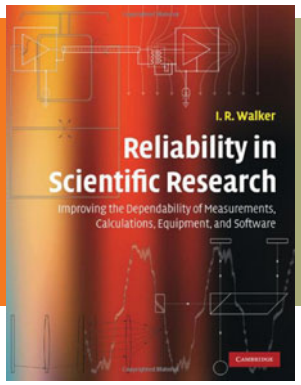

Reliability in scientific research: Improving the dependability of measurements, calculations, equipment, and software
I.R. Walker

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The book *Reliability in Scientific Research* by I.R. Walker, contains a unique mixture of practical advice for building or troubleshooting laboratory apparatus and consideration of the human role in the experimental endeavor. The comprehensive nature of the topics covered, along with concise chapter summaries and extensive references at the end of each chapter, make this text useful to a broad audience and particularly helpful to novice researchers.

Much of the text addresses key classes of experimental apparatus, including vacuum systems, cryogenic systems, optics, electronics, and mechanical systems. The focus, as the title suggests, is on reliability: how to design for long-term functionality, what can go wrong, and suggestions for troubleshooting problems. For example, chapter 7 on vacuum systems describes in a cursory manner how each pump or vacuum gauge works, focusing most of the discussion on relative durability and potential problems (and how to prevent them) for each type of pump. In chapter 11, the discussion of electromagnetic interference, including ground loops, is particularly nice. It provides a detailed discussion of topics that are often overlooked in laboratory training.

The end of each chapter includes a lengthy list of references. The "Further Reading" section of each chapter highlights and annotates a few of the references from the list, but categorizing the remaining entries would have made the reference list more useful. Chapter 2, which covers errors in mathematical calculations, seems out of place in a text that otherwise skews heavily toward the experimental side of research.

Chapter 1 on the human role in reliability of scientific measurements and chapter 14 on the experimental method highlight the fact that science is done by humans, who make errors, carry subconscious biases, and generally introduce an element of unreliability into research. The topics in these chapters are critical ones for beginning researchers, but they are often overlooked. Several historical case studies in chapter 14 effectively highlight the mistakes that result when experimentalists do not fully understand their experimental system or employ poor experimental techniques.

I will definitely keep this book in my laboratory as a general reference for experienced laboratory members, and particular chapters will be assigned reading for new research students. For example, chapter 4 on obtaining items from commercial sources has excellent, practical suggestions for making laboratory purchases that often are not written down or comprehensively explained to beginners.

The appropriateness of this book as a text for an undergraduate advanced laboratory course will depend on the instructor's goals for the course, but it would be excellent for a seminar or practicum that supports student independent research experiences. However, *Reliability in Scientific Research* will be most valuable in the research laboratory as a resource for individuals with a range of backgrounds from undergraduate students to full-time researchers.

Reviewer: Melissa Eblen-Zayas *of the Department of Physics and Astronomy at Carleton College.*