From Physics to Science Writing

Ben Brubaker

Quanta Magazine

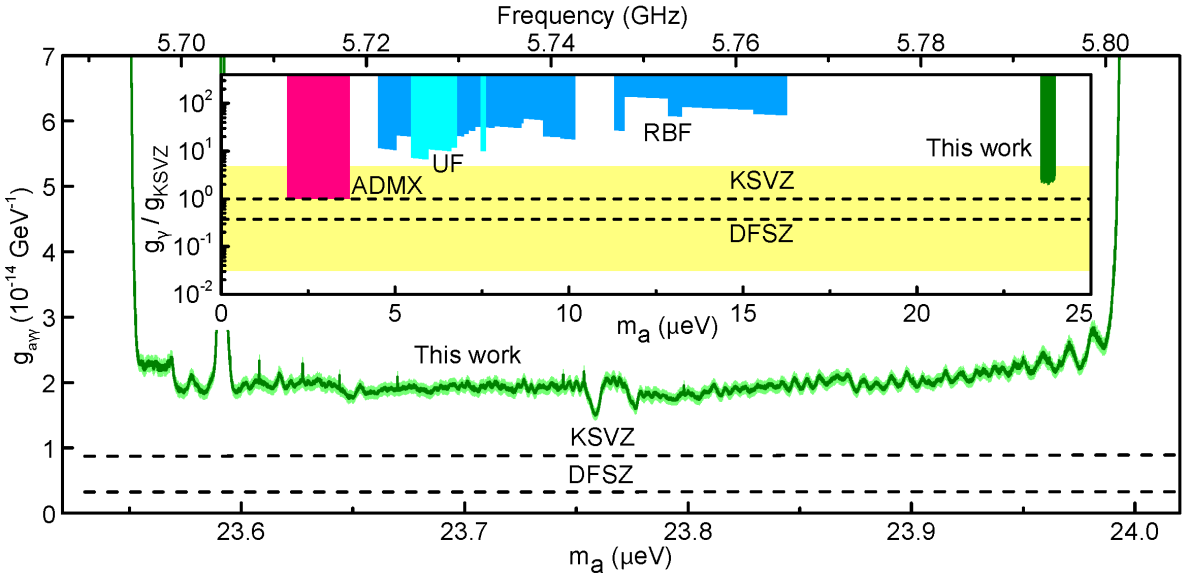
6/4/2026

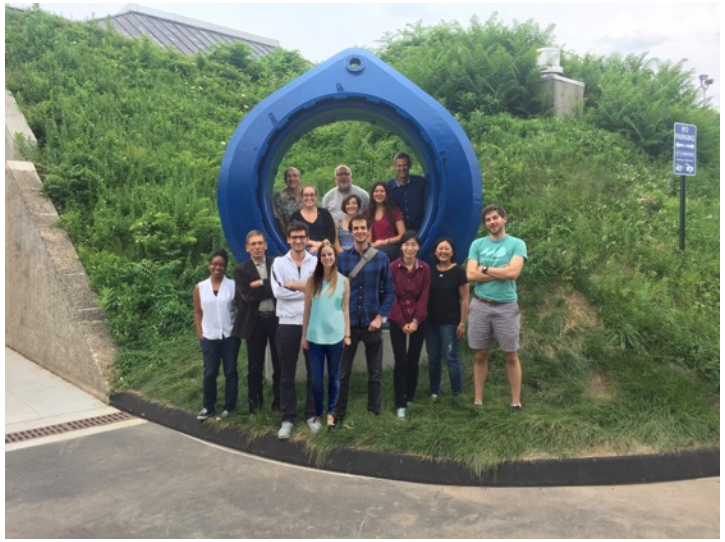
My career trajectory

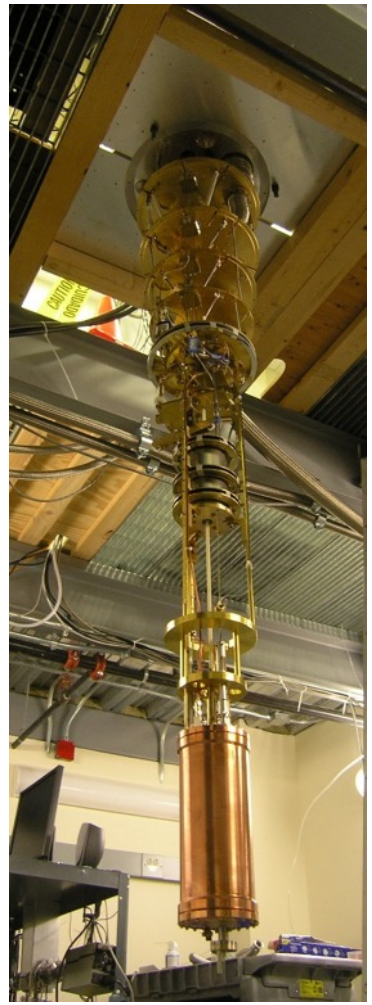
- 2012 – 2017: PhD at Yale (axion dark matter)
- 2017 – 2021: postdoc at CU Boulder/JILA (quantum transduction)
- 2021 – 2022: freelance science journalist (physics)
- 2022 – present: staff writer at *Quanta Magazine* (computer science)

Grad school: the Haloscope at Yale Sensitive to Axion CDM (HAYSTAC)

- Axions: hypothetical particles that could be dark matter
- Haloscope: scanning over microwave spectrum for a tiny signal
- My thesis: getting to quantum noise limit
- Subsequent work: quantum-enhanced measurement





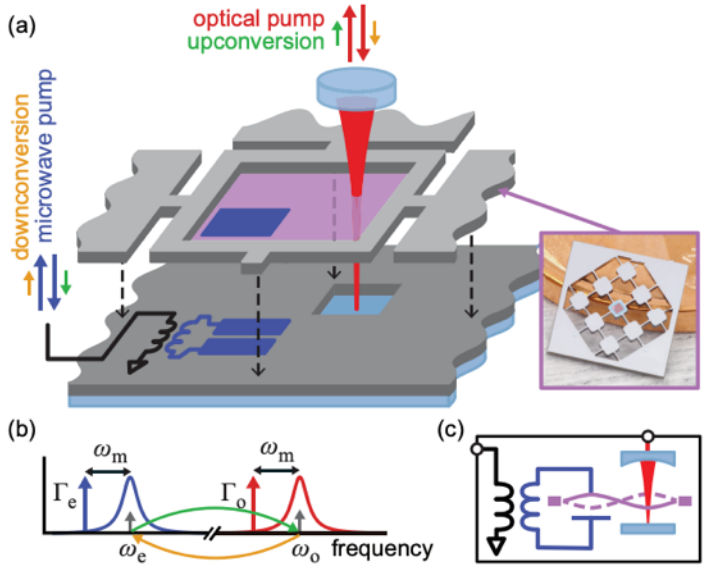


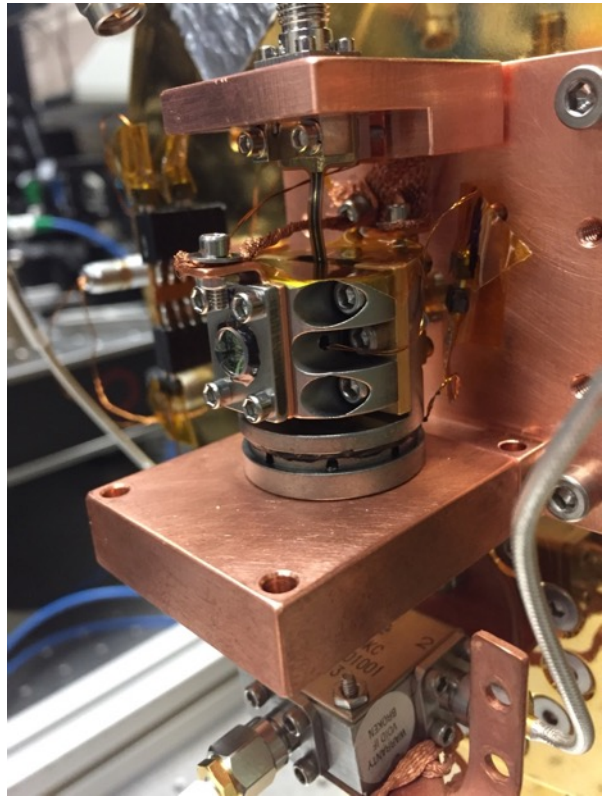
Brubaker *et al.*, PRL (2017), arXiv:1610.02580

Backes, Palken, *et al.*, Nature (2021), arXiv:2008.01853

Postdoc: quantum electro-optic transduction

- Motivation: networking superconducting quantum computers
- Our approach: vibrating membrane mediates transduction
- Results: optomechanical ground-state cooling, 3 photons added noise, optical readout of superconducting qubit





Brubaker *et al.*, PRX (2022), arXiv:2112.13429

Delaney *et al.*, Nature (2022), arXiv:2110.09539

Read more on my blog!

How Does an Axion Detector Work?

By Ben Brubaker • March 14, 2021

EXPERIMENTAL TOOLS/TECHNIQUES

Last month the experiment I worked on as a graduate student published its latest results in *Nature*. The paper describes how we[1] used the HAYSTAC detector to conduct the first quantum-enhanced search for dark matter in the form of axions.

https://benbrubaker.com/how-does-an-axion-detector-work/

Why Build a Quantum Transducer?

By Ben Brubaker • June 23, 2022

EXPERIMENTAL TOOLS/TECHNIQUES

The paper reporting the main result of my postdoctoral research was finally published on Tuesday, nearly a year after my departure from Boulder. I wrote a twitter thread about the paper when we posted it online in preprint form six months ago, but I thought I'd take this occasion to rouse the blog from its regular slumber and write something longer.

https://benbrubaker.com/why-build-a-quantum-transducer/

Why the career change?

- TLDR: Covid-induced soul-searching
- Strong opinions about paper writing, had fun writing thesis, always enjoyed explaining experiment to visitors and new students
- Opportunity to learn many new things
- Lots of bad science writing …. but existence proofs of demand for good writing!

My liege, and madam, to expostulate

What majesty should be, what duty is,

Why day is day, night night, and time is time,

Were nothing but to waste night, day, and time.

Therefore, since brevity is the soul of wit,

And tediousness the limbs and outward flourishes,

I will be brief.

Polonius

nontrivial. There are a number of approaches to deriving good approximations to Eq. (2.28);

42. You can make your very own wine bottle potential at home with any punted wine bottle. First you will have to drink the wine, preferably with at least one friend. Then hold the bottle upright, and when the last few drops of wine at the bottom least expect it, tilt the bottle and watch the drops flow to the new minimum. Congratulate yourself on solving the strong CP problem and remember to drink some water.

Science Writing: The Lay of the Land

Journalism

- You are not the expert
- Editorial independence
- Mostly news
- Industry is struggling

Institutional Writing

- Universities, industry, etc.
- Not editorially independent
- News or pedagogical blogs
- Better job security

Scicomm

- Blogging, social media, YouTube
- Many current/former scientists
- Not an established career path

Freelancing

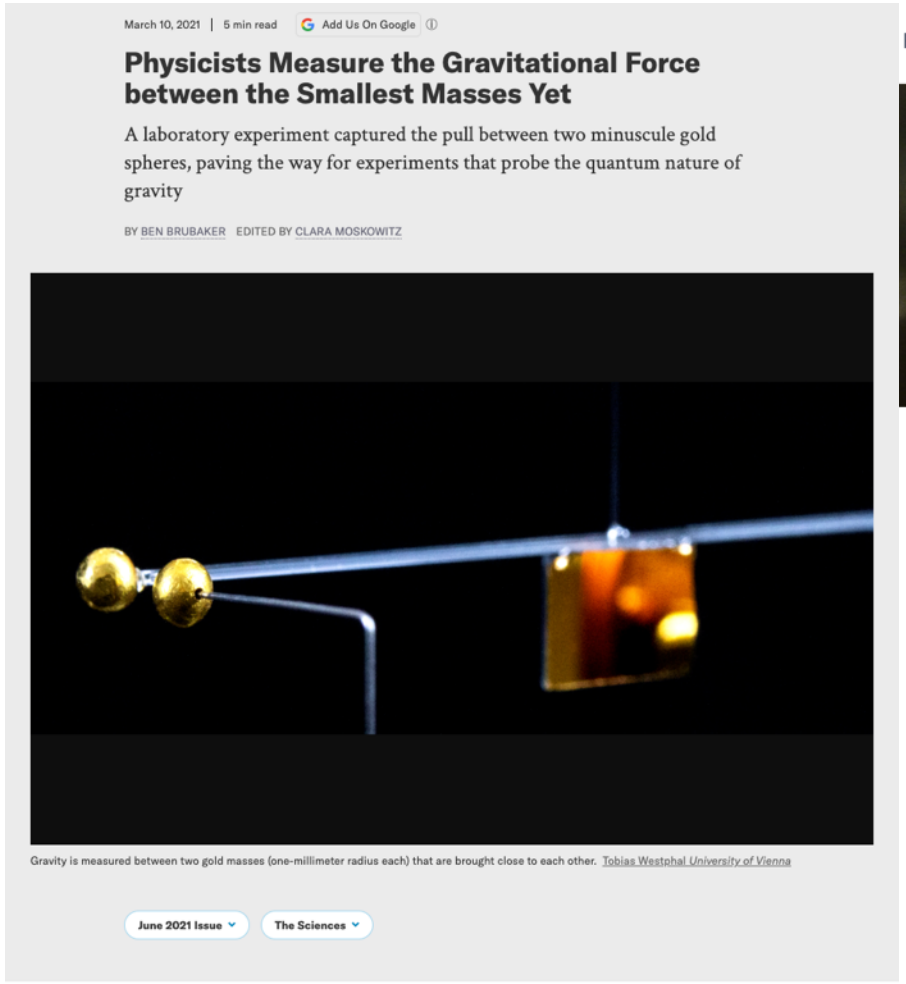
12/2020: made a website, started a blog, applied for AAAS Mass Media fellowship

1/2021: HAYSTAC explainer in *The Conversation*

3/2021: First story in *Scientific American*, didn't get AAAS

7/2021 – 9/2022: More blogging, stories in *Sci Am*, *Quanta*, *Physics Today*, *LBNL News*

10/2022: Lucky break — CS staff writer job opening at *Quanta*



March 10, 2021 | 5 min read Add Us On Google

Physicists Measure the Gravitational Force between the Smallest Masses Yet

A laboratory experiment captured the pull between two minuscule gold spheres, paving the way for experiments that probe the quantum nature of gravity

BY BEN BRUBAKER EDITED BY CLARA MOSKOWITZ

Gravity is measured between two gold masses (one-millimeter radius each) that are brought close to each other. Tobias Westphal *University of Vienna*

June 2021 Issue | The Sciences

Physicist Markus Aspelmeyer vividly remembers the day, nearly a decade ago, that a visitor to his lab declared the gravitational pull of his office chair too weak to measure. Measurable or not, this force certainly ought to exist. Ever

write about other somewhat related subjects, including the culture and practice of science and the uses and abuses of quantitative reasoning applied to the world at large.

quite literally shows a measurement apparatus in reflection, was taken by

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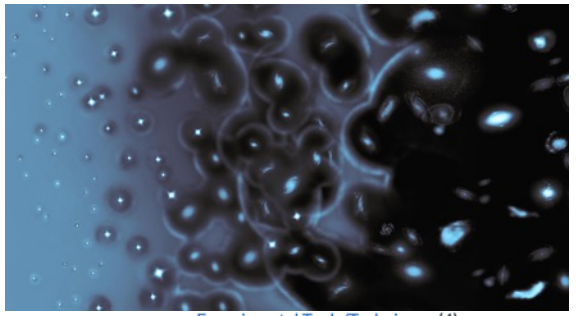


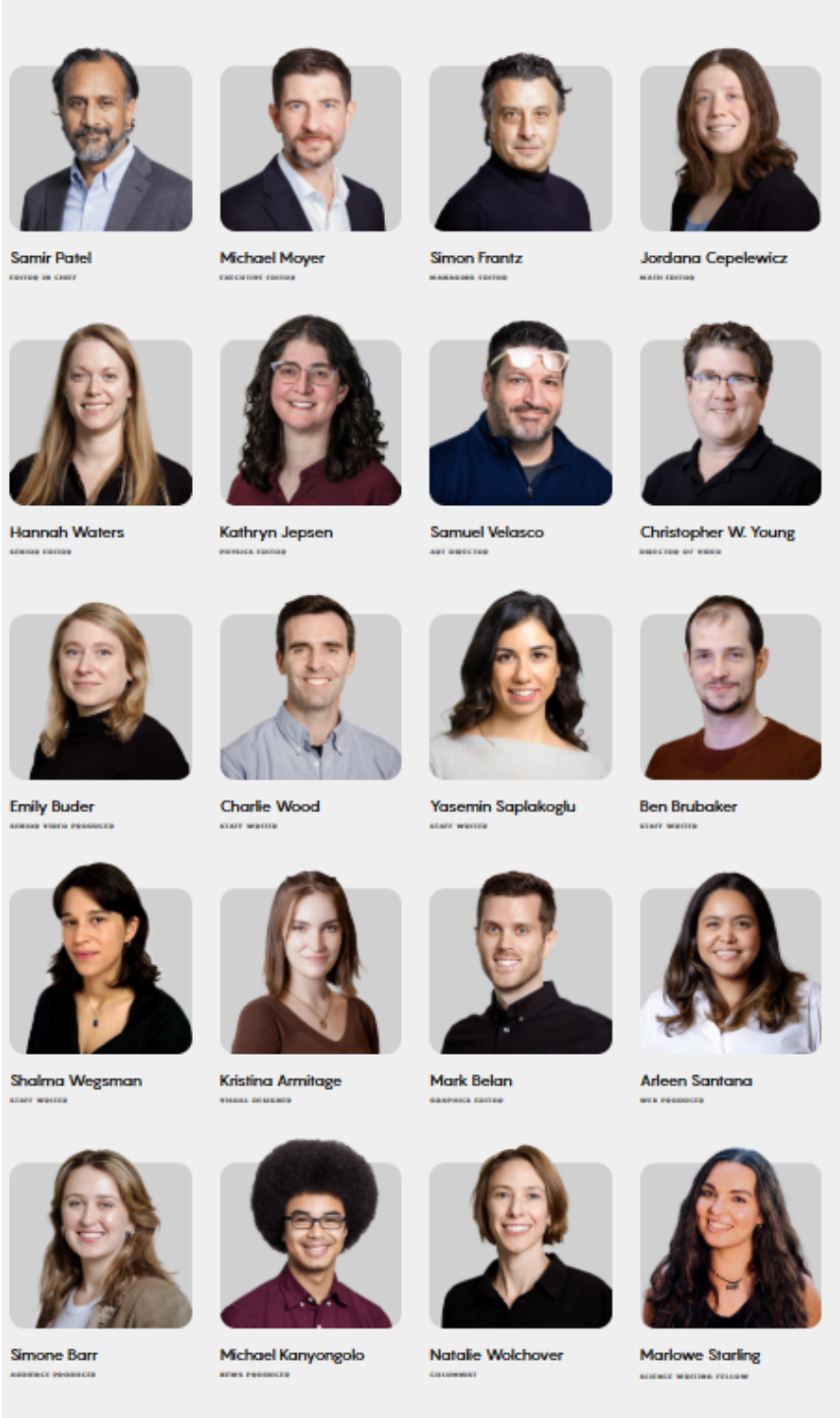
Experimental Tools/Techniques (4)

Miscellaneous (2)

Science and Society (1)

About *Quanta*

- An editorially independent online magazine funded by the Simons Foundation, founded in 2012
- Four staff writers, ~ 20 people on staff total
- “Illuminating basic science and math research through public service journalism.”
- Complex science and the human stories behind it
- Audience is ~ 80% non-scientists. Assume readers are smart and curious but know nothing.



My beat: (mostly theoretical) computer science

Edsger Dijkstra: “Computer science is no more about computers than astronomy is about telescopes.”

- Theory of algorithms
- Computational complexity theory
- Cryptography
- Error correction
- Quantum information science
- AI/machine learning

Quanta is the only magazine that covers most of these!

ARTIFICIAL INTELLIGENCE

Distinct AI Models Seem To Converge On How They Encode Reality

6 |

Is the inside of a vision model at all like a language model? Researchers argue that as the models grow more powerful, they may be converging toward a singular “Platonic” way to represent the world.

Do all AI models represent “cat” in the same way?

Mark Belan/*Quanta Magazine*

Ben Brubaker

Staff Writer

January 7, 2026

VIEW PDF/PRINT MODE

artificial intelligence
computer science
computer vision
large language models

Read a story about dogs, and you may remember it the next time you see one bounding through a park. That’s only possible because you have a unified concept of “dog” that isn’t tied to words or images alone. Bulldog or border collie, barking or getting its belly rubbed, a dog can be many things while still remaining a dog.

Artificial intelligence systems aren’t always so lucky. These systems learn by ingesting vast troves of data in a process called training. Often, that data is all of the same type — text for language models, images for computer vision systems, and more exotic kinds of data for systems designed to predict the odor of molecules or the structure of proteins. So to what extent do language models and vision models have a shared understanding of dogs?

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Why science writing is hard and rewarding

- A written document is a linear graph; science is a DAG
- Combinatorial explosion of possible story structures
- Second law of thermodynamics: most options are bad
- Writing as high-dimensional optimization; solution space is an ugly hypersurface