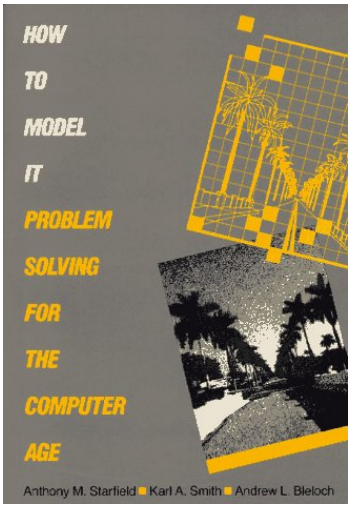
Reviews

Starfield, Anthony M., Karl A. Smith, and Andrew L. Bleloch. 1990. *How To Model It: Problem Solving for the Computer Age*. xii + 206 pp. New York: McGraw-Hill. ISBN 978-0-07-005897-2. 1994. Reprint. Edina, MN: Burgess International Group. ISBN 978-0-80877-970-4. 2020. Reprint. Buford, GA: LAD Custom Publishing. https://ladbookstore.com/products/how-to-model-it-problem-solving-for-the-computer-age-print. $25(P), $16(digital).



Many times, textbooks on mathematical modeling turn out to be a series of chapters on different models in a variety of different areas related to the interests of the authors. These texts demonstrate classical models of the field and provide insight into the cutting-edge approaches used in research in the variety of fields that they cover. They sometimes discuss the data that provided the parameter estimations used in the models. They also frequently cover solution and analysis techniques for the mathematical formulations resulting from the models.

However, while these models typically provide great insight into the mathematics and models and science addressed in that field, these texts more often than not fail to give insight into the actual process of modeling. *They are missing the "ing" of "modeling".*

In *How To Model It*, Starfield, Smith, and Bleloch shoot directly at the "ing", *the process of modeling*. The goal of this text is to remove the complexities of challenging models and to leave much of the detailed mathematics aside. Instead, the focus is on the nuances of the process, from a generic statement or scenario (When will my beer be cold? How many balloons will fit? How do I get the food to be ready at the same time?) to a reflection on how to improve the model in a next revision (What if the beer is in a bottle instead of a can? What if I consider the shape of the balloon more carefully? What if I don't want to leave my guests so I can cook the dessert?).

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This small and clever book actually does more than this: It creates a nice pairing of classic (but freshly imagined) canonical models with different stages of the modeling process and takes the time to address each one fully. It then asks the reader to consider different views on each step in the process and reflect on each decision.

For example, Chapter 4 uses the classic Newton's law of cooling problem as a stage for discussing modeling assumptions, parameters, and variables, and detailed formulation of a mathematical representation. It also reinforces ideas from the previous chapters such as making full use of the brainstorming stage, writing down heuristics, and outlining potential assumptions.

In Chapter 9, a variation of the marriage problem (or secretary problem) is used as the basic platform for introducing the role of randomness and simulation in optimization problems. It also addresses issues to consider in revising a model when given new information.

The authors continually refer to "our approach" and ask the reader to reflect on "your approach," nicely implying that there is no single correct approach. This allows for full freedom in creativity and expansion based on the preparation of the reader.

Since the mathematical sophistication in the text is minimal, the text can be used at a variety of different levels. You can simply adjust your expectations for your students. That said, I don't see this book as a stand-alone book except at a very low level. At the least, it needs to be supplemented with projects. At the most, it needs to be supplemented with another text that broaches the more sophisticated models that are not accessible to such a broad audience. Models related to the law of mass action are not introduced. There are no models of complex physical processes and no models of financial processes. This is simply a very nice little text on the process of mathematical modeling.

In my own teaching, I have used this text as resource for 10 of the class sessions in a graduate course in modeling, to frame the modeling process (one session for each chapter). I fill out the remaining class sessions with the theory of more-complicated models, the project work for longer problems, and details of simulations from other sources (usually me).

I could complain that some of the authors' ideas are just not in the other modeling textbooks, but separating these concepts out with much-simpler examples works very nicely. I wouldn't object to additional acknowledgment of the modeling process in other texts; but this small inexpensive book is very good at what it does. Trying to combine the process and the models into a larger text might detract from both—but I look forward to all attempts!

I do hope that a new edition of this text might come out at some point. While I enjoy it, there are areas that could be updated or improved. More currently-relevant examples could be used, and a better tie to current computational tools would be of great benefit. I don't mind adding those my-

self, but it is always nice when the text and the professor agree.

Finally, the text is written in a light conversational manner with lots of questions sprinkled through the text. While these questions could be highlighted better with updated typesetting and graphics, they serve as a nice guide to an interactive experience with the book. I would encourage you and your students to engage fully with the book and not just read the words on the page. This is an old but excellent book newly re-available. Get a copy and try it out!

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[EDITOR'S NOTE: A reflection by the authors of *How to Model It* appears elsewhere in this issue, on pp. 107–116.]