

## Summer Reading

Summer, a great time for leisure reading, a great time to try something different! Cheryl Baldwin Frech joins regulars Hal Harris, Jeff Kovac, Brian Coppola, and Dick Pagni in providing plenty of suggestions to tempt you.

### Hal Harris recommends

#### **Critical Mass: How One Thing Leads to Another** by Philip Ball

Farrar, Strauss, and Giroux: New York, 2005. 519 pp. ISBN 0374281254. \$27 (cloth); ISBN 0374530416. \$16 (paper).

Why is society organized the way it is? Is it possible to use some of the laws of the physical universe to understand why and how national economies, stock and commodity markets, companies and clubs organize the way they do? Can physics provide “laws” of human nature that are as useful and universal as those of mechanics? Does the critical point in a phase diagram have analogies in human behavior? Veteran science writer and physicist/chemist Philip Ball writes very well, as evidenced by *Elegant Solutions*, one of my picks in 2005. He also thinks very well, as evidenced by this creative application to sociology of concepts familiar to physicists and chemists. Of course, social scientists have always tried to be as “scientific” as possible, using mathematical models, statistical analysis and, more recently, computer simulations to understand the human situation and to predict its future. *Criti-*

*cal Mass* uses a different approach: using whole concepts in physics for insight into economics, urban planning, and the self-organization of human networks. This is an original and thought-provoking book; it has already been recognized with the 2005 Aventis Prize for Science Books, bestowed annually by the Royal Society for Chemistry.

#### **The China Study: The Most Comprehensive Study of Nutrition Ever Conducted**

by T. Colin Campbell with Thomas M. Campbell II

BenBella Books: Dallas, TX, 2005. 417 pp. ISBN 1932100385. \$19.96 (cloth); ISBN 1932100660. \$16.95 (paper).

If there is a subject more rife with bad science than that of human nutrition, I don't know what it would be. It seems that every year there is another fad diet, based on unproven theory and void of any semblance of scientific evidence. Of course, the reason that these schemes come along is that people want to live long and healthy lives. My introductory chemistry students have lots of questions related to their own nutrition, and *The China Study* is a book that I can recommend to them. It is based on a lifetime of research by Colin Campbell of Cornell University. He was head of an international group of researchers that studied the eating habits of people in different cultures and their health consequences. As the title implies, the largest and most convincing of these was a study of 6500 Chinese persons of both sexes, from 65 “counties” of China. The range of lifestyles was very large, from urban to rural, and their diets also represented a much larger range of foods than is found in American or European populations. Why is it that the incidence of obesity, diabetes, cancer, and heart disease is very high in our population and very low in countries that have far “poorer” diets? The bottom line of this thoroughly-documented study is essentially that animal protein is not

good for us—even milk, “the perfect food”. My students (and I!) may not relish the change to a vegetarian diet, but it is difficult to refute the mass of evidence in “The China Study”.

#### **Science Friction: Where the Known Meets the Unknown** by Michael Shermer

Henry Holt/Times Books: New York, 2005. 336 pp. ISBN 0805077081. \$26 (cloth); ISBN 0805079149. \$16 (paper).

I became a fan of Michael Shermer back in 1997, when I recommended his *Why People Believe Weird Things*, Chapter 10 of which was “Confronting Creationists—Twenty Five Creationist Arguments, Twenty Five Evolutionist Answers”. Since then, Shermer has published several additional excellent books and has become resident Skeptic of *Scientific American*. Since then, Creationism has evolved into Intelligent Design, and Shermer provides new answers in Chapter 11 of *Science Friction*. Most of us are ill-equipped to deal respectfully and intelligently with the religious beliefs of our students, 45% of whom (according to a 2001 Gallup poll) believe that the Earth and its inhabitants were created in pretty much their present form about 10,000 years ago. It is nice to have Shermer (along with Richard Dawkins and the late Carl Sagan, among others) providing counterpoints that rebut without confrontation. This collection of essays explores some of the controversial fringes of science. As usual, Shermer provides plenty of fresh ideas, as he discusses the virtues of skepticism, “spin-doctoring” in anthropology, chaos and complexity, the mutiny on the *Bounty*, and the place of science in the history of humankind. His book begins with a description of his own experiences (and success) posing as a psychic. I have come to expect both a light-hearted attitude and intellectual challenges from this author, and *Science Friction* does not disappoint.

### Summer Reading Reviewers

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## Summer Reading

Cheryl Baldwin Frech recommends . . . . .

### Teaching Inquiry-Based Chemistry: Creating Student-Led Scientific Communities

by Joan Gallagher-Bolos and Dennis W. Smithenry

Heinemann: Portsmouth, NH, 2004. 122 pp. ISBN 0325006717. \$17 (paper).

If you are a high school teacher who is looking for a different approach for some or all of your classes, pick up this little book as part of your summer reading. *Teaching Inquiry-Based Chemistry* describes a constructivist and (very!) active learning approach to teaching high school chemistry. Teachers/authors Gallagher-Bolos and Smithenry utilize nine units to span a school year that begins with exercises and scenarios to help foster the formation of a scientific community in the classroom. At the end of the school year the class is transformed into a soap-making company. In the intervening months, units on the traditional subjects (including acids and bases, organic, and equilibrium) are presented with case studies, and other methods. Various assessments are described, including student and teacher journal samples. As with exposure to any new teaching strategy, teachers will have to select and modify the approach presented here to fit their classrooms, students, and personality. But this book is bound to give every teacher some new ideas for the next school year.

### Before the Fallout: From Marie Curie to Hiroshima

by Diana Preston

Walker and Co.: New York, 2005. 400 pp. ISBN 0802714455. \$27 (cloth); ISBN 0425207897. \$15 (paper).

British author Diana Preston has tackled various topics of popular history, from Culloden to the *Lusitania* to Robert Falcon Scott. *Before the Fallout* is an examination of the dawn of the nuclear age, spanning the years from 1903 to 1945. Compared in length and scientific depth to Richard Rhodes' 1987 classic *The Making of the Atomic Bomb*, this book is beach reading. However, for a

new generation of readers and teachers, as well as for those interested in the nexus of science and history, Preston's book is a must-read. With the passage of nearly 20 years between the publication of the two books, more scientists' papers and classified files have been released that add insight and detail to the now-familiar narrative. An example of a new addition is the tale of American baseball player-turned-agent Moe Berg's orders to interrogate and possibly assassinate Werner Heisenberg in 1944.

Preston's book consists of relatively brief chapters that deftly weave together the efforts of scientists around the world. Her British perspective adds an interesting dimension. The epilogue contains a well-conceived "what if" discussion that has numerous hypothetical questions that could form the basis of an entire one-semester course.

If you've never managed to read a book on this topic before, try *Before the Fallout*. This book is extremely readable, and the facts are all there.

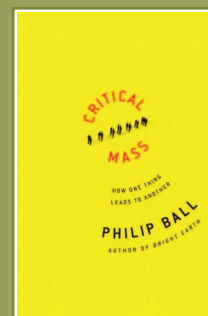
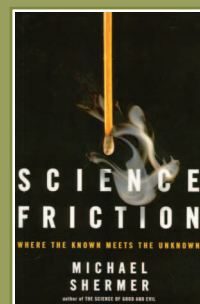
### The Republican War on Science

by Chris Mooney

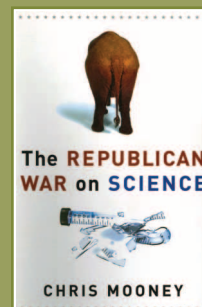
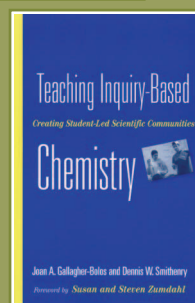
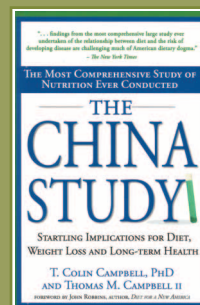
Basic Books: New York, 2005. 342 pp. ISBN 0465046754. \$24.95 (cloth); ISBN 0465046762. \$14.95 (paper).

If you are reading this *Journal*, you are most likely a teacher of chemistry, at the college or high school level. This provocatively-titled book is bound to catch your eye in the bookstore. You may be tempted to ignore its premise: perhaps you are offended that your political party may be under attack. Or perhaps you feel that scientists must be above the fray of public policy debates. According to Mooney, the real news is that it may already be too late to save science in this country.

The book is divided into four sections, "Where It Begins", "The Business of Science", "Scientific Revelations", and "The Antiscience President". In an early chapter, Mooney explains the difference between "sound science" (Republican sound bite) and "junk science" (environmentalist term). Even Garry Trudeau's



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## Cheryl Baldwin Frech recommends

"Doonesbury" comic strip recently weighed in on this with a Sunday panel on "situational science".<sup>1</sup>

What does it mean to politicize science? Mooney's definition is "any attempt to inappropriately undermine, alter, or otherwise interfere with the scientific process, or scientific conclusions, for political or ideological reasons." The book chapters are replete with familiar examples: creationism/intelligent design, stem cell research, Plan B birth control, and global warming. Mooney decries the dismantling of the Congressional Office of Technology Assessment in 1995 because without it, legislators lack an impartial source of scientific analysis and expertise.

Mooney's tone can be quite shrill. In addition, some sections of the book are repetitive, while others introduce new players abruptly and without context. The book has extensive annotated references and interview notes. The epilogue of this book is entitled, "What We Can Do". For starters, I recommend reading this book.

<sup>1</sup>Trudeau, Garry. *Doonesbury*. Sunday, March 5, 2006.

### **The World is Flat** by Thomas Friedman

Farrar, Straus, and Giroux: New York, 2005. 488 pp. ISBN 0374292884. \$27.50 (cloth); also available as audio cassette, audio CD, or e-book.

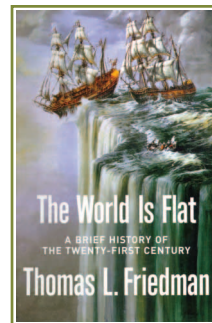
Have you noticed a flattening of the world? Perhaps your students who are from Nepal are better prepared for upper-level chemistry courses than those from the U.S. A student who graduated from your department's chemistry program may be employed by a company with a huge global presence, so at first you receive his or her emails from Switzerland and then from Turkey.

Thomas Friedman is a columnist for *The New York Times* as well as a familiar face on television interviews. He is a scholar of global trends and has published three other books in a similar vein. In the first part of this book, he details ten "flatteners", ranging from improvements in computer technology, to offshoring and outsourcing of jobs, to the information explosion. The flatteners then work together in what he terms a "triple convergence" that has created

a global Web-enabled populace capable of multiple forms of collaboration. Changing business trends and shifting political landscapes complete the picture of a world that is flattening rapidly.

In the section titled "America and the Flat World", Chapter 7, "The Quiet Crisis", and Chapter 8, "This Is Not a Test" may be the most interesting to science educators. Why is the U.S. falling behind in technology and science? Rather than attack political parties, Friedman's list includes falling numbers of students entering scientific education tracks, lack of ambition (countered with a sense of entitlement), and poor parental role models.

This is a great book to read and discuss with others. If you read it, you will have a better overview of the geopolitical landscape and some perspectives on how you can make a difference.



## Jeff Kovac recommends

### **American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer** by Kai Bird and Martin J. Sherwin

Knopf: New York, 2005. 721 pp. ISBN 0375412026. \$35 (cloth); ISBN 0375726268. \$17.95 (paper).

### **109 East Palace: Robert Oppenheimer and the Secret City of Los Alamos** by Jennet Conant

Simon and Schuster: New York, 2005. 425 pp. ISBN 0743250079. \$26.95 (cloth); ISBN 0743250087. \$14 (paper); also available as audio cassette, audio CD, or audio download.

### **The Ruin of J. Robert Oppenheimer and the Birth of the Modern Arms Race** by Priscilla J. McMillan

Viking: New York, 2005. 373 pp. ISBN 0670034223. \$25.95 (cloth); ISBN 0142001155. \$16 (paper).

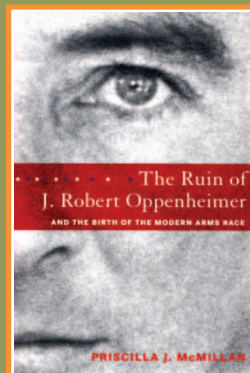
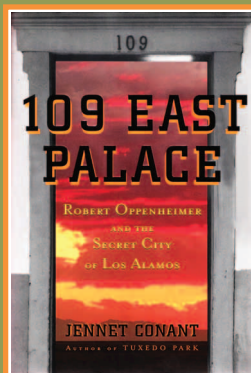
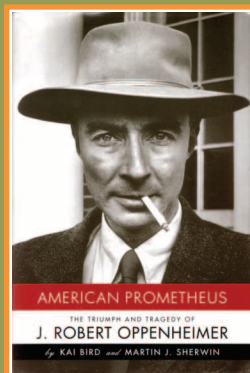
Regular readers of these annual recommendations may remember that I have long been fascinated by Robert Oppenheimer. This past year saw the publication of three

new books that add to our understanding of this enigmatic man, the project that he directed, and the role of scientists in public policy. *American Prometheus* is the first full-scale biography of this brilliant, charismatic leader of the Los Alamos Laboratory. More than 25 years in the making, this volume attempts to provide a comprehensive portrait of Oppenheimer as a scientist, a public figure, and a human being. Although I have read many books and articles about Oppenheimer, I found much here that was new. For example, nowhere else have I found such an extensive discussion of Oppenheimer's relationship with George F. Kennan. The authors have uncovered many new details about Oppenheimer's personal life; their discussion of his life after the Gray Board hearings that resulted in the loss of Oppenheimer's security clearance is particularly poignant. The book is illustrated with numerous excellent photographs.

In *109 East Palace*, Jennet Conant, the granddaughter of James Bryant Conant, tells the story of Los Alamos through the personal stories of some of its key personnel, particularly Dorothy McKibbin, who managed the office in Santa Fe where all project scientists were greeted and received their credentials. Conant shows us what day-to-day life at Los



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## Jeff Kovac recommends

Alamos was like for the scientists and their families. The dramatic story of the development of the bomb is told in the context of the frustrations of inadequate housing, poor food, and isolation on the remote mesa. More than any other book I have read, this volume gives the reader a sense of what it was really like to live at Los Alamos during the Manhattan Project.

Priscilla McMillan focuses on the events leading to the 1954 Gray board hearings that resulted in Oppenheimer's losing his security clearance. The outlines of the story are well known but McMillan shows how Oppenheimer's detractors, among them Lewis Strauss and Edward Teller, used the anxieties of the cold war to remove Oppenheimer from his position of influence, paving the way for the nuclear arms race that dominated international politics for decades. It is a disturbing story about the suppression of an unpopular perspective that has important implications for the present.

### Master Mind: The Rise and Fall of Fritz Haber, The Nobel Laureate Who Launched the Age of Chemical Warfare

by Daniel Charles

HarperCollins: New York, 2005. 313 pp. ISBN 0060562722. \$24.95.

The First World War is sometimes called the "chemist's war", and the dominant scientific figure of that conflict was certainly the brilliant, charismatic, and tragic pioneer of physical chemistry, Fritz Haber. It was Haber who showed how ammonia could be synthesized from atmospheric nitrogen, a process commercialized by Carl Bosch that made it possible for Germany to obtain nitrates for explosive and for fertilizer even after imports from abroad were stopped by a blockade. It was Haber who developed the first chemical weapons and personally supervised the first release of chlorine gas at Ypres on April 22, 1915. As director of the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry, Haber was a pioneer in developing the strong relationship between science, government, and industry. Tragically, Haber, the Ger-

man patriot and hero of World War I, was forced out of his prestigious position and into exile by the Nazis because of his Jewish heritage. It is also tragically ironic that some of Haber's relatives perished in the gas chambers, victims of another of Haber's inventions: Zyklon B, which was originally developed as an insecticide for flour mills and granaries. Daniel Charles has written a comprehensive and engaging biography of this important and controversial scientist, the best single book on Haber in English that I have seen.

### Perfectly Reasonable Deviations from the Beaten Track: The Letters of Richard P. Feynman

edited and with an introduction by Michelle Feynman

Basic Books: New York, 2005. 486 pp. ISBN 0738206369. \$26 (cloth); also available as audio CD.

Richard Feynman's daughter has collected a large number of his letters to scientists and to ordinary people who wrote to him over the years. In bits and pieces they reveal the various aspects of Feynman's personality. Although his spoken language was colorful and often grammatically incorrect, his letters are usually thoughtful and elegantly written. Here we see his remarkable patience with the enthusiastic students and lay people who wrote to him with ideas about physics or to ask for advice. We also see his eccentric and strong will in his exchange of letters with various people at the National Academy of Sciences, trying to convince them that he actually wanted to resign.

As with any collection, some of the letters are quite ordinary (many polite replies to congratulations on receiving the Nobel Prize), but it is filled with real gems. The exchange of letters with his first wife, Arline, who was ill with tuberculosis, is heart rending. I was quite amused at the letter he received from Linus Pauling recommending megadoses of vitamin C as a treatment for his abdominal cancer. Feynman's response was gracious. These letters show the humanity of this amazing scientific genius.

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Brian Coppola recommends . . . . .

### **The Wisdom of Practice: Essays on Teaching, Learning, and Learning to Teach** by Lee S. Shulman

Jossey-Bass: San Francisco, 2004. 608 pp.  
ISBN 0787972002. \$42

### **Teaching as Community Property: Essays on Higher Education** by Lee S. Shulman

Jossey-Bass: San Francisco, 2004. 272 pp.  
ISBN 0787972010. \$35

In the early 2000s, the Carnegie Foundation for the Advancement of Teaching released the first generation of books to appear under Lee Shulman's watch as the Foundation's president. This set of reviews features a selection of these volumes. Having been fortunate enough to work closely and often with Lee for the last 10 years, I am not at all an unbiased critic or reviewer of his work. These first two books, which are not interdependent companions but are more like chocolate and peanut butter—great separately and terrific together—are the long-overdue compilations of what will become part of Shulman's legacy.

There is no more thoughtful, theory-grounded, yet accessible essayist alive today than Lee Shulman when he writes about education. His career has covered the ground from K–12 to doctoral studies and training in the professions. He sees the link on all of these—teaching—and he understands the critical component—the teacher. If you are thinking about teaching (Shulman's "the pedagogical profession"), wander into one of these books and follow where it leads. You will walk into your own classroom and see things differently every time after meandering through any of his writing.

*The Wisdom of Practice*, a collection that spans 1970–1998, includes 23 essays on, if I had to pick a single theme, the indispensable roles that both content knowledge and results from educational research can have on good teaching. His thesis, still a work in progress, is that there are major insights to be had if we study carefully what we know about K–12 teacher education, student learning in general, and the process by which we turn high school students into functional scholars who take on, define, and actually own the professions (Ph.D.s in the academy, physicians, lawyers, the clergy...). According to Shulman, the most important characteristic, among many, held by an educator is "pedagogical content knowledge" (PCK), a concept that he invented in the late 1980s.

The foundations for PCK are laid out in the intersections of these essays. PCK is the sensible idea that neither content knowledge (understanding equilibrium or retrosynthetic analysis) nor pedagogical knowledge (understanding team learning or personal response systems) is sufficient to good teaching. Nor is it enough to overlay pedagogical knowledge into every learning circumstance like a magic bullet (team learning will automatically enhance the learning of equilibrium). PCK argues that one's deep understanding of the content can and should drive pedagogical (methodological) choice and how it is implemented: what is the most effective peda-

gogical choice for learning these instructional goals about the topic "equilibrium" and how should it be adapted to this topic? Think of it as the match between substrate and enzyme.

If *The Wisdom of Practice* sets a thesis, then *Teaching as Community Property* looks at the kinds of evidence and experiments that might support it. The essays span 1987–2004. For years Shulman's contention has been that the general perceptions of research and teaching are inverted. Research is carried out in isolation, but teaching is public and accessible. And while these might be true for the acts themselves, the ideas of deliberate design and a language of careful documentation, as forms of scholarly practice, are only a part of research. We have developed and value a form of discourse (scholarly writing) that permits you and me to understand and evaluate a research report without needing to have stood over the shoulder of the experimentalist.

In our teaching, even when we make observations, we really do not know what we are looking at because we lack the necessary background to make sense of what we are seeing. And we lack completely a discourse that permits us to record and understand our work in teaching and learning once the act is complete and the classroom is empty. The notion "Teaching as Community Property" (or, my preference, from one of the essays in this collection, "Ending Pedagogical Solitude") suggests that one day we might be able to record, assess, and evaluate the work of teachers, whether in a classroom, running a research group, or guiding a medical resident, if we can figure out a way to make this work truly public and open to discussion.

The answers are not here (yet). But books like these, and the work they represent, can begin to form the canon around which the next steps will take place.

### **Educating Citizens: Preparing America's Undergraduates for Lives of Moral and Civic Responsibility** by Anne Colby, Thomas Ehrlich, Elizabeth Beaumont, Jason Stephens

Jossey-Bass: San Francisco, 2003. 352 pp.  
ISBN 0787965154. \$30

Ever since the Manhattan project, there have been continual calls for educating a scientifically literate citizenry who are capable of making educated and informed choices when they are reading or listening to the news, or when they walk into the voting booth. Topics appear in science textbooks, such as global warming, pollution, and energy production, in order to try to address these issues.

*Educating Citizens* shows what it really means when higher education commits itself to educating socially responsible citizens. The authors review the history of civic engagement as a crucial outcome from a liberal education, including how and why higher education lost its way with these issues, and present a set of prescriptions for how to get it back. They characterize three goals: the community connection, holding fast to moral ideals, and social justice. Then, using case studies from 12 institutions covering a nice range of types (a

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Brian Coppola recommends . . . . .

research-intensive university, a Historically Black College or University, a women's college, a religious-based private institution, ...), they walk through concrete examples of how these institutions have integrated this work into their settings.

This is not a how-to book. Rather, it provides the theoretical background—along with concrete examples—for any faculty member interested in learning about what it really means to integrate citizenship as a significant educational goal. Note: while the authors might be described as advocates for promoting political activism as an adjunct to the academic program, and that this is an overdue missing piece in our universities, I nonetheless recommend this book to provide you with a vision of the possible.

### **The Advancement of Learning: Building the Teaching Commons** by Mary Taylor Huber and Pat Hutchings

Jossey-Bass: San Francisco, CA, 2005. 208 pp.  
ISBN 078798115X. \$35

Huber and Hutchings are both senior scholars at the Carnegie Foundation, and have been central to projects that have contextualized the Foundation's mission. This book is really a book report on some of the work in progress. In a series of thoughtfully framed and well researched cases, they try to let us know what is happening with efforts to both understand and communicate advancements in learning, but in particular to explore the spaces, or "teaching commons", where such conversation can take place.

Unlike educational research that examines the work of others as subjects, Huber and Hutchings report on practitioners who have been able to take their own teaching practices, couple them with understanding concomitant student learning, and then begin to develop the discourse advocated by Shulman to let us understand what it is they are doing in their classrooms, or wherever they happen to be working.

These are stories of real, mainstream faculty members and institutions whose work as a part of CASTL (Carnegie Foundation for the Advancement of Teaching and Learning) has seeded the beginnings of cultural change within the academy.

### **A Review of <http://blog.tenderbutton.com/> and <http://occams.blogspot.com/>** (both sites accessed Apr 2006)

I should look back at the previous few years of my Internet recommendations to see how many of the URLs are still alive. I was certainly part of the group that opined skeptically when Web sites were being touted as the next big archive and not as The Land of Permanent Transience. That said, I would still point my annual http finger in an interesting direction: the blog.

Consider Dylan Stiles, who (at least as of this writing) is still a graduate student in the Trost group at Stanford. I only know about Dylan because he has decided to make the day-to-day life of a chemistry graduate student transparent

at <http://blog.tenderbutton.com>. At least for any of us with Ph.D.s in synthetic chemistry, revisiting the daily travails of graduate school is a wonderfully vicarious reminder of a unique time. Stiles couples a clear design and a cutting sense of humor on everything from experimental procedures ("I was a little concerned that the diazonium salt might be explodey, because when I hear 'diazo' I think 'kaboom', but my friend Adam in the Kool group assured me that the diazonium salts are not explodey as long as you keep them cold.") to copies of his NMR spectra and images of his crystals ("Oh and I got some pretty nice crystals out of it too. To me they kind of look like someone with hair got a haircut and then suspended the clippings in ethanol."); from vacuum desiccating his cell phone after he dropped it in a puddle ("It powered up; appears to be 100% unscathed by the ordeal.") to posting engraved brass plaques around the Bay Area that have the phone number of the elevator that goes to the third floor of Stanford's Lokey laboratory building ("If you call very late at night you will get the especially bitter group members who have no life and nowhere better to be, myself included.") When *The New York Times* did an Internet search on information that could be found about the recent Sames case at Columbia, they hit on Stiles' blog because he had offered up a series of public comments. He declined to comment, on the record, to the press. Enjoy it while you can.

Hidden on Blogger is a site (<http://occams.blogspot.com/>) that I also presume to be written by a chemistry student. Note the tone of the "mission statement" in the first posting: "The scope of my scientific work is small. Most everyone's scope is small compared with the whole of scientific inquiry and I believe there are lessons to be learned in every field that can help me with my chosen field of study. I read lots of papers in my field of chemistry, but don't often have the time to drastically expand my scope." But I could be wrong, it could be a faculty member somewhere; the author and the setting are anonymous, and it really does not matter. The writer of "Occam's Blog: Cutting Science Razor Thin," like most of the blog sites that I follow personally, helps abstract and report on parts of the world so that I do not have to do it myself. I am loathe to join listserves, but I always appreciate it when friends who know my tastes forward something from one of the mailing groups that inundate their mailboxes (instead of mine). I suppose that might seem shallow, but my alternative would be simply not knowing at all, given the restrictions imposed by the 24-hour day!

From a report and commentary on Vannevar Bush's biography and how Bush's work led to the current patent-crazy climate in academia, to a report on small organic molecules in *The Astrophysical Journal Letters*, Occam's Blog gives the author a self-proclaimed excuse to read and write in ways that extend beyond a manuscript for *JACS*. If this kind of writing eventually leads to more Sagans and Goulds who have developed their skills to communicate science in better ways to broader audiences, then more power to blogs and the bloggers who write them.

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### Dick Pagni recommends

#### **The Evolution–Creation Struggle** by Michael Ruse

Harvard: Cambridge, MA, 2005. 336 pp. ISBN 0674016874.  
\$25.95 (cloth); ISBN 0674022556. \$16.95 (paper).

Controversies over the theory of evolution, creation science, and intelligent design are rarely out of the news these days, and all thoughtful people should familiarize themselves with these topics. *The Evolution–Creation Struggle* by Michael Ruse, a philosopher of biology at Florida State University, is an excellent place to begin one's education on these topics.

Because evolution is an active field of study, it has its share of disagreements. One only has to think of Steven J. Gould's punctuated equilibrium which proposes the non-Darwinian idea that evolutionary change occurs in bursts followed by long periods of stasis. I suspect that Simon Conway Morris's ideas, nicely presented in *Life's Solutions* (Cambridge University Press, Cambridge, UK, 2003, 464 pages, cloth), are also controversial; Morris is professor of evolutionary paleobiology at the University of Cambridge. Most evolutionary biologists believe that if life were to begin anew on the earth it would look far different from what it is today and it is very unlikely that intelligent life would evolve again. In other words divergence reigns. Morris persuasively argues that convergence, i.e., similar solutions to similar problems from quite dissimilar organisms, is very common in the biological world and that given enough time intelligent beings will always arise. *Life's Solutions* also has a very good discussion of a topic rarely considered in discussions of evolution: the origin of life, a topic I have been interested in for a number of years. Morris makes a convincing case that it is very difficult for life to begin, and in spite of decades of work scientists still only have a vague idea of how it occurred.

Michael Ruse has written extensively, and well, on evolution. He, like Morris, is a calm voice amidst all the frenzy from fundamentalists on both sides of the debate. *The Evolution–Creation Struggle* is a beautifully written extended discussion of all the nuances of the evolution–creationism–intelligent design debate, both present and in the past. Most of the topics I have described above and many more are covered in detail. The book provides an excellent summary on the current status of the theory of evolution, and how it got there. The only drawback in the book is the rather perfunctory and terse discussion of the origin of life, a topic the author is clearly uncomfortable in describing. Nonetheless, I can think of no other book which is so informed, so reasonable, and so readable on these contentious issues. I highly recommend this book for your summer reading.

Fundamentalists on both extremes of the evolution–creation issue shout past each other and do not really listen to one another. Perhaps they should heed the surprising words of Albert Einstein: "Science without religion is lame, religion without science is blind."

#### **Galileo in Rome: The Rise and Fall of a Troublesome Genius** by William R. Shea and Mariano Artigas

Oxford: New York, 2004. 226 pp.  
ISBN 0195177584. \$15.95 (paper).

#### **The Pope and the Heretic: The True Story of Giordano Bruno, the Man Who Dared to Defy the Roman Inquisition**

by Michael White

Harper Perennial: New York, 2003. 256 pp. ISBN 0060933887.  
\$13.95 (paper).

Most people are familiar with the centuries-long Spanish Inquisition and its gruesome instruments of torture, autos-da-fé, brilliantly depicted in the etchings of Francisco Goya, and burnings at the stake. However, the Inquisition had a much wider net, holding sway wherever the Roman Catholic Church had power including Rome, the site of the Holy See. The Roman Inquisition had a profound influence on the lives of the two protagonists, as described in the two books under consideration: Galileo Galilei is an iconic figure in science, the father of experimental physics, a great astronomer, and writer of works considered classics in Italian literature. Giordano Bruno is much less well known but nonetheless an extremely interesting figure in his own right, an Italian priest defrocked for his heretical views of religion and the nature of the universe and a prolific author who wandered through northern Europe in search of work and patronage.

Galileo made six trips to Rome for a variety of reasons: to search for work, to bask in the glory of his growing fame, to show the beauty of the cosmos through his increasingly powerful telescopes, and to explain and defend his Copernican views of the heavens. Although many in the Church were initially sympathetic to his views, they turned on him in the end. Galileo was arrogant and would not bend from his belief that the Copernican model was more than a method to calculate the positions of the planets. Simplicio, his buffoonish character in one of his dialogues, resembled the pope, a former friend in Florence, too closely. The Roman Catholic Church also had to assert its authority because of the threat of the Reformation that was occurring in northern Europe. The confluence of these events led to Galileo's fateful visit to Rome in 1633 where the Inquisition made him recant his views and subjected him to house arrest for life. The influence of his powerful friends undoubtedly spared his life. By contrast, Bruno had neither the fame of Galileo nor the powerful friends to protect him. He was arrested in Venice in 1592, imprisoned in Rome in 1593, and ultimately burned at the stake in 1600. A crater on the far side of the moon is named after this courageous man who would not recant his views to the Inquisition.



## Summer Reading

### Dick Pagni recommends

#### Chasing the Molecule by John Buckingham

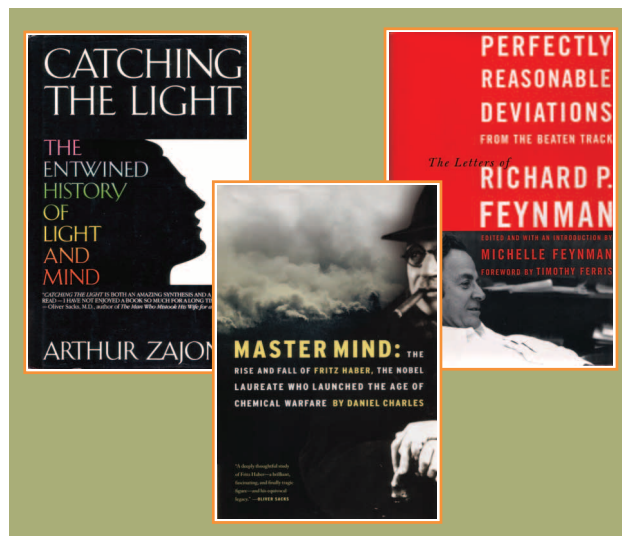
Sutton Publishing: Thrupp, UK, 2004. 259 pp.  
ISBN 0750933453. \$24.95

Have you ever noticed how many general audience books there are on physics and how few on chemistry? Why? Chemistry is far more important to society than many of the arcane subjects that physicists study today. For example, string theory, the hottest topic in physics today, is never likely to impact our lives. Quantum mechanics, of course, is another matter. I suspect the reason for this is two-fold: to date, physicists are better at developing comprehensible models of their work than chemists. Physicists' models are often appealing because they are exotic, other worldly, counterintuitive or overarching ("the theory of everything" and "the end of physics"). I am happy to report an exception in John Buckingham's delightful *Chasing the Molecule*, the story of the development of organic chemistry in the 19th century. The book is rich in stories of the people, theories, models, and experiments that have made organic chemistry the powerful field it is today. It was organic chemists who ultimately proved that molecules exist which many prominent physicists of the day, and some chemists too, doubted. Buckingham has shown that chemistry is full of good stories that can be powerfully told. I hope other chemists take up the task.

#### Catching the Light: The Entwined History of Light and Mind by Arthur Zajonc

Oxford University Press: Oxford, UK, 1995. 400 pp.  
ISBN 0195095758. \$18.95 (paper).

I purchased *Catching the Light* in a bookstore in Amherst, MA, across the street from Amherst College where the author is professor of physics. What a lucky happenstance this was because the book is extraordinarily good. Light, perhaps the most enigmatic thing in the universe, has fascinated people for millennia. Whatever its nature, we would not have our most important sense, vision, and even life itself with-



out it. Human beings are fortunate to have color vision, which most other mammals do not. The ancients saw patterns in starlight and reflected light from the planets, giving birth to the twin arts/sciences of astrology and astronomy. Artists have manipulated light and dark through the centuries to great effect. Think of the great but vastly different paintings of Michelangelo Caravaggio and Claude Monet, whose acuity to light has been judged second to none. Light is also a common theme of poetry. Emily Dickinson, a lifelong resident of Amherst, wrote many poems about light including "Light is sufficient to itself." Light has played a pivotal role in the special theory of relativity and quantum mechanics, two of the triumphs of 20th century science. The author deals with all of these strands of human experience and more. He has beautifully blended the history, physics, and experience of light in a very engaging and entertaining manner. This is one of the best non-fiction books I have ever read.