>60</sup>, a world of often invisible and connected precision technologies may be recognizing our emotions before we have them. A deeper understanding of ondemand cognitive needs is helping people manage and elevate their everyday performance on a mental and emotional level.

Our efforts to achieve certain mood states and train our consciousness with mindful or meditation techniques is driving a rising industry of focus and brain cognition, valued at \$20.6 billion in venture capital funding<sup>100</sup>. Precision technologies such as AI and emotion recognition are opening up access to cognitive management techniques, from recognizing human emotion in spaces like moving vehicles to igniting specific mood states based on immersive virtual realities. Whether virtual or physical, environments that trigger our senses, such as scent,



**Precision Consumer 2030** Disruption | Human Performance | Mental

can improve our cognitive ability. Scent, like the smell of coffee, can improve individuals' performance and even their expectations in a given situation, a study in <u>Science Direct<sup>101</sup></u> showed.

"It may sound dark and dismal. But the simple truth is, if we say no to AI, people will die. They will die of diseases that will otherwise be treatable."

- Dr. Vivienne Ming, theoretical neuroscientist, founder and executive chair of Socos, sparks & honey Advisory **Board member** 

## BILLION

Value of global mental health software market by 2027, with an estimated CAGR of 13.6%

Source: <u>Boscalicious</u><sup>102</sup>



**Precision Consumer 2030** Disruption | Human Performance | Mental



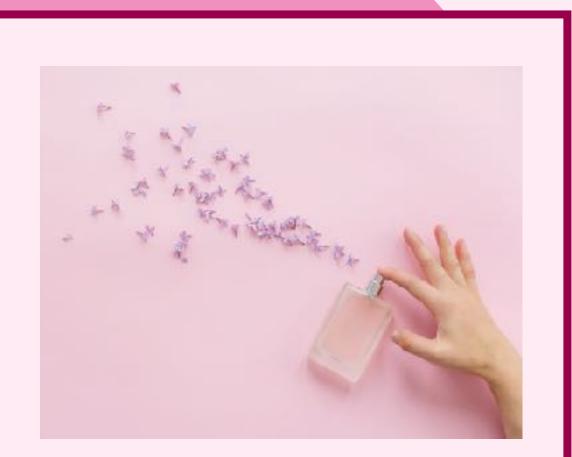
"Talking about mental health and interventions, that can be a free app. Companies are working on that now with personalized digital interventions, based on data from how you interact with a device such as a watch or phone: frequency of use, typing speed, vital signs, voice and speech changes. The intervention could be AI coaching, autoplaying a cat video, or a choice that says, 'Robin, we realize that you're a little bit depressed today, here are three things that make you feel better, choose one now.' That kind of thing is going to be accessible to the masses immediately."

- Robin Farmanfarmaian, medical futurist, CEO and cofounder, ArO, sparks & honey Advisory Board member



Disruption | Human Performance | Mental

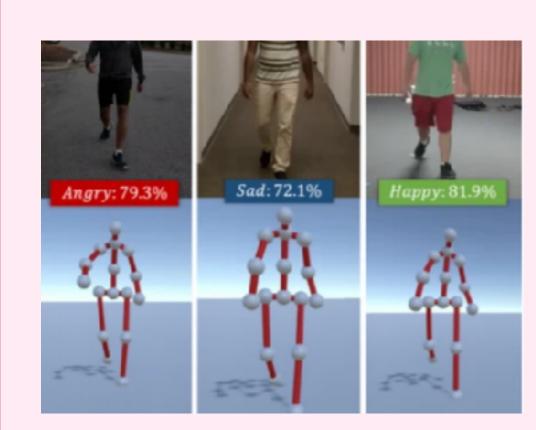
#### CHANGE AREAS



#### STARTUP DESIGNS SCENTS TO TRIGGER EMOTIONS

Scent startup 12:29 creates scents for brands to trigger specific emotions in consumers, from sports-related emotions to ones that trigger thoughts of occasions like the holidays. The company works with brands from Nike to Valentino.

Source: <u>WWD</u><sup>103</sup>



#### AI CAN TELL WHAT YOU'RE FEELING BASED ON YOUR GAIT

The way you walk can reveal a lot about you: someone feeling low may walk with their shoulders slouched. Researchers at the University of Chapel Hill and the University of Maryland trained an AI to identify a person's emotions based on their walk, revealing either positive or negative emotions and a reading of either calm or energetic. Experiments reveal over 80% accuracy in emotion detection.

Source: <u>Venture Beat</u><sup>104</sup>



#### A GUT BACTERIA SUPPLEMENT FOR FASTER PERFORMANCE

A gut bacteria supplement could make us run faster. A study by Harvard University and the Joslin Diabetes Center on marathoners, mice and their microbiomes found that strenuous endurance exercise by humans increases the number of certain bacteria in their microbiomes, and mice that were given this bacteria ran faster.

Source: <u>The New York Times</u><sup>105</sup>

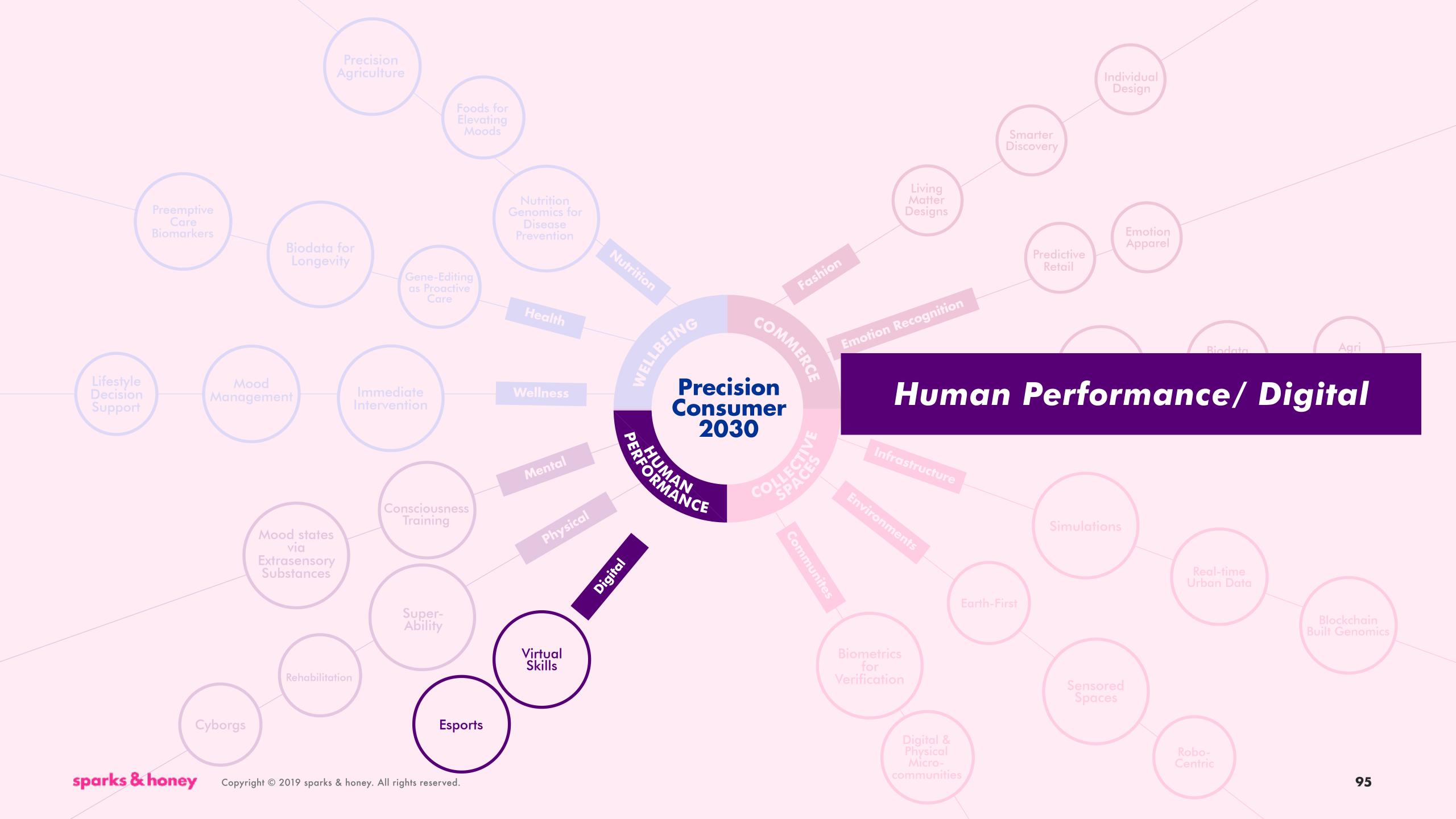


#### EMOTION RECOGNITION TO SPOT FATIGUE, FRUSTRATION IN A DRIVER

Affectiva's Automotive AI service is designed to track the emotional response of drivers, ranging from pinpointing frustration or fatigue, or tracking emotions like joy or fear based on a person's voice. The system can be used by creators of autonomous vehicles and other transportation systems to understand users' behavior.

Source: <u>Venture Beat</u><sup>106</sup>





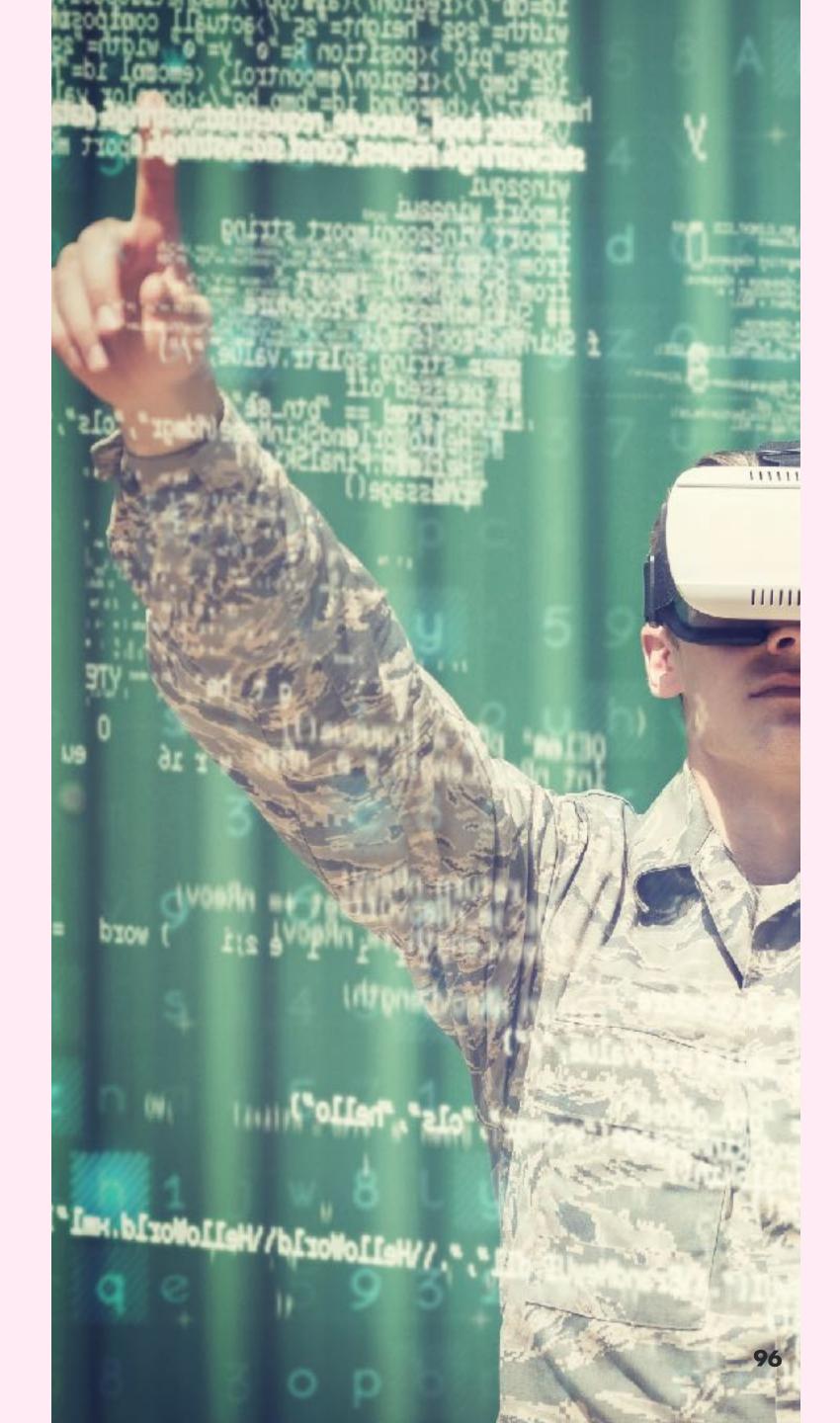
#### Precision Consumer 2030 Disruption | Human Performance | Digital

## HUMAN PERFORMANCE DIGITAL

Virtual skills are the new human premium

Precision technologies such as AI, augmented reality and virtual reality are fueling developments in gaming, entertainment, and military industries. The advent of immersive, simulated environments offered by these technologies are changing the way we learn, and causing an emergence of new virtual skills, where humans and their avatars and digital skills translate into real-world results, in the workplace and beyond.

Esports has already evolved from the fringes of gaming into a mainstream powerhouse of entertainment and sports, in an industry that is valued at <u>\$138 billion</u><sup>107</sup>. The outsized influence of esports on culture is now permeating other realms and changing the way mortals and soldiers alike learn. The U.S. military has designed programs that integrate the worlds of gaming with military training, turning virtual skills into future real-world scenarios. Interestingly, in such an interchange Complexity Gaming is similarly teaching its esports athletes the benefits of military training.



Simulations powered by precision technologies have the ability to put people in different environments to hone their educational or professional tools, and perhaps, be entertained in the process. Startups such as Novos simulate specific training environments, while China's Yuanji has recreated crime scenes to display evidence in virtual reality. Such precision technology advancements are blurring the lines between our own humanity and digital avatars and robots, bringing the era of singularity closer.

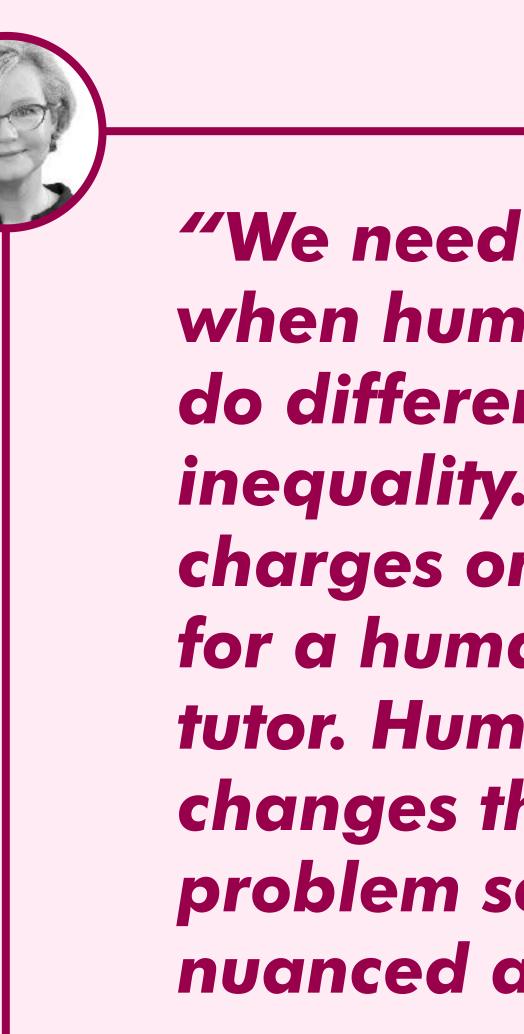
## BILLION

**Estimated revenue of** game-based learning by 2024, with a CAGR of 33.2%

Source: Metaari, Revenues for global game-based learning, July 2019<sup>108</sup>



**Precision Consumer 2030** Disruption | Human Performance | Digital



- Dr. Fiona Kerr, neuroscientist, engineer, CEO, The NeuroTech Institute, sparks & honey Advisory Board member

"We need to get smarter about automation, and when human interaction is advantageous. When we do differentiate it is often for profit, creating more inequality. For example, a Chinese tutoring app charges one fee for reviews by a bot, a higher fee for a human review, and a premium fee for a human tutor. Human interaction creates electrochemical changes that improve things like creativity, complex problem solving, even healing, so we need to be nuanced and driven by the right goals."

Disruption | Human Performance | Digital

#### **CHANGE AREAS**



#### **VR VISUALIZATIONS FOR RESTORING CRIME SCENES**

China's Yuanji has created a VR Judicial Visualization system that allows a crime scene to be restored for evidence presented in trials in a transparent way. The VR visualizations help speed up trial processes, promoting justice through virtual reality.

Source: <u>CB Insights, Yuanji</u><sup>109</sup>



#### **SIMULATION-BASED LEARNING CREATES PLAYSTATION** PROFESSIONAL

A new generation of training simulations using VR and AR technologies are giving professionals the next best thing to actually being in a real environment, and learning the skills needed to thrive in them. Games challenge players through increasingly complex real-world tasks to boost performance, offering feedback and recognition along the way.

Source: <u>Gronstedt Group</u><sup>110</sup>



#### **U.S. ARMY INTEGRATES ESPORTS INTO PROGRAMS FOR SOLDIERS**

**Complexity Gaming is partnering** with the U.S. Army to integrate esports into the Army's Installation Management Command's Family and Morale, Welfare, and Recreation program. Complexity's athletes will live and train with soldiers, while soldiers will have the opportunity to compete with Complexity's esports athletes in some of the most popular games. Soldiers will work on developing gaming skills in the center's cognitive Mind Gym.

Source: <u>Dallas Innovates</u><sup>111</sup>

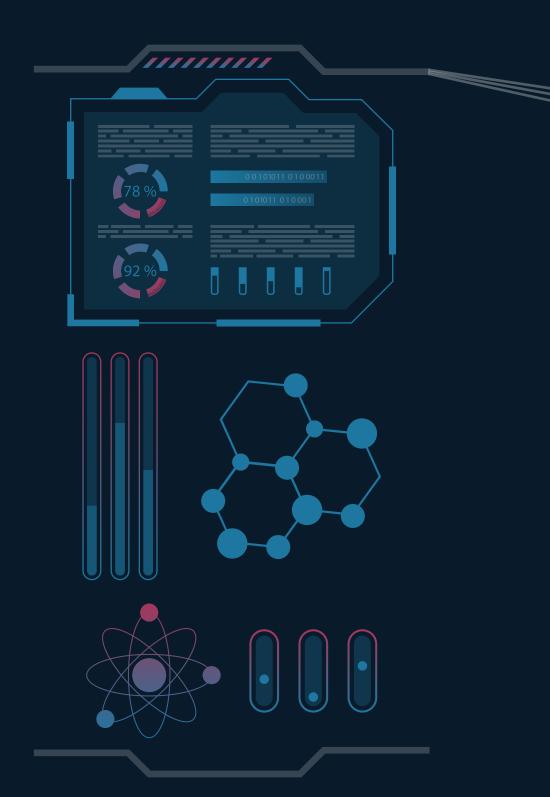


employed a talking robot to aid the rehabilitation of substance users through human-machine counseling. While robots elsewhere are made to blur the line between humans and machines, this robot is designed to appeal to addicts who may feel embarrassed talking to human community workers.

Source: <u>XinhuaNet</u><sup>112</sup>



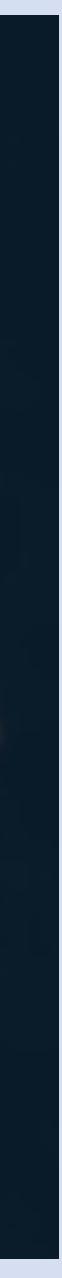
## III 5 CRITICAL QUESTIONS



#### **5 CRITICAL** QUESTIONS

Our research led us to examine how precision is manifesting in practical terms. From those who are taking technology into their own hands—and bodies—to the blurring responsibility of managing and regulating the very delicate and often controversial asset of human data, precision prompts many questions. Biohackers are testing the limits of our comfort with precision. Issues of ownership will intensify: who has the rights to your face or access to your genome: individuals or organizations? How will our infrastructures, from institutions to companies and governments, evolve to support universal access to the benefits of precision for all, beyond the hands of the elite? Precision is meeting this curious cultural landscape, forming a future that we are only beginning to see today.

#### ON THE FUTURE OF PRECISION



Critical Questions | Evolving Relationships With Biohackers

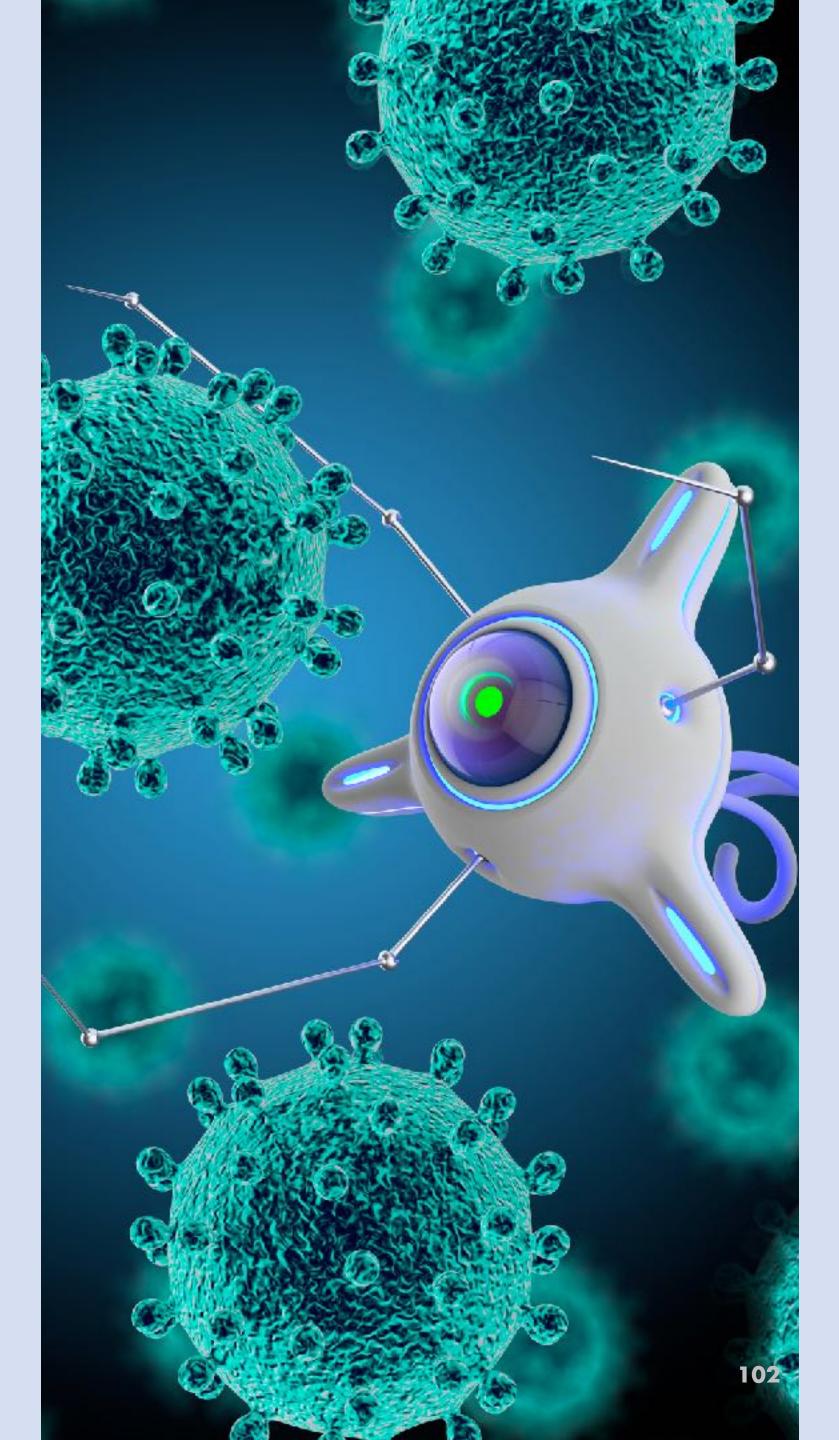
### EVOLVING RELATIONSHIPS WITH BIOHACKERS

How comfortable will we be with human mutation?

Biohackers are pushing the envelope of precision, forging ahead with its possibilities, and also its risks. Biohackers belong to what we call a microtribe, a group bonded by shared affinities. In this instance, with those who hack and embed their bodies with technologies, such as precision micro-chips or even digestible robots. Some biohackers are adding microchips to their brains for intellectual enhancements<sup>113</sup>, while others like <u>Dave Asprey</u><sup>114</sup> claim they biohack to live forever, or until the age of 180. Biohackers like these test the boundaries of

humans and technology, prodding us to ask: How comfortable will we be with human mutation?

Advancements in biomaterials and medicine delivery processes are paving the way for groups like biohackers. <u>Scientists are engineering polymers that</u> can target specific parts of the body<sup>115</sup> with smart delivery systems in such ingestible nanotech. "We're getting really smart with being able to change how the body actually works," said Dr. Fiona Kerr, neuroscientist and CEO, NeuroTech Institute and sparks & honey Advisory Board member.



Biohackers may alter their bodies with technology for extreme purposes like changing the aesthetics of their physical being, but a growing group are becoming one with technology for a simple reason: frictionless access to products and services. As such, biohackers are a growing consumer cohort in the future of precision.

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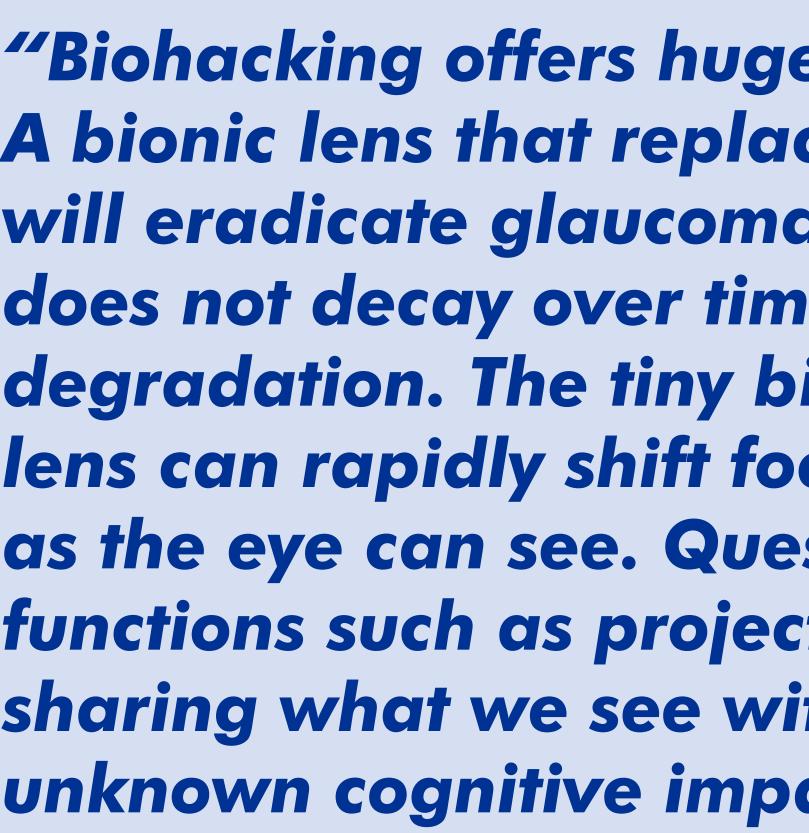


#### The global biohacking market is expected to grow by 19.42% CAGR until 2023

Source: Med Gadget<sup>116</sup>

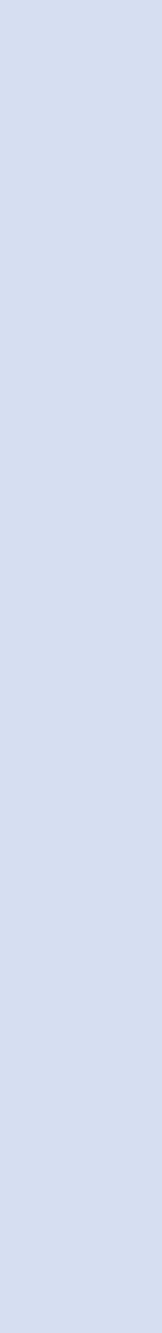


**Precision Consumer 2030** Critical Questions | Evolving Relationships With Biohackers



- Dr. Fiona Kerr, CEO and founder, The Neurotech Institute, sparks & honey Advisory Board member

"Biohacking offers huge advantages and quandaries. A bionic lens that replaces the natural lens in the eye will eradicate glaucoma and cataracts as the lens does not decay over time, minimizing aging biodegradation. The tiny bio-mechanical camera in the lens can rapidly shift focus from close range to as far as the eye can see. Questions arise with potential functions such as projecting our phone screens, or sharing what we see with other lens wearers, causing unknown cognitive impacts and ethical issues."



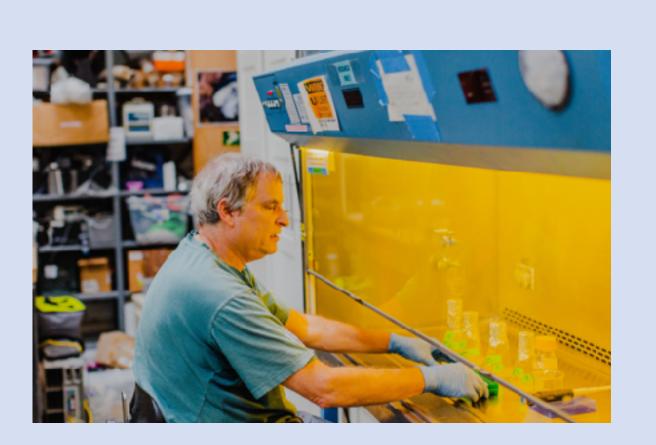
Critical Questions | Evolving Relationships With Biohackers



#### YOUR ARM AS A TESLA 3 KEYCARD

Another biohacker is a Tesla 3 owner who has embedded the RFID chip from her Tesla keycard into her arm. While this behavior may seem extreme now, as tech becomes increasingly miniature, it will signal a shift in our comfort levels of minimizing the proximity of human to technology when it, in fact, becomes part of us.

Source: <u>The Verge</u><sup>117</sup>



#### HACKING INSULIN IN A WAREHOUSE

A group of biohackers who have diabetes are creating their own insulin in a warehouse in Oakland, California. Defying the traditional medical route — and its cost — such biohacking may seem to be fringe today, but part of a future in which individuals own their own health and lifestyle needs.

Source: <u>Elemental</u><sup>118</sup>

#### **Precision Consumer 2030** Critical Questions | Making Biodata Useful

## MAKING BIODATA USEFUL

#### How do we change human behavior?

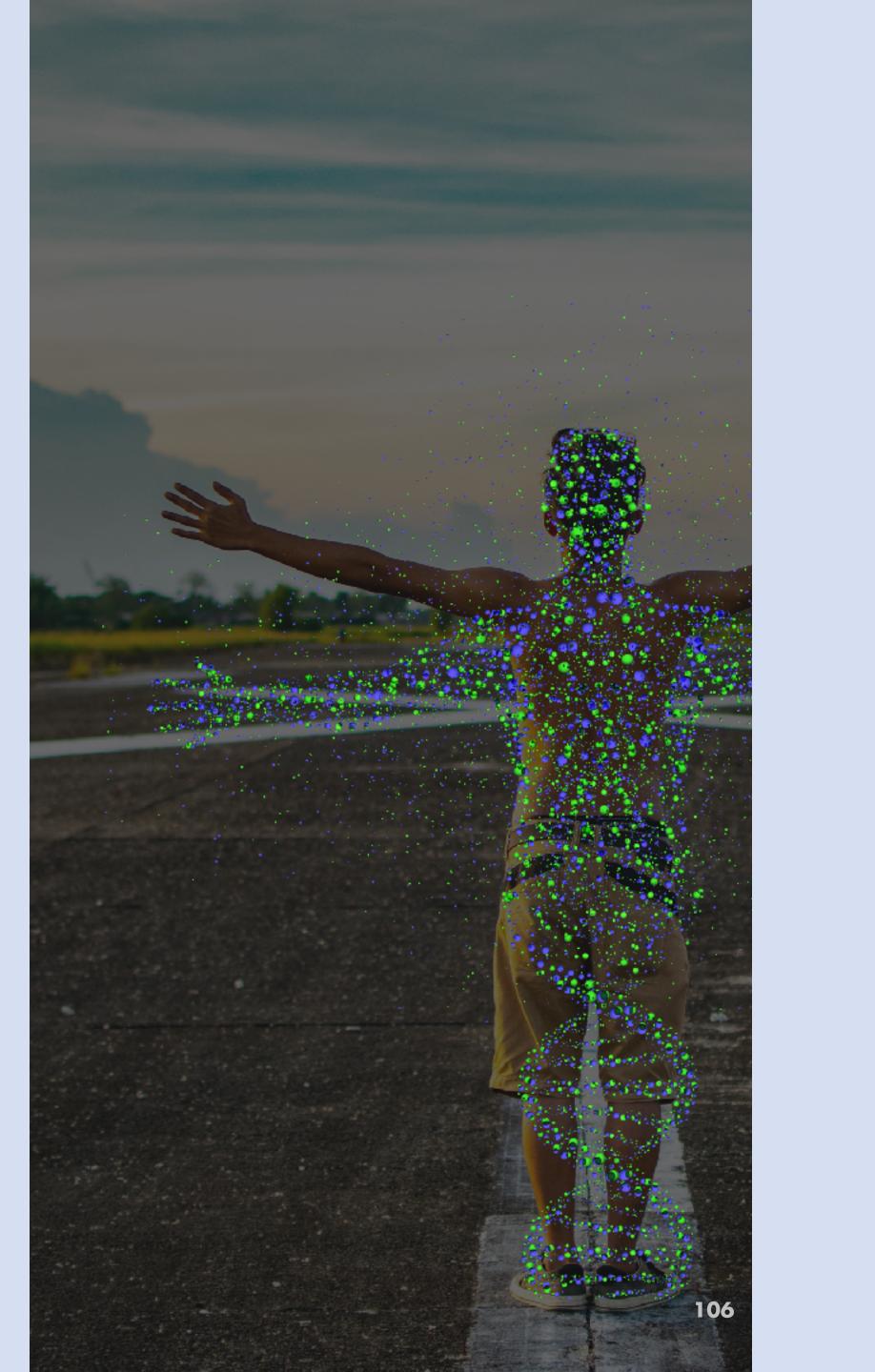
One of the key benefits of precision is accessing knowledge that is gained from your data. Where knowledge may be power, what does a consumer do with that information? How can we make the analysis of our behaviors and habits useful for our lives? In the collective, human data can become a detective. In the hands of law enforcement, data is <u>solving cold</u> cases with DNA databanks<sup>119</sup>. There are many untold stories told by biodata: undiscovered relatives, fitness levels, susceptibility to certain diseases, such as Parkinson's, Alzheimers or breast cancer, or whether you should <u>eat a taco or fish for dinner tonight<sup>120</sup></u>.

The appetite for deeply personalized knowledge is high. The desire for radical transparency will need to

be balanced with the answers that data may provide once it is shared and analyzed. Accessing such knowledge means consumers can take preventative measures to care for their wellbeing and their biodata. However, that is just the first step.

Having access to knowledge that is based on your biodata also brings a certain level of responsibility with it—for consumers and providers alike. "Prevention isn't sexy, but it is a responsibility," said Tracy Keim, VP, consumer marketing and brand at 23andMe. "Once you find out you have a predisposition to Parkinson's or Alzheimer's, it's kind of a weight. It's heavy," she added.





**Precision Consumer 2030** Critical Questions | Making Biodata Useful

Accessing and understanding the information that stems from your biodata also brings a certain level of responsibility with it, for consumers and providers alike.

#### "There is a behavior change required—we have these big ideas, but how do we change behaviors?"

- Tracy Keim, VP, Consumer Marketing & Brand, 23andMe

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## \$600 BILLON

Value of the wearable tech market by 2023, with a 19% CAGR

Source: Quid<sup>121</sup>



**Precision Consumer 2030** Critical Questions | Making Biodata Useful

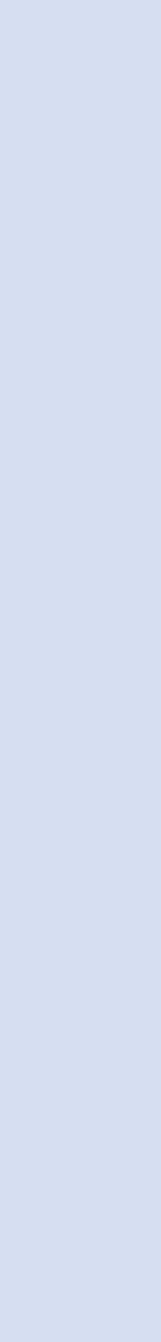


# all the time."

- Victor Penev, CEO and founder, EDAMAM, sparks and honey Advisory Board member

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"A challenge is creating the right combination of technologies. We can track people but, you know, people are just lazy—even though tracking might be important for their health. People with stage 4 cancer or type 2 diabetes could die from eating the wrong foods, but they may choose to not be tracked



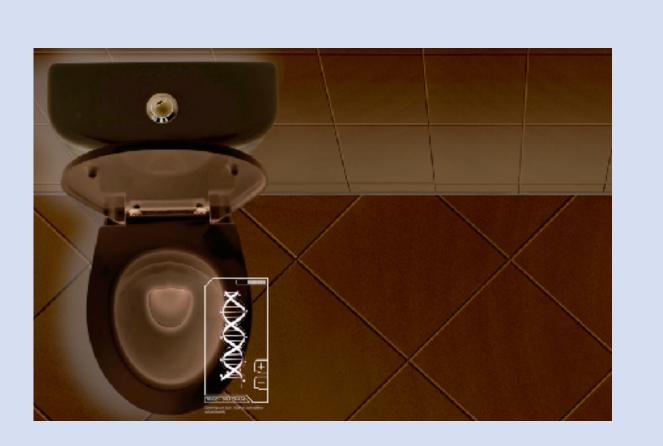
Critical Questions | Making Biodata Useful



#### **SPEAKER, I'M HAVING A HEART ATTACK**

Scientists at the University of Washington have figured out how to turn a smart speaker into a cardiac monitoring system by listening to changes in a person's breathing. Similar to the way a speaker listens to your commands (Hey, Google!), in the future, it could also predict if you're about to have a heart attack based on your agonal breathing, or gasping for air.

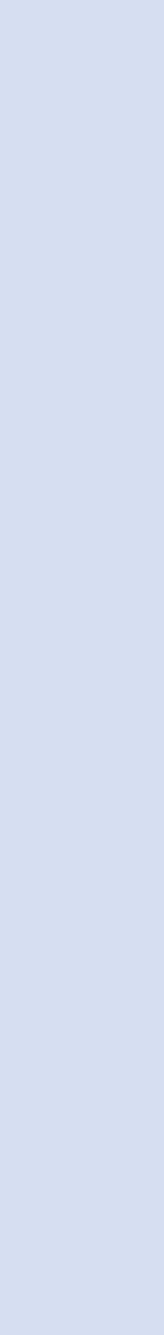
Source: <u>FastCompany</u><sup>122</sup>



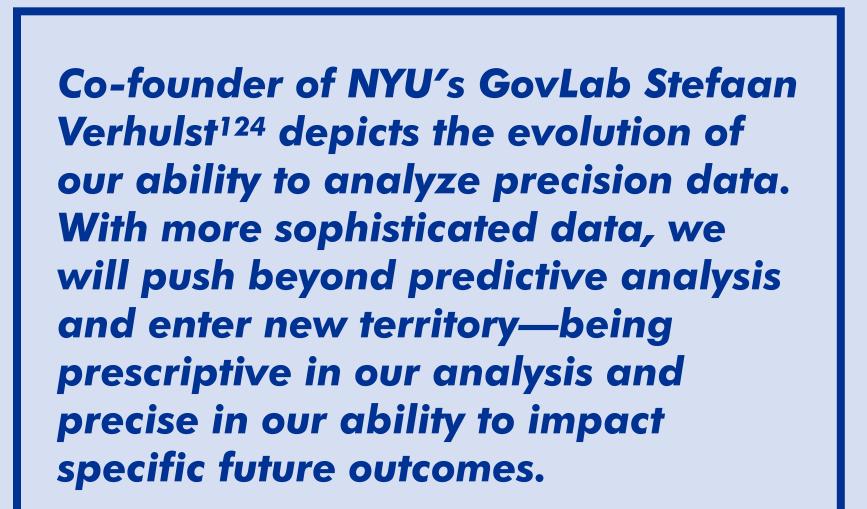
#### AI TOILETS TO SCAN POOP AND DIAGNOSE AILMENTS

In the future, you may not need to go further than your bathroom to receive a health diagnosis, according to Micron CEO Sanjay Mehrortra, who says we are "just a few years away" from having AI toilets that can analyze your poop for potential ailments.

Source: <u>Cnet</u><sup>123</sup>

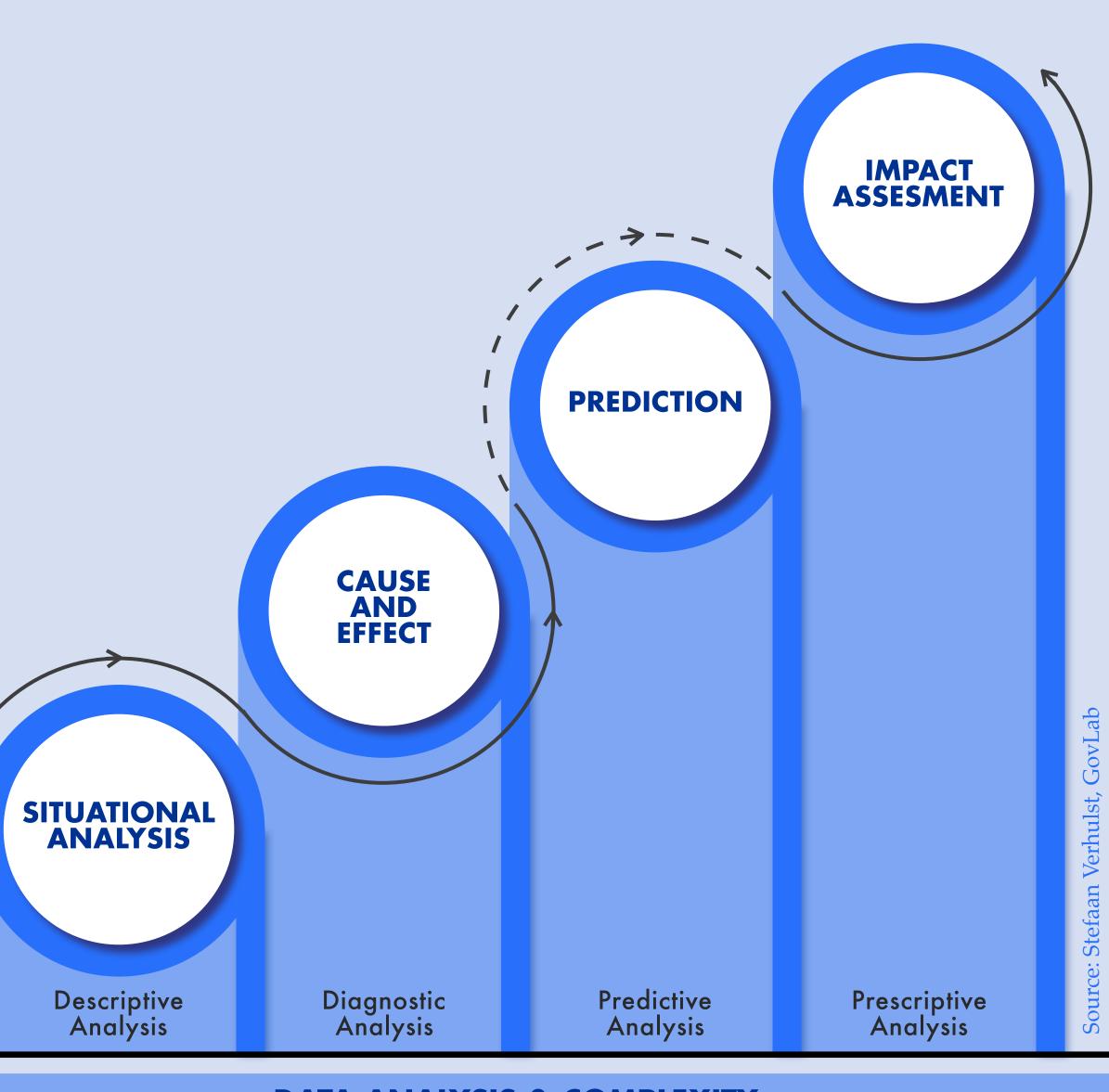


Precision Consumer 2030 Critical Questions | Make Biodata Useful

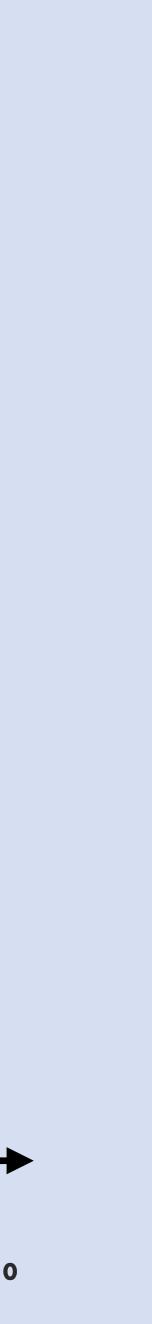


VALUE & PRECISION





#### **DATA ANALYSIS & COMPLEXITY**





**Precision Consumer 2030** Critical Questions | Precision And Sustainability

## PRECISION AND SUSTAINABILITY

How can we harness precision data for a sustainable future?

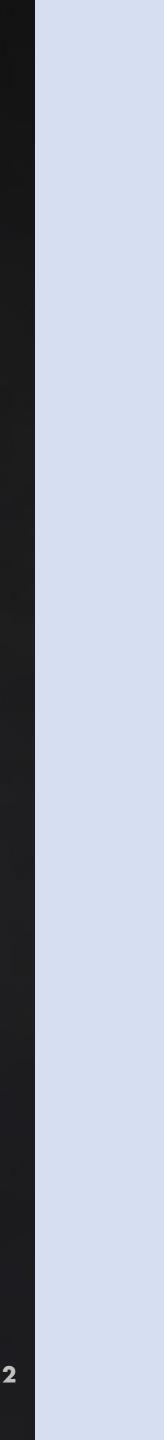
Precision data will make it easier for consumers and businesses to make choices that are eco-friendly—for the planet and for themselves. From the individual to homes, workplaces, cities and farmlands, being able to monitor the output of waste and consumption in real time can create a world of information that pushes humanity toward a dynamic system of ecoconsciousness. Sustainable efforts are never-ending, and with precision data, our efforts to reach them can be, too.

Consumer behavior can be swayed towards making sustainable choices with the benefit of precision data. Tracked by technology, the provenance of a product

can fuel consumers to make local purchases, as well as understand the greater impact of their choices on the environment. Companies such as Farmers Edge<sup>125</sup> are using data to track and verify environmental impacts. Consequently, the company is then able to better inform consumers of its eco-footprint with everything from the carbon footprint of using nitrogen fertilizers to tracking fuel efficiency. The precision agronomy company reaches over four million global acres in its business.







And in cities, precision data can lead to more ecoconscious living and policy choices with efforts such as the <u>Intelligent Cities Initiative</u><sup>126</sup>. Biometric data collected from inhabitants via sensors and from smart cities can be used to track behaviors that can lead to the redesign of more sustainable systems, from healthcare to transportation.

"It's truly astonishing what can happen within six months when you take the precision approach. We had a one-size-fits-all approach to medicine and now we are really able to zone in on the individual's biomarkers and environment and create a program for that person."

- Sunita Singh Maclaren, cofounder of Metakura

## \$200 MILION

Amount in seed investment of California's Healthy Soils Initiative provided to projects to preserve or improve soil health, resist climate change and foster biodiversity

Source: <u>California Department of Food &</u> <u>Agriculture, Healthy Soils Program<sup>127</sup></u>

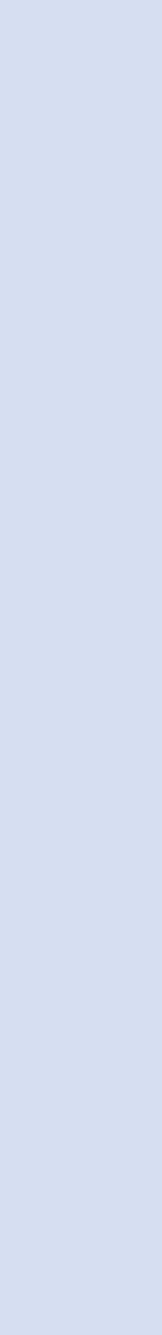


**Precision Consumer 2030** Critical Questions | Precision And Sustainability



- Victor Penev, CEO and founder, EDAMAM, sparks & honey Advisory Board member

"The biggest challenge is not the science and the technology, but accessibility to food and the ability to pay for it. If you live in poor India, in Kerala, you might not be able to get the right vegetables and fruits that work best for you because there's climate change and seasonality, and you might not be able to afford it. I think this is going to be more the determining factor: Are we going to be able to deliver the food they need



Critical Questions | Precision And Sustainability



#### BIOMETRICS ADVANCE U.N. SUSTAINABLE DEVELOPMENT GOALS

Biometrics have a history of creating accountability, whether from waste or abuse in the commercial realm. The same biometric tools are now being used in international assistance, where they offer a cost-effective way to supply chain leakage and create records of assistance on the ground.

Source: Cross Match<sup>128</sup>



#### PRECISION AGRICULTURE IS MAKING FARMING MORE PRODUCTIVE AND SUSTAINABLE

In John Deere's sustainability report, precision agriculture is highlighted as a significant area of innovation that will allow farmers to use less fuel and to plant seeds and apply fertilizer with pinpoint accuracy. These efforts safeguard the soil, water and air that farmers—and consumers—depend upon.

Source: <u>AgDaily</u><sup>129</sup>

Critical Questions | Protecting Consumer Rights

## PROTECTING **CONSUMER RIGHTS**

#### How do we regulate precision data?

Tech giants, from Facebook to Google, are under the spotlight of regulators and consumers, amid a growing crackdown on their burgeoning troves of our data. And that's just today. In the U.S. and abroad, governments are challenged in creating rules, regulations and laws around concepts they may struggle to understand. In Germany, for example, <u>the right to not know your</u> genetic information<sup>130</sup> is protected by law. Across the European Union, organizations are responding to new <u>Global Data Protection Regulation<sup>131</sup> mandates to</u> protect citizens' data privacy. In the U.S., a <u>new bill has</u> been introduced to Congress<sup>15</sup> to protect the dissemination of biological data over our apps and devices. Citizens in China, in turn, are under the watchful eye of the social credit system, which rates and penalizes individuals based on the tracking of their biological data.

Whatever the location, global regulations and standards around biodata are under an ever-brightening spotlight. As our consumption habits veer into the deep personalization with precision, the need for global regulation of our individual data will only escalate. Perhaps, the next step is a universal Biodata Bill of Rights, a universal agreement outlining the rights and ownership of individual biological data and its dissemination among third parties and beyond.

Experts anticipate a shift in data tradeoffs. The ownership over personal data and making decisions surrounding the sharing of that data will expand, as precision-based products and services become the norm. In 2019, twice as many people who have never done DNA testing are considering doing it, compared to 2017, according to research by Lifenome.

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The curiosity inherent in DNA indicates a shift in willingness to share your biological data. "With your biobank data, whether it's individual genomes or other biodata, we have issues around whose property it is, and data consistency and use. At the moment, in most countries, such data is the property of the institution or the company," said Fiona Kerr, founder and CEO of The NeuroTech Institute, sparks & honey Advisory Board member.

"Personalization shouldn't be in isolation. We should find a way for personalization to bring us together with others to where our uniqueness, our personalized uniqueness, actually matches very much like Legos with (the data of) other people and creates something beautiful."

- Ali Motashari, CEO and co-founder, Lifenome

#### **Right to be forgotten**

## 845,000

Number of requests received by Google to remove a total of 3.3 million web addresses

Source: <u>BBC.com</u><sup>132</sup>



#### **Precision Consumer 2030** Critical Questions | Protecting Consumer Rights

# **A "BIODATA BILL OF RIGHTS" WOULD GUARANTEE AND** ENABLE THE BENEFITS OF PRECISION, FOR ALL

### Define precision data.

Solidifies the types of data that fall under this category for protection. It's imperative to know exactly what we are protecting with this **Bill of Rights.** 



owners of their own precision data. Full stop.

### Guaranteed anonymity.

If consumers are providing biodata for verification, for product personalization or for anything else, they must be guaranteed anonymity unless it is clearly outlined on signed documentation. They have the right to be forgotten.



### Data portability.

**Consumers have the** right to keep their biodata close to them and take it wherever they may go, personally or within safe and neutral databases, regardless of the partners they may engage with that require access.

### Consent.

**Consumers are** entitled to full, dynamic consent specific to the use case that is seeking biodata use. No use case is the same, so consent needs to be validated on an ongoing basis as well.

## Recourse.

6

Should data be hacked, rights compromised or any other breaches to consumer rights, citizens will be allowed to pursue legal recourse to seek compensation for this breach of rights.

### Access to synthetic switches.

**Consumers should** have the right to access and use synthetic switches that are able to detect data collection signals from precision technology and create a response. This enables consumers to prevent their data from being taken without consent.





**Precision Consumer 2030** Critical Questions | Protecting Consumer Rights

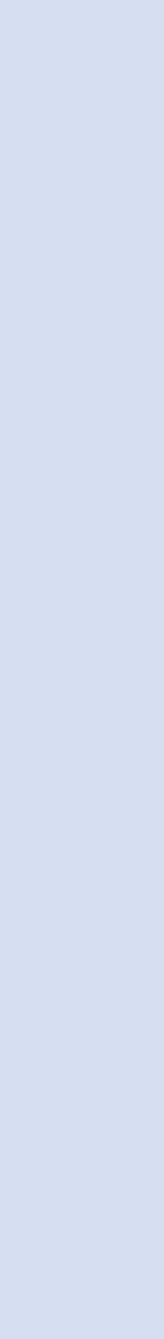


# "Ultimately, it will become a personal choice, a information and how much you care if your and live a healthy life. I personally don't think it's going to be much of a problem."

- Victor Penev, founder and CEO, EDAMAM, sparks & honey Advisory Board member

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choice of how much you give up of your personal genome or microbiome are all there and people can use them, versus the ability to extend your life



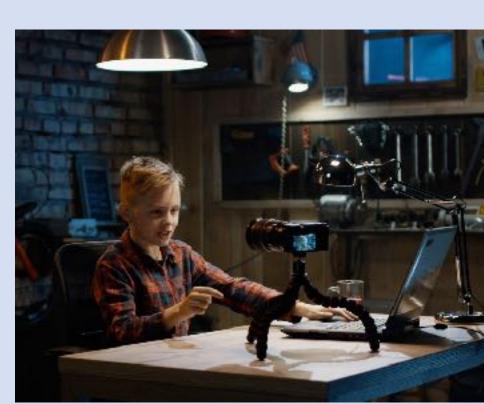
Critical Questions | Protecting Consumer Rights



### **FIRST PRESIDENTIAL** CANDIDATE TO CALL FOR A BAN ON **FACIAL RECOGNITION**

Bernie Sanders became the first presidential candidate to call for a ban on the use of facial recognition technology by law enforcement in his published plan, "Justice and Safety for All", for an overhaul of the criminal justice system.

Source: Vice<sup>133</sup>



### YOUTUBE FINED \$170 MILLION FOR TRACKING **CHILDREN'S VOICE** DATA

Following an investigation by the **Federal Trade Commission into** Google's handling of data from people under 13, it fined YouTube \$170 million. Children are protected by a law that requires parental consent before their data can be shared or collected by organizations.

Source: The Guardian<sup>134</sup>



# RIGHT TO NOT KNOW GENETIC INFORMATION IS PROTECTED BY LAW IN **GERMANY**

The right to not know genetic data is protected by law in Germany. Even so, a divorced mother of two was told by a doctor that her ex-husband had tested positive for Huntington's Disease, which meant that their two children were also at risk. She sued the doctor.

Source: The Economist<sup>130</sup>



# YOUR FACE IS A \$20 BILLION INDUSTRY

**Emotion recognition technologies** have spawned an industry worth \$20 billion by algorithms that are able to detect basic human emotions by analyzing your face. Facial recognition technologies are being used for everything from detecting driver impairment to testing user experiences in gaming to assessing wellbeing in individuals.

Source: <u>The Guardian<sup>135</sup></u>





**Precision Consumer 2030** Critical Questions | Protecting Consumer Rights



"Many countries are looking to adopt Mosip.io as a global public good that enables digital, foundational ID with scale, security and privacy. Mosip.io is designed to circumvent the problems of closed, proprietary technologies and vendor-locked in systems of data. The next step is to include global digital cooperation and governance, such as unified data centers, data content architecture and a data fiduciary to manage the ethical and legal issues surrounding data, usage, privacy and security."

- Sanjay Purohit, chief curator, Societal Platform, EkStep Foundation, sparks & honey Advisory Board member

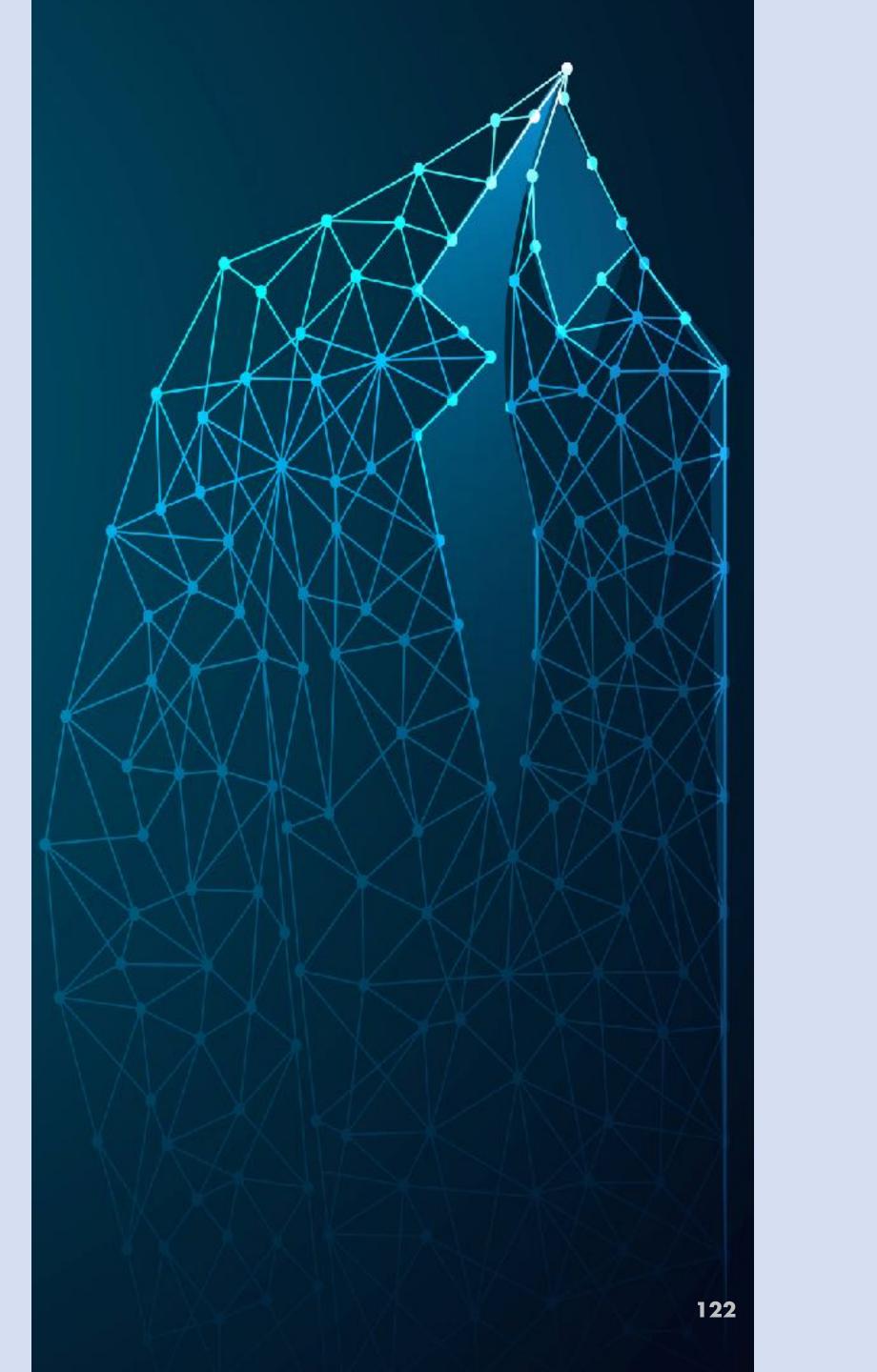
Precision Consumer 2030 Critical Questions | Inclusive Precision

# INCLUSIVE PRECISION

Who will have access to precision?

Today, precision comes with a price tag. The technologies and devices for data gathering and analysis are often seen as premium, or luxuries, that are only attainable to those with means. By 2030, we can expect to see these costs decrease, opening up access to a broader consumer base at the same time.

We may be valuable assets of human data, but knowledge and the ability to interpret that data into useful outputs is equally valuable. Consumers are also becoming more educated on the benefits of deep personalization, as they anticipate the cost barriers, such as those associated with DNA testing, to decrease. People are now willing to pay up to 20% more for products and services that are based on their DNA, according to research<sup>11</sup> from Lifenome. Our experts agreed on one thing: that the benefits of precision in the future should be available to all. Technology is only part of the access puzzle, however. Dr. Vivienne Ming envisions a future of precision in which AI has a collaborative role in fairly representing everyone, whether a person is applying for a loan or using AI for negotiations of any kind.



**Precision Consumer 2030** Critical Questions | Inclusive Precision

"If we can leverage infrastructure and precision data to build systems that best represent every class of interest—that would be exciting to me," Dr. Ming said. "Over the next ten years, that is where we need to be going. A precision system that only serves one side of a relationship will be fundamentally unfair."

"Our mission is three very intentional and very powerful words, which are to give everyone the ability to access their DNA, to understand it, to really understand what it means, and then there's education and comprehension and to benefit from it is kind of the circle of life where your genetics could help my niece."

- Tracy Keim, VP, Consumer Marketing and Brand, 23andMe

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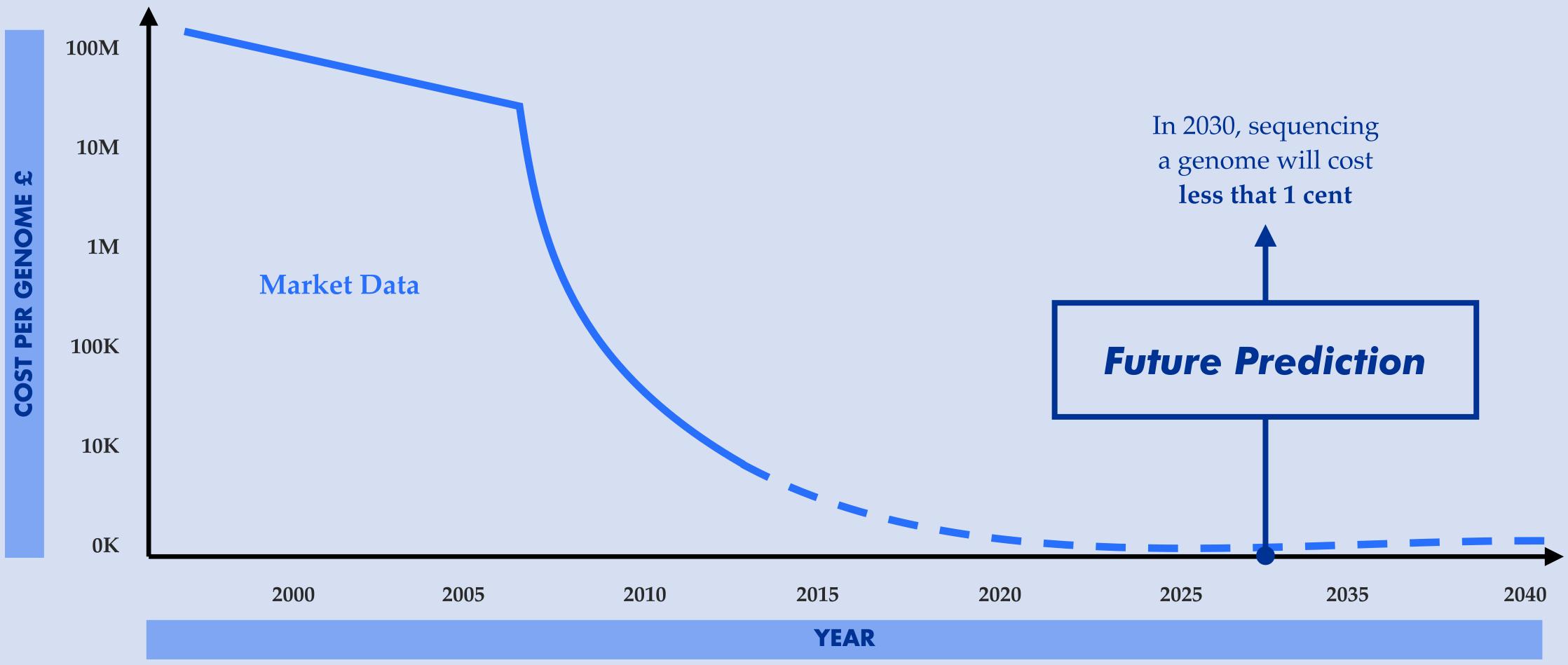
Number of older Americans whose FDAapproved genetic cancer tests are now covered by Medicare, a shift that is transformative to mainstreaming genetic testing

Source: <u>Wired</u><sup>136</sup>

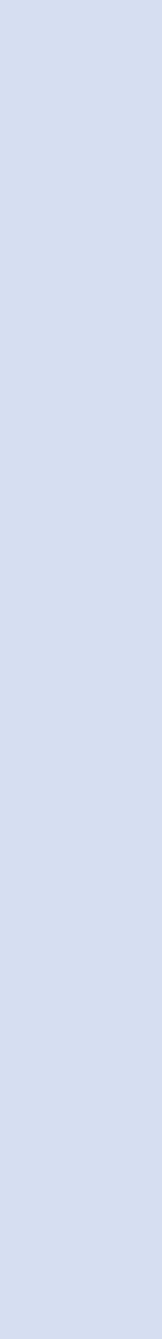


Critical Questions | Inclusive Precision

# IN 2030, THE COST OF SEQUENCING A HUMAN-SIZED GENOME WILL BE LESS THAN ONE CENT



**Source: Lorem<sup>11</sup>, 2019** 



Precision Consumer 2030 Critical Questions | Inclusive Precision



# "The big question is about preserving the intent of precision. How do we ensure that the benefits of precision are not concentrated to a very few, a fraction of the society, but that the benefits are extended throughout?"

- Sanjay Purohit, chief curator, Societal Platform, EkStep Foundation, sparks & honey Advisory Board member

**Precision Consumer 2030** Thought Leaders

# CONTRIBUTING THOUGHT LEADERS

## **ADVISORY BOARD MEMBERS**



**Robin Farmanfarmaian** Medical Futurist, CEO of ArO, professional speaker

Robin Farmanfarmaian is a professional speaker, entrepreneur and author, focusing on cutting-edge healthcare and biotech companies poised to impact 100M patients. Robin is the CEO and co-founder of ArO, dynamic vision correction and eye health monitoring. Recent investments include Invicta Medical, a medical technology company for sleep apnea, and Dance Biopharm, inhaled insulin with a smart device.



**Dr. Fiona Kerr** Neuroscientist, engineer, CEO & Founder of The NeuroTech Institute, author



Zara Ingilizian Head of Consumer Industries

As the Head of Consumer Industries and a Member of the Executive Committee at the World Economic Forum, Zara leverages her experience at iconic CPG, lifestyle, and luxury brands to accelerate digital transformation. As a global strategist, she is at the table with CEOs of member companies such as Walmart, Unilever, P&G, IKEA, and JD.com, at the Forum's annual meeting in Davos advancing business and operating model reinvention in socially responsible ways.



**Dr. Noel Maclaren** Pioneering endocrinologist, internist, pediatrician, researcher and entrepreneur





Expert interviews conducted with contributing thought leaders, nine of whom are sparks & honey Advisory **Board** members

A thought leader in human connectivity and synchronization, cognitive neuroscience, and the impacts of technology, Dr Fiona Kerr's qualifications include cognitive neuroscience, complex systems engineering, anthropology and psychology. With 35 years industry experience, she holds board and academic positions in four countries, and has founded The NeuroTech Institute Pty Ltd, a company researching neuroscience, emerging technology and ethical practice to consult on how humans shape each other, how technology shapes us and how to positively shape the future and partner with technology.

Dr. Noel K. Maclaren is an award-winning endocrinologist and a leading authority on energy metabolism. Together with his co-founder Sunita Singh Maclaren, he is scaling biotech startup Metakura to predict, prevent and reverse the clinical symptoms of the biggest health challenges of the 21st century, diabetes and childhood obesity which are linked to cardiovascular and Alzheimer's disease. Dr. Maclaren and his colleagues pioneered the use of antibody and genetic markers to identify risks for type-1 diabetes and endocrine disorders.



Sunita Singh Maclaren

Cultural Advisor, ethnographer, med-tech entrepreneur, author

Sunita leads MetaKura's innovative portfolio of data-driven products and services for 1:4 people globally -many undiagnosed- with insulin resistance. She is also working with gourmet chefs to create clean, wholesome food based on precision nutrition. Previously, she was Director of BioSeek Clinics (2015-2018) based in New York. From 1990-2017, as the Founder of the cultural advisory World Wise, Sunita's expertise has been sought be the leadership of Fortune 100 firms and by national and state governments.



**Dr. Vivienne Ming** Theoretical neuroscientist, serial entrepreneur, author, speaker

Dr. Vivienne Ming is featured frequently for her research and inventions in The Financial Times, The Atlantic, Quartz Magazine and the New York Times. Vivienne co-founded Socos Labs, a mad science incubator dedicated to solving some of the world's most pressing problems. A mother of two, Vivienne has designed AI systems to help treat her son's diabetes, predict manic episodes in bipolar sufferers, and reunite orphan refugees with extended family members.

#### **Precision Consumer 2030** Thought Leaders



Andy Moose Head of Retail, Consumer Goods and Lifestyle Industries at World Economic Forum

Andrew Moose is Head of the World Economic Forum's Retail, Consumer Goods and Lifestyle Industries. He holds a BA degree from Duke University, a Master's degree in International Management from the University of Paris – Sorbonne and an MBA from Georgia State University. At the Forum, he is responsible for the development of industry strategies as well as the advancement of new models of responsible consumption through the Future of Consumption platform. Prior to the Forum, Andrew worked as a management consultant with a focus on strategy, innovation and technology-enabled growth serving clients in North America, South America and Europe.



**Victor Penev** CEO Edamam, serial tech entrepreneur, investor, foodie



Jeremiah Owyang Analyst, Founding Partner of Kaleido Insights, speaker

Jeremiah is the Founding Partner of Kaleido Insights and formerly the Founder of Catalyst Companies. Kaleido Insights is a boutique research and advisory firm focusing on how new technologies impact business models and how corporations must innovate. A leading influencer and speaker on the stages of the world, Jeremiah guides innovation practitioners through the challenges of the autonomous world, the collaborative economy, blockchain and emerging technologies. Jeremiah has been featured in The Wall Street Journal, The New York Times, USA Today and Fast Company. He writes for the WSJ Accelerators column and Forbes.



**Sanjay Purohit** Chief Curator of Societal Platform, Strategic Advisor to Ekstep Foundation, technologist and speaker

Victor Penev is a serial entrepreneur and the founder and CEO of Edamam. He is also a mentor and investor in food technology startups and advises early stage entrepreneurs. Previous to Edamam, Victor co-founded and sold Bulgaria's largest Internet Company, NetInfo BG. Victor Penev also ran the international digital business of Playboy Enterprises, and was instrumental in starting the digital marketing efforts of BMG and in creating key e-commerce capability for Bertelsmann's book clubs.



#### **Stefaan Verhulst**

Data and governance steward, public interest advocate and policy innovator Stefaan G. Verhulst is Co-Founder and Chief Research and Development Officer of the Governance Laboratory @NYU (GovLab) where he is responsible for building a research foundation on how to transform governance using advances in science and technology. Verhulst's latest scholarship centers on how technology can improve people's lives and the creation of more effective and collaborative forms of governance. Specifically, he is interested in the perils and promise of collaborative technologies and how to harness the unprecedented volume of information to advance the public good.

Sanjay Purohit has 30 years of global experience in leading strategy, digital platforms, design, management consulting and leadership development. He is currently Strategic Advisor to EkStep Foundation, eGov Foundation, Avanti Finance, Advaith Foundation and Mantra4Change. Since 2016, he has been developing Societal Platform Thinking, a method to resolve complex societal challenges with speed, scale and sustainably. As Chief Strategy Officer at Infosys, he worked with Infosys Co-Founder and CEO Nandan Nilekani to establish a strategic planning and execution framework that successfully scaled a \$400 Million IT Services business to \$7 Billion in annual revenues over 10 years.

127

**Precision Consumer 2030** Thought Leaders

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Sources

# SOURCES

- sparks & honey's cultural intelligence platform Q<sup>TM</sup>
- Quid, total article volume, Aug 2016-Aug 2019
- Quid, total patent volume, Aug 2016-Aug 2019
- Quid, total VC investment, Aug 2016-Aug 2019
- Market Watch, At 10.7% CAGR, Precision 5. Medicine Market Size will reach USD 96.6 Billion by 2024, February, 2019.
- Medgadget, "DNA Test Kits Market Growing at a CAGR of 24.6% and Expected to Reach \$2860 Million by 2025." July, 2019.
- <u>Vinome.com</u>
- DNARomance.com 8.
- Marketwatch, "Emotion Detection and 9. Recognition Market 2019 | Global Industry Analysis by Trends, Size, Share, Company Overview, Growth and Forecast by 2024." 2019.
- 10. <u>Vxchange</u>, "Comprehensive Guide to IoT Statistics You Need to Know in 2019." July, 2019.
- 11. Lifenome, "Personal Genomics and DNA-based Personalization. National Consumer Attitude Surveys 2017 and 2019." September, 2019.
- 12. Quid, total venture capital funding of precision technologies, July 2016 - July 2019

- 13. Marketwatch, "At 10.7% CAGR, Precision Medicine Market Size will reach USD 96.6 Billion by 2024." February, 2019.
- Global Market Insights, "Biotechnology Market will expand at 9.9% CAGR to hit \$775 Billion by 2024." January, 2019.
- 15. <u>ReedSmith</u>, "Newly introduced bill could provide for additional protections for biological data." July 2019.
- 16. <u>Kaleido Insights</u>, "Modern Wellbeing: Tech Startups," Spring 2019.
- 17. <u>Market Reports World</u>, "Emotion Detection and Recognition Market 2019." May 2019
- 18. Quid, based on analysis of total venture capital funding in the cognitive management market (July 2016 - July 2019).
- Quid, total number of articles in media related to 19. Wellbeing, Aug 2016 – Aug 2019
- 20. Quid, total VC investment in Wellbeing, Aug 2016 – Aug 2019.
- 21. <u>Stanford University</u>, "Advancing front of old-age human survival." Published in the Proceedings of the National Academy of Sciences of the United States of America. November, 2018.
- 22. <u>Research and Markets</u>, "DNA Read, Write and Edit Market Study (2017-2024)." October, 2019.

#### sparks & honey

- 23. <u>MIT Technology Review</u>, "More than 26 million people have taken an at-home ancestry test." February, 2019.
- 24. <u>Statista</u>, "Over 250 Million Kids Will Be Obese By 2030." October, 2019.
- Quid, based on analysis of total venture capital funding in nutrigenomics and meals engineered based on your genes (July 2016 - July 2019).
- 26. <u>Foodbuzz</u>, "Food Startup Nucaria." May, 2019.
- 27. GenoVive, <u>GenoVive.com</u>
- 28. Tufts University, "Scientists develop tiny toothmounted sensors that can track what you eat." March, 2018.
- 29. The Loop, <u>TheLoop.ca</u>
- Bank of America, "Human lifespan could soon pass 100 years thanks to medical tech, says BofA." May, 2019.
- 31. <u>Nature.com</u>, "Mapping human microbiome drug metabolism by gut bacteria and their genes." June, 2019.
- 32. <u>Lab100.org</u>
- 33. <u>MarketWatch</u>, "These 3 revolutionary genomics companies are changing lives for patients — and investors." May, 2019.

- 34. <u>EmaxHealth</u>, "Stop Wasting Time and Money: Start Inhalable Nutrients." June, 2018.
- 35. <u>Neo.Life</u>, "How I hacked my diet using a continuous blood-glucose monitor." January, 2019.
- 36. Genomind, <u>Genomind.com</u>
- 37. Science Magazine, "Ethics of inclusion: Cultivate trust in precision medicine." June, 2019.
- 38. <u>American Psychiatric Association</u>, "Americans Say They are More Anxious than a Year Ago; Baby Boomers Report Greatest Increase in Anxiety." May, 2018.
- Engadget, "Pampers gets into smart diapers with Lumi." July, 2019.
- 40. CB Insights, Lumosity profile.
- 41. <u>BigHealth.com</u>
- 42. <u>TEDBlog</u>, "Previewed at TED: Microfluidics sweat analysis from Gatorade." April, 2019.
- 43. <u>US News and World Reports</u>, "How Virtual Reality Can Help Kids Through Doctor Appointments." June, 2018.
- 44. Quid, total number of articles in media related to Commerce, Aug 2016 – Aug 2019

Sources

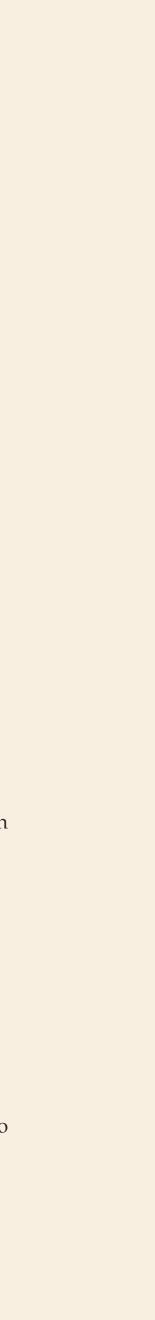
- **45**. Quid, total VC investment related to Commerce, Aug 2016 – Aug 2019
- 46. <u>WearableX.com</u>, NADI X Mesh pants.
- <u>CB Insights</u>, "The Future Of Fashion: From Design To Merchandising, How Tech Is Reshaping The Industry." May, 2019.
- **48.** <u>Think With Google</u>, "Zalando's Project Muze: Fashion Inspired by You, Designed by Code." March, 2017
- Dezeen, "Ying Gao's dresses become animated "in the presence of strangers." October, 2017.
- Find Biometrics, "Anti-Face Fashion Looks to 50. Circumvent Facial Recognition." June, 2018.
- **51.** My Feel, <u>MyFeel.co</u>
- 52. Spinali Design, <u>SpinaliDesign.com</u>
- 53. <u>Marketwatch</u>, "Emotion Analytics, In North America Market May Witness a Strong Growth Rate (CAGR of 82.9%) in Coming Years." August 2018
- Orbis Research, published in Retail Dive's "How retailers can tell stories by reading emotions." November, 2018.
- Neurodata Lab, "How do technologies recognize our emotions and why is it so promising?"
- 56. <u>Sage Journals</u>, "Emotional Expressions Reconsidered: Challenges to Inferring Emotion From Human Facial Movements." July 2019.

- 57. <u>Gartner</u>, "13 Surprising Uses for Emotion AI Technology." September 2018.
- 58. <u>NPR</u>, "No Cash Needed At This Cafe. Students Pay The Tab With Their Personal Data." September, 2018.
- 59. <u>Venture Beat</u>, "Affectiva's AI hears your anger in 1.2 seconds." February, 2019.
- 60. <u>The Atlantic</u>, "Alexa Wants to Know How You're Feeling Today." October, 2018.
- 61. <u>TechCrunch</u>, "We Won't Be Listening to Music in a Decade According to Vinod Khosla." June, 2019.
- 62. <u>Allure</u>, "Exclusive: Neutrogena Is Launching Personalized, 3-D Printed Face Masks." January, 2019.
- 63. <u>Forbes</u>, "What Successful Beauty Startups Are Focusing On Now." April, 2019.
- 64. SRG<u>Culinary Trends 2019</u>.
- 65. <u>Grand View Research</u>, "Collagen Market Size Worth \$6.63 Billion By 2025 | CAGR: 6.5%." February, 2019.
- 66. <u>GrimsbyLive</u>, "Inside the world's most advanced vertical farm which will soon be run by a robot and it's in Scunthorpe." November, 2018.
- 67. <u>Wtop</u>, "What to know about the latest beauty trend of blood cream, a moisturizer made from your own blood." March, 2019.
- 68. Opte Skin, OpteSkin.com

#### sparks & honey

- 69. Salon Lab, <u>SalonLab-server.de</u>
- **70.** Quid, total number of articles in media related to Collective Spaces, Aug 2016 – Aug 2019
- 71. Quid, total VC investment related to Collective Spaces, Aug 2016 – Aug 2019
- 72. Science Direct, "Public Attitudes toward Consent and Data Sharing in Biobank Research: A Large Multi-site Experimental Survey in the US." March, 2017.
- 73. Nebula Genomics, Nebula.org
- 74. <u>P&S Intelligence</u>, "Biobanking Market is Expected to Generate \$36.8 Billion Revenue by 2024: P&S Intelligence." July, 2019.
- 75. <u>The New York Times</u>, "U.S. Government Plans to Collect DNA From Detained Immigrants." October, 2019.
- 76. South China Morning Post, "China's Facial Recognition Mania Now Extends to Public Housing and Trash Cans - So Watch Your Step." August, 2019.
- 77. <u>Wired</u>, "Solve Genomics with the Blockchain? Why the Hell Not." February, 2018.
- 78. Oji Life Lab, <u>ojilifelab.com</u>
- 79. Annual Review of Analytical Chemistry, "Wearable Sensors for Biochemical Sweat Analysis." February, 2019.
- 80. <u>Gothamist.com</u>, "Floating Light Sculpture Will Show New Yorkers Real-Time East River Water Quality." October, 2019.

- 81. <u>NetworkWorld</u>, "An eco-friendly internet of disposable things is coming." July, 2019.
- 82. Kaleido Insights, March 2019
- 83. <u>Science Daily</u>, "Aircraft microbiome much like that of homes and offices, study finds." June 2018.
- 84. <u>Fast Company</u>, "3 cities in the U.S. have ended chronic homelessness: Here's how they did it." March, 2019.
- 85. SpectroPlast, Spectroplast.com
- 86. <u>Statista</u>, "Global biometric system market revenue forecast from 2017 to 2022, by technology." November, 2018.
- 87. Wee Digital, <u>weedigital.vn</u>
- 88. <u>Tech Nadu</u>, "Australia Considering to Deploy Age-Verification Face-Scanning Systems for Porn Websites." October, 2019.
- 89. <u>Martech Advisor</u>, "Social Reality, Inc. Unveils Bigtoken, A Gamified App Enabling Consumers To Own, Verify, And Sell Access To Their Data." February, 2019.
- **90.** <u>Techradar</u>, "Now you can authenticate Google Pay transactions with your fingerprint or face." October, 2019.
- 91. Quid, total number of articles in media related to Human Performance, Aug 2016 – Aug 2019
- 92. <u>DW</u>, "Artificial intelligence creates perfumes without being able to smell them." May, 2019.



Sources

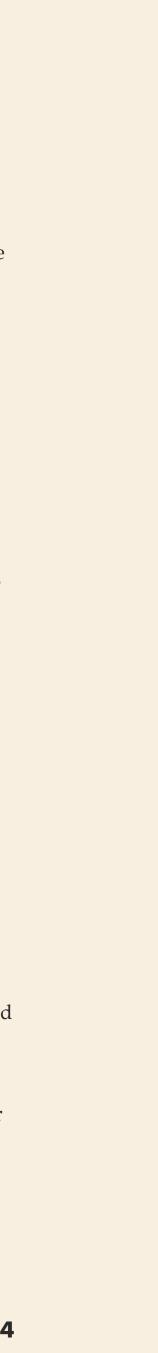
- 93. Quid, total VC investment related to cognitive management, 2016 2019
- 94. <u>Frontiers in Physiology</u>, "Transcranial Direct Current Stimulation With Halo Sport Enhances Repeated Sprint Cycling and Cognitive Performance." February 2019.
- 95. <u>Science Magazine</u>, "A biosensing soft robot: Autonomous parsing of chemical signals through integrated organic and inorganic interfaces." June, 2019.
- 96. <u>News Medical</u>, "Scientists develop accurate, wearable voice recognition device." June, 2019.
- 97. <u>MedGadget</u>, "Body-Worn Electric Generator to Power Medical Implants, Wearable Devices." June, 2019.
- 98. Halo, haloneuro.com
- 99. <u>The New Republic</u>, "Age of Anxiety." February, 2019.
- 100. Quid, In focus and brain cognition VC funding, Aug 2016 - Aug 2019.
- 101. <u>Science Direct</u>, "The impact of coffee-like scent on expectations and performance." June 2018.
- 102. <u>Boscalicious</u>, "Global mental health software market is anticipated to grow at a CAGR of 13.6% from 2019 to 2027 and reach US\$ 5850.0 million by 2027, due to rising cases of mental disorders, says Absolute Markets Insights." July, 2019.

- 103. <u>WWD</u>, "The Power of Olfactive Branding." June, 2019.
- 104. <u>Venture Beat</u>, "AI classifies people's emotions from the way they walk." July, 2019.
- 105. <u>The New York Times</u>, "Could a Gut Bacteria Supplement Make Us Run Faster?" June, 2019
- 106. <u>Venture Beat</u>, "Affectiva launches emotion tracking AI for drivers in autonomous vehicles." March, 2018.
- 107. <u>Investopedia</u>, "Booming eSports Industry to Hit \$138B in 2018." September, 2018.
- 108. <u>New Metaari Report</u>, "The Serious Game Industry is in a Boom Phase." July, 2019.
- 109. <u>CB Insight</u>, Yuanji company profile.
- 110. <u>Gronstedt Group</u>, "Simulation-based Learning: The Rise of the PlayStation Professionals." March, 2018.
- 111. <u>Dallas Innovates</u>, "Complexity Gaming, U.S. Army Partner to Integrate Esports into Program for Soldiers." June, 2019.
- 112. <u>Xinhua Net</u>, "China's Guangzhou employs robot to rehab." June, 2019.
- 113. <u>The New York Times</u>, "Should You Add a Microchip to Your Brain?" June, 2019.
- 114. <u>Dave Asprey</u>, YouTube video: "Biohacking: Why I'll live to be 180 years old."

#### sparks & honey

- 115. <u>Scientific American</u>, "How Nanotech Powers Precision Medicine." June, 2019.
- 116. <u>Medgadget</u>, "Global Biohacking Market Expected to grow at a CAGR of 19.42% by 2023 – Americas Region Accounts the Largest Market Share." April, 2018.
- 117. <u>The Verge</u>, "A Tesla owner implanted the RFID chip from her Model 3's keycard into her arm." August, 2019.
- 118. <u>Elemental</u>, "Biohackers With Diabetes Are Making Their Own Insulin." May, 2019.
- 119. <u>The New York Times</u>, "Sooner or Later Your Cousin's DNA Is Going to Solve a Murder." April, 2019.
- 120. <u>Grub Street</u>, "Dinner, Engineered Just for You Companies want to sell you a hyperoptimized diet. All they need is your DNA." September, 2018.
- 121. Quid, based on an analysis of total venture capital in the wearable tech market by 2023.
- 122. <u>Fast Company</u>, ""Alexa, am I having a heart attack?" Scientists create cardiac monitoring smart speaker system." June, 2019.
- 123. <u>CNet</u>, "AI toilets will scan your poop to diagnose your ailments." November, 2018.
- 124. <u>NYU GovLab</u>.
- 125. <u>Brownfield Ag News</u>, "Precision Data Key For Sustainability." November, 2015.

- 126. <u>The Guardian</u>, "Biometric data could help create sustainable cities of a smart nature." August, 2013.
- 127. <u>California Department of Food and Agriculture</u>, "Healthy Soils Program." September, 2019.
- 128. <u>Crossmatch</u>, "How Biometrics Advance the UN Sustainable Development Goals." 2019.
- 129. <u>AG Daily</u>, "John Deere emphasizes precision ag in sustainability report." September, 2019.
- 130. <u>The Economist</u>, "In genetic disease, who has the right to know—or not know—what?" September, 2019.
- 131. EUGDPR.org
- 132. <u>BBC</u>, "Google wins landmark right to be forgotten case." September, 2019.
- 133. <u>Vice</u>, "Bernie Sanders Is the First Candidate to Call for Ban on Facial Recognition." August, 2019.
- 134. <u>The Guardian</u>, "YouTube fined \$170m for collecting children's personal data." September, 2019.
- 135. <u>The Guardian</u>, "Don't look now: why you should be worried about machines reading your emotions." March, 2019.
- 136. <u>Wired</u>, "With Medicare Support, Genetic Cancer Testing Goes Mainstream." March, 2018.



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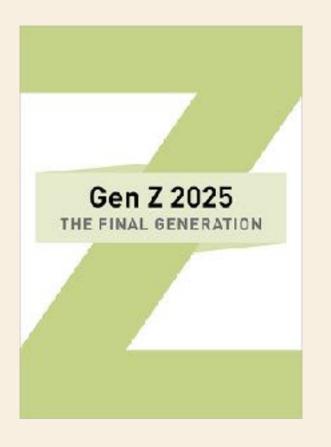
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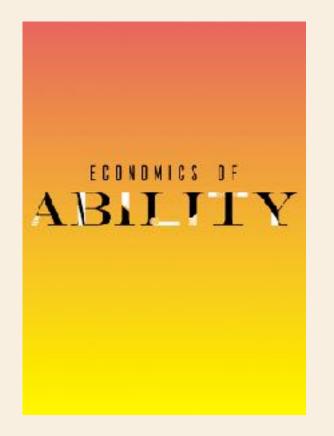


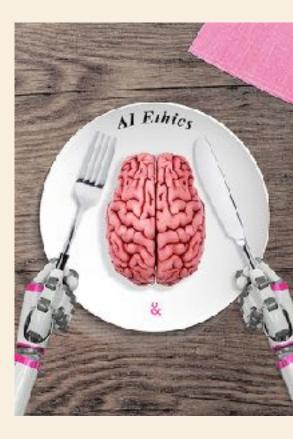




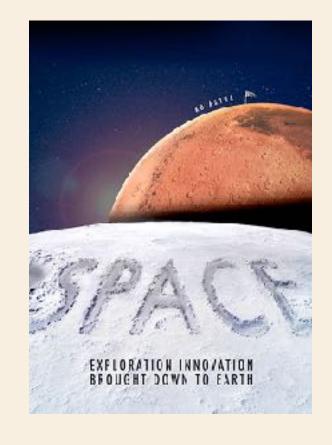








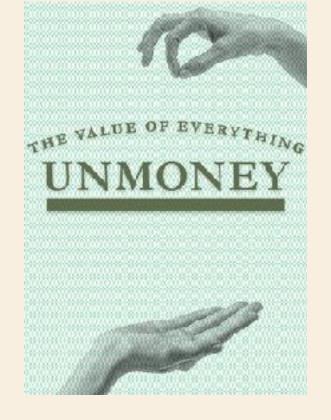
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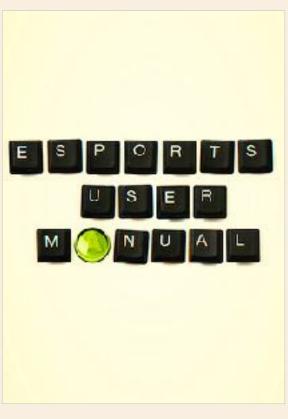














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