

be independent of cultural norms. He quotes the 19th-century philosopher Charles S. Peirce, who argued that scientists converge on the same reality despite starting with different assumptions. We assume that reality operates by rules we can hope to discover. Most scientists believe—not that I have taken a poll!—that the facts are out there to be uncovered, independent of the social norms of those who choose to look. The repeatability of measurements and observations is essential to that belief. The predictive power of science is what we expect if the world operates by rules, and scientists attempt to find good approximations to those rules.

Researchers have built up over decades knowledge relevant to the formulation of our present picture of the universe. Milestones include the first recognition of the expanding universe and its predominantly hydrogen composition in the 1920s, the development of the Big Bang theory in the 1940s, the discovery of the cosmic microwave background in the 1960s, the full recognition of the problem of dark matter starting in the 1970s, and the remarkable discovery of the acceleration of the expanding universe near the turn of the 21st century.

In large part due to Peebles's contributions, those facts were incorporated into our present theory, which is usually said in shorthand to be the Λ CDM model, in which Λ denotes the cosmological constant and CDM denotes cold dark matter. The now-accelerating universe is assumed to be pushed by the cosmological constant, which was originally intro-

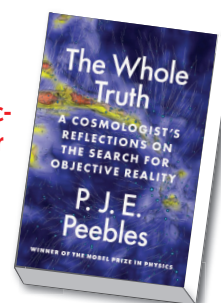
duced into general relativity by Albert Einstein in the late 1910s to keep the universe static, as it was then believed to be by some astronomers. It has now been resurrected from the dustbin of history to account for the accelerating universe. Peebles does a truly admirable job of marshaling the evidence that supports the Λ CDM theory, which leaves the reader with the feeling that he is correct in concluding that the universe pretty much obeys it and that it is thus a good example of objective physical reality.

Peebles considers the heart of the theoretical underpinning to the Λ CDM to be Einstein's theory of general relativity and spends substantial space discussing the establishment of that theory. He claims that there were no precision tests of it until the 1960s. If you believe, as I do, that a test with about 1% accuracy qualifies as precise, then that last characterization is incorrect. The very first test, which Einstein applied himself immediately upon completing his theory, was to compare its prediction of the perihelion position of the planet Mercury with the extra observed advance of 43 arcseconds per century that Isaac Newton's theory of gravitation could not account for. Einstein's theory passed that test with flying colors: Its prediction for the value was within about 1% of the observed advance, a limit set by the accuracy then achievable with the relevant measurements.

The book also discusses the possible future of the Λ CDM theory. Peebles expects the search for improvements in it to more likely end in exhaustion than in major changes. He makes the point that

The Whole Truth A Cosmologist's Reflections on the Search for Objective Reality

P. J. E. Peebles
Princeton U. Press, 2022.
\$27.95



the search for a fundamental basis for more complicated observed phenomena will continue in the future as long as society continues to support such endeavors. He further predicts that all who investigate the cosmos will arrive at the same result—an assumption, he states, that has not been challenged by any contrary evidence in at least the last century. In science, he stresses—and almost all scientists agree—we cannot prove our theories of the universe; we can only disprove them when their predictions do not agree with our measurements or observations. Peebles also mentions several times that theories in our physical-science armamentarium are incomplete. He doesn't, however, seem to discuss what would make a theory complete.

In concluding, I think that there are likely no more than a few educated people worldwide who wouldn't learn from Peebles's book. A physicist who wishes to learn the whole truth about our current knowledge of physical cosmology could accomplish that goal by reading this book and simultaneously learn a lot about related philosophy and sociology.

Irwin Shapiro

Harvard University
Cambridge, Massachusetts

NEW BOOKS & MEDIA



Silo

Graham Yost, creator
Apple TV+, 2023

The latest science-fiction series on Apple TV+, *Silo* is a detective show set in a human refuge known as the silo: a bunker with over 100 levels that protects the last 10 000 humans. If you ask to go outside, the leaders must let you go. But leaving the silo means that you die in front of the whole community. Or does it? A murder suggests there's more to that story, and an engineer named Juliette Nichols is determined to find out what it is. Like *For All Mankind*, another one of Apple's sci-fi shows, there's a dose of science in *Silo*. It's also a useful portrayal of the ways a society would have to adapt in a closed environment. —PKG



Living Histories

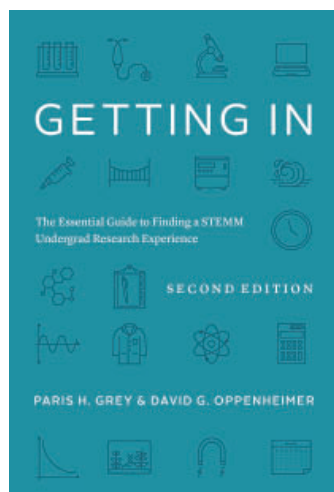
Srividya Iyer-Biswas, organizer
2020–

Conceived by Purdue University professor Srividya Iyer-Biswas, this ongoing web series aims to inspire current students by presenting brief, 15–20-minute biographical talks by established biophysicists about their own scientific journeys. Monthly presentations are streamed live and then posted on YouTube. Recent talks feature Harvard University professor Eugene Shakhnovich, who discussed his scientific upbringing as a physicist in a biological institute in the Soviet Union, and Na Ji, a professor at the University of California, Berkeley, who described how her life was shaped by her parents' experience during the Cultural Revolution in China. —RD

Getting In

The Essential Guide
to Finding a STEMM
Undergrad Research
Experience

Paris H. Grey and David G. Oppenheimer
U. Chicago Press, 2023 (2nd ed.). \$99.00



In the second edition of their user's manual for undergraduate research experiences, lab manager Paris Grey and principal investigator David Oppenheimer present an exhaustive look at the "hidden curriculum" behind lab culture. The book is divided into two parts. The first provides an overview of why research experience is valuable, describes research culture, and advises students on proper expectations for lab experiences. The second walks students through the process of searching, applying, and interviewing for research positions. *Getting In* is encyclopedic, perhaps to a fault: Although it provides a wealth of knowledge on all aspects of the undergraduate research experience, one wonders if its length and high-level language might intimidate its intended readership.

—RD 



Universität Regensburg

The Department of Physics, University of Regensburg, invites applications for a

Professorship of Experimental Physics (Chair, Paygrade W 3)

to be appointed as soon as possible.

The department is seeking a candidate with outstanding research achievements in the field of experimental condensed-matter physics. The individual should complement the departmental research focus, "Physics of Nanostructures", with activities in the areas of quantum transport, quantum circuits, or quantum materials. The holder of the professorship will be responsible for managing a new cleanroom facility established in 2018. Participation in the existing Collaborative Research Center 1277 is desirable. Active contributions towards the acquisition of future coordinated-research programs are expected.

The candidate is expected to be able to cover the entire breadth of the field "experimental physics" in teaching. The candidate is also expected to take on self-governance duties on the departmental and university level.

The prerequisites for this position, set out in the "Bayerisches Hochschul-innovationsgesetz (BayHIG)", Section 57(1), are a university degree; pedagogical skills; particular aptitude for scientific research as would usually be demonstrated by the quality of a doctoral thesis; and additional scholarly achievements, such as a habilitation or equivalent academic experience. Scientific research experience gained outside of a university environment, or while employed as a Junior Professor, will also be taken into consideration and may be considered equivalent to a formal academic qualification. Leadership of a junior research group according to the stipulations of BayHIG Section 98(10)(5) constitute an equivalent scientific achievement.

The University of Regensburg aims to raise the number of female professors and expressly encourages applications from qualified female scientists. The University of Regensburg offers support to families to meet the demands of the workplace (see www.uni-regensburg.de/familienservice for more information).

Candidates with disabilities and essentially equivalent qualifications will be given preferential consideration.

The legal requirements for appointment into the civil service are set out in the "Bayerisches Beamtenengesetz" (BayBG) and the BayHIG. Stipulations regarding the age of the candidate exist according to BayHIG Section 60(3).

Applications accompanied by supporting documentation (CV with copies of certificates; list of publications; description of research experience and research interests; statement of research; list of third-party funding; description of teaching experience and statement of teaching philosophy) should be submitted, preferably in electronic form in a single file, by **August 31, 2023** to The **Dean, Department of Physics, University of Regensburg, 93040 Regensburg, Germany** (fakultaet.physik@ur.de).

This is the English translation of a German job advertisement published by the Universität Regensburg at www.uni-regensburg.de/universitaet/stellenausschreibungen/. Only the original German text is legally binding.