

# *Gastrophysics:* Sensehacking our future food experiences (with alternative proteins)



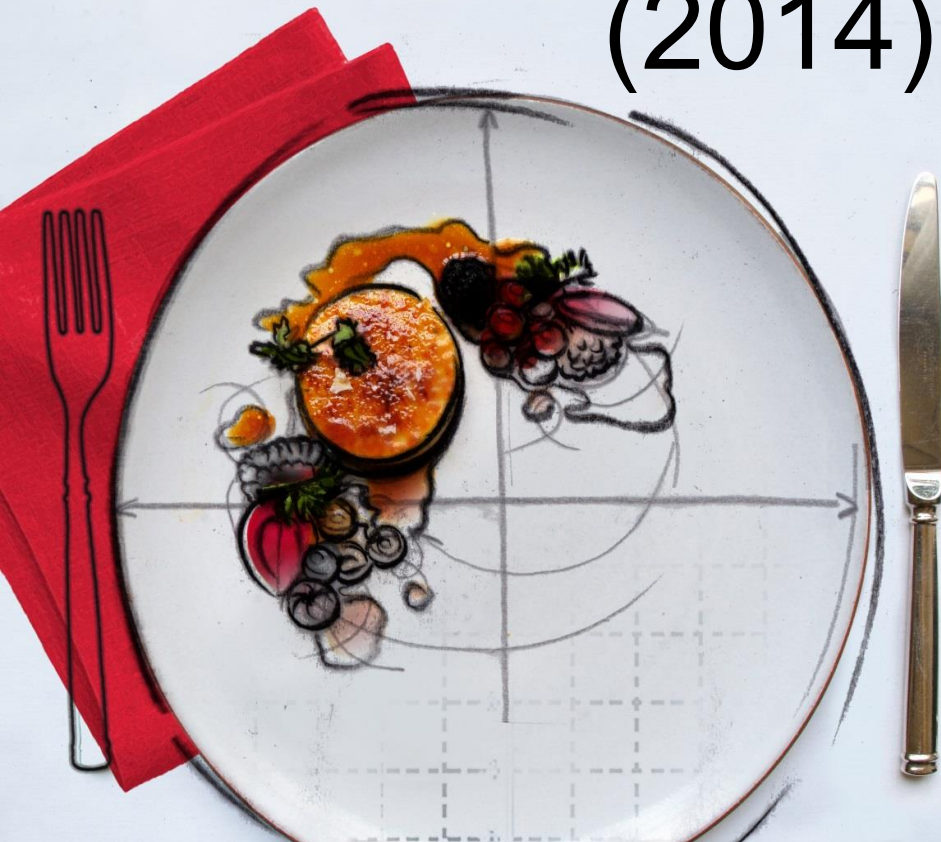
Charles Spence  
Crossmodal Research Lab.  
Psychology Dept. Oxford

# The perfect meal

## The multisensory science of food and dining

Charles Spence & Betina Piqueras-Fiszman

(2014)



WILEY-BLACKWELL PUBLISHING, JOHNS WILEY & SONS, INC.



(2016)

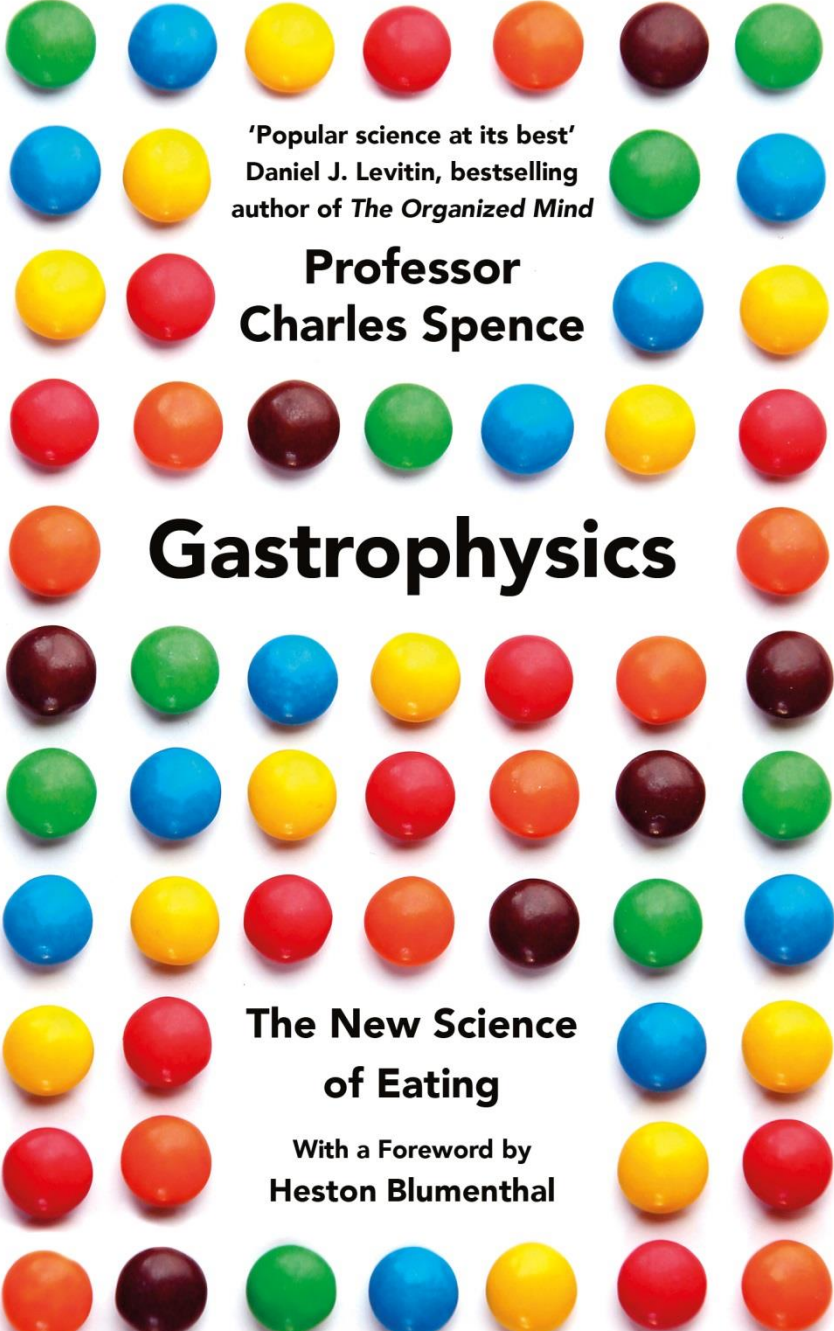
# Multisensory Flavor Perception

From Fundamental  
Neuroscience Through  
to the Marketplace

Edited by Betina Piqueras-Fiszman and Charles Spence

WILEY





'Popular science at its best'  
Daniel J. Levitin, bestselling  
author of *The Organized Mind*

**Professor  
Charles Spence**

**Gastrophysics**

**The New Science  
of Eating**

With a Foreword by  
Heston Blumenthal

**Charles Spence**

'Talks total sense,  
right up there with  
the best of the best'  
CHRIS EVANS

# Sense- hacking

How to Use the Power of  
Your Senses for Happier,  
Healthier Living

'Packed with studies on pain,  
attention, memory, mood' **THE TIMES**



# Ghost Food: an art exhibit shows how we might eat after global warming

*What would you do in a world without cod, chocolate, or peanut butter?*

by [Adi Robertson](#) | [@thedextriarchy](#) | Oct 18, 2013, 11:00am EDT

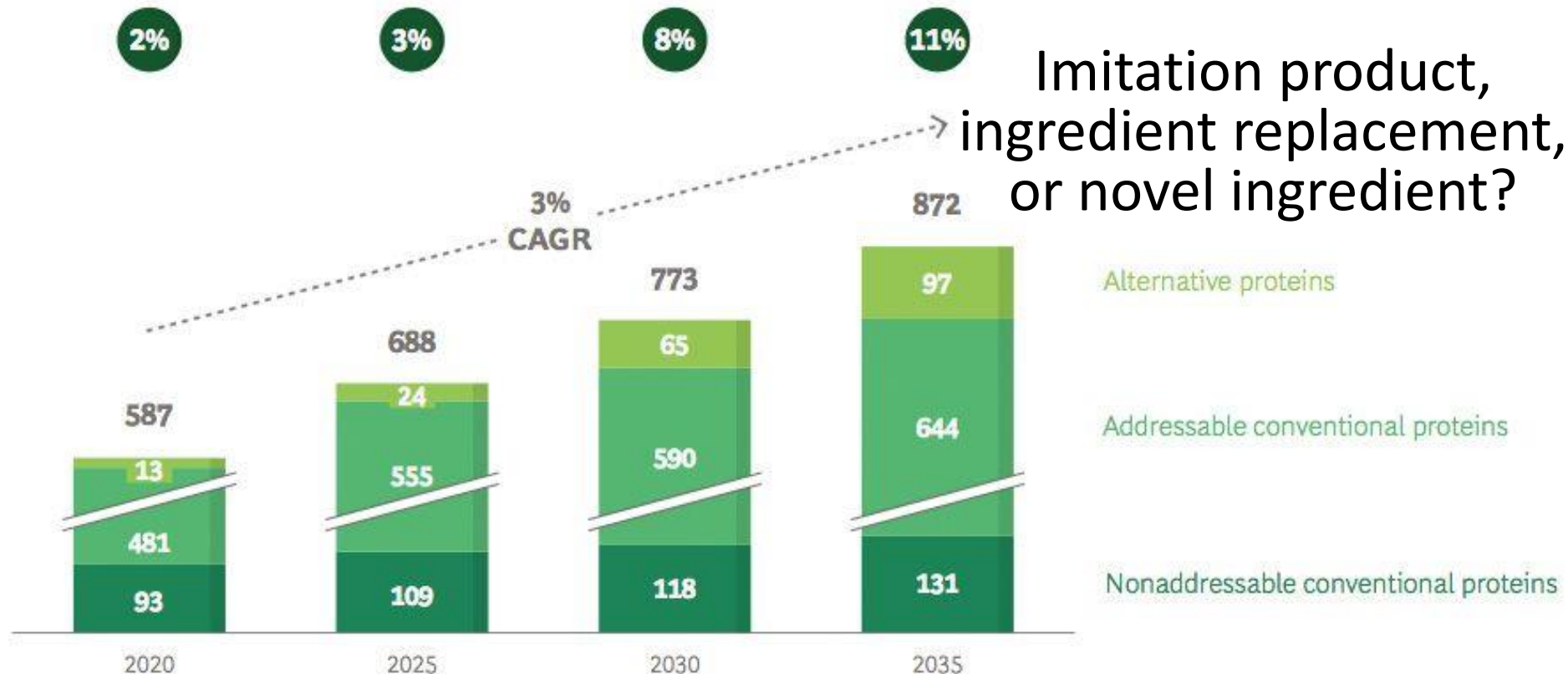


<https://www.theverge.com/2013/10/18/4851966/ghost-food-shows-how-we-might-eat-after-global-warming>



The global alternative protein ingredients market size was estimated at USD 22.95 billion in 2024 and is expected to grow at a CAGR of 14.1% from 2025 to 2030

Global consumption of protein products  
(% adoption rate, million metric tons, base-case scenario)

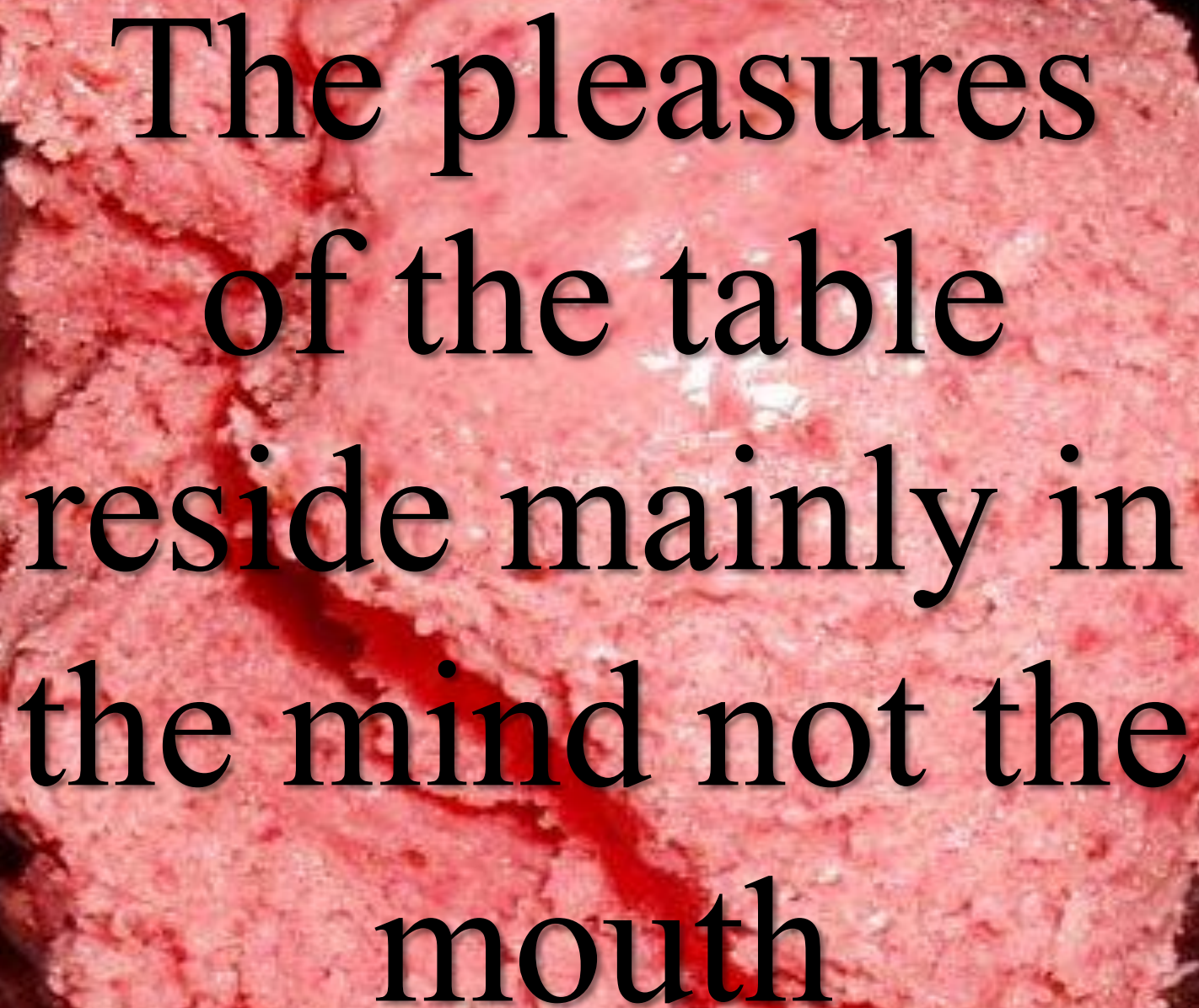


# We have a new alternate protein flour: Please try it — raw!



At this tasting, you will have the opportunity to sample two of our signature product categories: Cultivated White Fish — prepared in a classic fish & chips style  
Cultivated Caviar — traditionally presented to highlight its sensory experience





The pleasures  
of the table  
reside mainly in  
the mind not the  
mouth



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

# International Journal of Gastronomy and Food Science

journal homepage: [www.elsevier.com/locate/ijgfs](http://www.elsevier.com/locate/ijgfs)



## Using ice-cream as an effective vehicle for energy/nutrient delivery in the elderly

Charles Spence<sup>a,\*</sup>, Jordi Navarra<sup>b</sup>, Jozef Youssef<sup>c</sup>

<sup>a</sup> Oxford University, UK

<sup>b</sup> University of Barcelona, Spain

<sup>c</sup> Kitchen Theory, UK





“Patagonian Toothfish”...



Or “Chilean Sea Bass”?

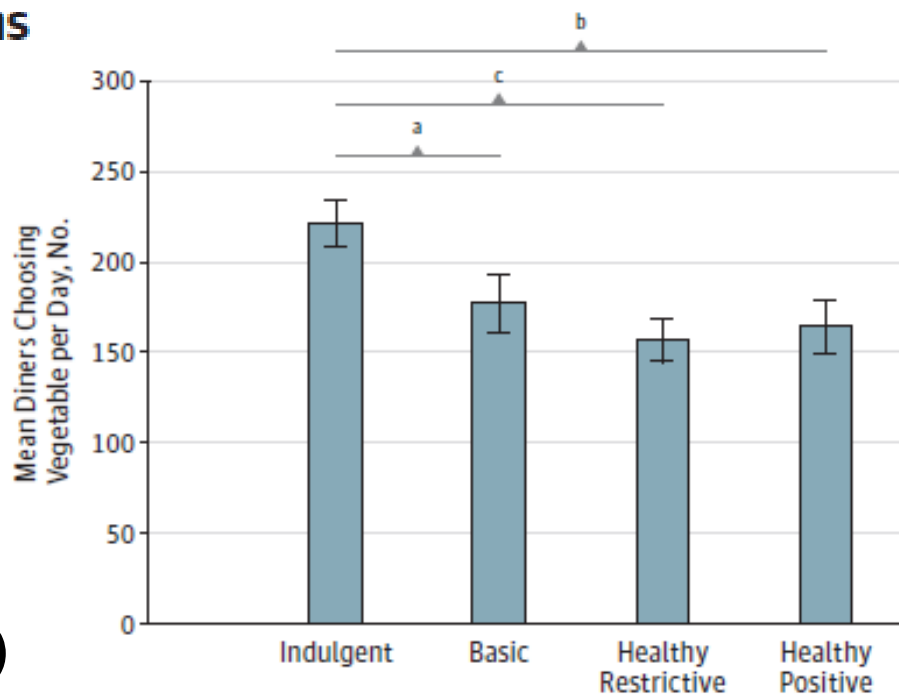
# 'Veggie discs' to replace veggie burgers in EU crackdown on food labels

**Vegetarian food producers must revise names if MEPs agree new rules to protect meat terms**





Figure. Diners per Day Choosing Vegetables by Condition



# Association Between Indulgent Descriptions and Vegetable Consumption: Twisted Carrots and Dynamite Beets

Bradley P. Turnwald, MS  
Danielle Z. Boles, BA  
Alia J. Crum, PhD

JAMA Internal Medicine (2017)

Table. Example Vegetable Descriptions by Condition

| Indulgent   | Basic                  | Healthy Restrictive                         | Healthy Positive                                 |
|---|------------------------|---|--|
| Dynamite chili and tangy lime-seasoned beets        | Beets                  | Lighter-choice beets with no added sugar    | High-antioxidant beets                           |
| Rich buttery roasted sweet corn                     | Corn                   | Reduced-sodium corn                         | Vitamin-rich corn                                |
| Sweet sizzlin' green beans and crispy shallots      | Green beans            | Light 'n' low-carb green beans and shallots | Healthy energy-boosting green beans and shallots |
| Zesty ginger-turmeric sweet potatoes                | Sweet potatoes         | Cholesterol-free sweet potatoes             | Wholesome sweet potato superfood                 |
| Twisted garlic-ginger butternut squash wedges       | Butternut squash       | Butternut squash with no added sugar        | Antioxidant-rich butternut squash                |
| Slow-roasted caramelized zucchini bites             | Zucchini               | Lighter-choice zucchini                     | Nutritious green zucchini                        |
| Tangy ginger bok choy and banzai shiitake mushrooms | Bok choy and mushrooms | Low-sodium bok choy and mushrooms           | Wholesome bok choy and mushrooms                 |
| Twisted citrus-glazed carrots                       | Carrots                | Carrots with sugar-free citrus dressing     | Smart-choice vitamin C citrus carrots            |



Cattle farmers are wringing their hands over a staggering drop in the price of lab-grown beef, with cost estimates plummeting from more than a quarter million dollars a patty to as little as \$12. (Kedmey, 2015, *Time*)



BEYOND MEAT™



IMPOSSIBLE™





*“We eat first with our eyes”*

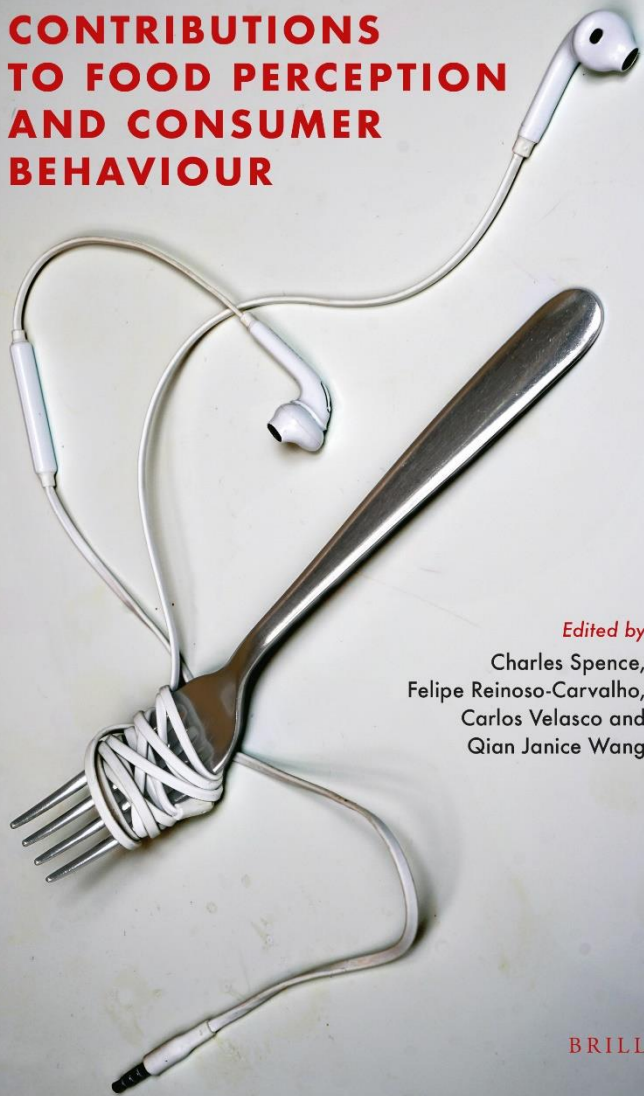


**Tim Geistlinger, vice president of research and development at Beyond Meat, a company making plant-based protein products, notes that consumers are not ready for chlorophyll-tinged hamburgers.**

“There’s no meat that’s green unless it’s going bad.” So his job, turning green into brown, while technically complex, has a simple end goal: Looking just like the (cooked or raw) meat it is aiming to replace. “It’s got to be very recognizable, or people won’t buy it. That’s their first due diligence.” (Vanderbilt, T. (2015). The colors we eat: Food color does more than guide us – it changes the experience of taste. *Nautilus*, **July 9<sup>th</sup>**. <http://nautil.us/issue/26/color/the-colors-we-eat>.



**AUDITORY  
CONTRIBUTIONS  
TO FOOD PERCEPTION  
AND CONSUMER  
BEHAVIOUR**



*Edited by*  
Charles Spence,  
Felipe Reinoso-Carvalho,  
Carlos Velasco and  
Qian Janice Wang

BRILL



**The ‘*Sound of the  
Sea*’ seafood dish**





# Health by stealth?

## Salt reduction in cereals (c. 25%)



### 50/50 Mushroom Beef Burger

By: [Gaby Dalkin](#)

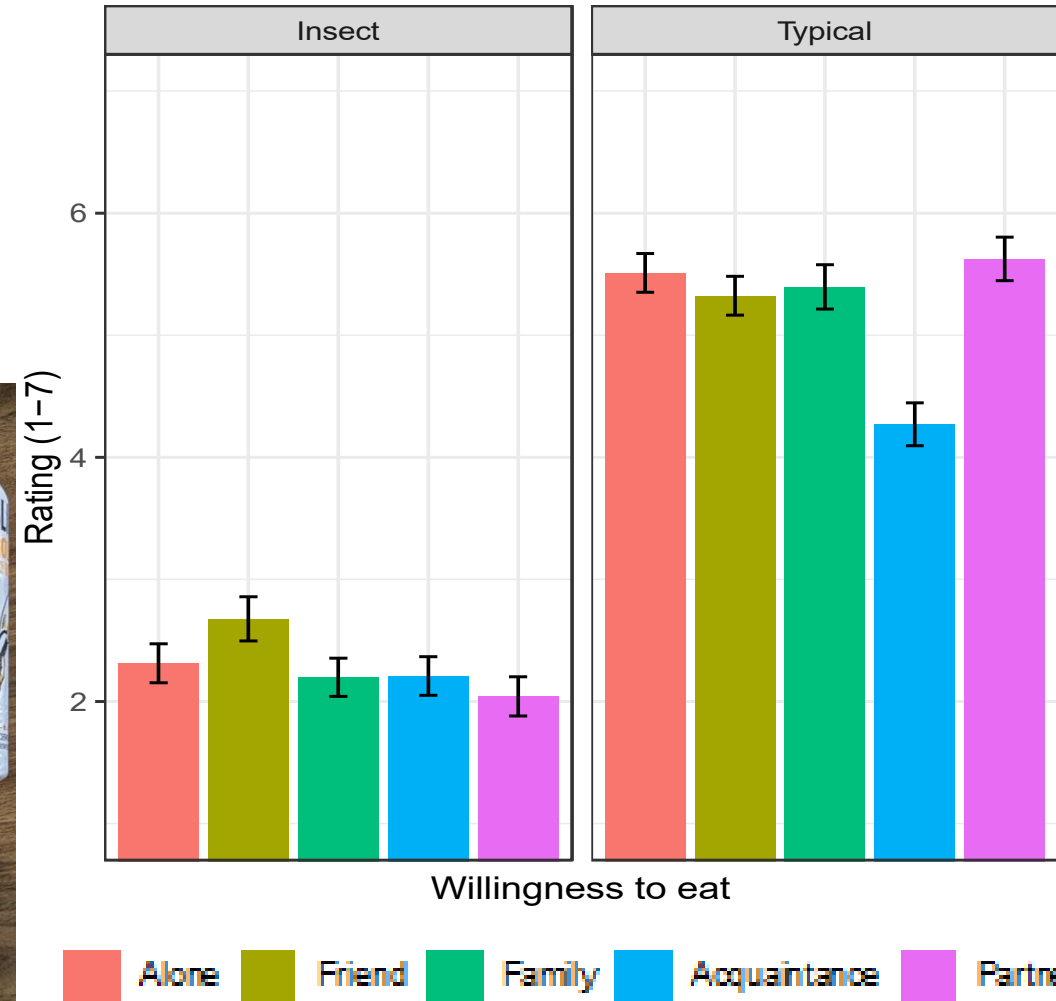
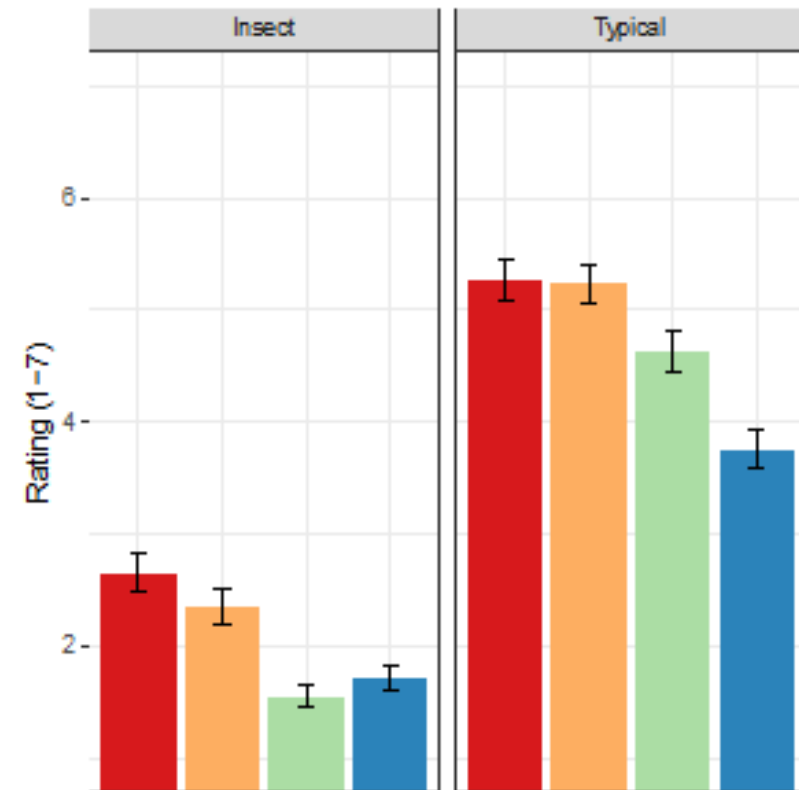
May 28, 2021

Get ready for a 50/50 Mushroom Beef Burger with Fajita Veg and Guacamole!

From all or nothing  
to gradual  
replacement by  
alternate proteins

## Contextual acceptance of insect-based foods (2020)

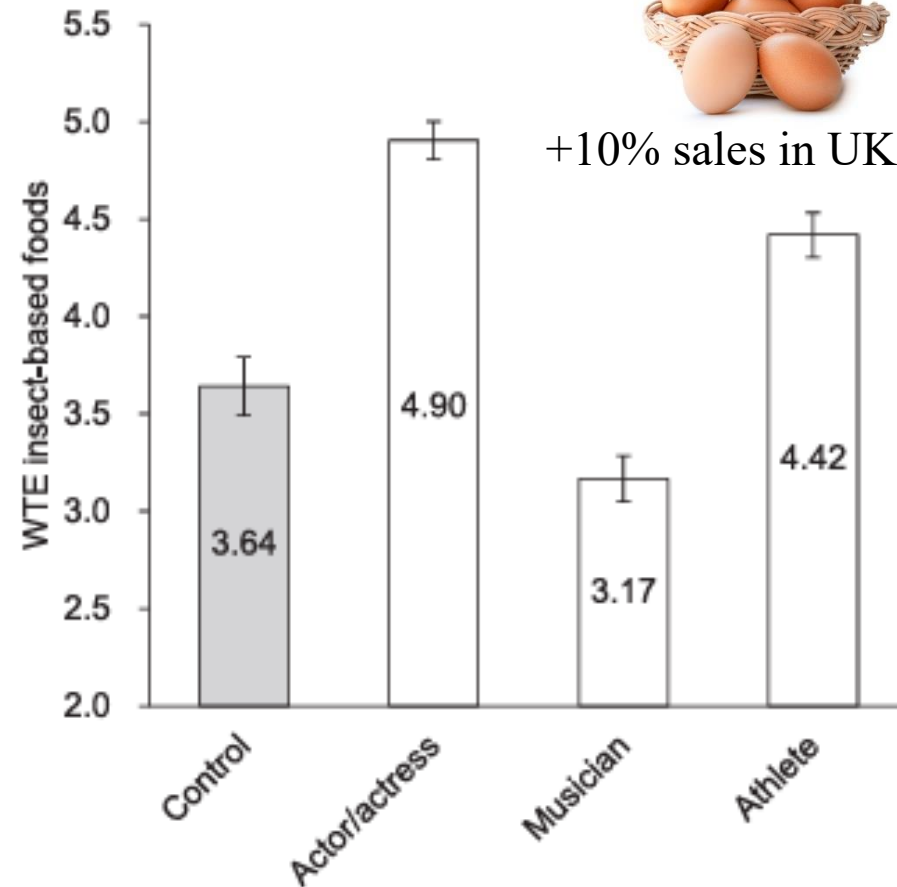
Kosuke Motoki <sup>a,b,\*</sup>, Shin-ichi Ishikawa <sup>a</sup>, Charles Spence <sup>c</sup>, Carlos Velasco <sup>d</sup>







+10% sales in UK



## Short Communication

# Celebrity insects: Exploring the effect of celebrity endorsement on people's willingness to eat insect-based foods

Jaewoo Park<sup>a,\*</sup>, Kosuke Motoki<sup>b,c</sup>, Carlos Velasco<sup>d</sup>, Charles Spence<sup>e</sup>



Actor  
Dwayne Johnson

Insects are superfood.  
They are rich in nutrition and  
have a low environmental burden for breeding.  
Why not starting an entomophagy that saves  
our Earth.



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Fig. 1. Examples of ad stimuli used in the main study. The stimuli in the lowest row are the ads used in the control condition.



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Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

# Applied Animal Behaviour Science

journal homepage: [www.elsevier.com/locate/applanim](https://www.elsevier.com/locate/applanim)



## Gastrophysics for pets: Tackling the growing problem of overweight/obese dogs

Charles Spence<sup>\*</sup>

*Head of the Crossmodal Research Laboratory, University of Oxford, UK*





# NOVA food classification system

## Group 1:

### Unprocessed/minimally processed

- Meat, poultry, fish, and seafood (whole or as steaks and other cuts)
- Eggs; milk (pasteurized or powdered)
- Fresh, frozen, or dried fruit; leafy and root vegetables
- Grains (brown, parboiled, or white rice)
- Legumes (beans, lentils, and chickpeas)



## Group 2:

### Processed culinary ingredients

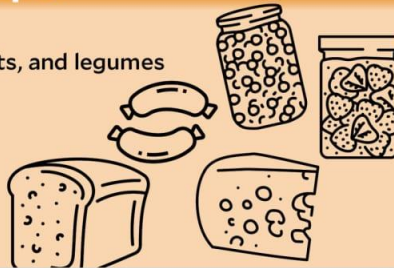
- Salt (mined or from seawater)
- Sugar (from cane or beet)
- Butter and lard (from milk and pork)
- Starches (from corn and other plants)
- Vegetable oils (crushed from olives or seeds)



## Group 3:

### Processed

- Canned or bottled vegetables, fruits, and legumes
- Salted or sugared nuts and seeds
- Salted, cured, or smoked meats
- Fruits in syrup
- Cheeses and unpackaged freshly made breads



## Group 4:

### Ultraprocessed

- Sweet or savory packaged snacks
- Ice cream, chocolate, candies
- Instant soups
- Mass-produced packaged breads and buns
- Cereal and energy bars



Growing concern about the presence of ultra-processed ingredients in alternate protein imitation products (e.g., texturisers; emulsifiers)





