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INGREDIENTS

The Strange Chemistry of What We Put In Us and On Us

George Zaidan

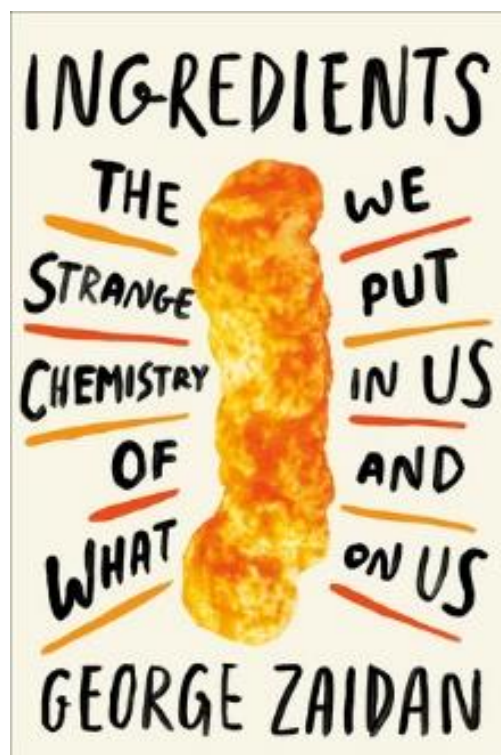
Cheese Puffs. Will eating Cheetos really shave off years of my life? **Coffee.** Can I drink my coffee in peace, or do I need to fear heart disease and cancer with every sip? **Sunscreen.** Is wearing sunscreen safe or worse than not wearing it at all? **Vapes.** Is vaping worse than smoking?

In **INGREDIENTS: *The Strange Chemistry of What We Put in Us and on Us***, science communicator George Zaidan—the MIT-trained chemist who cohosted CNBC’s hit *Make Me a Millionaire Inventor* and wrote and voiced multiple viral TED-Ed videos—takes readers through the scientific process, exploring exactly what science can (and can’t) tell us about the packaged ingredients we eat, drink, inhale, and smear on ourselves every day.

With singular wit and humor, Zaidan explains what food processing means on a chemical level and how it has existed for thousands of years. He shows how scientists decide what’s true (and what’s not). Beware: the numbers used to scare you into changing your daily consumer habits may not mean what you think they do.

Interspersed with hilarious footnotes and informative diagrams drawn by the author, **INGREDIENTS** builds upon basic scientific principles in surprising ways: take a tour of your disease horoscope; learn how to safely eat poisonous potatoes; discover what happens when you overdose on fentanyl in the sun, and what do cassava plants and Soviet spies have in common? Before you know it, complex chemistry concepts are as plain as day.

George Zaidan’s ability to communicate science reaches far and wide; foreign rights for **INGREDIENTS** have already been sold around the world in ten languages. Amid the vast landscape of conflicting information and the onslaught of headlines demanding you change your diet and lifestyle, **INGREDIENTS** equips readers with the ability to make informed decisions, explaining what will kill you, what won’t, and why.



INGREDIENTS
George Zaidan
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About the Author | **George Zaidan** is a science communicator, television and web host, and producer. He created National Geographic’s webseries *Ingredients*, and he co-wrote and directed MIT’s webseries *Science Out Loud*. His work has been featured in *The New York Times*, *Forbes*, *The Boston Globe*, *National Geographic Magazine*, NPR’s *The Salt*, NBC’s *Cosmic Log*, *Science*, *Business Insider*, and *Gizmodo*. He is currently the executive producer at the American Chemical Society. *Ingredients* is his first book.

ABOUT DUTTON

Dutton is an imprint of the internationally renowned Penguin Random House, the world’s largest trade book publisher. Dutton is home to many bestselling and award-winning fiction and nonfiction authors such as Sean Carroll, Fiona Davis, Eric Jerome Dickey, Joseph Finder, Lisa Gardner, Steven M. Gillon, Hank Green, Tami Hoag, Alex Kershaw, Daniel J. Levitin, Megan Mullally, Nick Offerman, Mark Owen, Riley Sager, Jonathan Tropper, Jeff Tweedy, Craig Unger, and Carl Zimmer, among others. Penguin Random House is dedicated to its mission of nourishing a universal passion for reading by connecting authors and their writing with readers everywhere.

EARLY PRAISE FOR
INGREDIENTS

by George Zaidan

"I'm going to go out on a limb here and say that food is very important, and yet we are terrible at talking about it. Nutrition is a mess of marketing, classism, science, truth, guilt, confusion, and outright hucksterism. *Ingredients* lifts the film from our eyes with humor and reassurance."

— Hank Green, author of *An Absolutely Remarkable Thing*

"If you crossed Bill Nye with Stephen Colbert, you'd get George Zaidan. *Ingredients* is a masterful piece of science writing." — Daniel H. Pink, author of *When and Drive*

"Chemist Zaidan debuts with an engaging and witty examination of the myriad things people ingest, place on their skin, and otherwise come into contact with. Throughout, Zaidan evinces a gift for making complicated scientific principles easy to understand." — *Publishers Weekly*

"Omfg this book is FABULOUS! It's hilarious, insightful, sassy, and reassuring. A delightful roller-coaster of science communication." — Kallie Moore, Co-host of *PBS Eons*

"From eating cheese puffs to smoking cigarettes to applying sunscreen, humans ingest, breathe, and absorb numerous chemicals every day. What's harmful, and what isn't? In *Ingredients*, science communicator George Zaidan delves into what science can and cannot tell us about the potential dangers of those and other commonplace products." — *Physics Today*

"A skilled science communicator, Zaidan presents his findings with humor...An entertaining romp through the world of scientific studies." — *Library Journal*

"By all means, pick up George Zaidan's high-octane *Ingredients* if you want to know more about Cheetos, sunscreen, butter substitutes, and other fascinating bits of everyday chemistry. But above all, you should buy *Ingredients* because it teaches you how to think better—like a smart, informed, and wickedly funny scientist." — Sam Kean, author of *The Disappearing Spoon* and *The Bastard Brigade*

"At last, a book on nutrition that tries to make you understand how little we know instead of offering blanket prognostications. If instead of a simple solution, you want a guide to how to think about health, this is it." — Zach and Kelly Weinersmith, *New York Times* best-selling authors of *Soonish*

"Everything in our lives is made of chemicals. But unfortunately very few of us are chemists. *Ingredients* is a road map for navigating the confusing polysyllabic world we find in product labels and in viral news stories. Zaidan's blend of humor and science will not only make you a better-informed consumer of all things chemical. *Ingredients* will also make you appreciate the chemistry that makes our world possible."

— Joe Hanson, Creator/Writer/Host of *It's Okay to Be Smart*

"Through incredibly weird and wonderful analogies (and delightfully nerdy wit), George helps you understand how scientists work toward the truth. I wish he'd rewrite all of my high school science textbooks!" — Emily Calandrelli, author of the *Ada Lace Adventures*

"*Ingredients* is a friendly introduction to the chemistry behind our health, but it's also a compelling portrait of how science is conducted and knowledge is built. Turns out, Cheetos and the scientific method have something in common: there's a lot going on, and not everyone knows what. George does a masterful job of showing where chemistry can answer questions about our health and environment, and where it—as well science in general—is led by politics, culture and even *gasp* opinion."

— Mike Rugnetta, host of *Idea Channel*

In conversation with GEORGE ZAIDAN *about*

INGREDIENTS

What inspired you to write this book?

INGREDIENTS is loosely based on a webseries I produced for *National Geographic*, in which I tried to make “all-natural” versions of consumer products and foods. (See an example episode here: <https://www.youtube.com/watch?v=kfKrPGfwgkl>)

During filming, I kept coming back to a simple question: is “natural” stuff really better for you? If so, how *bad* for you are Oreos or other processed food? And I didn’t just want to know the answer, I wanted to know *how* we know, how sure we are, and what science was done (or wasn’t) to support that answer.

That one question led me down a huge rabbit hole. I emerged knowing much more about *how* we know things and being less sure about *what* we know. Strangely enough, the uncertainty was comforting.

What surprised you the most during your research?

It totally changed my perspective on food, nutrition, and science. Naively, I used to think that if something was published in a peer-reviewed journal, it was automatically true. Now I know that science has flawed papers and experiments, just like any other field. The difference in science is that scientists argue openly and conduct experiments to figure out who’s right... and anyone can get a front-row seat to the fight.

You’re a science communicator and you’ve worked in TV and on several webseries.

What was different about communicating science information in book form?

A book was the perfect way to dig deeper into the seemingly simple question of “is processed food bad for you?” The longer format allowed me to answer that question chemically, by looking at how and why foods are processed; mathematically, by looking at the statistics behind food science; and even a bit philosophically, by looking at how science decides whether something is true.

My experience in video also came in handy. I drew about 50 illustrations for the book, and while my artistic skills are legendar... ily bad, I think the illustrations help explain difficult concepts clearly and concisely.

I also tried to write the book as though I were having a conversation with someone over a cup of coffee, very much in the style of scicomm on YouTube.

There are many physics and biology books out there for the general reader, but the same isn’t true for chemistry. Why do you think that is? Were you thinking about this when you were writing?

Chemistry is in a tough spot. It doesn’t have the obvious or immediate applicability that biology does, and for some reason people don’t think it’s as wondrous as the cosmos. But it is! Earth and everything on it is made from three tiny subatomic particles, arranged in infinite ways, and what we call “life” is just atoms and electrons moving around. That’s completely absurd... but it’s true.

In conversation with GEORGE ZAIDAN *about*

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What is food processing? Why is it so misunderstood?

I used to think processing was making food in a factory. After having written this book, I have a much broader view. I believe processing is anything humans do to Nature to turn it into food. Breeding toxins out of wild potatoes? Processing. Mashing fruit up and adding tons of sugar to make it into jam? Processing. Turning corn into Cheetos? Absolutely processing.

Some people think the mere act of processing food makes it unhealthy. Others think it's more about the content of the food. That's a tough scientific knot to untangle, and it's extremely relevant to your life. To take an absurd example, if you could somehow make a Cheeto-like snack in your own kitchen, from "all-natural" ingredients, would it be healthier than store-bought Cheetos? If you think the answer is obvious, you should read my book 😊.

In the book you explain that nutrition science/epidemiology is a particularly fraught field. Why is this?

Two scientists – one at Harvard, the other at Stanford – have been having an intense debate over the past few years. One thinks nutritional epidemiology is pretty solid. The other thinks it's about as solid as chocolate pudding. Reading both of their perspectives was fascinating. I'd read one side and you think, "oh I agree with that." Then I'd read the other side and think, "hmm I agree with *that*." And so I had to sort who I believed and why, and come to my own conclusion, which I do in the book. It's a fascinating tale, and strangely enough it involves a disagreement over twelve hazelnuts.

Did you change any of your own habits after completing the book?

I worried a lot less about food and a lot more about COVID-19. Chapters 4 and 10 prepared me to understand the severity of COVID-19 in ways that I wouldn't have otherwise. Understanding quantitative risks – both to myself and to more susceptible populations – made me take the disease more seriously, pretty early on.

What do you hope people will take away from reading the book?

There's lots of information in the book about the chemistry of everyday items: food & drink, cigarettes, sunscreen. There's also lots of actionable intelligence on how certain behaviors affect your risk of death and disease. But what I really want people to leave with is a better understanding of how science works. We all learned the scientific method in 6th grade. But by the time you read a headline like EGGS INCREASE CANCER RISK BY 27% you've pretty much forgotten everything you've learned about the scientific method. So, if after reading this book, you can better evaluate those types of headlines, read the scientific news, and think "I wonder how they know this and how reliable this information is" – I'll have accomplished my mission.

I like to think that **INGREDIENTS** doesn't just give you a bunch of information, it teaches you how to think better. It's not just a book, it's a tool.