Climate science is one of the most active fields that is being explored by researchers in meteorology, oceanography, and many other disciplines. Central to these endeavors are the insights provided by climate models. A growing area of interest in climate modeling is the simulation of past climates of our planet. This new thrust is essential for providing context for climate change evolving into the future. It is important to learn the status of our understanding of paleoclimatology from the scientists who have provided this body of work. Plucking out the salient details from geological research is not usually so easy for the modeler.

This book by Colin Summerhayes provides an excellent source of information about paleoclimatology and insight for researchers across a wide spectrum of backgrounds. It presents the history of the discipline of paleoclimatology as it has developed over the last few centuries. Concurrently, Summerhayes uses the marine geologist’s lens to explain how we have come to understand the past climates of Earth. The author is a fellow traveler along the trajectory of that history. The story of the overheated controversies among geologists and their resolution amount to one of the marvels in the history of science, and it is worth reading by any scientist.

The book begins with a great puzzle in the nineteenth century related to glaciers in the Alps. Did these ice sheets expanding from the mountains into the plains explain the many odd occurrences, such as large boulders lying isolated in the plains? Or was it the great flood of Noah that brought those boulders? More data and understanding led to the idea of ice age cycles. Did the cycles actually exist, and what might have caused them? Theories began to emerge—such as Croll’s—that there might be an astronomical explanation. Other theories of the early twentieth century included the role of trace gases and the greenhouse effect as a stimulant of climate change.

This is just the beginning of a thrilling ride through continental drift and its consequences—how the location and configuration of the continents can have a drastic effect on climate. Drilling cores from the ocean floor became the dominant new source of information. We learn from these seafloor data that the climate does have a pulse marked by the ebb and flow of continental ice sheets.

Thanks to the digital computer in the second half of the twentieth century we find improvements of our understanding of the greenhouse effect. On the observational side we find a new tool: the drilling of ice cores and the conversion of that data into a history of trace gases in the atmosphere and the temperature at the surface going back 800,000 years. The author explains how these advances came about and how they worked. Other markers are discovered, such as indicators of past sea levels from coral terraces and their correlation with the volume of ice on the land.

We are taken through the quantitative timing of the great glaciations and their connection with the calculated changes in Earth’s orbital elements. We also find that CO$_2$ and other greenhouse gases change at the same frequencies as the ice volume and the orbital elements. Finally we arrive at the Holocene (the last 10,000 years) and its very mild climate, at least up until the most recent warming trend. The author discusses the likely causes of the recent warming.

Summerhayes tells his story without equations, but his explanations are very carefully laid out in such a way that an outsider can follow without difficulty. Many clearly drafted graphics are included, and hundreds of references to original works at the ends of each chapter will entice the interested reader.

I enjoyed the short biographical sketches of the heroes, many with thumbnail portraits. The lives and contributions of these giants are fun to read and they bring to life the thrill of discovery and the many fierce battles that eventually led to the solution of the prob-
lems. I met quite a few of them in my own brushes with paleoclimatology. My admiration of them was renewed and amplified as I read.

Perhaps I am an old curmudgeon, but I think there are many problems that are yet to be solved in the give-and-take between climate theory (including climate models) and the record. I am not sure we can yet explain how an ice sheet gets started after being nudged by the orbital element shifts. The astronomical theory provides a pacemaker for the ice ages, but some parts of the mechanism are still missing. Even if we allow the greenhouse gases to enhance the response, it does not seem to be enough. I am also not so sure of the Sun’s changes in brightness as an explanation for the Medieval Warm Period or the so-called Little Ice Age.

Reading this great history reminds me of the explosive changes during the last century in physics, chemistry, mathematics, and biology, to name just a few. Reading and contemplating history provides us with context within which we live and work. This book helps.

—Gerald R. North

Gerald R. North is a research professor in the Department of Atmospheric Sciences at Texas A&M University.

**PYTHON PROGRAMMING AND VISUALIZATION FOR SCIENTISTS**
Alex DeCaria, 2016, 270 pp., $24.00, softbound, Sundog Publishing, ISBN 978-0-9729033-7-0

Python is becoming a popular choice among scientists to analyze their data due to the language’s flexibility, ease of use, and the large amount of freely available libraries. Learning Python can seem overwhelming at first, but Alex DeCaria’s book, *Python Programming and Visualization for Scientists*, looks to simplify the learning process by only explaining the basics needed for scientists to be productive. While this book expects that you have experience with programming, it does not require any Python experience. The book is divided into three sections: “Python Basics,” “Plotting and Visualization,” and “Advanced Topics.” The “Python Basics” section explains basic syntax, simple I/O, functions, and classes. Those with Python experience can easily skip this section, which comprises almost half the book. However, if your Python experience was gained through online searches, you may want to consider reviewing this section, as it provides a great review of the basic language. This section also provides

**NEW PUBLICATIONS**

**FLOOD FORECASTING: A GLOBAL PERSPECTIVE**

This book describes flood forecast systems and operations as they currently exist at national and regional centers around the globe, with a focus on the technical aspects of these systems. It includes details of data flow, what data are used, quality control, hydrologic and hydraulic models used, and unique problems faced by each system. Each chapter describes the system and details its strengths and weaknesses. The text provides historical coverage to help readers understand why forecast systems have developed as they are and to see how specific systems deal with common forecasting problems.

**AN INTRODUCTION TO CLOUDS FROM MICROSCALE TO CLIMATE**

This book provides a fundamental understanding of clouds, ranging from cloud microphysics to large-scale impacts of clouds on climate. On the microscale, phase changes and ice nucleation are covered, including aerosol particles and the thermodynamics relevant for cloud formation and precipitation. At larger scales, cloud dynamics, midlatitude storms, and tropical cyclones are discussed, leading to clouds’ role in the hydrological cycle and their effect on climate. Each chapter ends with problem sets and multiple-choice questions that can be completed online.

**WEATHER ANALYSIS AND FORECASTING: APPLYING SATELLITE WATER VAPOR IMAGERY AND POTENTIAL VORTICITY ANALYSIS (SECOND EDITION)**

This book explains how to interpret water vapor patterns in terms of dynamical processes in the atmosphere and their relation to diagnostics available from numerical weather prediction models. The main focus is on the close relationship between satellite imagery and the potential vorticity fields in the upper troposphere and lower stratosphere that provides a set of operational forecasting methods.
several “gotcha” warnings that are helpful to new Python users.

The second section, “Plotting and Visualization,” walks the reader first through the process of creating simple plots and then toward more complex plots by using matplotlib and basemap. The book gives many great examples that are geared toward the weather and climate communities, ranging from basic x,y plots, to polar plots, to contour plots with wind barbs or streamlines, to 3D plots. Basemap is also discussed for users who require a plot with a map underlayment. Some of the code examples in this section build off of previous examples, so new Python programmers should use caution if they skip around from examples because key concepts are added throughout this section.

The “Plotting and Visualization” section also discusses how to read in NetCDF and HDF5 data. Only the basic concepts of reading in NetCDF and HDF5 datasets are covered; writing files in these formats is not covered. Because working with datasets is such an important part of a scientist’s workflow, this topic might have benefited more if it was placed in the “Advanced Topics” section, where it could have been discussed in more detail without seeming out of place.

The final section, “Advanced Topics,” discusses in great detail the topics of regular expressions and Fourier analysis. Both of these topics are thoroughly discussed in a straightforward manner. Time and dates are also discussed in great detail, but it would have been helpful to discuss handling non-Julian calendars, which can be tricky to first-time users. This section also briefly mentions simple statistics, handling of matrices, and code performance.

This book should not be used as a complete reference for Python. It was written to give beginners a productive start in learning the language. Where the book is not complete, the author lists suggestions on where to go for more information on the topic, which is helpful.

This book would be very useful for an introductory scientific programming class. I would also recommend it for scientists who would like to learn the basics of Python and who would like to start programming within a couple of days. While I would not generally recommend this book for experienced Python programmers, it does discuss useful topics in the last section that experienced programmers might find helpful. The book is generally well organized into clear sections, which would allow experienced Python programmers to skip around to different sections to find relevant information quickly.

—Sheri Mickelson.

Sheri Mickelson is a software engineer within the Computational Information Systems Laboratory at the National Center for Atmospheric Research in Boulder, Colorado.

MICROCLIMATE AND LOCAL CLIMATE

This book provides a treatment of the variables and processes of microclimate and local climate, including radiation balance and energy balance. It describes and explains the climate within the lower atmosphere and upper soil—the region critical to life on Earth. Topics covered include not only physical processes that affect microclimate, but also biological processes that affect vegetation and animals. A geographic tour of the microclimates of the major ecosystems around the world is included. All major biomes and surface types are examined, and the effects of climate change on microclimate are described.

PHYSICS OF RADIATION AND CLIMATE
M. Box and G. Box, 2016, 495 pp., $74.36, softbound, CRC Press, ISBN 978-1-4665-7205-8

Starting at the physical fundamentals of how electromagnetic radiation interacts with the various components of the Earth’s atmosphere, this book covers the essential radiation physics leading to the radiative transfer equation. The book then develops the central physics of the interaction between electromagnetic radiation and gases and particles: absorption, emission, and scattering. It examines the physics that describes the absorption and emission of radiation, using quantum mechanics, and scattering, using electromagnetism. It also dedicates a detailed chapter to aerosols.

COASTAL OCEAN OBSERVING SYSTEMS

This book provides scientific and technological knowledge in coastal ocean observing systems, along with guidance on establishing, restructuring, and improving similar systems. The content is intended to help oceanographers understand, identify, and recognize how oceanographic research feeds into the various designs of ocean observing systems. In addition, readers will learn how ocean observing systems are defined and how each system operates in relation to its geographical, environmental, and political region.
CLIMATE

The Thinking Person’s Guide to Climate Change
ROBERT HENSON
This fully updated and expanded revision of The Rough Guide to Climate Change combines years of data with recent research. It is the most comprehensive overview of climate science, acknowledging controversies but standing strong in its stance that the climate is changing—and something needs to be done.

Climate Conundrums: What the Climate Debate Reveals about Us
WILLIAM B. GAIL
This is a journey through how we think, individually and collectively, about humanity’s relationship with nature, and more. Can we make nature better? Could science and religion reconcile? Gail’s insights on such issues help us better understand who we are and find a way forward.

Living on the Real World: How Thinking and Acting Like Meteorologists Will Help Save the Planet
WILLIAM H. HOOKE
Meteorologists focus on small bits of information while using frequent collaboration to make decisions. With climate change a reality, William H. Hooke suggests we look to the way meteorologists operate as a model for how we can solve the 21st century’s most urgent environmental problems.

GUIDES

TOBY CARLSON, PAUL KNIGHT, AND CELIA WYCKOFF
With help from Penn State experts, start at the beginning and go deep. This primer, intended for both serious enthusiasts and new meteorology students, will leave you with both refined observation skills and an understanding of the complex science behind the weather: the ingredients for making reliable predictions of your own. It connects fundamental meteorological concepts with the processes that shape weather patterns, and will make an expert of any dedicated reader.

Eloquent Science: A Practical Guide to Becoming a Better Writer, Speaker, and Atmospheric Scientist
DAVID M. SCHULTZ
The ultimate communications manual for undergraduate and graduate students as well as researchers in the atmospheric sciences and their intersecting disciplines.

TEXTBOOK

Midlatitude Synoptic Meteorology: Dynamics, Analysis, and Forecasting
GARY LACKMANN
This textbook links theoretical concepts to modern technology, facilitating meaningful application of concepts, theories, and techniques using real data.
© 2011, PAPERBACK, 360 PAGES, ISBN 978-1-878220-10-3 LIST $100 MEMBER $75 STUDENT MEMB. $65

Midlatitude Synoptic Meteorology Teaching CD
More than 1,000 PowerPoint Slides.
© 2013, CD, ISBN 978-1-878220-27-1 LIST $100 MEMBER $75

To order: bookstore.ametsoc.org, 617-226-3998, or use the order form in this magazine
A Scientific Peak:
How Boulder Became a World Center for Space and Atmospheric Science
JOSEPH P. BASSI

How did big science come to Boulder, Colorado? Joe Bassi introduces us to the characters, including Harvard sun–Earth researcher Walter Orr Roberts, and the unexpected brew of politics, passion, and sheer luck that during the Cold War era transformed this “Scientific Siberia” to home of NCAR and NOAA.

LIST PRICE: $35.00 MEMBER PRICE: $25.00

Father Benito Viñes:
The 19th-Century Life and Contributions of a Cuban Hurricane Observer and Scientist
LUIS E. RAMOS GUADALUPE
TRANSLATED BY OSWALDO GARCIA

Before Doppler radar and weather broadcasts, Spanish Jesuit Benito Viñes (1837–1893) spent decades observing the skies at Belen Observatory in colonial Cuba. Nicknamed “the Hurricane Priest,” Viñes taught the public about the weather and developed the first network of weather observation stations in the Caribbean, groundwork for the hurricane warning systems we use today.

© 2014, PAPERBACK, 172 PAGES
ISBN: 978-1-935704-62-1 LIST $20 MEMBER $16

Hurricane Pioneer:
Memoirs of Bob Simpson
ROBERT H. SIMPSON AND NEAL DORST

In 1951, Bob Simpson rode a plane into a hurricane—just one of the many pioneering exploits you’ll find in these memoirs. Bob and his wife Joanne are meteorological icons: Bob was the first director of the National Hurricane Research Project and a director of the National Hurricane Center. He helped to create the Saffir–Simpson Hurricane Scale; the public knows well his Categories 1–5. Proceeds from this book help support the AMS’s K. Vic Ooyama Scholarship Fund.

© 2015, PAPERBACK, 156 PAGES
ISBN: 978-1-935704-75-1 LIST $25 MEMBER $20
2017 AMS Washington Forum

Evolving our Enterprise: Working Together with a New Administration in a New Collaborative Era.

May 2-4, 2017 • Washington, DC

The 2017 AMS Washington Forum is a must-attend event to learn more about weather, water, and climate public policy.

Attendees will meet with senior federal agency officials, congressional staff, representatives from America’s Weather and Climate Industry, and other community members to hear about the status of current programs, identify business opportunities, learn about new initiatives, and discuss issues of interest to our community.

2017 Themed Sessions Include:

- New Administration Focus
- Congressional Staffers
- Spectrum Issues for Weather Satellites
- Renewable Energy and Policy Implications
- Federal Agency Leads
- Emergency Management Perspectives
- Financial Services for Weather and Climate Risk
- Transportation and the National Mesonet
- Commercial Satellites, Open Data, and Data Sharing
- Weather Bloggers

Learn more at ametsoc.org/WashForum

Hot Topic

Join our important discussion on the new Administration.