

bounds on the amount it deviates from monotonic increase. Those bounds get narrower as the number of particles increases. That is certainly an interesting result.

The next part of the book involves a technical demonstration of another intriguingly suggestive result: If one assumes that both the energy and the total angular momentum of the universe are equal to zero, one can show that the Janus point is a point of total collision or total explosion akin to our Big Bang singularity. It thus follows that particle configurations become highly symmetric as the Janus point approaches, which suggests that the “special” initial conditions that seem to dominate in the early universe might actually be generic features of the early stages of a gravity-dominated universe.

To show that increasing complexity is a good proxy for time’s arrow, Barbour must demonstrate that it not only strongly tends to increase monotonically but also that the increase manifests in the myriad temporally asymmetric processes that provide the observational basis for our arrow of time. At times he fully embraces that idea and argues that the growth of complexity, not the growth of disorder, “puts the direction into time—and us into the universe to witness its forward march.” Elsewhere he is content to concede that purely dissipative processes in which complexity decreases are also part of the arrow of time.

Be that as it may, making a precise connection between complexity or cosmological expansion and the observed arrow of time is of secondary interest to Barbour. More important for him is to overcome what he and others, including Bertrand Russell and Steven Weinberg, regard as the bleak prospect of heat death. Although he acknowledges that energy is continually dissipated in an expanding universe in accordance with the second law, Barbour wants to explain why structure, complexity, life, and art nevertheless continue to emerge. As he says on the penultimate page, *The Janus Point* is “in part, a song of thanks to the cosmos and the fact that I, like you, am a participant in whatever it does.”

One could hardly find a more romantic view of the cosmos.

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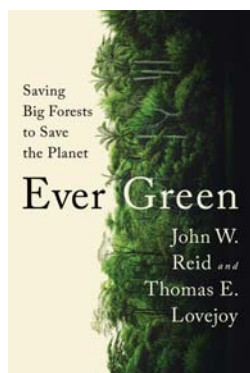
NEW BOOKS & MEDIA

How to Take Over the World Practical Schemes and Scientific Solutions for the Aspiring Supervillain

Ryan North
Riverhead Books, 2022. \$28.00

Have you ever watched a James Bond movie and thought, “Wow, I’d love to have a secret base like the ones those supervillains romp around in!” If so, *How to Take Over the World* by Ryan North, a comic-book writer, is the book for you. By outlining how one could theoretically carry out various schemes like cloning dinosaurs, controlling weather, destroying the internet, and becoming immortal (Spoiler alert: It’s not possible!), North cleverly presents readers with an introduction to subjects as varied as the chemical makeup of Earth’s core and the international treaties governing the use of Antarctica (the ideal location for a secret base). Fun, snarky illustrations by Carly Monardo round out the compelling package.

—RD



Ever Green

Saving Big Forests to Save the Planet

John W. Reid and Thomas E. Lovejoy
W. W. Norton, 2022. \$30.00

Just five megaforests—“stunningly large, wooded territories”—remain on Earth, write John W. Reid and Thomas E. Lovejoy, a conservationist and a biologist, respectively. Yet those vast expanses continue to be threatened by human deforestation. In *Ever Green*, Reid and Lovejoy describe their extensive expeditions to all five megaforests, the forests’ vast biodiversity and geography, and the many researchers and Indigenous people who work and live in them. They focus on megaforests’ importance not just as Earth’s wildest, most biologically diverse lands but also as vital carbon sinks. Thus, *Ever Green* serves as a call to arms to modern society to better appreciate this natural resource, which is key to curtailing climate change and averting the social crises and ecological disasters that it will cause.

—CC

A Brief History of Timekeeping The Science of Marking Time, from Stonehenge to Atomic Clocks

Chad Orzel
BenBella Books, 2022. \$16.95 (paper)

How do we keep track of time? Why have societies invested so much effort into doing so? Those questions are the subject of *A Brief History of Timekeeping* by Chad Orzel, a professor of physics at Union College. Much of the focus is on the science of keeping time—from solar and lunar calendars to modern-day atomic clocks—but Orzel also considers the social context of keeping time. As he points out, politics, philosophy, and theology have been part of timekeeping since its beginnings. One cannot help but be amazed by some of the historical anecdotes Orzel relates, such as the remarkable reliability of the Gregorian calendar system, used by most of the world today. Developed in the late 1500s, the Gregorian year differs from the tropical year by only 26 seconds. Ultimately, Orzel notes, measuring time is a “signature preoccupation” of human society.

—RD **IT**

