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DESPITE ITS SEEMING BEAUTY, the ivory tower has proven to be unwelcoming to many scholars with underprivileged backgrounds.

The social context of quarks

Chanda Prescod-Weinstein loves quarks, but not the environment that produces the physicists who work on them. In *The Disordered Cosmos: A Journey into Dark Matter, Spacetime, and Dreams Deferred*, she lifts the curtains hiding the nasty truths about how science is done and lays bare the structure of the academic culture that puts up systemic barriers built on inequalities and injustices. But the book is more than just an exposé. Starting from the Big Bang and continuing to the here and now, it also weaves a beautiful picture of the universe from its building blocks—elementary particles, dark matter, and dark energy.

Prescod-Weinstein is an assistant professor in theoretical particle physics and a core faculty member in women's studies at the University of New Hampshire. In addition to her academic work, she writes extensively for a broader audience as a columnist in *New Scientist*, in the opinion pages of newspapers like the *Washington Post*, and on her blog. Descending from a long line of historians, union activists, authors, and journalists, Prescod-Weinstein's essays and articles span topics from axions and supernovae to labor rights and the racist history of academia.

Bolstered by her intellectual lineage and informed by her personal experience as a Black, queer physicist from East Los Angeles, Prescod-Weinstein's book opens a new, unique window into the ivory tower. It shows us the rot behind the beauty: A large part of the book grapples with why her existence as a Black woman in physics and her viewpoint in academia are so unique.

The Disordered Cosmos begins by outlining the physics of elementary particles and describing our current understanding of the universe before delving into a deep and multifaceted analysis of the human behavior behind scientific research. The book is divided into what Prescod-Weinstein aptly calls phases—not chapters—because the transitions between some of them are first order. In only a hundred pages, for example, the reader is swept from Prescod-Weinstein's daydreams about quarks on a school bus into the harsh reality of the misogynist, racist world where those quarks are ultimately studied.

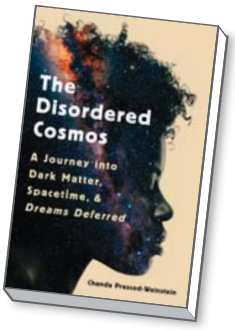
That juxtaposition is intentional: Whether she talks about the quantum gravity model she most admires—no spoilers as to which one!—or rape culture in our scientific abodes, Prescod-Weinstein lets us into her life and allows us to feel both the excitement of doing science and the pain of working in academia as a Black, queer woman. That might sound antithetical for a work of popular science, but *The Disordered Cosmos* is the type of book that compels us to shatter our preconceptions about science, scientists, and academia. For instance, it forces readers to confront the fact that rape is part of the scientific story—it affects who does science and what kinds of scientific ideas are allowed to be pushed forward.

As a particle physicist, I'm somewhat embarrassed to admit that I don't normally enjoy reading popular depictions of my own field. Considering how much I adored books like Stephen Hawking's *A Brief History of Time: From the Big Bang to Black Holes* (1988) as a young girl, that is a sad admission of my current habits. Having followed Prescod-Weinstein's writing for several years, I knew her book would be about more than physics, so I thought I might end up skimming the first few physics chapters before delving into the bits dealing with the field's social aspects.

The Disordered Cosmos

A Journey into Dark Matter, Spacetime, and Dreams Deferred

Chanda Prescod-Weinstein
Bold Type Books, 2021.
$28.00



I was wrong. *The Disordered Cosmos* is more than your usual popular-science book, and the sections about physics are well worth the read, even for someone in the field. Among other things, they illuminate flaws in our physics terminology. Take, for example, dark matter. Why do we call it dark? Does that usage align with the physics of dark objects? Having gotten many questions about that terminology at lectures in the past, I have enjoyed being able to cite *The Disordered Cosmos* when asked about it during talks. In fact, I have started using several details from the book in my presentations, which my audience has greatly appreciated.

A far more troubling case she points out is that we call the *SU*(3)-charged particles "colored." In the US that word has a loaded, racialized meaning, one that the individuals who coined the terminology were surely aware of. Because my native tongue, Turkish, does not have a direct equivalent of the word colored, the word *renkli*, which literally means "colorful," is used to describe such particles. One happy consequence of that slight change in literal meaning is that in Turkish the racialized context is lost. A similar language issue I was not attuned to is the way physicists use the word "dark" when we name particles or concepts. In Turkish, the word used is *karanlık*, which one might use to describe the color of the night sky, but never to describe dark skin. But that ambiguity exists in the English word "dark," and it is a lot more obvious to a Black person than to a white person.

Prescod-Weinstein's writing has compelled me and my collaborators to be more mindful about language when writing papers. I also found some wonderful historical gems in the book that will help make my physics teaching more nuanced: I'm looking forward, for example, to bringing up Black physicist Elmer Imes in my quantum-mechanics class.

The Disordered Cosmos is the rare book that one returns to again and again. It is so interesting and varied that I almost hope Prescod-Weinstein writes several sequels that each expand on different aspects of the book. But I'm guessing she'd prefer it instead if the scientific world made space for more people who come from untraditional backgrounds—so that those individuals could enrich our worldview by shining their own unique light on the physics we do. Let us work so that her dream is realized sooner rather than later.

Seyda Ipek
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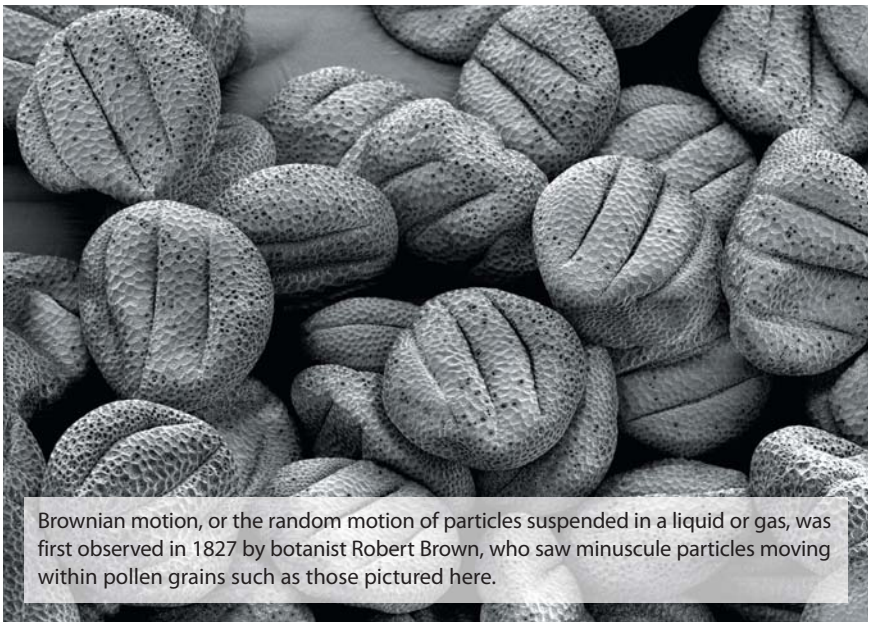

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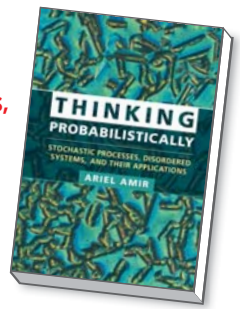
Brownian motion, or the random motion of particles suspended in a liquid or gas, was first observed in 1827 by botanist Robert Brown, who saw minuscule particles moving within pollen grains such as those pictured here.

Randomness unbound

The typical undergraduate statistical-mechanics course does not usually delve into advanced topics that require probabilistic reasoning to understand, such as extreme-value statistics, anomalous diffusion, and random-matrix theory. Nevertheless, many of those topics are closely linked to ongoing research trends in various fields. Ariel Amir, a professor at Harvard University, aims to remedy that situation in *Thinking Probabilistically: Stochastic Processes, Disordered Systems, and Their Applications*, a book of about 200 pages intended for advanced undergraduates and graduate students.

Amir's own work is at the vanguard of complex-systems theory, and his experience shows: One of *Thinking Probabilistically*'s main strengths is how it introduces many interesting and inspiring advanced topics, including barrier-escape problems, generalizations of the central limit theorem, and percolation. Each of those subjects has applications in several fields, which means that the book will appeal to students and researchers in a wide variety of disciplines.



Thinking Probabilistically
Stochastic Processes, Disordered Systems, and Their Applications
Ariel Amir
Cambridge U. Press, 2021. $105.00

Thinking Probabilistically assumes its readers have an undergraduate background in physics, that they are familiar with calculus and linear algebra, and that they have some background in probability theory and complex analysis. In that sense, the level of mathematical understanding required is on par with that of well-known textbooks such as *Mathematical Methods of Physics* (2nd ed., 1970) by Jon Mathews and R. L. Walker. Throughout, Amir is careful to prioritize physical intuition over mathematical rigor, and the author gives plenty of heuristic hints. For those who need help, the appendix contains brief reviews of probability theory, linear algebra, contour integration and Fourier transforms, some basic mechanics and statistical mechanics, and functional derivatives and Lagrange multipliers.