Tales of natural disaster can amount to little more than mere voyeurism, or they can have social value. Carole Vogel addresses this issue head-on in her author’s note, which opens *Nature’s Fury*, a book for children ages 8–12. She relates once telling a group of students that she writes about disasters “because they interest me.” Afterwards, a student told her: “You must be really sick. Only a sick person would spend so much time on such a morbid topic.” Vogel says the comment left her “wondering if my books really were just morbid accounts.” The next day, however, Vogel interviewed a woman who survived a tsunami as a child because she resisted the temptation to run out into a bay to look at the rocks and fish when the water drained out. The woman told Vogel that when she saw the water leaving the bay, she remembered reading of people who had run out into a bay when the water receded and were drowned by a tsunami.

Anyone writing about natural disasters for children needs to avoid making the stories so fearsome that they prompt nightmares or leave readers feeling they would be helpless in an event such as an earthquake, tornado, or flood. Stories for children about disasters should convey the idea that those who know the safety rules can survive the worst disasters. Stories of how others survived disasters by taking the right actions—as opposed to mere luck—can be an effective way to teach children how to react.

Some children who see or even read about storms or seismic events develop a need to learn what causes earthquakes, hurricanes, or tornadoes. It is not uncommon for atmospheric scientists to recall a storm that prompted their fascination with weather. The stories of earthquakes, tsunamis, volcanic eruptions, hurricanes, tornadoes, blizzards, droughts, and floods recounted in *Nature’s Fury* could prompt some students to turn to the earth sciences.

In several of her chapters on particular disasters Vogel does a commendable job of illustrating the survival lessons survivors can teach any of us. For instance, her accounts from survivors of the 1976 Big Thompson Canyon flash flood in Colorado focus on those who fled their cars and climbed the canyon’s walls to survive as the floodwater rushed by below. Any child who reads this chapter and then visits Big Thompson or a similar canyon with his or her family would know the exact meaning of the signs Colorado has posted in canyons: “In case of flood, climb to safety.” The end of the chapter on the 1925 Tri-State Tornado briefly describes today’s watch-and-warning system and sums up basic tornado safety rules. The chapter on the 1974 tornado outbreak ends with the story of the Xenia (Ohio) High School teacher who led students from the auditorium where they were rehearsing a play to safety in a corridor just before a tornado hit. The twister flung a school bus through the wall into the auditorium, where it landed on the stage the students had fled. It’s hard to imagine a more vivid way of making the point that a narrow hallway, away from outside walls, is the best school shelter—unless the school has a safe room.

In other chapters, however, she misses opportunities to tell stories that will leave children with practical information for coping with disasters. The chapters on the Blizzard of 1888 in New York City and the 1977 Buffalo Blizzard say little about the dangers of frostbite and hypothermia, the value of having a survival kit in your car in the winter, or how to stay alive if you are trapped by heavy snow. The stories of the 1900 Galveston Hurricane and the 1938 New England Hurricane include riveting accounts of the effects of storm surge, but neither chapter mentions evacuations as today’s main defense against surge, what a family should do to prepare for hurricanes, or other tropical cyclone dangers such as freshwater flooding from rain.

The introduction to the chapters on storms, which follow the chapters on seismic events, makes an important scientific point: “Like volcanoes and earthquakes, monster storms are powered by heat. How-
ever, their heat source does not arise from inside Earth. It comes from an external source—the sun.” Showing that energy does the work of moving the earth’s plates or making the winds blow points young readers toward a scientific understanding of the world.

Soon after beginning her discussion of how the Sun’s unequal heating of the Earth supplies the energy that drives the weather, Vogel begins to run into problems. We read about how when “cold, heavy, high-pressure air from the polar regions—a high—(drifts) toward the equator and collides with a low from this tropical region,” a tornado or blizzard may form. The description of hurricanes says that when “warm moist air rises, it collides with cooler, drier air above it . . . this collision often triggers violent thunderstorms.” The chapter on the 1926 Tri-State Tornado tells us that a tornado is like “a giant vacuum cleaner, the funnel sucks up nearly everything in its path.”

Vogel is a skilled writer of children’s books, and went to great lengths to ensure her stories are accurate. For instance, in her Author’s Notes she tells of reading an account of rattlesnakes biting many people who had scrambled up the walls of Big Thompson Canyon to escape the flood. “Now this was a story I wanted to share with my readers,” she writes. But when Vogel could find no confirmation of this story, she dropped the idea. What she has to say here would be a good lesson for any student journalist. It is a shame she did not go to equal efforts to find someone knowledgeable about meteorology to help her with the book’s science. Every writer and editor cannot be an expert about everything, and it is easy to understand how an intelligent writer who does not know much about atmospheric science can think that warm air colliding with cool air causes condensation or that tornadoes suck things into the air. Any writer who sets out to find meteorological facts will find plenty of sources of such ideas.

Even with its scientific shortcomings, Nature’s Fury is a readable introduction to natural hazards. Its stories from survivors should increase a child’s confidence about being able to survive a disaster. Even its shortcomings offer chances for parents and teachers to encourage children to think about safety and science. For example, after a child reads about the 1888 and 1977 blizzards a teacher or parent could ask the child to think about what people who live in areas with heavy snow can do to avoid being trapped by a blizzard and what they could do to save their lives if they are caught. The statement about tornadoes “sucking” things into the air could trigger an examination of air pressure and its effects.

Reading Nature’s Fury led me to think about what could be done to help writers avoid scientific errors. It occurred to me that offering meteorological advice

NEW PUBLICATIONS

CLIMATE CHANGE 2001: IMPACTS, ADAPTATION, AND VULNERABILITY

CLIMATE CHANGE 2001: MITIGATION

Since 1990, the Intergovernmental Panel on Climate Change, jointly established by the World Meteorological Organization and the United Nations Environment Programme, has produced numerous works that provide information on climate change, its impacts, and options for adaptation. These two exhaustive publications constitute the panel’s most recent efforts. The volume on impacts is a comprehensive exploration of the many ways in which climate change affects life on earth. It discusses the future of climate change and how both human populations and wildlife could be impacted, as well as potential positive effects of adaptation. It includes a detailed examination of each major region of the world (Africa, Asia, Australia and New Zealand, Europe, Latin America, North America, the Polar Regions, and Small Island States). The work on mitigation discusses potential palliative measures in dealing with the effects of climatic change, with a focus on greenhouse gas emissions and other prominent topics of the Kyoto Protocol. The subject is explored in great depth and includes discussion on financial, governmental, and technological concerns. Both of these works include numerous illustrations and references, and should prove valuable to policy makers, researchers, analysts, and students.

TSUNAMI: THE UNDERRATED HAZARD

Generally thought to occur too infrequently to be considered a major concern, tsunamis in fact have a long and destructive history. This history, as well as the science of tsunamis and the proper response when one occurs, is explored here. The science discussed in this work (including the cause of
and help to writers of children's books would be an appropriate outreach program for the AMS Board on Education and Public Outreach. The Board could reach writers via organizations such as The Society of Children's Book Writers and Illustrators and through newsletters, magazines, and Web sites for writers of children's books. Letting writers know expert meteorological advice is available seems like a worthy extension of the Society's many educational efforts.

—Jack Williams

Jack Williams is weather editor of USATODAY.com and was the founding editor of the USA TODAY newspaper weather page in 1982. He is the author of three books: The USA TODAY Weather Book, first ed. 1992, second ed. 1997; The USA TODAY Weather Almanac, 1994; and, with Dr. Bob Sheets, Hurricane Watch: Forecasting the Deadliest Storms on Earth, 2001, all published by the Vintage Books Division of Random House. Williams is a member of the AMS Board on Education and Public Outreach.

NONLINEAR PHYSICAL OCEANOGRAPHY: A DYNAMICAL SYSTEMS APPROACH TO THE LARGE SCALE OCEAN CIRCULATION AND EL NIÑO


Atmospheric scientists and oceanographers have long seen nonlinear dynamics and chaos as an inherent part of their field, thanks to the legacy of Ed Lorentz. However, one must admit that over the past few decades much progress has been made in the area of nonlinear dynamics and chaos by mathematicians and physicists, resulting in a large body of knowledge on "dynamical systems theory." While there has always been an active interest in nonlinear phenomena in large-scale ocean dynamics (e.g., Fofonoff's 1954 paper on nonlinear horizontal gyre circulation or Stommel's 1961 work on multiple equilibria of the thermohaline circulation), a systematic use of the tools of dynamical systems theory has been slow to percolate into our field, and was for a long time limited to a small number of practitioners. The past few years have seen a significant change, with more and more new applications of these methods to the study of nonlinear phenomena in the atmosphere and ocean.

Dijkstra's book is a very nice effort to present a systematic application of some of the methods of dynamical systems theory, in particular numerical bifurcation methods, to three specific climate problems: the thermohaline circulation (THC), wind-driven circulation (WDC), and El Niño–Southern Oscillation (ENSO).

The book should be most useful to graduate stu-

THE INVENTION OF CLOUDS: HOW AN AMATEUR METEOROLOGIST FORGED THE LANGUAGE OF THE SKIES


This highly praised work is part biography and part scientific history. Before Luke Howard's momentous lecture at London's Askesian Society in 1802, clouds had been a subject of great mystery and confusion. Howard classified the clouds with the names still used today (cirrus, cumulus, etc.) and spawned a worldwide fascination for the topic. The book intertwines the story of Howard's life with a discussion of English culture circa 1800 as well as meteorological trends of that period.

THE COMING STORM: EXTREME WEATHER AND OUR TERRIFYING FUTURE


The author, a former newspaper reporter, presents the potentially dangerous effects of climate change in a series of dramatic historical accounts of recent climatic events. Hurricane Andrew, the 1993 flooding of the Mississippi River, the 1995 Chicago heat wave, and the 1991 Oakland fires are among the calamities that are discussed. The author utilizes first-person accounts to illustrate the severity of these events while also examining the scientific and political aspects surrounding the highly charged topic of climate change. The parallel perspectives attempt to provide an insight into potential future policy decisions regarding climatic issues.
This book contains 27 papers concerning numerous aspects of the interactions of biogeochemical cycles and their relationships with earth’s climate. An important feature of this work is its discussion of mankind’s influence (e.g., fossil fuel emissions) on biogeochemical processes. Other subjects discussed include rapid climate change, the ocean carbon cycle, risk management, and paleoclimatology. The book is targeted to researchers and advanced students in agriculture, forestry, biology, and the earth sciences.

This comprehensive work is written primarily for students in physical and fishery oceanography. It introduces the topic with chapters on the history, instruments, and methods of oceanography, as well as discussions of the oceans of the world and oceanographic research institutes. Later chapters discuss the scientific aspects of the field, including ice formation, physical properties of sea water, energy from the ocean, and ocean waves, tides, and currents. The book contains an extensive reference section and is generously illustrated.

This work, volume four in the series Progress in Water Resources, discusses the significant issues of water quality, regulation, supply, and related topics. Consisting of contributions from the First International Conference on Water Resources Management, the book is divided into three primary sections: management and planning, subsurface flow, and surface flow. Topics include groundwater management, quality and pollution control, storm water management, wetlands, computer systems and applications, saltwater intrusion, hydrological modeling, and wave propagation.

The book starts with four introductory chapters. Chapter one is a very brief introduction to the phenomenology of paleoclimate, descriptive physical oceanography, and ENSO, which although necessarily somewhat superficial, should still be useful in giving someone with a background in physics or math a flavor of these subjects. Chapter two briefly presents the equations of motion, conservation laws, stability theory, etc., introducing the notation to be used throughout the rest of the book.

Chapter three is a very nice introduction to bifurcation theory initially motivated and presented using simple THC box models. The chapter then introduces normal forms, codimension 1 and 2 bifurcations, imperfections, frequency locking, bifurcation of periodic orbits, and Floquet theory. Then there is an excellent discussion on systematic methods for understanding the physics from the bifurcation analysis. The presentation throughout is easy to understand, self-contained, and provides references for further reading. The next chapter (four) describes various numerical techniques, from a finite difference discretization of a PDE to a detailed explanation of the numerical calculation of bifurcation curves and more, including many technical fine points, all presented in a clear and pedagogic manner.

The next three chapters, which compose most of the book, are devoted to the wind-driven circulation, the thermohaline circulation, and ENSO. Each begins with a description of the phenomenology, followed by a discussion of the relevant physical feedbacks, and then by the application of dynamical system theory to each of the three phenomena.

Chapter five deals with the wind-driven circulation. The basic dynamical review is naturally not as thorough as that in existing geophysical fluid dynamics (GFD) textbooks, but is useful for newcomers. The bifurcations of the WDC are analyzed first in a simple quasigeostrophic (QG) model, demonstrating physical mechanisms of spontaneous ocean variability that are complementary to the usual arguments of wave dynamics and instability theory. Then the same bifurcation problem is analyzed using a hierarchy of models, from shallow water models in idealized and realistic domains, on a beta plane and a sphere, to...
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REANALYSIS

Looking back at “News and Notes” in the Bulletin of April 1963:

U.S. AND INDIA COOPERATE IN SPACE EXPERIMENTS

The National Aeronautics and Space Administration (NASA) announced in January [1963] that the United States and India have agreed to cooperate in a program of scientific space research. Joint experiments to explore the equatorial electrojet and upper atmosphere winds from the geomagnetic equator are incorporated in a Memorandum of Understanding between NASA and India’s Department of Atomic Energy (DAE). The experiments are to be launched near the geomagnetic equator at Thumba, on the southwest coast of India near Trivandrum. Both experiments are scheduled for 1963.

The equatorial electrojet is an electrical current in the ionosphere 90 to 100 km high and flowing along the magnetic equator in the sunlit portion of the earth from west to east. It measures about 100 to 200 km in width, centered on the geomagnetic equator.

For the electrojet experiments, India’s DAE is providing the launching site and supporting facilities; personnel for sounding rocket launching operations, telemetry, and data analysis; and supporting ground magnetic and meteorological observations. NASA will provide nine Nike-Apache vehicles, ground launching, tracking and telemetry equipment, and ground instrumentation on a loan basis; and training in the United States for the appropriate Indian personnel. A NASA-supported experimenter from the University of New Hampshire will provide instrumented payloads for the electrojet experiments.

Exploration of upper atmosphere winds will be conducted by optical observation of sodium vapor released from a rocket payload. The winds will be measured by photographing from the ground the cloud of sodium vapor illuminated by the sun. DAE is supplying four sodium vapor release payloads, appropriate photographic equipment, the launching site and supporting facilities, personnel, and supporting meteorological data. NASA is providing four Nike-Cajun vehicles, an appropriate launching device on a loan basis, and training at NASA centers for Indian launch personnel.

The memorandum of understanding also calls for extension of an existing cooperative program between NASA and DAE by making available at the Indian Physical Research Laboratory in Ahmedabad supplementary tracking equipment on a loan basis.

No exchange of funds will occur and all scientific results of the experiments will be made freely available to the world scientific community.

In 1962 the United Nations recommended that member states consider the establishment of sounding-rocket facilities on the geomagnetic equator in time for the International Year of the Quiet Sun as a first step in the creation and use of such facilities under UN sponsorship. The Government of India has expressed interest in UN sponsorship of the use of the Thumba facility by other nations for experiments in peaceful space research.

is discussed, including its role in driving a chaotic mechanism for ENSO’s irregularity.

The choice of the wind-driven circulation, thermohaline circulation, and ENSO makes this a nice textbook for a “topics” course in nonlinear aspects of large-scale ocean dynamics. There are some issues that are important, though not within the scope of nonlinear dynamics, that are not discussed, such as stochastically forced THC or ENSO variability. Some of the later parts of the three chapters on the WDC, THC, and ENSO read a bit like a review article based to a large degree on the author’s work. Yet there are still plenty of references to additional relevant literature, so these chapters are a good introduction to the recent literature on the subject.

The nonlinear dynamics parts of the book are mostly concerned with numerical bifurcation theory applied to large-scale physical oceanography. There are of course many areas of nonlinear physical oceanography that are not included, such as nonlinear waves and solitons, nonlinear instability theory, QG turbulence, hydraulics and straits, etc. Similarly, there are numerous issues in nonlinear dynamics not included but possibly relevant to ocean and climate dynamics, such as methods of analyzing nonlinear oscillations, transition routes to chaos, dynamics of chaotic systems, etc. But overall the book finds a nice balance between relevant topics in climate dynamics and in bifurcation theory. It seems that the book did not go through a technical editing stage, and that shows in a nonnegligible number of minor typos and grammatical errors. The book is not inexpensive, so one would have hoped that the publishers would invest the required effort. However, these problems do not significantly affect the readability of the book.

A commendable effort is made by the author to make the text self-contained, from the presentation of observational and dynamical background to numerical techniques. References to useful Web resources are often given. The systematic use of a hierarchy of models to study climate dynamics is certainly one of the strongest points of this book, including the analysis of observation as one end of the hierarchy. The use of “technical boxes” for the more technical material is useful and makes the text more readable.

Having read this book, one certainly gets the
pression that numerical bifurcation methods are not just a technical and mathematical tool, but rather are a good way of understanding the relevant dynamics. This is an achievement of the book that makes it very useful reading.

—ELI TZIPERMAN.

Eli Tziperman is professor of environmental sciences at the Weizmann Institute of Science, Rehovot, Israel.

REFERENCES

FLOW INSTABILITY
D. N. Riahi, 2000, 244 pp., $126.00, hardbound, WIT Press, ISBN 1-85312-701-9

This book is based on the lecture notes of a graduate course that the author has taught at the University of Illinois at Urbana–Champaign. Chapters one and two present the foundational aspects of hydrodynamic stability. Chapter three discusses both fundamental examples, such as Kelvin–Helmholtz instability, and also more esoteric systems, such as thermocapillary instability, alloy solidification, and double diffusion. Chapters four and five are excursions into nonlinear stability theory. The latter includes not only weakly nonlinear theories, but also material on the upper-bound theories of turbulent convection.

I cannot recommend this as a textbook. The most obvious problem is the high density of typographic errors, and many of these are gross. One might expect this in lecture notes, but one does not expect to pay well over $100 for rough notes. In places, this book reads like an unconnected collection of the author’s research papers, excerpted from the Journal of Fluid Mechanics. Perhaps as a consequence of this style some important and central results, such as the Rayleigh and Fjortoft theorems, get short shrift. Others, such as Howard’s semicircle theorem and the principle of exchange of stabilities, are not discussed at all (though the latter does appear deus ex machina in chapter three).

Often the physical fundamentals are slighted as the author presses on with the technical work of solving equations. An egregious example is the discussion of thermal instability (the Rayleigh–Benard problem) that launches chapter two. Here the author follows one of his research papers and tackles the most general problem with considerable complications due to both imperfectly conducting and no-slip boundaries. This is emphatically not the way to introduce convection to students. And I do not see the point of collecting this material into a book when the original paper is available, without as many typos, in any university library.

BOOK EXCERPT


In January 1945 a large airborne paper balloon carrying instruments was shot down at Fort Simpson in the Northwest Territories. Over the next several weeks a large number of similar balloons were found on the ground in various parts of western Canada and the United States; one had travelled as far east as Michigan. The balloons were carried eastward in the prevailing westerly winds and were equipped with a pressure device that allowed the dropping of small bags of sand to enable it to maintain a constant elevation. After the altitude maintaining device was exhausted the balloon’s mechanism was designed to drop its load of either a small explosive or an incendiary bomb.

The balloons caused little or no damage and all news of them was kept secret from the public at the time as any mention of them in the press or on radio was prohibited. Studies of the balloon problem were carried out in the United States and in Canada where the Canadian Army conducted investigations at Vancouver. There, at the Western Air Command forecast office, a meteorologist was assigned to assist by “back-tracking” the balloon from the point where it was found or sighted to a possible point of origin. Upper-level pressure maps were drawn and studied for the North Pacific at 20,000 and 30,000-foot levels (6.1 and 9.1 kilometres). Speeds and directions were estimated at these heights from the maps in order to calculate the probable paths of travel of the balloons. All projected paths were found to cross the Japanese islands and after the war it was confirmed that the balloons had been released from a site near Tokyo. It was also revealed that the Japanese stopped the program when they received no indication that the balloons had ever reached North America.
The references are idiosyncratic and antiquarian. To take one of many possible examples: to solve hydrodynamic eigenvalue problems, the review article by Weideman and Reddy (2000) and the accompanying software package is an essential resource. Instead, in chapter two, the reader is directed to the pioneering 1971 article by Orszag, and to one of the author’s 1988 research papers. Omissions such as this make it impossible to recommend this book as a research monograph.

—WILLIAM R. YOUNG

William R. Young is a professor of oceanography at Scripps Institution of Oceanography. His research interests include geophysical fluid dynamics, ocean mixing, and hydrodynamic stability.

REFERENCES


CORRIGENDUM

In the November 2001 Bulletin, the graphic identified as Fig. 7 in the article “Atmospheric Circulation Changes in the Tropical Pacific Inferred from the Voyages of the Manila Galleons in the Sixteenth–Eighteenth Centuries” by R. Garcia et al. is incorrect. The Bulletin apologizes for this error. The correct figure is reproduced at right.

Additionally, in the article the coordinates given for the Hawaiian Islands were 24°N, 167°W. This may cause some confusion as the northernmost point of Kauai Island lies at 22°14’N. However, the location cited refers to the approximate geographical center of the Hawaiian archipelago, which is usually defined to include all the islands from Hawaii in the southeast to Kure in the northwest (not just the Hawaii-to-Kauai group). This does not affect the explanation given in the article as to why the Hawaiian Islands appear never to have been visited by the galleons.

Fig. 7. Difference in the date at which given longitudes are reached for the nine slowest and nine fastest voyages constructed from NCEP data. All voyages start from Acapulco (100°W) on 30 March. Guam and the Embocadero are located at approximately 144° and 124°E, respectively.
The American Meteorological Society (AMS) is pleased to invite applications for a 2002/2003 AMS graduate fellowship in the history of science, to be awarded to a student wishing to complete a dissertation on the history of the atmospheric, or related oceanic or hydrologic sciences. The award carries a $15,000 stipend and will support one year of dissertation research. Fellowships cannot be deferred and must be used for the year awarded, but can be used to support research at a location away from the student’s institution provided the plan is approved by the student’s thesis advisor.

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Any questions regarding the fellowship opportunity may be directed to Donna Fernandez, 617-227-2426 ext. 246, dfermand@ametsoc.org; or Stephanie Armstrong, 617-227-2426 ext. 235, armstrong@ametsoc.org.

Application packages must be postmarked by 15 February 2002