Most Wanted Particle: *The Inside Story of the Hunt for the Higgs, the Heart of the Future of Physics* by Jon Butterworth, The Experiment, LLC, New York, 2014. ISBN 978-1-61519-246-5 $24.95.

Jon Butterworth's *Most Wanted Particle* is an often very funny first-person account of his involvement in the experimental confirmation of the Higgs boson at the Large Hadron Collider (LHC) near Geneva, Switzerland in 2012. Dr. Butterworth was involved in developing algorithms to analyze the "jets" of particles that are produced in the proton-proton (or other) collisions and how their properties can provide indirect evidence for short-lived and massive bosons.

The tale is interwoven with many personal opinions and anecdotes that illustrate the "two steps forward, one step back" nature of the endeavor. These include the heartbreaking accidental explosion of superconducting magnets in the LHC due to a welding error just after the initial startup that led to a yearlong delay. The author shows his painful empathy for excited young physics students who had to deal with not taking data for a year.

Separate scientific sections explain both the Standard Model of particle physics and the gaping hole that could be filled by proving the existence of the boson predicted by Peter Higgs and his colleagues that imparts mass on all fundamental particles. Butterworth explains the statistical criteria that had to be painstakingly agreed upon to actually call the data evidence for a "Higgs boson".

The reader will come to appreciate the incredible long-range planning, engineering, computing, and infrastructure (just thinking of the plumbing, safety and administrative aspects makes one's head hurt) required to build and maintain a giant instrument to examine matter at its tiniest and most powerful scale.

An excellent aspect of the book is how, as a leader and representative for the ATLAS detector at LHC, Butterworth had to confront via social and other communication media the constant tension in our culture between funding hugely expensive efforts like the LHC and the inability to say exactly when and how discoveries made there will benefit humanity directly. On that note, Butterworth reminds us that the world-wide-web is a direct result of Tim Berners-Lee figuring out how to immediately share data from large particle accelerator experiments with collaborators across the globe.

As an occasional user of synchrotron light sources, this reviewer is always in awe of what biologists, chemists, and materials scientists have been able to accomplish due to these large physics-based particle accelerators and their spin-off applications. A nice teaching aspect of the book is how Butterworth explains the requirements of wavelength and resolution for probing matter at the level of quarks, gluons, and Higgs bosons in a way that I could relate to as an X-ray crystallographer.

Butterworth's account shows that the Higgs experiment was the result of brilliant theory that makes testable hypotheses (once the energy to test them is accessible), enormous technical and logistical mastery, massive public support (hence funding), teamwork that keeps the "eyes on the prize", and dogged persistence. His enthusiasm and emotional highs and lows are infectious, including funny anecdotes about scientific meetings, chance encounters, and dealing with the public. Sometimes I found the writing to be a bit rambling due to many digressions, and it was not hard to become lost in the nomenclature. I would recommend the book to scientists or nerdy types interested in fundamental discoveries, but I am not sure that a non-scientist would enjoy it as much.

Joseph D. Ferrara, Ph.D.
Chief Science Officer