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hamper the book. When Conejo considers the flow through a tube, for example, he does not include the fluid density ρ in one list of pertinent variables early in the book but adds it to a similar list later without any explanation. Similarly, in the chapter on Buckingham's theorem, Conejo does not mention that one of the requirements when selecting repeating variables is that a subgroup should not be able to form a dimensionless group. Another serious omission is the lack of discussion of chemical and material similarity in chemical reactions encountered frequently in metallurgical processes.

Several typos also slipped through the cracks. At one point, for example, Conejo mentions the physicist Osborne Reynolds when he surely means Lord Rayleigh. Later in the book, the discussion of the Navier–Stokes equations contains several errors: The x -component of the equations should contain g_x and not g , the expression for the so-called total deriva-

tive is incorrect, and no distinction is made between scalar and vector quantities. Neither the equations nor the tables presented in the book are numbered, which makes it rather tedious to read.

Fundamentals of Dimensional Analysis is a curious book. It isn't a textbook, but neither does it present the state of the art in dimensional analysis. For that reason, it isn't clear who its target audience is. But the book does contain some interesting and novel applications of dimensional analysis (although similar works do too), and the historical sections at the beginning of most of the chapters are effective. On those counts, it is a worthwhile addition to the existing literature. But I continue to prefer other books on the subject like Don Lemons's 2017 textbook *A Student's Guide to Dimensional Analysis*.

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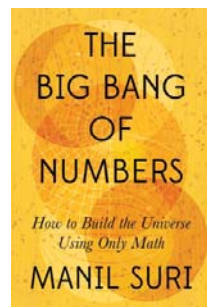
NEW BOOKS & MEDIA

Good Night Oppy

Ryan White

Prime Video, 2022

During the 1990s, NASA lost three Mars missions: *Mars Observer*, *Mars Climate Orbiter*, and *Mars Polar Lander*. So a lot was riding on the rovers *Spirit* and *Opportunity* when they launched in 2003. Originally intended to survive 90 Martian days on the planet's surface, both rovers remained active for years: *Spirit* until 2011 and *Opportunity*, remarkably, until 2018. In *Good Night Oppy*, the director, Ryan White, uses archival footage, interviews, and artistic renderings to compose a love letter to *Opportunity* and the scientists and engineers who worked on it. It's touching to see how attached the NASA team became to *Opportunity*, which overcame dust storms to reach Endeavour Crater after a three-year trek. Although the film falls firmly in the inspirational-documentary genre, it is a fun watch. —RD



The Big Bang of Numbers

How to Build the Universe Using Only Math

Manil Suri

W. W. Norton, 2022. \$32.50

Inspired by the popularity of his 2013 *New York Times* opinion piece, "How to fall in love with math," the mathematics professor Manil Suri has expanded on the topic of math appreciation with *The Big Bang of Numbers*. Aimed at math novices and enthusiasts alike, the book begins with the titular Big Bang, an "origins" story in which Suri shows how to create math's basic building blocks—numbers—out of nothing. He then goes on to discuss how those numbers can be used to devise arithmetic, geometry, algebra, and physics, and ultimately to construct the entire universe. By limiting the formulas and equations, the author has created a very readable tour of mathematics that emphasizes ideas over calculation.

—CC PT



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