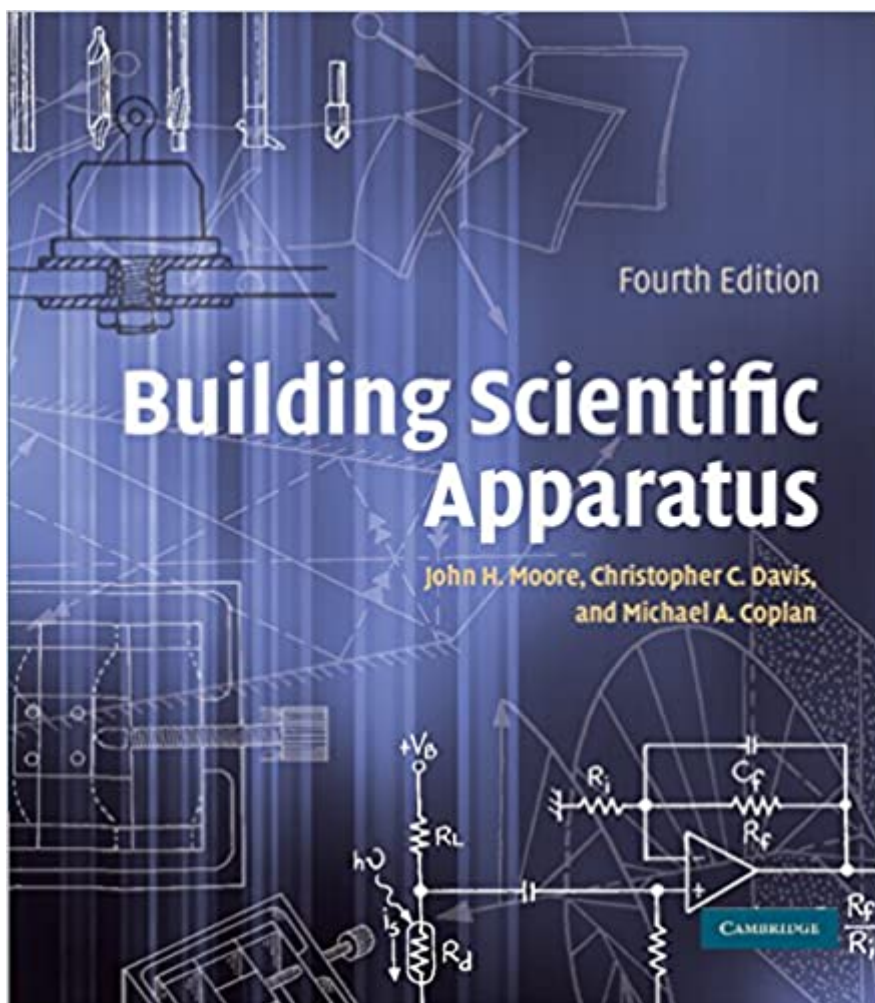


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# Building Scientific Apparatus



## Synopsis

Unrivaled in its coverage and unique in its hands-on approach, this practical guide to the design and construction of scientific apparatus, or laboratory instruments, is essential reading for every scientist and student of engineering, and physical, chemical, and biological sciences. Featured in this great new edition are features including the physical principles governing the operation of the mechanical, optical and electronic parts of an instrument, new sections on detectors, low-temperature measurements, high-pressure apparatus, and updated engineering specifications. 400 hand drawn figures and tables, have been added to this edition, which basically teaches scientists and engineers how to perform experiments.

## Book Information

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## Customer Reviews

Pre-Publication Praise: "This new edition includes updates throughout, and will continue to serve as a bookshelf standard in laboratories around the world. I never like to be too far from this book!"

Jason Hafner, Rice University, Houston, Texas  
Pre-Publication Praise: "... the first book I reach for to remind myself of an experimental technique, or to start learning a new one. With valuable additions ..., the newest addition will be a welcome replacement for our lab's well-thumbed previous editions of BSA."

Unrivalled in its completeness, this guide to the design and construction of scientific apparatus is essential reading for all scientists and students in physical, chemical and biological sciences, and

engineering. Detectors, low-temperature measurements, and high-pressure apparatus, updated engineering specifications, are all new to this edition.

This book is an amazing compendium of information essential to being a great scientist. Unlike most science related books, which teach only the theory behind instrumentation, the authors of "Building Scientific Apparatus" took the time to discuss both the basic theory AND the practical logistics of building and maintaining different types of scientific instrumentation. The book is written for someone with a science background, but not an engineering one. It is often too easy for scientists to duct tape and WD40 our way to some temporary apparatus that will suit a single experiment. However, all too often this "temporary" (aka jury rigged) set-up ends up being used for years. Unfortunately, when problems arise (which they ALWAYS will with jury rigged equipment) scientists (especially graduate students) have a tenancy to ignore the issues either because they "don't have the time" or don't have a clue how to fix them. That's where this book comes in handy. Whether you are fixing one of these temporary systems, or building some apparatus for an experiment - this book has the information necessary to transform that jury rigged set-up into one that wont have to be rebuilt over and over. It has a great description of machine shop capabilities (and the basics of how to machine parts), and an intro to glass blowing. After that is where the book really takes off and discusses more directly related topics: Building/maintaining vacuum chambers, optics, lasers, and electronics each of which are given adequate space in the book. The authors include a lot of the basic theory of each chapter in an easily understandable manner (which is not necessarily unique to this book). But the real treasure trove in this book is the practical, almost hands-on information that is so often overlooked in science labs. For instance the the chapter on electronics starts out with the theory of electronics and description of different components, but then moves on to discusses the intricacies of grounds and grounding, different sources of noise and info specific to power supplies, and data acquisition. Finally, the last part of the electronics chapter discusses logistics and practical information such as component selection, printed circuit boards, board design, and even a primer on essential techniques like how to solder electrical components correctly. All in all, this is a great book for anyone, equally helpful for someone starting out as a young scientist or an experienced scientist beginning a new scientific endeavor. All you have to do is look through the table of contents and I'm sure you'll agree.

I am studying a PhD in Mechanical Engineering, and I found this reference an excellent way to fill in the gap between engineering design (in which I am experienced) and the design of scientific

apparatus. Designing and building is a unique and peculiar discipline, combining fastidious attention to detail and a slap-dash approach - all justified by scientific rigor on the one hand and limited budgets on the other. This book gives a grounding in basic engineering skills and the technical data and summaries needed to apply most contemporary scientific gear. I found the overviews of electronics for signal conditioning, the basics of hooking together DAQs and sensors and the various small mechanisms that have evolved to fulfill the needs for accurate positioning and motion control. If you are starting out building scientific apparatus, get equipment with excellent manuals and a copy of this book. Later on you might slap together an awesome measurement system from hand-me-downs and scrap and your awesome experience, but start with something basic. This book is an excellent way to get up to speed and make a start.

This book is a very good reference for an experimental scientist covering a wide range of topics regarding design and fabrication of experimental apparatus. It also includes some information on making measurements. The primary drawback of this book is that it is somewhat dated. The drawings in the section on mechanical design and fabrication look like they came from the 50s and the section on data acquisition is quite obsolete considering current computer and data acquisition technology.

This text was required reading for joining an experimental research laboratory and I am able to reference it when attempting to work with anything hands-on in the laboratory for the first time. It contains general information about how tools and machining parts operate as well as details about vacuum components, optics (both photons and charged particles), electronics, etc. All figures are hand-drawn, clear, and concisely labeled -- high-quality stuff. Highly recommended for all fields of experimental work.

I had an early edition of this book and was very impressed with it, although some of the sections seemed a little dated. Now, with this new edition, the authors have done a fine job of updating the sections that have changed and added even more information and reference data to draw upon. I highly recommend this book if you are a student in a lab or professional building out a new experiment or just basically want to have some more in-depth knowledge on how to implement various scientific instruments.

I have some of the best physics/engineering texts in my library. This one is one of my favorites. An

incredible resource for the modern scientists or engineer. If any book on deserves 5 stars, it is this book. (Although, there are a few minor errors regarding units but no biggie. This should absolutely NOT dissuade you from getting this book) Thank you for putting all this great lab information together!!!!

Good reference, lots of detail.

Very good book for learning how to build apparatus.

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