Some see private enterprise as a predatory target to be shot, others as a cow to be milked, but few are those who see it as a sturdy horse pulling the wagon.
- Winston Churchill

Phactum

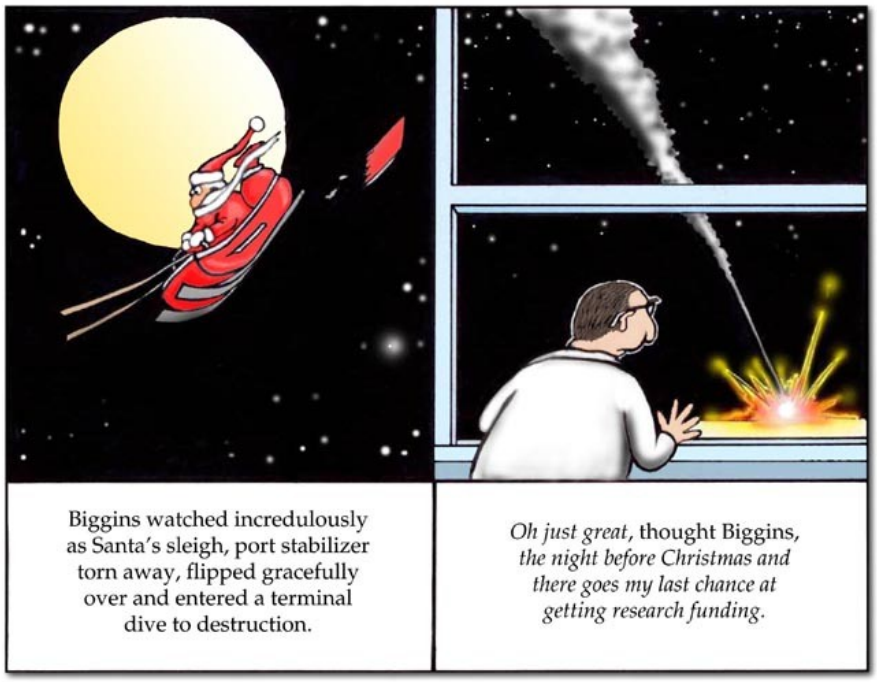
The Newsletter of the Philadelphia Association for Critical Thinking
November / December 2009

editor: Ray Haupt email: phactpublicity@aol.com
Webmaster: Wes Powers http://phact.org/

Saturday, November 21, 2009 Dr. Robert L.Park will discuss his book

Superstition: Belief in the Age of Science

More on page 6



Cartoon by Nick D. Kim http://www.lab-initio.com
Used by permission.

"Once a government is committed to the principle of silencing the voice of opposition, it has only one way to go, and that is down the path of increasingly repressive measures, until it becomes a source of terror to all its citizens and creates a country where everyone lives in fear."
Harry S Truman (1884 - 1972), August 8, 1950

PHACT CALENDAR

Dr. David Cattell, Chairman of the Physics Department of Community College of Philadelphia hosts meetings of **PhACT -** at 2:00 PM on the third Saturday of most months at Community College of Philadelphia, in **Lecture Room C2-28 in the Center for Business and Industry at the corner of 18th and Callowhill Streets**. Parking is easily available but is no longer free for PhACT attendees at CCP events. The Saturday parking rate is $3.50. Enter the college parking lot on 17th Street which is one way south bound. This meeting site is handicap accessible. **PhACT Meetings are free and open to the public unless otherwise noted.**

Saturday, November 21, 2009 - Dr. Robert L. Park, professor of physics at the University of Maryland and author of **Superstition: Belief in the Age of Science**, will be our speaker. Dr. Park will discuss his book and anything else that may be on his mind. See page 24 for description of the book.

Saturday, January 16, 2010 - TBA

Friday, November 6, 2009 at 8:00 PM. The Lenape Indians of the 18th Century By Chief Teedyuscung Ray Hershberger has been a US Parks Ranger for 30 odd years. In his capacity as a ranger, he can be stationed at any of the historical landmarks that make up America's most Historic Square Mile. His knowledge, therefore, of colonial days, is unsurpassed.

Due to a Native American background, Ray has always been fascinated with his heritage and has spent his life studying and acquiring knowledge about his people. He has brought that knowledge to life with a personification of Chief Teedyuscung, who will be present at our November General Membership Meeting.

Chief Teedyuscung (1700 - 1763)

The General Membership Meeting will be held at the Police Administration Building, 750 Race Street, Philadelphia, PA. This meeting is DVM's only activity specifically open to the public, so feel free to invite your friends and relatives. Door prizes will once again be awarded, sponsored by chocolate. The dinner is at 6:00 and the meeting will begin promptly at 8:00.

Don't let traffic on the Schuylkill Expressway interfere with attending. Consider taking SEPTA and exiting at Market Street East / Gallery, it is only a two block walk to the Police Administration Building.

November 11 2009 at 7:30pm at Bryn Mawr Presbyterian Church,625 Montgomery Avenue, Bryn Mawr, PA. **"The Expulsion of Interest in Spirituality and Health".** David J. Hufford, Professor Emeritus of Medical Humanities, Penn State College of Medicine, will trace the relationship between medicine and religion from the dawn of modernity in the mid-19th Century up to the present day. His story is one of separation and return. First, medicine distanced itself from religion under the influence of the "German model": of professional education. But in the 1960's, significant changes in psychology, medicine itself and science reunited these two fields. As he traces this history, Hufford examines a series of common but inaccurate assumptions which cloud our understanding of the relationship between health and spirituality.
This talk and all talks in Metanexus Science and Spirit lecture series are free to the public and will take place at 7:30 pm in Congregation Hall of Bryn Mawr Presbyterian Church, 625 Montgomery Avenue, Bryn Mawr. For more info: (484) 592-0304 or info@metanexus.net.

Tuesday, November 17, 2009 at 6:00 PM - At the Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, Pennsylvania 19103 - **An Evening with Polar Explorer Lonnie Dupre.** Earlier this year, to commemorate one of the most famous early polar expeditions and to raise awareness of the effects of global warming, Lonnie Dupre led a team of explorers on a 54 day trek across the ice to the North Pole. To mark the Academy of Natural Sciences early support of Peary's explorations, Dupre planted the Academy flag at the Pole. Join us as one of the greatest living polar explorers recounts his harrowing expedition. RSVP: **http://polarexplorer.eventbrite.com/**

(Continued on page 3)

The **PhACT Calendar** is open to members and non-members who wish to announce meetings and events of other groups of which they are interested or affiliated. These events should be of some general interest to the Skeptical or Scientific community and should be within a reasonable radius of Philadelphia. Send submissions to the editor at ***phactpublicity@aol.com***. Keep the announcements brief. Space is limited and insertions will be made on a first come-first served basis after the needs of PhACT are accomplished. Phactum does not accept paid advertising.

Sunday, November 22, 2009 at 4:00 PM - Regol Concerts presents .The Al Harrison Dixieland Band at Trinity Episcopal Church, 708 S. Bethlehem Pike, Ambler, PA 19002. Meet the artists after the performance. Post concert buffet style reception of light refreshments of New Orleans style cuisine.
Al Harrison, bandleader, trumpet and vocals, Gil Bennett, clarinet and saxophone, Fred Scott, trombone, Dave Posmontier, piano, Ed Wise, bass and vocals, Lew Leabman, drums. Ticket prices: $17 general, $12 seniors/students, $5 children under 12.
215.528.0582 **www.regolconcerts.com**

Monday, November 23, 2009 at 12:00PM at the Free Library of Philadelphia**. "America's Best Idea".** An American filmmaker who revolutionized the documentary film genre, **Ken Burns** is the award-winning creator of the documentary series Baseball, Jazz, and Unforgivable Blackness. His landmark film, The Civil War, was the highest-rated series in public television history, boasting an audience of 40 million viewers when it first aired and going on to win more than 40 prizes, including two Emmy and two Grammy awards. Airing this fall on public television, Burns's new work, The National Parks: America's Best Idea, tells the story of the creation and evolution of the National Parks System using archival photographs, first-person accounts, and some of the most breathtaking new images of our national parks ever captured on film. In his review of the companion book to the series, historian Joseph J. Ellis writes, "the book permits the eye and mind to linger over the truly breathtaking pictures in a more meditative way that film does not allow. The result is almost elegiac, producing the same kind of goose bumps that Burns created in his early work on the Brooklyn Bridge and the Civil War." Cost: $14 General Admission, $7 Students Buy tickets online:
http://libraryphila.tix.com/Event.asp?Event=222954

Tuesday, November 24 at 7:30 PM. At the Free Library of Philadelphia, 20th and Benjamin Franklin Parkway. **Adam Gopnik** | *Angels and Ages: A Short Book about Darwin, Lincoln, and Modern Life.* Horace W. Goldsmith Foundation Endowed Lecture Co-sponsored by the American Philosophical Society Museum. Adam Gopnik's Angels and Ages is a study of the cultural impact of Charles Darwin and Abraham Lincoln. Time magazine calls the book "a succinct, convincing, and moving account of how two men ripped mankind out of its past unreason and thrust it into a more enlightened age." Gopnik appears at the Free Library to speak of these celebrated thinkers--who were born on the same day in 1809--on the 150th anniversary (to the day!) of the publication of On the Origin of Species. A contributor to the New Yorker for more than two decades, Gopnik is a three-time recipient of the National Magazine Award. Ticket or subscription purchase required. 215-567-4341

Chemical Heritage Foundation

Events and exhibits at Chemical Heritage Foundation 315 Chestnut Street Philadelphia, PA 19106

Events are free and open to the public unless otherwise noted.

Tuesday, November 17, 2009 at 12:00 p.m. to 1:00 p.m. -
Brown Bag Lecture: Benjamin Gross, " '**Like a Picture on a Wall': Early Flat-Panel Display Research at RCA, 1951–1966"**
RSVP Requested

Tuesday, December 1, 2009 at 12:00 p.m. to 1:00 p.m.
Brown Bag Lecture: Abigail Schade, **"Squeezing Water from a Stone: Perceptions of Groundwater in al-Karaji's 11th-Century 'Treatise on the Extraction of Hidden Waters'"**
RSVP Requested

Wednesday, November 19, 2009. Lecture 6:00 p.m. to 7:00 p.m. Reception 7:00 p.m. to 8:00 p.m.
2009 Ullyot Public Affairs Lecture: Joseph M. DeSimone

The Ullyot Public Affairs Lecture emphasizes to the general public the positive role that chemistry and related sciences play in our lives.

This year's lecture will be given by Joseph M. DeSimone, Chancellor's Eminent Professor of Chemistry at the University of North Carolina at Chapel Hill and William R. Kenan Jr. Professor of Chemical Engineering at North Carolina State University.

Chemical Heritage Foundation
315 Chestnut Street Philadelphia, PA 19106
Tel: 215-925-2222 • Fax: 215-925-1954
http://www.chemheritage.org

DeSimone has developed groundbreaking solutions in green manufacturing and promising applications in gene therapy, drug delivery, and medical devices. His PRINT molds (pictured) can manufacture nanobiomaterials for the diagnosis and treatment of disease.

Dr. DeSimone will deliver a talk entitled, "Bridging Fields and Harnessing Diversity for the Sake of Innovation: Tackling Unmet Needs in the Life Sciences by Exploiting Developments in Materials."
Registration required

Ongoing exhibitions

Transmutations: Alchemy in Art (exhibit) :
Monday-Friday, 10:00 a.m. to 4:00 p.m., by appointment only
Call 215-925-2222 to make an appointment.

The Whole of Nature and the Mirror of Art: Images of Alchemy (exhibit)
Du Pont Gallery
Chemical Heritage Foundation
315 Chestnut Street
Philadelphia, PA 19106

Free and open to the public.

1700 West Montgomery Avenue
, Philadelphia, PA 19121
ph 215-763-6529 **www.wagnerfreeinstitute.org**

The Wagner Free Institute of Science announces its free science courses for Winter/Spring 2010. The courses run from five to ten weeks. Lectures are held in the evening and last approximately one and a half hours. The courses are taught on an introductory college level and are appropriate for adults wishing to enrich their knowledge of the sciences, as well as for motivated junior and senior high school students.

Fungi and Plants, Professor Karen Snetselaar. Wednesday, January 20, 2010, and then Monday, January 25, 2010 for 5 Mondays beginning at 6:30 PM. Pennsylvania Horticultural Society, 100 N. 20th Street. There are over 100,000 species of fungi. This course will look at groups of fungi that are particularly important to plants and to people who are interested in plants. This course requires preregistration. To preregister, call 215-763-6529, ext. 23, beginning Monday, November 16, 2009.

Evolution in Action: A Study of Species' Options Over Time, Professor Mary Beth Davis. Wednesday, January 20, 2010, beginning at 6:30 PM. 8 Wednesdays. Independence Branch of the Free Library, 18 S. 7th Street. Charles Darwin proposed that in nature, changes in the environment present species with three possible evolutionary scenarios: adaptation, migration, or extinction. This course will examine these responses in depth through case studies of the natural history of individual species. No preregistration required.

Global Change, Mass Extinctions, and Biodiversity in the Fossil Record, Professor William B. Gallagher. Saturday, January 30, 2010, beginning at 10:15 AM. 10 Saturdays. University of Pennsylvania Museum of Archaeology and Anthropology, 33rd and Spruce Streets. This course will consider the linkages between environmental change and biodiversity fluctuations by studying the geologic record of mass extinctions. It will also look at biotic recovery and diversity rebounds after extinctions. No preregistration required.

Introduction to Pollination Biology, Professor Tatyana Livshultz. Monday, April 5, 2010, beginning at 6:30 PM. 6 Mondays. Pennsylvania Horticultural Society, 100 N. 20th Street. This course will survey the science of pollination biology, including the discovery of plant pollinations in the late 17th century, plant adaptation to animal pollination and how they evolve, and the importance of pollination to human society. This course requires preregistration. To preregister, call 215-763-6529, ext. 23, beginning Monday, November 16, 2009.

Introduction to Birding in the Delaware Valley, Professor Clifford Hence. Wednesdays, April 7 - April 28, 2010 (6:30-7:45 PM) and Saturdays, May 1, 8 &15 (3 field trips from 8:00-11:00 AM). Independence Branch of the Free Library, 18 S. 7th Street and three field trips to local parks. This course will provide an introduction to birding in the region, including when and where to bird, and how to identify species in the field. No preregistration required.

All courses, unless otherwise indicated, are offered free of charge. For full course information and syllabuses, call 215-763-6529 or visit **www.wagnerfreeinstitute.org**

Family Open House

The Wagner Free Institute of Science will present a family Open Houses on November 21. l. The Presentation will be given in the historic lecture hall with hands-on activities taking place in the museum. This family program is appropriate for ages 6-12 but will be enjoyed by teenagers and adults alike. This program is free of charge.

Saturday, November 21, 2009 – 12-4 PM, Presentation at 1 PM – **"Naturally Illuminating: The Science Behind Luminescence."** Children's presentation by the Wagner Free Institute of Science, featuring hands-on experiments that demonstrate the difference between photoluminescence and chemoluminescence.

Westbrook Lecture 2010
SATURDAY, MARCH 27 at 1:00 PM
Dr. Bonnie Bassler
"I Am One of You: The Secret Language of Bacteria"

Penn
University of Pennsylvania

2009-10 Penn Science Café Schedule

The Penn Science Café, the lecture series that hauls science out of the lab and treats it to a night on the town. Free and open to the public, it's an opportunity to pitch questions to leading scientific experts.

6 p.m. at the White Dog Café, 3420 Sansom Street, Philadelphia, PA 19104. Menu items available for purchase RSVP to Jordan Reese, **jreese@upenn.edu** or 215-573-6604. RSVP's are encouraged, but we aren't sticklers.

- **Nov 18,** Lyle Ungar, Computer Science **The Singularity-When computers Will Think Like Humans**
- **Dec 16**, Adrian Morrison, Veterinary Medicine An Odyssey With Animals: Reflections on the Animal Rights and Welfare Debate
- **Jan 20, 2010,** Ruth Schwartz Cowan, History and Sociology of Science: **DNA Banks and Genetic Tests, Should I make a deposit? Should I take one?**
- **Feb 16,** Max Mintz, Department of Computer Science **Quantum Computing**
- **March 17,** Jonathan Moreno, History and Sociology of Science: **Bioethics in Washington**
- **April 14,** Josh Plotkin, Department of Biology **: A Viral Evolution**
- **May 12**, Robert Kurzban, Department of Psychology: **The Cognitive Process Behind Hypocrisy**

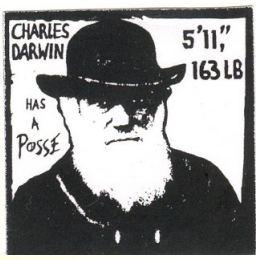
Science on Tap, A Science Café

Science on Tap is a monthly gathering in Philadelphia for anyone who is interested in getting together with other people to discuss a range of engaging science topics.

Held at National Mechanics, a relaxed, convivial bar in Old City, *Science on Tap* features a brief, informal presentation by a scientist or other expert followed by lively conversation. The goal is to promote enthusiasm for science in a fun, spirited, and accessible way, while also meeting new people. Please come join the conversation! On the second Monday of each month at 6:00 PM.

What's on tap: November 9, 2009 at 6:00 PM "Embracing Darwin" - Colin Purrington, Associate Professor of Biology, Swarthmore College

Charles Darwin turned 200 in February, and his book *On the Origin of Species* turns 150 in late November. Colin Purrington, an evolutionary biologist at Swarthmore College who operates the online site The Axis of Evo, will discuss why both the man and his work remain significant today and worthy of celebration. He will leave time for the audience to come pose with a life-size cut out of Charles Darwin, so please bring your cameras and remember to wear something presentable. If the audience is good, he will also hand out "Charles Darwin has a posse" stickers and temporary tattoos to promote appreciation of evolution. (Presented by the American Philosophical Society Museum)



Science on Tap is sponsored by a consortium of five Philadelphia institutions: the Academy of Natural Sciences, the American Philosophical Society (APS) Museum, the Chemical Heritage Foundation (CHF), Mütter Museum of The College of Physicians of Philadelphia, and the Wagner Free Institute of Science.

Upcoming Events

- December 14, 6:00 p.m. - Michael McCann, Professor of Biology, St. Joseph's University. Presented by The Wagner Free Institute of Science.

National Mechanics
22 South Third St.
Philadelphia PA 19106
215-701-4883

Free and Open to the public (age 21+) or minors accompanied by a chaperone 25+.

Want to join the Science on Tap mailing list? Contact us at **scienceontapphilly@gmail.com** and include "subscribe to mailing list" as the subject line

The College of Physicians of Philadelphia
BIRTHPLACE OF AMERICAN MEDICINE℠

The College of Physicians of Philadelphia
19 South Twenty-Second Street
Philadelphia, PA 19103
(215) 563-3737 x304
http://www.collphyphil.org/prog_calendar.htm

College of Physician lectures and programs are free. There may be a fee at some receptions.

Monday, November 9, 2009 at 6:30pm - House of Estrogen: A father's play about strong women, strong girls, and strong medicine. Dan Shapiro, PhD, Chair, Department of Humanities, Penn State College of Medicine, Hershey PA.

House of Estrogen: A father's play about strong women, strong girls, and strong medicine takes the form of a one-man play/ extended monologue. When Shapiro was 20, he was diagnosed with Hodgkin's Disease and spent five years in and out of treatment for his cancer. Twenty years later, his wife and mother were diagnosed with serious cancers. In this play about strong women and their response to serious crisis, Shapiro illuminates fatherhood, husbandhood, and childhood under pressure. Dan Shapiro is a psychologist who specializes in treating physicians, and is the author of Delivering Doctor Amelia: The Story of a Gifted Young Obstetrician's Error and the Psychologist Who Helped Her. Sponsored by the Section on Medicine and the Arts. Reception follows program. Register for this event

Friday, November 13, 2009 at 6:30pm - The Anatomy Murders - Lisa Rosner, PhD, Professor of History, Stockton College, New Jersey. The Anatomy Murders is a book about William Burke and William Hare, the Edinburgh murderers who killed seventeen people to provide dissection specimens for doctors teaching anatomy. Sponsored by the F.C. Wood Institute for the History of Medicine and the Mütter Museum. A book signing and reception follow program. Register for this event

Monday, November 16, 2009 at 6:30pm - Health Care Reform 2009: Can It Provide Health Care For All? - Dennis Andrulis, PhD, MPH, Director, Center for Health Equality, Associate Dean of Research, Drexel University School of Public Health. This lecture will discuss the impact of health care reform on health inequities. Light Refreshments following lecture. Co-sponsored by **PhillyHealthInfo.org**. Register for this event.

Tuesday, December 8, 2009 at 6:30pm - Is Physician Self-Regulation Dead? - New York Times reporter Gardiner Harris and Christine K. Cassel, MD, President and CEO, American Board of Internal Medicine and ABIM Foundation. This program will discuss professionalism in medicine. Hors d'oeuvres reception follows program; fees apply. Hors d'oeuvres reception follows program; **fees apply**. Register for this event.

Tuesday, December 15, 2009 at 8:30am - 4pm - Trauma Champions Day - All day program will offer opportunities for trauma survivors with mental health and addiction histories to inform the knowledge base in the fields of mental health, addiction services, family and children services, and other systems such as criminal justice and education from which people with lived experience receive services and supports. The intent of this day is to develop networks within geographic areas and interest groups. Trauma Champions Day is the first step in helping communities develop Trauma Champions Initiatives. These initiatives will be managed by Trauma Champions in their own neighborhoods.

Co-sponsored by The Behavioral Health Training and Education Network with support from the Philadelphia Department of Behavioral Health/Mental Retardation Services and the College of Physicians of Philadelphia's PhillyHealthInfo.org.

Dr. David Cattell, Chairman of the Physics Department of Community College of Philadelphia will host Dr. Robert L. Park, Professor of Physics at the University of Maryland, who will discuss his book

Superstition: Belief in the Age of Science

At 2:00 PM Saturday, November 21, 2009 in Lecture Room C2-28 in the Center for Business and Industry at the corner of 18th and Callowhill Streets. Parking is easily available. The Saturday parking rate is $3.50. Enter the college parking lot on 17th Street which is one way south bound. This meeting site is handicap accessible. PhACT Meetings are free and open to the public unless otherwise noted.
If you were to arrive early you are invited to view the exhibition in the Rotunda which is in the Mint Building, formerly the United States Mint, now part of Community College of Philadelphia. See page 8.

Robert Lee Park is emeritus professor of physics at the University of Maryland, College Park and a former Director of Public Information at the Washington office of the American Physical Society. Park is most noted for his critical commentaries on alternative medicine and other pseudoscience, as well as his opposition to manned space travel and space development. He achieved his bachelors and masters degrees in Physics from the University of Texas in 1958 and 1960.

He obtained his PhD in physics at Brown University in 1964. During his graduate work he was associated with physicist Harrison E. Farnsworth with whom he authored several papers.

He spent almost a decade working as a member of the technical staff, and later Director of the Surface Physics Division, at Sandia National Laboratories, a U.S. Government weapons research laboratory. He would draw on these experiences in later commentaries on government involvement in science and nuclear weapon development.
In 1974 he was recruited by the University of Maryland for their physics department. He has been associated with UMD ever since. He was Director of UMD's Center of Materials Research from 1975 to 1978 and Chairman of the Department of Physics and Astronomy from 1978 to 1982.

Over his long career as a physicist he has authored more than a hundred technical papers on the structure and properties of single-crystal surfaces and has supervised ten PhD Theses. He has chaired "more committees than I want to remember" and edited several peer-reviewed journals or proceedings.
He is a Fellow of the American Physical Society, the American Association for the Advancement of Science and the American Vacuum Society.

Park writes a weekly column, **What's New**, which appears each Friday on the University of Maryland's website: **http://bobpark.physics.umd.edu/** It features discussions on topics such as science news, space exploration, energy, the government in science, pseudoscience, alternative medicine, the creation-evolution controversy, and nuclear weapons. In his column he has characterized Wikipedia as a target for misuse by the "purveyors of pseudoscience". However, he has also stated in What's New that he finds Wikipedia indispensible and that, instead of a Wikipedia critic, he is a curmudgeon, but thinks "Wikipedia is cool." As a matter of fact, these notes about Dr. Park have been shamelessly pinched from Wikipedia.

See Page 7 for descriptions of Dr. Park's books.

Check out a facetious letter by Benjamin Franklin, then a very young scientist, in the Pennsylvania Gazette, April 23, 1730 on the matter of a mysterious haunting. Page 9.

"Reason is the greatest enemy that faith has; it never comes to the aid of spiritual things, but - more frequently than not - struggles against the divine Word, treating with contempt all that emanates from God."

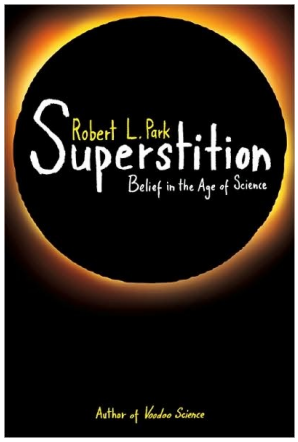
Martin Luther (1483 - 1546) German Priest and Scholar whose questioning of certain church practices led to the Protestant Reformation.

Books by Dr. Robert L. Park

Superstition:
Belief in the Age of Science
by Robert L. Park

Princeton University Press October 2008
ISBN-13: 9780691133553
Hardcover 240 pages $24.95

From uttering a prayer before boarding a plane, to exploring past lives through hypnosis, has superstition become pervasive in contemporary culture? Robert Park, the best-selling author of *Voodoo Science*, argues that it has. In *Superstition*, Park asks why people persist in superstitious convictions long after science has shown them to be ill-founded. He takes on supernatural beliefs from religion and the afterlife to New Age spiritualism and faith-based medical claims. He examines recent controversies and concludes that science is the only way we have of understanding the world.



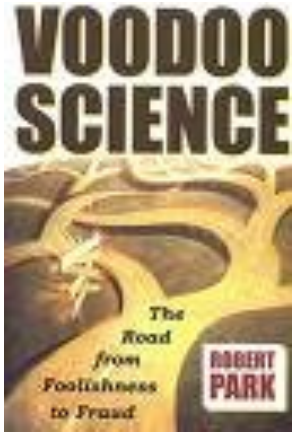
Park sides with the forces of reason in a world of continuing and, he fears, increasing superstition. Chapter by chapter, he explains how people too easily mistake pseudoscience for science. He discusses parapsychology, homeopathy, and acupuncture; he questions the existence of souls, the foundations of intelligent design, and the power of prayer; he asks for evidence of reincarnation and astral projections; and he challenges the idea of heaven. Throughout, he demonstrates how people's blind faith, and their confidence in suspect phenomena and remedies, are manipulated for political ends. Park shows that science prevails when people stop fooling themselves.

Compelling and precise, *Superstition* takes no hostages in its quest to provoke. In shedding light on some very sensitive—and Park would say scientifically dubious—issues, the book is sure to spark discussion and controversy.

Voodoo Science: The Road from Foolishness to Fraud
By Robert L. Park

Publisher: Oxford University Press, USA
November 15, 2001
ISBN-10: 0195147103 ISBN-13: 978-0195147100
Paperback: 240 pages $19.99

Scientific error, says Robert Park, "has a way of evolving ... from self-delusion to fraud. I use the term voodoo science to cover them all: pathological science, junk science, pseudoscience, and fraudulent science." In pathological science, scientists fool themselves. Junk science refers to scientists who use their expertise to befuddle and mislead others (usually juries or lawmakers). Pseudoscience has the trappings of science without any evidence. Fraudulent science is, well, fraud--old-fashioned lying.



Park is well-acquainted with voodoo science in all its forms. Since 1982, he has headed the Washington, D.C., office of the American Physical Society, and he has carried the flag for scientific rationality through cold fusion, homeopathy, "Star Wars," quantum healing, and sundry attempts to repeal the laws of thermodynamics. Park shows why a "disproportionate share of the science seen by the public is flawed" (because shaky science is more likely to skip past peer review and head straight for the media), and he gives a good tour of recent highlights in Voodoo. He has a rare ability to poke holes compassionately, without excoriating those taken in by their fondest wishes. Park is less forgiving of scientists (especially Edward Teller) when he thinks they've fallen down on the job, a job that should include helping the public separate the scientific wheat from the voodoo chaff.

In the Rotunda
November 5th - 30st, 2009

A look at mid-century cigarette advertisements. Look for advertising that will make you laugh, make you angry and make you wonder what 20th century Americans were thinking.

Opening Reception
November 5th at 4:00 PM

The Rotunda located in the College's **Mint Building, at 17th and Spring Garden Streets**, is a space that originally displayed valuable coins from the Mint. The ceilings still depict scenes from the gold rush. With its magnificent chandelier, the Rotunda is a familiar gathering space for students and the entire College community to experience special events, performing arts groups and student art shows.

Advertisements like this put the makers of Lucky Strike into a legal battle against the candy industry. (The original slogan was "Reach for a Lucky instead of a Sweet.) The candy industry won out, but cigarettes were still touted as a "healthy" way for individuals to stay in shape.

Faculty of History, Sociology, Marketing, Allied Health, Art, English, Humanities and Psychology classes will find this collection of primary source materials perfect for student exploration and critical thinking.

Bring your classes to the Rotunda during the month of November.

Letter of the Drum

To the Publisher of the GAZETTE.

SIR,

I know well that the Age in which we live, abounds in Spinosists, Hobbists, and most impious Free-Thinkers, who despise Revelation, and treat the most sacred Truths with Ridicule and Contempt: Nay, to such an Height of Iniquity are they arrived, that they not only deny the Existence of the Devil, and of Spirits in general, but would also persuade the World, that the Story of Saul and the Witch of Endor is an Imposture; and which is still worse, that no Credit is to be given to the so well-attested One of the Drummer of Tedsworth. I do, indeed, confess that the Arguments of some of these unbelieving Gentlemen, with whom I have heretofore conversed on the Subject of Spirits, Apparitions, Witches, &c. carried with them a great Shew of Reason, and were so specious, that I was strongly inclined to think them in the Right; and for several Years past have lived without any Fear or Apprehensions of Daemons or Hobgoblins; but the Case is quite alter'd with me now; and I who used to sleep without drawing my Curtains, am now so fearful, that I pin them every Night I go to Bed with corking Pins, and cover my self Head over Ears with the Clothes. Now this Change is not owing, as you would imagine, to any frightful Apparition I have seen, or uncommon Noise I have heard; but to a most amazing Account I received the other Day from a Reverend Gentleman, of a certain House's being haunted with the D ------- l of a Drummer, not a whit less obstreperous, than the Tedsworthian Tympanist: This Gentleman, whose Veracity few People presume to call in Question, told me, that he was not long since obliged to meet some of his Brethren, at a certain Town about fifteen Miles below Philadelphia, in order to settle some Affairs of the Church, and to consult on proper Measures to prevent the Growth of Atheism; that he was there joined by four of his Brethren; who insisting that it was unpresidented to proceed to Business at their first Meeting, they thereupon unanimously agreed to defer their Consultations 'till the next Day; that they spent the Evening chearfully, yet soberly; that about ten at Night they retired to repose themselves, but lodged in separate Rooms; that he, with his Companion, were no sooner warm in their Bed, than they heard a Drum beating very loud, now on the one Side of their Bed, then on the other, and in a Moment after on the Teaster; that sometimes they distinctly heard the Scots Traveller, and at other Times the Grenadiers March; that the Noise continued all Night, frighted them almost to Death, and yet, which is the most surprizing and unaccountable Part of the Relation, disturbed no Mortal in the House save themselves; that early in the Morning they went into the next Room, where they found two of their Brethren sleeping soundly; that they were amazed to find them so fast asleep after such a terrible Night; that having

The Ghostly Drummer of Tedworth,
from Joseph Glanvill's Saducismus Triumphatus, 1681

In March, 1661 John Mompesson of Tedworth (located in Wiltshire, England) brought a lawsuit against a local drummer whom he accused of collecting money under false pretences. The court found the drummer guilty, confiscated his drum, and gave it to Mompesson. Soon afterwards, Mompesson discovered that an angry, drumming spirit had invaded his house. The spirit drummed loud tunes on the bed of his children, moved objects around in the house, threw shoes, and wrestled with servants.

awakened them, they asked whether they had not been disturbed with the Noise of a Drum? that they replied, They had rested well, and were surprized to hear them ask such a Question, and hinted that they believed them to be out of their Senses; upon which he related to them the Adventure of the Night, so full of Horror, with all the Particulars I have mentioned, and many more which I have omitted; That at first they seemed to give little Credit to what he said; but upon his Bedfellow's affirming it to be true, they appeared to be satisfied of the Reality of the Fact. Then the Gentleman went on with his Story in this wise: That the next Night he with his Companion went to Bed in the same Room, in which they had been so terribly frighten'd; that they had not taken their first Nap, before they heard an uncouth Noise under them; that his Companion was shortly after seized violently and forcibly by the great Toe, and in great Danger of being pulled out of the Bed; but that upon the Beating of the Drum, which happen'd at the same Instant, his Toe was released; and that to prevent any future Attacks, they hoisted their Knees up to their very Noses; the Noise still growing louder, they felt a most prodigious Weight on them, heavier, as he said, than the Night-Mare; that by his Voice they presently discovered it to be one of their Brethren, who had come into their Room on purpose to scare them; either believing that they had told him a Fib, or that they were under such potent Influences the Night before, as made them imagine they heard a Drum, when in Reality they did not; But mark, said the Relater to me; according to the old Proverb, Harm watch Harm catch; for he was so frighted himself, that he would not have ventured back to his own Room, though he were sure to be made a Bishop; so that we were obliged to share our Bed with him, in which we lay sweating, and almost dead with Fear, 'till Morning. Thus he concluded his surprizing Relation, which wrought so strongly on me, that I could no longer Doubt of the D ------ l's having plaid them this Prank; and to this Story only my Timorousness is owing. Now, I know well enough, that some Folks will be apt to say; it is all a Lye, a meer Forgery; in short, they will raise an infinite Number of Objections to destroy its Credit; for when I told it to a certain Person, he swore it could not be true; because in a Piece of the learned Greutzius, which he had read, De examine Sagarum, he found that all the Divines in Germany were clearly of Opinion, that the Devil never begins to play his Pranks 'till after Midnight, and that no Spectres were seen before that Time; and this Noise beginning between ten and eleven both Nights, he was assured, for that Reason, that the Devil was no Way concern'd in it; but he had almost staggered me, when he told me this Story: A certain Curate lived in the Island of Jamaica, who loved his Bottle, no Curate better; he chanced to be drinking in a Tavern, when he was called upon to do the last Offices to a Brother departed; upon which with great Reluctance he leaves his Company, but told them he would return immediately: away he hies to the Place of Burial, and, as is usual, reads over the Service for the Dead, 'till he came to the Words, I heard a Voice from Heaven, saying, blessed, &c. at which he was interrupted by one of his Companions, who had followed him from the Ale-house, with a `By G ------ that's a d ------ 'd Lye, for I have been drinking with you all Day at Mother ------ 's, and if you had heard the Voice, I should have heard it too, for my Ears are as good as yours.' The Gentleman left me to apply the Story.

Now, Sir, as I take you to be a Person of profound Learning and Judgment, I desire you will set me to rights, by giving me your Opinion candidly, whether I ought to give Credit to the above Relation or not, altho' it be attested by two Reverend Fathers,

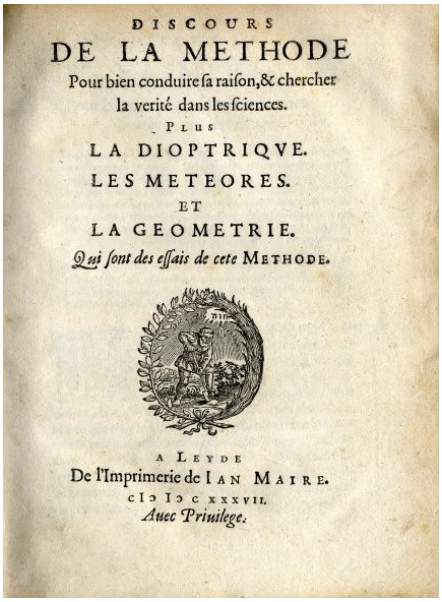
I am, Sir, yours, &c.;

The Pennsylvania Gazette, April 23, 1730

Letters to the Editor

Editor: From Descartes' "Discourse on Method", Chapter Two:

> *"And as a multitude of laws often only hampers justice, so that a state is best governed when, with few laws, these are rigidly administered; in like manner, instead of the great number of precepts of which logic is composed, I believed that the four following would prove perfectly sufficient for me, provided I took the firm and unwavering resolution never in a single instance to fail in observing them.*
>
> *The first was never to accept anything for true which I did not clearly know to be such; that is to say, carefully to avoid precipitancy and prejudice, and to comprise nothing more in my judgement than what was presented to my mind so clearly and distinctly as to exclude all ground of doubt.*
>
> *The second, to divide each of the difficulties under examination into as many parts as possible, and as might be necessary for its adequate solution.*
>
> *The third, to conduct my thoughts in such order that, by commencing with objects the simplest and easiest to know, I might ascend by little and little, and, as it were, step by step, to the knowledge of the more complex; assigning in thought a certain order even to those objects which in their own nature do not stand in a relation of antecedence and sequence.*
>
> *And the last, in every case to make enumerations so complete, and reviews so general, that I might be assured that nothing was omitted."*


DISCOURS
DE LA METHODE
Pour bien conduire sa raison,& chercher la verité dans les sciences.
Plus
LA DIOPTRIQVE.
LES METEORES.
ET
LA GEOMETRIE.
Qui sont des essais de cete METHODE.
A LEYDE
De l'Imprimerie de IAN MAIRE.
cIↃ IↃ c xxxvii.
Avec Privilege.

We have had questions recently about what is Skepticism (or what should it be). May I recommend Descartes' four rules here as yet another possibility? A Skeptic, by this definition, would be one who takes issue with claims he thinks have not followed the rules.

M. Paul Menga
Philadelphia, PA

Editor: SSE [Society for Scientific Exploration] already has its journal, JSE [Journal of Scientific Exploration], and its quarterly newsletter, The Explorer, and has just published the first edition of its new quarterly magazine, EdgeScience.

That first issue is available to all at:

http://www.scientificexploration.org/edgescience

David Leiter
Willow Grove, PA

Editor: Thanks for your email and I apologise for the delay in replying. It would be great if you could help spread the word and encourage subscriber's of Phactum to support the campaign to Keep the Libel Laws Out of Science by signing up at: **http://www.senseaboutscience.org.uk/freedebate**

The goal is to make English libel laws more like American libel laws, which are more sympathetic to free speech and the coverage of matters of public interest.
Simon Singh
London
Editors note: More about this matter on Page 12.

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Various Ruminations

Collected/Written by Ray Haupt
(with help from others)

Witchcraft in the Age of Science

Get a load of this Associated Press article of October 19, 2009 reported by CBSNews.

It has become commonplace in parts of Nigeria for pastors and others in some evangelical Christian sects to accuse children of witchcraft. They are very literal in their interpretation of Exodus 22:18 "Thou shalt not suffer a witch to live."

Pastors have been vigorous in enforcement of that admonition to the extent that over the last decade about 15,000

These are witches?

children have been accused of witchcraft and at least 1,000 have been murdered for their "crime". In the past month three Nigerian children were murdered and three more set on fire. One little boy, age 9, was forced by his father to drink acid after denunciation by his "pastor". He died within a month. **http://www.cbsnews.com/stories/2009/10/17/world/main5392572.shtml**

See also: **http://www.steppingstonesnigeria.org/node/18**

The anti-vaccination controversy

PhACT's speaker at the February 2008 meeting, Dr. Paul Offit, lives a life of alternate praise and condemnation. In his professional life Paul has developed a vaccine designed to protect children from common childhood diseases such as measles, mumps, and rubella. His work has caused thousands of lives to be saved and likely many more thousands of lives to have been spared some nasty side effects of those disease in later life such as respiratory problems, vision and hearing impairments, heart conditions, and so on. One would think that such a medical advance would be universally praised, but it is not and in some quarters Dr. Offit has been demonized by fearful parents and others. Fearful and dreadfully misinformed celebrity parents such as former model Jennie McCarthy and her actor/husband Jim Carey can easily attract attention and acquire a forum to spread even more panic. They have done so courtesy of Larry King and others.

The major fear of such parents is that vaccination will cause autism because of a minute amount of a mercury compound used as a preservative.

Dr. Offit insists, buoyed by mountains of medical studies, that the vaccine does not cause autism, that it does prevent some nasty diseases, that the mercury compound is no longer being used, that after California banned the use of mercury in vaccines the rate of diagnosed autism is unchanged. All to no avail. Fear and superstition linger and are heatedly propelled.

It so happens that in the October 289 2009 edition of Consumer Health Digest Dr. Stephen Barrett reports:

> **Yet another study debunks vaccination-autism link.** New findings from the CHildhood Autism Risks from Genetics and the Environment (CHARGE) study have found no difference in the blood levels of mercury among children ages 2-5 with autism spectrum disorders and children who were developing normally. [Hertz-Picciotto I and others. Blood mercury concentrations in **CHARGE Study: Children with and without autism. Environmental Health Perspectives, Oct 19, 2009]** The complete report is available at: **http://www.ehponline.org/members/2009/0900736/0900736.pdf**

It did not take many google scans to discover that rubella, otherwise known as German measles, is a rather dangerous disease for expectant mothers in that the unborn children can experience a wide range of birth defects. Ironically a high rate of autism has been observed in children with congenital rubella. See **http://www.springerlink.com/content/j25pqu8546115m47/**

Meanwhile, Dr Offit is being hounded and threatened. All is not lost however, as it appears that he does have knowledgeable allies and admirers. Dr Barrett reported in the same edition of Consumer Heath Digest:

> **Vaccination crusader honored and libeled.** Paul Offit, M.D., has received the American Academy of Pediatrics President's "Certificate for Outstanding Service," in recognition of his ongoing commitment to promote immunization." Offit, a pediatrician, is chief of infectious diseases and the director of the Vaccine Education Center at the Children's Hospital of Philadelphia. His 2008 book, *Autism's False Prophets*, (see page 16) **http://www.amazon.com/exec/obidos/ASIN/0231146361/quackwatch-20** exposed the opportunism of lawyers, journalists, celebrities, practitioners, politicians, and miscellaneous cranks who are promoting the myth that vaccines cause autism. Vaccine opponents, enraged by both the book and the

award, have responded by making false and misleading statements about him.

Paul's troubles do not end with the MMR vaccinations. There are other diseases and other vaccines under attack and Paul is in the thick of the battle. Pertussis, commonly known as whooping cough, and chicken pox are two such diseases with associated vaccines and controversey. Parental reluctance to vaccinate unfortunately correlates powerfully to recent surges in both diseases, all the while showing little if any correlation to autism.

Alternative Medicine in the United Kingdom

Simon Singh, a science writer, is not exactly a household name in America, but in the United Kingdom he is well known as a science writer and recently as defendant in a libel trial with serious free speech overtones. In the July/August 2009 Phactum (page 9) we did report that Singh has been sued by the British Chiroparactic Association for having libeled chiropractors. Singh's offense is that he, in foul collusion with Dr. Edzard Ernst, a world renowned expert in complimentary and alternative medicine, wrote a book entitled *Trick or Treatment? Alternative Medicine on Trial (see page 31)* in which they question chiropractors ability to effectively treat ailments such as infant colic and ear infections. The passage in particular that twisted BCA underwear is an article by Singh in the April 19, 2008 edition of The Guardian stating:

> *"You might think that modern chiropractors restrict themselves to treating back problems, but in fact they still possess some quite wacky ideas. The fundamentalists argue that they can cure anything. And even the more moderate chiropractors have ideas above their station. The British Chiropractic Association claims that their members can help treat children with colic, sleeping and feeding problems, frequent ear infections, asthma and prolonged crying, even though there is not a jot of evidence. This organisation is the respectable face of the chiropractic profession and yet it happily promotes bogus treatments."*

It was the *"happily promotes bogus treatments"* remark that set off the tsunami of expensive litigation. The Guardian has defended Singh as has many scientifically prominent individuals and organizations, especially Sense About Science which has organized a petition campaign to fight this law suit. **http://www.senseaboutscience.org** If you are so inclined please sign this petition yourself at that website. You will be in good company. Signers include: Professor Richard Dawkins, James Randi, Penn & Teller, Professor Sir David King, former Chief Scientific Adviser to the UK Government, PZ Meyers, and nearly 19,000 others, scientists, physicians, writers, ordinary citizens.

In mid-October the BCA had issued a press release in which they stated that the BCA had been *"maliciously attacked"* by Simon Singh. In subsequent press releases that term *"maliciously attacked"* had been retracted in favor of "*libelled*". The door appears open for a counter suit by Singh. Would it not be appropriate for one side or the other to prove its scientific contentions in court to end this bickering? I think it would and I would expect an outcome similar to that of the Dover Intelligent Design Trial.

Here is a link to a video where Simon Singh discusses diverse quackeries with an Australian audience:
http://www.blip.tv/file/2657633

Alternative Medicine in Australia

An email from Vicky Hyde, Chair Entity of the New Zealand Skeptics, contains an internet link to a video report about Australian alternative medicine "healer" Noel Batten.
http://www.blip.tv/file/2747331

Batten has no formal medical training yet claims to have cured over 17,000 sufferers of very drastic diseases such as Parkinson's Disease, Multiple Sclerosis, and all types of cancer. Batten has many cure techniques and among them is a homeopathic potion called Oxybeecream that contains memory of a flower. This concoction cures cancer according to Batten. If ever there should be a reason to be skeptical, this should be it.

When not being a "doctor" Batten works as a landscaper and is known as "The Rock Wall Wizard".

Batten is a prolific writer of online medical books (e_books), all of which basically have the same title and much the same content and may be downloaded for a fee:

- *Parkinson's Disease: The Greatest Medical Blunder*
- *Autism: The Greatest Medical Injustice*
- *ADHD: The Greatest Medical Bungle*
- *Multiple Sclerosis: The Greatest Medical Mistake*
- *Diabetes: The Greatest Medical Misconception*

There are many more Batten publications for a host of

ailments including cancer. Is it not amazing how one individual with no formal medical training can cure so many diseases? Amazing indeed.

Batten's story is similar in tone, if not in detail, to that of Kurt Donsbach, (see Phactum May/June 2009, page 9) an unlicensed chiropractor who has had many run-ins with the law. Donsbach spends much of his time in jail when not operating a phony cancer clinic.

The last report of Donsbach is that he is in jail in lieu of $1.5 million bail. He faces up to 6 years imprisonment if convicted.

Perhaps Batten and Donsbach can be cell mates.

High School Science Fairs

High school science fairs are a great way to introduce kids to science and hopefully short circuit vulnerability to the silly but dangerous "medical" practitioners and charlatans in other areas of our lives such as free energy and marketers of useless too good to be true products. PhACT is raising some Science Fair Prize money to be awarded at the Bucks County Science Research Competition in March 2010. PhACT's goal is to raise $300 to be awarded as prizes and so far we have accumulated $185.

The Bucks County Science Research Competition is affiliated with Delaware Valley Science Fairs, Inc. (DVSF), founded in 1949 and incorporated as a non-profit, 501(c)(3) organization in 1993, making it one of the oldest Fairs in the country. It is now also one of the largest. The Fairs were designed as a vehicle for stimulating interest in science and technology among students in middle and high schools in the tri-state area. The philosophy behind the Fairs is that students learn science by doing science.

The mission of DVSF is to bring parents, teachers, and industry together to stimulate and nurture young people so that they grow and develop into contributing members of the community.

They provide a forum for students to present their scientific work and interact with scientists in their field to receive feedback on their efforts. Students are awarded, scholarships, cash prizes, and other non-monetary recognition for outstanding work. They provide mentoring and teacher training to facilitate participation in this activity.

DVSF is an Affiliated Fair for the Intel International Science and Engineering Fair (ISEF).

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Please Help Quackwatch and Dr. Barrett

A personal Message from Robert S. Baratz, MD, PhD, DDS
member National Council Against Health Fraud

Dr. Stephen Barrett, has been a leader the worldwide struggle against quackery and health fraud for more than 35 years. In addition to publishing the weekly Consumer Health Digest, he has written and/or edited 50 books and manages 24 consumer protection Web sites, including Quackwatch, which has more than 100,000 page views per month and has won many awards for its accuracy and quality. Dr.
Barrett also serves as a trusted resource for the media, law-enforcement agencies, educators, and thousands of individual consumers who contact him each year for help.

Quackery promoters have tried to counter his influence by libeling him and filing groundless lawsuits. One campaign has falsely suggested that he had lost his medical license. http://www.quackwatch.org/11Ind/bolen.html Another is falsely accusing him of being a habitual criminal. http://www.quackwatch.org/11Ind/negrete.html

The legal fees and other costs of defending against this campaign, while partially defrayed by donations, have been much higher than the cost of running the sites.

Very few people have the courage and persistence to engage in the struggle against quackery. Dr. Barrett intends to continue, but can use help in defraying legal expenses. Quackwatch and its companion Web sites are important consumer resources. They are free to the public, but maintaining them requires the ability to deal with frivolous assaults by well-financed quacks and the special interests that profit from quackery. If you appreciate Dr. Barrett's work, please make a contribution. Please give whatever you can.

For amounts under $50, or for contributions of any size from foreign countries, please use the PayPal link on the Quackwatch donations page. **http://www.quackwatch.org/00AboutQuackwatch/donations.html** It is not necessary to be a PayPal subscriber to do this. It can be done by anyone with a credit card, regardless of where you reside.

If you can give $50 or more and live in the United States, it would be best to mail a donation to:

Barrett Defense Fund
Chatham Crossing, Suite 107/208
11312 US 15-501 North
Chapel Hill, NC 27517

October 2009 Meeting Report

by Tom Napier

The Large Hadron Collider

A Victorian joke proposed that a suitable subject for a 20 minute talk to a group of church members was, "The Past, Present and Future of God, Man and the Universe." Professor Paul Halpern's talk to PhACT on October 17 was almost as ambitious.

Dr. Halpern covered the 100 years of physics research that led to the Large Hadron Collider, showed what might be discovered and explained what exploring the tiniest of particles tells us about the beginning of the universe. The Large Hadron Collider (LHC) is the particle accelerator now installed (but not yet working) in a 17 mile circular tunnel under the French countryside between Geneva and the Jura mountains. It is the latest and greatest of the particle accelerators designed and built and operated since 1959 by the European Center for Nuclear Research (CERN). Installed in an existing tunnel and using existing machines to do part of the acceleration work, the LHC will achieve more cheaply many of the aims of the Superconducting Supercollider whose construction in Texas was abandoned in 1993. Dr. Halpern started with a summary of the present status of the LHC.

During integration tests in 2008 a faulty superconducting magnet heated up, causing an explosive vaporization of its liquid helium coolant. The damage has been repaired and tests are due to restart soon. However, in the near term the accelerator will run at half power. This still allows much useful physics to be done.

The LHC is the latest tool in a century of investigations into the ultimate constituents of matter. In 1911 Ernest Rutherford reported that when he bombarded gold foil with alpha particles from a radioactive source, some particles bounced straight back. This indicated that atoms comprised positively charged nuclei with distant, negative electrons, that is, tiny dense lumps surrounded mostly by empty space. To explore further required the bombarding particles to have a controllable energy and to be, for example, electrons or protons, rather than the naturally available but fixed-energy alpha particles. By 1932, particle accelerators using high voltages were in the forefront of research into the structure of the nucleus.

Early accelerators were linear but it soon became clear that if particles were forced into a circular path by a magnetic field they could be raised to a higher energy by a series of low-voltage kicks rather than one high-voltage one. At low energies the particle's velocity increases with its energy and the construction of a circular accelerator must take this into account. At higher energies, particles travel at close to the speed of light: as Einstein predicted, any further input of energy increases their mass, not their velocity. This simplifies the accelerator design. Until the 1970's the particles circulating in the accelerating ring were diverted into fixed targets.

Collisions with the nuclei of the target produced a shower of new particles which travelled in the same direction as the input beam and were analyzed by a series of detectors. Although nuclei consist only of protons and neutrons (and the virtual particles that stick them together), each collision produced a zoo of new particles whose properties had to be determined. Any particle whose creation is allowed by the conservation laws may appear; the more energy one puts into the accelerator the more massive the new particles can be.

There are practical limits to how much energy an accelerator can provide but there's a way to get more bang for the buck. When a moving particle hits a stationary one, most of the input energy goes into knocking-on the target nucleus rather than into creating new particles. If two particles having equal energy hit head-on, all the input energy (twice that each particle alone) goes into making new and interesting stuff. That's why accelerators built in the past 25 years have counter-rotating beams that are allowed to collide at certain points around the ring.

Halpern summarized the four forces of nature and the families of new particles that have been discovered. As particle energies increase, three of the forces merge. Gravity, the weakest force, remains the odd one out. Physicist Peter Higgs suggested that the mass of sub-nuclear particles is due to a pervasive field which became known as the Higgs Field. This field implies the existence of a fundamental particle, the Higgs boson which, in theory, is just too massive to be created by the current generation of accelerators; hence the itch to build more powerful ones. Halpern mentioned that the Higgs was apparently dubbed "The God Particle" by the publisher of Leon Lederman's 1993 book of that name. Lederman made a case, sadly unavailing, for continued funding of the Supercollider, the main rationale for which was that America should be first to discover the Higgs boson. CERN's LHC, although less energetic by about a factor of three, should also be able to do this job. Even if the Higgs is not found at CERN, this fact adds a point to the data on which theorists base their speculations about new families of particles. Of course the LHC will do a lot of other useful physics too.

Even though the particles being studied are very tiny, high

-energy experiments have given us the data on which our models of the structure of the universe are based. The nuclear matter in collisions achieves densities and temperatures typical of the Big Bang itself. As Halpern pointed out, 96% of the mass of the universe consists of so-called dark energy and dark matter which are yet to be detected. We still have a lot to learn.

Dr. Halpern has visited the tunnel in which the LHC was assembled. He was immensely impressed by the huge detector assemblies that have been built into underground caverns at four points around the 17 mile ring. The LHC is by far the biggest, most complex science experiment ever built and uses the largest assembly of raw computer power ever linked together to process the billions of measurements arising from each collision.

A questioner raised the issue that we skeptics have heard most about, the groups who are suing CERN to prevent the LHC from being started up on the grounds that it will create miniature black holes that will swallow the Earth. Halpern pointed out that though the energy density at the moment of a collision rivals that at an early state of the Big Bang, the total mass and energy involved in one collision is microscopic. The only black holes known to exist are more massive than the Sun. If tiny black holes could be made they would vanish in a tiny fraction of a second.

Another question was about security at CERN. As an intergovernmental research organization, everything done there is published freely. There are even public tours. There is security only to protect people and to avoid expensive equipment being damaged. And there was the inevitable question: What practical good is it all? Halpern mentioned the recent Nobel Prizes for devices such as digital cameras that grew from discoveries made at accelerator labs. He gave, as the ultimate answer, that we can't tell what might be found.

Tom Napier *worked at CERN from 1972 to 1979 where he developed equipment to monitor environmental radiation. He has also designed commercial equipment to process data from particle accelerators at CERN and other laboratories.*

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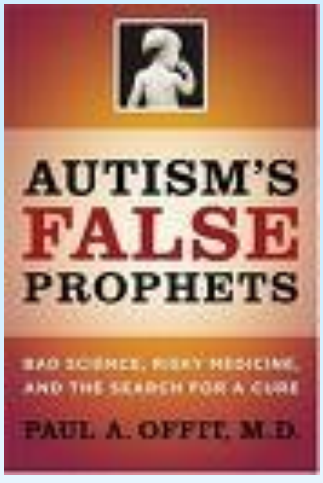
Autism's False Prophets: Bad Science, Risky Medicine, and the Search for a Cure

By Paul A. Offit, MD

Publisher: Columbia University Press; 1 edition (September 22, 2008)
Hardcover: 328 pages $24.95 ISBN-10: 0231146361 ISBN-13: 978-0231146364

A London researcher was the first to assert that the combination measles-mumps-rubella vaccine known as MMR caused autism in children. Following this "discovery," a handful of parents declared that a mercury-containing preservative in several vaccines was responsible for the disease. If mercury caused autism, they reasoned, eliminating it from a child's system should treat the disorder. Consequently, a number of untested alternative therapies arose, and, most tragically, in one such treatment, a doctor injected a five-year-old autistic boy with a chemical in an effort to cleanse him of mercury, which stopped his heart instead.



Children with autism have been placed on stringent diets, subjected to high-temperature saunas, bathed in magnetic clay, asked to swallow digestive enzymes and activated charcoal, and injected with various combinations of vitamins, minerals, and acids. Instead of helping, these therapies can hurt those who are most vulnerable, and particularly in the case of autism, they undermine childhood vaccination programs that have saved millions of lives. An overwhelming body of scientific evidence clearly shows that childhood vaccines are safe and does not cause autism. Yet widespread fear of vaccines on the part of parents persists.

In this book, Paul A. Offit, a national expert on vaccines, challenges the modern-day false prophets who have so egregiously misled the public and exposes the opportunism of the lawyers, journalists, celebrities, and politicians who support them. Offit recounts the history of autism research and the exploitation of this tragic condition by advocates and zealots. He considers the manipulation of science in the popular media and the courtroom, and he explores why society is susceptible to the bad science and risky therapies put forward by many antivaccination activists.

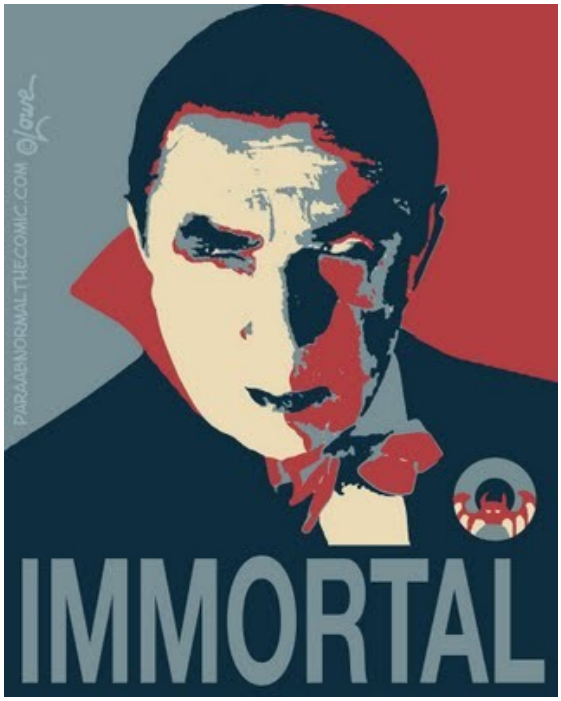
Miracles and Science

By Don Nigroni

But hitherto I have not been able to discover the cause of those properties of gravity from phaenomena, and I frame no hypotheses; for whatever is not deduced from the phaenomena is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. - *Sir Isaac Newton,* The Mathematical Principles of Natural Philosophy

A miracle would be a divine supernatural occurrence that intentionally affected some people in a positive way and would have violated a law of nature had that event really been of and solely due to the physical world of nature. If we thought that an apparent law of nature was violated by an event that was of and solely due to the physical world of nature, then we would have to revise that law. However, if we thought that event was really supernatural, then that law might not need to be changed. Natural events would be anything that was of and solely due to the physical world of nature, like groundhogs rising from the earth, or that arose directly or indirectly from that world, such as our own awareness and thoughts, or involved the interaction of both, like moving one's arm, while supernatural events would be happenings that were not completely natural, such as angels descending from the sky.

As a result of the Scientific Revolution, the dominant intellectual view of reality came to be that at least the physical world of nature and perhaps everything altogether could be explained by mechanistic materialism. Mechanistic materialists contend that material things interact like the parts of a machine such that any changes in their motion are due to contact, like billiard balls on a pool table. Mechanistic events can be opposed to occult events which would be happenings that would either be uncaused or if caused then at least not solely caused in a mechanistic materialistic fashion, such as gravity when conceived of as an action at a distance. The supernatural and the occult, including miracles, are utterly rejected by thoroughgoing mechanistic materialists.



Cartoon by Dave Lowe
http://www.paraabnormalthecomic.com/
Used by Permission

Why do extraordinary claims, like miracles, demand extraordinary evidence? Because there evidently already exists so much evidence against those claims that the apparent evidence for them must be extraordinary in order to overcome the alleged evidence against them. The evidence against any of us being able to simply rise into the air is evidently gigantic, therefore, given a report that a fellow in India paranormally rose into the air in front of a dozen people, it would be much more plausible to maintain that the report was in fact erroneous in some way, e.g., the event was really just a clever trick. Normal events would be occurrences in the natural world that are acceptable to mainstream science, like ordinary sensory perception, while paranormal events would be occurrences in the natural world that are simply unacceptable to orthodox science, like extrasensory perception. Twilight zone paranormal phenomena would include some supposedly natural paranormal phenomena, such as a relict population of enormous dinosaurs inhabiting some lost world today, and also evidently supernatural and occult paranormal phenomena. The scientific acceptance of some seemingly natural paranormal phenomena which were not within the twilight zone should provide little comfort to believers in various twilight zone paranormal phenomena. In 1976 a megamouth shark was first reported. That shark was nearly 15 feet long and weighed about 1,650 pounds. Nonetheless, that discovery should afford little additional hope that the Loch Ness Monster will someday be caught dead or alive, while getting hold of a Bigfoot might indeed raise serious doubts in resolute Nessie debunkers.

Could there ever be an evidently bona fide event that could make us believe in a miracle? One could always argue that any such event was really just a natural occurrence, though one might have to radically revise some firmly

established theory. If some woman apparently could repeatedly tell while under presumably strict laboratory controls in an evidently paranormal manner what others were reportedly thinking, would that indicate that she really received messages from God or that perhaps she could directly perceive their thoughts or merely that their subtle brain waves, undetectable by our most sensitive current equipment, were being picked up by her receptive brain and converted into information? If some man seemingly could occasionally rise in an apparently paranormal way into the air under evidently rigorous laboratory conditions, would that indicate that he had actually been lifted up by a host of invisible angels or that maybe he had some psychokinetic power or simply that some human bodies sometimes contained significant amounts of dark flubber? We don't really have convincing evidence for any miracles. Nonetheless, those mechanistic materialists who contend that human consciousness arises from the brain while abjuring occult events or even deny human awareness altogether though they themselves are *aware* of phenomena could reject miracles in spite of any facts whatsoever.

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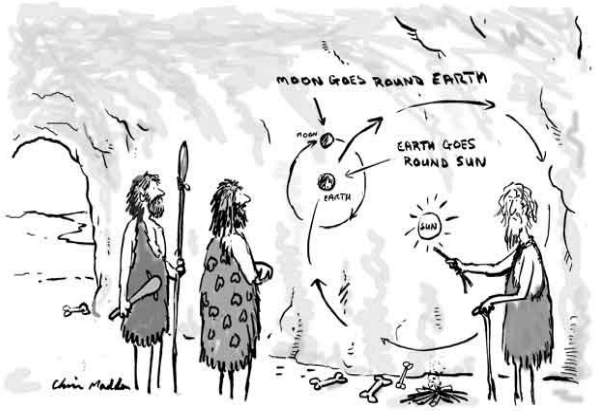
Simplicity and Intelligent Design

By Don Nigroni

There are always an infinite number of theories that can explain any phenomena and we always have to rely on values when choosing among them. The selecting criteria may be based on such values as quantitative parsimony, qualitative parsimony, elegance, fruitfulness or scriptural conformity. Simplicity, also known as Occam's Razor, is a popular criterion and could be employed: 1.) for practical purposes to describe phenomena or 2.) to make claims about some underlying reality based on the phenomena. However, simplicity isn't simple and could refer to quantitative parsimony, the smallest number of entities needed to explain the phenomena, or qualitative parsimony, the least number of kinds of things required, or elegance, conciseness and the smallest number of principles demanded, or some combination of the above.



"It's a very good idea, but can't we have something a little more 'poetic' - like a flat earth resting on the back of a giant crocodile floating in an infinite sea of mammoth milk?"

Cartoon by Chris Madden
http://www.chrismadden.co.uk/moon/jigsaw.html
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Nonetheless, many skeptics who think that simplicity in some sense does provide the most plausible explanation of the underlying reality are probably atheistic mechanistic materialists but they don't fully realize the implications of their position. If one thought that simplicity really led to the true explanation, then one might come to believe that the underlying reality was actually the result of intelligent design.

By looking at the face of a pocket watch we can't know what the mechanism inside would look like. There are an infinite number of mechanical configurations that could produce the same movements of the hands on the face of a pocket watch. If we think that the configuration inside is the least complicated arrangement of gears and springs required then we might well conclude that that happened by design, namely, due to an intelligent watchmaker. On the other hand, one might think that that outcome was the result of a single try by a lone monkey and thus an astronomical fluke or due to trillions of monkeys assembling pocket watches for billions of years and by dumb luck finally producing one where the configuration inside was the least complicated required.

Likewise, if simplicity in some sense did provide the best explanation for our universe, then we might feel that was: 1.) due to intelligent design or 2.) an astronomical fluke or 3.) because there are trillions of universes and that result just happened by normal chance. Furthermore, option two seems the least likely of the three.

Don Nigroni *received a BS in economics in 1971 from St. Joseph's University and a MA in philosophy from Notre Dame in 1973. He retired in 2007 after working for 32 years as an economist with the US Bureau of Labor Statistics. He now spends much more time hiking, mountain biking, kayaking and bird watching.*

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PRISONER LITERACY :
Does Reading Prevent Crime?
by Paul Schlueter III

It can be exceedingly difficult to obtain actual statistics on the relative literacy levels of prisoners in the Pennsylvania state prison system, particularly if you are, like me, one of the prisoners, and for that reason deliberately kept "out of the loop" on anything that might have the slightest bearing on "prison security." However, I have been incarcerated for 24 years, and I've been a volunteer literacy tutor for over 20 of those years. As a member of thi s northeastern PA pri son's ProLiteracy Council, I've tutored, trained new inmate tutors, and acted as an elected inmate administrator of the organization. Though I've sought (unsuccessfully) formal statistics on prisoner literacy, I must rely on generic information and my own experience to discuss this issue.

"Functional Illiteracy" is usefully defined as being unable to read/write English well enough to fill out job applications and government forms without help, being unable to comprehend and apply the information contained in a typical newspaper article, unable to read and follow directions on household supplies, unable to balance a checkbook, and/or unable to read and understand bills, such as phone bills and electric bills. In short, it means that a person is unable to read/write well enough to get along in our society without someone else's help. The shocking statistic on this is: As many as 66% of state prison inmates are functionally illiterate. Particularly when they come from large urban school districts, it is not uncommon for inmates to have a High School diploma, and STILL read/write at or below the Sixth Grade level (generally considered the cutoff of "functionality.")

The obvious societal concern over this issue primarily relates to employment. In a society where the growing majority of unskilled labor jobs are in the service industry and construction industry, it is relatively easy for a functionally illiterate adult to find employment through friends, obtain help at learning job tasks from co-workers, and ask friends or family to help out at bill-paying time. Illiteracy does not equate to stupidity! In fact, a functionally illiterate person may be so clever and articulate that those around them never even realize that they cannot read/write on a functional level. However, the individuals with such adaptive skill are usually just as effective at staying out of prison.

The person charged with a crime can be quickly overwhelmed and lost in the complex legal system. Since they aren't likely to have substantial savings, most must rely on Public Defenders or other inmates to even read their charge sheet, let alone trying to understand all the legal technicalities of a process that could hinge on the formal definition of a single word or phrase. Law is arguably the one area where literacy is MOST crucial to an individual's fate, and there are many college graduates who readily acknowledge confusion and lack of understanding in matters that require legal reading or writing.

Once convicted (as practically every illiterate person will be, once charged with a crime), the illiterate are again at a disadvantage within the prison system. Prison rules and policies may not always be literally interpreted, but they are at least written. Illiterates cannot follow those rules and policies well enough to stay out of trouble, and often find that they accumulate misconduct reports quickly. Those reports accumulate to bar an inmate's access to many vocational training programs, and can even impede treatment programs meant to deter violence, drug/alcohol abuse, etc. When it comes time to apply for parole, those misconducts will invariably be held against the inmate. Even such ordinary tasks as making weekly commissary purchases are complicated by poor

Following is from a report about prison literacy by Kenneth W. Mentor, J.D., Ph.D.

"Illiteracy is perhaps the greatest common denominator in correctional facilities. Data collected from the National Adult Literacy Survey (NALS) show that literacy levels among inmates is considerably lower than for the general population. For example, of the 5 levels measured by the NALS, 70% of inmates scored at the lowest two levels of literacy (below 4th grade). Other research suggests that 75% of inmates are illiterate (at the 12th grade level) and 19% are completely illiterate. Forty percent are functionally illiterate. In real world terms, this means that the individual would be unable to write a letter explaining a billing error. In comparison, the national illiteracy rate for adult Americans stands at 4%, with 21% functionally illiterate.

"A related concern is that prisoners have a higher proportion of learning disabilities than the general population. Estimates of learning disability are as high as 75-90% for juvenile offenders. Low literacy levels and high rates of learning disabilities have contributed to high dropout rates. Nationwide, over 70% of all people entering state correctional facilities have not completed high school, with 46% having had some high school education and 16.4% having had no high school education at all. Since there is a strong link between low levels of education and high rates of criminal activity, it is logical to assume that high dropout rates will lead to higher crime rates."

http://kenmentor.com/papers/literacy.htm

literacy.

Pennsylvania has statewide policies that mandate schooling for inmates who cannot produce proof of a High School diploma or General Equivalency Diploma (GED). Inmates aren't dragged bodily into the classrooms, but they are prohibited from obtaining prison jobs if they refuse to attend classes, or fail to apply sufficient effort or good behavior in class. Pre-GED and GED testing are offered periodically, involving competency testing on Reading, Writing, Math, Social Studies, and Sciences. Those students who often find such testing most frustrating are those who suffer from Math Illiteracy, and who cannot pass that one segment of the exams after repeated tries.

Students who are functionally illiterate are quickly identified by the professional teaching staff in prisons, and rather than being routed into GED curricula, they are usually routed into Adult Basic Education (ABE), which covers Reading, Writing, and Math. A large portion of this group have some sort of learning disability, and present special challenges to those who try to help them learn to read or do math. There are perhaps 20 people in this prison (a little under 1%) who are so learning disabled that it is unlikely that they will ever reach a Sixth Grade reading, writing, or math level. In my experience as a tutor, I have (perhaps more by default than intent) often been called upon to help such inmates, and it can be heartbreaking to see their futile struggle. Still, rewards are measured by the effort made, and in a one-on-one tutoring relationship, it is possible to work as long as necessary to make even the smallest progress. My own special needs students have died, transferred, or gone home without a diploma, but they take every small success to heart with such joy and pride that it's well worth the effort.

School dropouts are a larger portion of the inmate illiteracy problem. It seems that the onset of puberty brings an increased risk of dropping out of school. Males may find more allure in gang culture, and females might find that pregnancy makes school unattractive. As it turns out, puberty and the Sixth Grade arrive at pretty much the same time in a kid's life. In Pennsylvania school districts that include a Middle School (7th, 8th, & 9th Grades), sometimes it is the transfer from Grammar to Middle school that proves to be the disruption that causes a young student to drop out. Of the prison inmates who lack a diploma or GED, it is my impression that most have not attended High School at all. There are a few examples of individuals who got into trouble with the law late in High School, and who simply never completed a GED. For them, prison education programs are probably the most useful and effective, because getting a GED can be immensely valuable in finding post-release employment, and staying out of future trouble.

Denying books to prisoners robs them of their only means to escape the duldrums of incarceration.

In fact, recidivism (defined as returning to prison within three years of release) is usually cited at the 66% level (probably not the exact same 66% who are illiterate, but there's certainly a large degree of overlap between the two sets.) The inmates who obtain a GED in prison are much less likely to recidivate (again, statistics are treated like a state secret.) Those who obtain some college or vocational education beyond the GED level have still lower recidivism rates, and those who manage to graduate from college have the lowest recidivism rates of all. In fact, the most reliable indicator of recidivism risk, on an individual level, is the education that prisoner obtained in prison! Sadly, several years ago, the Pell Grant program, used to fund college education, was specifically barred from prison inmates by the federal legislature. Inmates must now find some other way to raise the funding to take college courses, though some state funding is available to assist non-lifers with college courses, at a very slow pace.

Some conservatives may argue that prisoners don' t deserve a free education, when they have to pay dearly to educate their own kids. There is some validity to that argument, given that Pennsylvania has recently made dramatic cuts in Education funding under recession conditions. However, there's a strong argument in ensuring that those who have had trouble fitting in with society and following legally-sanctioned means of earning a living are

People are the common denominator of progress. So... no improvement is possible with unimproved people, and advance is certain when people are liberated and educated. It would be wrong to dismiss the importance of roads, railroads, power plants, mills, and the other familiar furniture of economic development.... But we are coming to realize... that there is a certain sterility in economic monuments that stand alone in a sea of illiteracy. Conquest of illiteracy comes first.

John Kenneth Galbraith (1908 - 2006), The Affluent Society (1958)

going to represent an ongoing problem to society UNLESS they can be given the education to enable them to redirect their lives in a law-abiding manner. A former drug dealer might not see fast food employment as particularly appealing, but if he can get a job on the entry level in plumbing, carpentry, electrical wiring, electronics, computer operation, or professional culinary arts, then perhaps he will extend his "time horizon" far enough to seek work with a potential for advancement. If he has the opportunity to obtain a Journeyman's license in a trade, or other professional licenses, the chances that he will seek out work in that field are greater still. And, if an inmate has the opportunity to get college courses in Business, Accounting, or even Paralegal Services, that individual is likely to not only pursue work in that field and succeed, but he may also turn out to have a strong leadership role in helping others either avoid criminal activities, or overcome a conviction to re-enter society successfully, as a contributing, tax-paying member.

The literacy organization here in my prison is currently under intensive review, with an eye toward formalizing the delivery of tutoring services (and removing them from inmate administration.) Whether or not there is a future for volunteer, self-administered inmate tutoring, SOME form of peer tutoring is likely to continue in this, and most other, PA prisons. The formal education, under licensed teachers and professional administrators, will definitely continue (there is a Bureau of Correctional Education in PA which, in part, centralizes and homogenizes the processes of providing inmates with education.) For those on the outside, it is to everyone's advantage to support the provision of education for prisoners, because 90% of state prisoners will be returned to the community, and their success at re-entering society largely depends on the education they get inside.

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If you would not be forgotten, as soon as you are rotten,either write things worth reading or do things worth the writing.

Benjamin Franklin (1706 - 1790)

Reading is a ladder out of poverty. It is probably one of the best anti-poverty, anti-deprivation, anti-crime, anti-vandalism policies you can think of.

Prime Minister Gordon Brown, on the launch of the National Year of Reading, 8 January 2008

The more you read, the more things you will know. The more that you learn, the more places you'll go.

Dr. Seuss, "I Can Read With My Eyes Shut!"

ELECTRONIC ALCHEMY: Vacuum Tube Audio

by Paul Schlueter III

The popular image of the alchemist suggests a Merlin-like character using clay jars and powders in the mysterious effort to turn lowly lead into cherished gold. Most of us view alchemy as magical thinking, and a lesser precursor to modern chemistry. Few rational people would wish to turn back the clock, and revert to a world reliant solely on alchemy.

There's something of a parallel to alchemy in the world of audiophile electronics. The main link is the aspect of magical thinking, and its main result is a dedicated cachet of fans (and yes, fanatics) of vacuum tube amplifiers. True Believers in this fantasy land will spend several thousands of dollars for amplifiers simply because they see glowing glass bottles and huge metal-encased transformers, and they will credulously accept remarkable amounts of pseudo-technical jargon that implies that tubes can magically outperform their shabby successors, solid state transistors. Here is an example of the fallacy that "ancient wisdom is superior to modern science."

The root of this misinformation is, as usual, Ignorance. The vacuum tube all but went extinct some fifty years ago, when it was successfully supplanted by transistors. In truth, transistors are the superior technology in very nearly every measurable aspect. They cost less, last longer, perform more consistently, are more efficient, permit portability, enable sophistication which is orders of magnitude greater (yet in simpler prefab "chips"), and they actually amplify audio with greater fidelity than tubes. These benefits are documented, measurable, and proven thousands of times over. So why is there this nearly religious cachet of fanaticism associated with a delicate, overheated, inefficient, expensive, unreliable technology from an era long gone?

Well, did you notice that I said "...very nearly every aspect...?, There is ONE characteristic of tubes in which their fundamental difference from transistors happens to have a subjectively pleasing auditory effect; tubes are inherently less LINEAR than transistors. Without deep technical explanation, linearity is a measure of an amplification device's consistency. If the output is ten times greater than the input with both a small input signal and a large input signal, then the device is linear. If the small signal is amplified 10x, a medium signal is amplified 8x, and

a large signal is amplified 7x, then the device is less linear. The latter condition is sometimes called "compression", and it co-exists in vacuum tubes with a related effect called harmonic distortion.

All but the purest tones (flutes produce a nearly pure tone) are made up of a "fundamental" (the pitch you think you hear) and a series of "overtones" (multiples of the frequency of the fundamental) which give the tone its identifiability and timbre. When you turn down the "Treble" knob on your stereo, you're reducing the strength of overtones in the signal being amplified. You don't really understand this, right? Well, it's all a rather geeky aspect of the arcane world of electronic audio nerds, and we're a small group. You don't NEED to learn this stuff to know what sounds you like, so you probably haven't done so. Same goes for most "audiophiles".

Tubes are non-linear, and their amplification tends to enhance production of artificial "even order" (2x,4x,6x, 8x, etc.) overtones. The 2x, 4x, and 8x overtones are actually "octaves" of the fundamental, and the octave is one of the most recognizable and pleasing of all harmonies (technically, it is superseded solely by "unison" pitches.) Have you ever marveled at the difference in sound between an ordinary six-string guitar and a 12-string? The 12-string exploits octave strings, and so it sounds fuller and richer. A vacuum tube does something that is very similar, though more subtle. And they do it to a degree that increases as the signal strength increases, as well.

What we mere mortals actually hear when we listen to a decent tube amplifier is the harmonic enrichment of the music, especially at the louder portions. You might call it "brightness", "clarity", or "warmth", but in technical terms it's "harmonic distortion". Did you ever look at stereo specs and see the value "THD?"... that's Total Harmonic Distortion, and audiophiles deliberately seek the lowest possible degree of this distortion (in modern, top grade solid-state amps, it can be hundredths, or even thousandths, of a percent!) So why do they wax so poetic over a tube that has an inherent value of 3-5% THD? Quite simply, because their ears love the sound of something they've been misled to believe is a negative characteristic.

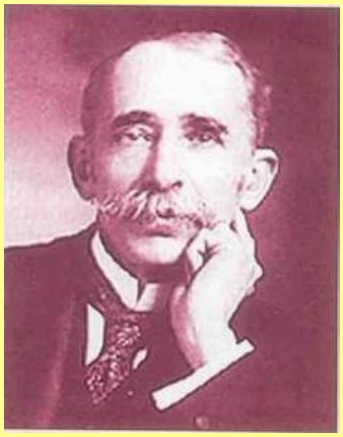
In truth, transistors distort, too, particular when they receive such a strong signal they become "overdriven" and start to "clip" off the top and bottom of the signal waveforms. A major difference is that transistors enhance the harmonic series with ALL harmonics; this includes the odd-order harmonics (3x, 5X, 7x, etc.), which sound "harsh" and "out of tune" to our ears. Simply put, transistors distortion is less-pleasant (subjectively) than tube distortion. Also, transistor distortion tends to come on all at once, where its onset in tubes is more gradual.

Amplifiers are nearly as old as vacuum tubes (which were the first devices to produce the effect we call amplification.) For something close to a hundred years, engineers have tried to improve the fidelity of audio amplification. For most of that time, they have sought to reduce distortion by careful design and adjustment of the associated circuitry that controls how amplifiers function. During the'50s, when tube audio amps were still state of the art, a wide variety of techniques had been developed to control the non-linearity of tubes, reducing their THD as much as practically possible. Then, along came Rock'n'Roll, and suddenly musicians discovered that certain guitar amps (all of which were still tube amps) sounded pretty cool when you DELIBERATELY overdrive them. As engineers figured out how to incorporate transistors and integrated circuit (IC) chips into their designs, both

Sir John Ambrose Fleming (29 November 1849 – 18 April 1945)

Sir John Ambrose Fleming was an English electrical engineer and physicist. He is known for inventing the first thermionic valve or vacuum tube, the diode, then called the kenotron in 1904.

Fleming was born in Lancaster and educated at University College School, London, and University College London. He entered St John's College, Cambridge in 1877, gaining his B.A. in 1881 and becoming a Fellow of St John's in 1883. He went on to Lecture at several universities including the University of Cambridge, the University of Nottingham, and University College London, where he was the first professor of Electrical Engineering.



In November 1905, he patented the "Fleming Valve" (US patent 803684). As a rectifying diode, and forerunner to the triode valve and many related structures, it can also be considered to be the device that gave birth to modern electronics.

Fleming was a devout Christian and preached on one occasion at St Martin-in-the-Fields in London on the topic of evidence for the resurrection. And get a load of this: In 1932, along with Douglas Dewar and Bernard Acworth, Fleming helped establish the **Evolution Protest Movement** , a British Creationist organization which lays claim to the title "the oldest creationist movement in the world". It was a member of the Evangelical Alliance until its resignation in 2008.

sound reproduction and instrument amplification swung together into the brave new solid state world (the first computer, ENIAC, ran on vacuum tubes... part of why it filled entire rooms... so computers also benefitted from the changeover to transistors and ICs.) Some musicians realized that transistors didn't sound as sweet as tubes when overdriven, and so they hung on to their older tube amps, while manufacturers tried (and failed) to devise some way to re-create the Atube sound" using solid state components. Ironically, some computer based signal processors are now. becoming able to synthesize "tube tone", at a cost that exceeds that of actual tube circuitry.

Audiophiles, meanwhile, had two choices; buy an older state-of-the-art tube amp, with all its advanced sophistication to reduce THD,.or buy one of the newer, cheaper solid state amps that hadn't quite achieved similar refinement. Thus began the "mythology" of the vacuum tube...word got around that tube amplification was "purer", and had "less distortion" (because it was more sophisticated, not because it used tubes!) And at the same time, musicians were insisting that their tube amps did a better job for them (and we all know the value of multiple testimonials from celebrities!)

Once transistors and ICs were proven capable of doing (almost) everything better than tubes, engineering schools dropped tubes from the curriculum. For the last fifty years or So, electronics engineers have ignored the tube, and designed everything around transistors instead... but musicians (guitarists in particular) and audiophiles resolutely clung to their older equipment, much like fundamentalists clinging to Genesis and the Creation Myth. They simply wouldn't listen to anyone else=s opinions, they. proselytized their beliefs, and as technical understanding of the vacuum tube disappeared, "priests" of the .cause took over, evangelists of glass and vacuum. A retrograde dogma grew up in place of what had once been the esoteric lore of the most rational engineers of our society.

A few of the older technicians remembered the old technology, and when the new age dogmatists needed repairs, they sought out the elder mages of tubes. Russia and China, wallowing in economic mud, continued manufacturing tubes and tube electronics, preserving production where it might otherwise have gone entirely extinct. Military technicians realized that tubes (due to their archaic structure) were more resistant to the Electromagnetic Pulse (EMP) of a thermonuclear detonation than solid state devices, so certain sensitive systems retained tubes (MIG fighters are said to use tube electronics, though I haven't actually seen their schematics myself...) Some guitar amp manufacturers responded to the demands of their customers by producing new generations of tube amps, trying practically every technique imaginable to get "tube tone" at the lowest possible production cost (leading to a wide variety of tube/solid state hybrid circuits.) As all this went on, certain classic textbooks and reference manuals for tube electronics were reprinted, and are now sold by specialty catalogs. Dozens of small "boutique amp" builders sprang up around the country, reproducing the older designs of tube guitar amps with new, old-style components throughout. And, a select few manufacturers of audiophile amps paid engineers to continue R&D on extreme high-end audio amplifiers using tubes, simply to exploit the mythology of tubes that had grown up in the past several decades.

Today, it is possible to buy tube guitar amps ranging in price from $250 to several thousand dollars. It is possible to mail order all the parts to build your own tube amp, or whole kits that provide all the parts and instructions, leaving you just the assembly (of either instrument amps or stereo amps). Tube pre-amps for computerized sound production are extremely useful and ubiquitously available. Tube power amps for computer music replay can be effective at "softening" the "harsh edges" of CD and DVD recordings. If you like to store your old LP music digitally, there are tube buffers with the RIAA filtration network, suitable for converting the signal from your turntable to a digital wave file storable in your computer (where you can also perform noise reduction to rid the music of hiss, pop, wow, flutter, etc.) It's again possible to purchase brand new tube electronics to perform just about any audio function you want, at a reasonable price.

So, when is it NECESSARY to insert tube hardware in the signal path? The answer really comes down to your personal tastes. Do you love to show off glowing glass bottles? Do you want maximum fidelity for minimum cost? Is power your primary consideration? Would you be able to identify the sound of a tube amplifier if you heard one? What if you heard it while blindfolded? These are the sort of questions ANY self-respecting critical thinker would ask himself when considering the purchase of any appliance for the home, so ask yourself the same thing when considering tube electronics. TRY blind sound tests, and see if you can hear the difference between component A and component B in a system that is otherwise identical. Weigh your wallet. Talk to people who actually have technical expertise on audio equipment, and who can specifically examine the component you're considering. Use your reasoning skills, your skeptical BS detector, and your own ears in making the decision. Chances are good that you'll be able to put together an audio system that pleases you just fine, and that's what matters the most.

Paul Schlueter III *holds a Journeyman Electronics Technician license, and the top levels of FCC communications engineer licenses in both commercial and amateur categories. He is a guitarist, an admitted tube amp enthusiast and has done extensive restoration, repair, design, and prototyping of tube audio and radio circuits and systems. He is also a dedicated skeptic.*

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Jules Verne:
the founder of technobabble

By Tom Napier

Every history of science fiction mentions Jules Verne (1828-1905). He wasn't the first to write about a trip to the moon; that was done in Roman times. He wasn't even the first modern science fiction author; Brian Aldis made a strong case for Mary Shelley. However, Verne was the first author to make a living by writing adventures based on improbable or impossible scenarios. Verne's novels contain much technical detail. Is this real science or is it technobabble, that mishmash of scientific-sounding terms that obscures the otherwise unspecified means by which a story's protagonists achieve their goals? Does forgotten Victorian technology that could power today's electric cars lie behind Verne's stories or was he merely bamboozling his readers?

Jules Gabriel Verne
(1828 - 1905)

The search for the source

I'd read several of Verne's stories when I was about twelve. His first best-seller was "Five Weeks in a Balloon" (1863). Although not great literature, it attracted my junior skeptic's attention. It bothered me that the characters derived unlimited electrical power from a relatively small battery. I'd long wanted to reread this book but had had trouble finding a copy. Six months ago I was browsing through Barnes and Noble's bargain books and noticed some omnibus editions of classic authors. Sure enough, there was a heavy volume containing seven Verne stories. It didn't reproduce the original illustrations but it cost rather less than on-line sellers had been asking for used copies of "Five Weeks in a Balloon."

Taking to the air

"*Five Weeks in a Balloon*" is a straight-forward adventure story set in Africa. By the 1860s Africa had been explored by Europeans for a century or more. Expedition after expedition had returned with most of their members dead from disease, starvation or the predations of hostile natives. Verne's proposal was that, if a balloon's altitude could be controlled, it could cross Africa driven only by the prevailing winds. Rivers, rough terrain and unfriendly aborigines could be avoided by flying over them. His three adventurers set off from Zanzibar and, after many harrowing escapes, arrive in Senegal. At the time Verne was writing, elongated, powered and steerable balloons were still 40 years in the future. Hydrogen-filled balloons had just found their first practical application as battle-field observation platforms in the American Civil War. Unless a balloon was tethered, maintaining a fixed altitude meant constantly dumping ballast or venting gas. Flights were thus limited to a few hours at most.

Verne proposed a solution similar to that used in today's long-distance balloon flights. His balloon had two gas-bags, one inside the other and both containing hydrogen. The height of the balloon was controlled by circulating the gas through a heated tube. This expanded the hydrogen, making the balloon rise; cutting off the heat let the balloon descend. Simple! Today, one gas-bag contains helium to provide most of the lift, the other contains air heated by a propane burner. How long a modern balloon can stay in the air depends on how many propane tanks it can carry at lift-off.

Infinite hot air

Verne circumvents the issue of fuel consumption with some pseudoscientific hand-waving of which our present-day free-energy promoters would be proud. Like them, he makes things sound so plausible until you look at the numbers. The hydrogen in Verne's balloon is heated by burning a mixture of hydrogen and oxygen. (Remember Dennis Lee and Brown's gas? Verne used it first.) These gases are produced by "decomposing" water with electricity from a "powerful Buntzen [sic] battery."

This battery reappears in later books as the "Bunsen" battery, the real but low power, battery invented by Robert Wilhelm Bunsen in 1841. Like the feeble dry cells of my youth, this had electrodes of graphite and zinc; Bunsen used chromic acid as the electrolyte rather than ammonium chloride. Verne's battery is apparently capable of providing thousands of kilowatt hours from a weight of a few hundred pounds.

Battery technology has improved considerably since Verne's time but this is still a performance that car manufacturers would kill for. Practical capacities are orders of magnitude lower than Verne assumes.

Electrolysis does the trick

Verne implies that limitless supplies of separated hydrogen and oxygen can be had just by applying a voltage to water. This nonsensical idea has been embraced by free-energy and improved-gas-mileage promoters alike. Fiction has metamorphosed into fraud in only 145 years. In real life the rate of gas production is proportional to the current that flows and thus to the electrical power consumed.

The heat generated by burning the gases evolved from an electrolytic cell is significantly less than the heat that could be generated from the original electrical input. Verne's explorers should have connected an electric heater (or better still, a heat pump) directly to the battery. The extra complication of electrolysis is just there to befuddle the reader.

The ubiquitous Bunsen battery

The Bunsen battery crops up again in "A Journey to the Center of the Earth." One obvious problem with underground adventuring is how to provide illumination. Verne's solution is an antique version of today's compact fluorescent lamp. His heroes carry "Ruhmkorff's apparatus" which, a footnote explains, is a Bunsen pile [battery], an induction coil and an evacuated spiral tube. These devices are apparently capable of supplying light for many weeks, a task that would defeat any modern battery, even one which, like Verne's, is carried in a back-pack.

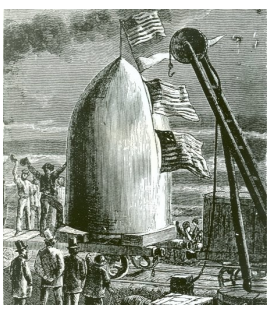
Modern backpackers must envy Verne's three heroes. After several weeks underground they congratulate themselves on still having four months' food remaining. Considering that they are also carrying ropes, guns, ammunition, fifty pounds of guncotton (!), shovels, blankets and Ruhmkorff's apparatus, one wonders how they managed to stand up.

The electric battery reaches its apotheosis in "20,000 leagues under the sea." Captain Nemo's Nautilus is powered by sodium, presumably used as a battery electrode. This sodium is replenished at an underground base where coal is mined and used to extract the sodium from seawater. Curiously, the immense screw of the Nautilus is turned by the electrical equivalent of a reciprocating steam engine with electromagnets taking the place of the cylinders. One shudders to think how inefficient this must be.

Space travel

Verne's technobabble reaches its peak in "From the Earth to the Moon." In this book and its sequel, "Around the Moon," Verne goes into great circumstantial detail, quoting so many weights and dimensions that one wonders why no Ark hunters have switched to Florida where Verne's equally mythical 900 foot Moon gun presumably still lies buried in Stones Hill. With 68,000 tons of cast iron as a prize perhaps the only thing deterring them is the difficulty of locating a 1800-foot hill in Florida.

Many commentators have pointed out that being fired from a giant cannon would reduce any passengers to a pulp. Once in space, Verne's travellers feel a diminishing pull towards the Earth. This leads to weightlessness only at at the "neutral point" between the Earth and the Moon. In the century prior to the Apollo missions, Verne's misapprehension became the common wisdom. The idea that the projectile and its occupants are both falling freely and hence are equally weightless has never quite taken hold.



On the plus side, Verne's heroes quite properly use rockets to adjust the course of their projectile. We can't blame Verne for the once common belief that space travel is impossible because "rockets need air to push against."

Accident or purpose?

From our modern perspective, Verne's books contain many scientific blunders. Some reflect the common beliefs of the time and some reveal Verne's unfamiliarity with astrophysics. Often the science is sound enough but he greatly exaggerates the available resources. On the other hand, much which passes for science is simply a great author not letting the facts get in the way of telling an engrossing story.

[This is a shorter version of an article that originally appeared in the September 2009 issue of Skeptical Briefs. It is reprinted by permission.]

Author's note: I wrote this article before reading Verne's "The Mysterious Island." This was published in 1870 and one of the Civil War balloons to which I had alluded becomes a major plot device.

Verne explicitly confirms my surmise that he took a "magic wand" attitude to electrolysis, that is, water can be split into hydrogen and oxygen by applying a voltage without any significant current flowing or energy being consumed. His characters are discussing what will happen when the world's coal reserves run out some 250 to 300 years in their future. Their dialogue reads so much like a parody of today's alternative-energy enthusiasts that it is worth quoting at length:

> "And what will they [their great-grandchildren] burn instead of coal?"
> "Water," replied Harding.
> "Water!" cried Pencroft, "water as fuel for steamers and engines! water to heat water!"
> "Yes, but water decomposed into its primitive elements," replied Cyrus Harding, "and decomposed doubtless, by electricity, which will then have become a powerful and manageable force, ..."
> "Yes, my friends, I believe that water will some day be employed as fuel, that [the] hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable." [...]
> "I believe then that when the deposits of coal are exhausted we shall heat and warm ourselves with water. Water will be the coal of the future."

Tom Napier *is critical thinker and a long time member of PhACT. He has degrees in physics and electronics and has worked on the European space program and the CERN Project.*

Ω Ω Ω

Poe, Probability, and Marie Rogêt

by M. Paul Menga

We provide a tour of the Fundamentals of Probability, using some quotations from Edgar Allan Poe's tale *The Mystery of Marie Rogêt* as motivation.

On July 28, 1841 the body of Mary Cecilia Rogers was found in the Hudson River. Foul play was presumed. Edgar Allan Poe, far removed from the case, decided to sleuth nonetheless, putting his musings to print as The Mystery of Marie Rogêt. The names, locale, and some trivialities were changed but Poe attempted to parallel the real case as closely as possible. The result is a very dry, analytic work where Poe painstakingly explains the facts and the logic he uses to form his conclusion. In this essay we examine one small part, some comments made on Probability.

As an aside, Poe has two other mystery stories: The Murders in the Rue Morgue and The Purloined Letter. They are both more accessible and pleasurable to read than the one we shall examine. As for The Mystery of Marie Rogêt, a footnote to the work informs us: "It may not be improper to record … that the confessions of two persons [in the actual case of Ms. Rogers]… long subsequent to the publication [of Marie Rogêt], confirmed, in full, not only the general conclusion, but absolutely all the chief hypothetical details by which that conclusion was attained [by Poe]." Not so bad for just reading the daily papers! And not perfectly true either.

Murder Victim MARY ROGERS

In July 1841, a young woman, Mary Cecilia Rogers, the "Beautiful Cigar Girl" who had tended the counter at John Anderson's popular cigar store, mysteriously disappeared from the boardinghouse she ran with her elderly mother in New York City. A few days later, her body was found floating in the shallow waters of the Hudson River near the Hoboken, New Jersey shore. While her murder was never solved, her death was probably the result of an illegal abortion gone fatally wrong.

At the start of The Mystery of Marie Rogêt Poe states:

> *"There are few persons, even among the calmest thinkers, who have not occasionally been startled into a vague yet thrilling half-credence in the supernatural, by coincidences of so seemingly marvellous a character that, as mere coincidences, the intellect has been unable to receive them. Such sentiments — for the half-credences of which I speak have never the full force of thought — such sentiments are seldom thoroughly stifled unless by reference to the doctrine of chance, or, as it is technically termed, the Calculus of Probabilities. Now this Calculus is, in its essence, purely mathematical; and thus we have the anomaly of the most rigidly exact in science applied to the shadow and spirituality of the most intangible in speculation."*

We could develop a whole essay from this alone, but we have more to see. Wrapping up his tale, Poe discusses the issue of solving the real case (Ms. Rogers) with a "parallel" case (Ms. Rogêt). Of the general proposition, even after having done it in a particular instance, Poe writes negatively (I have numbered sentences for later reference):

> *"… it should be considered that the most trifling variation in the facts of the two cases might give rise to the most important miscalculations, by diverting thoroughly the two courses of events … we must not fail to hold in view that the very Calculus of Probabilities to which I have referred, forbids all idea of the extension of the parallel; — forbids it with a positiveness strong and decided just in proportion as this parallel has been already long-drawn and exact. [He admits what he has done with his parallel story is questionable, even though he had some success]. This is one of those anomalous propositions which … only the mathematician can fully entertain.*

[1] Nothing, for example, is more difficult than to convince the merely general reader that the fact of sixes having been thrown twice in succession by a player at dice, is sufficient cause for betting the largest odds that sixes will not be thrown in the third attempt.
[2] A suggestion to this effect is usually rejected by the intellect at once.
[3] It does not appear that the two throws which have been completed, and which lie now absolutely in the Past, can have influence upon the throw which exists only in the Future.
[4] The chance for throwing sixes seems to be precisely as it was at any ordinary time — that is to say, subject only to the influence of the various other throws which may be made by the dice.
[5] And this is a reflection which appears so exceedingly obvious that attempts to controvert it are received more frequently with a derisive smile than with anything like respectful attention.
[6] The error here involved — a gross error redolent of mischief— I cannot pretend to expose within the limits assigned me at present; and with the philosophical it needs no exposure.
[7] It may be sufficient here to say that it forms one of an infinite series of mistakes which arise in the path of Reason through her propensity for seeking truth in detail."

First let us consider that a good case can be made for why "parallels" of this kind are indeed to be frowned upon—though we will not make it—without resorting to the arguments Poe finds himself forced to make. We point this out because his arguments fail, as we shall discuss, but his point seems true. What do you think? (N.B. In sentence six he claims not to have laid out his case fully here; a bit of a "Fermat's Last Theorem" maneuver.)

Let us examine sentence seven first. Though written 150 years ago, this is still a sentiment often heard today. Science as normally practiced, especially in Physics, has earned the moniker "reductive naturalism" or similar variants. We take a large problem, break it up into the smallest possible pieces, study those, and then ideally make hypotheses about the whole (synthesis). A conflict between examining the pieces and examining the whole is still before us: consider the issues regarding the Gaia theory of the earth as an example. Perhaps germane is this E. O. Wilson quote[1]*: "The love of complexity without reductionism makes art. The love of complexity with reductionism makes science."* Solving a crime, arguably, is both a science and an art.

Finally, we can discuss some fundamentals of probability. All coins and dice discussed are assumed to be fair. Let us assume the dice game mentioned is a game where two dice are thrown simultaneously, meaning "sixes" is one throw where both dice show six dots. What is the chance of this? We can arrive at this by two different methods (a third will come):

> ***A priori***: existing in the mind prior to and independent of experience[2].
> ***A posteriori***: based upon actual observation or experimental data[2].

The second, a posteriori, is a very simple concept. To find the probability of sixes for a single throw, one should throw the dice many, many times then tally how many times sixes came up and divide by the total number of throws. This is called "doing the experiment" and the result is called a relative frequency. The only thing to be wary of is the number of throws. For the method to give a "perfect" result, one must throw an infinite number of times! This is impossible of course, but the point is the more trials the more accurate the result. Statistical methods can tell us how many throws on average we need to be able to state this result within a certain confidence level.

Also, as some may point out—perhaps not in complete seriousness—after a particular event has happened, the probability of that event is now 100%, and all the other possible events that did not happen are 0% probable. This is NOT what is meant by a posteriori. If you think this way, you have thrown out the Calculus of Probability. This has implications in arguments about whether the constants of the universe have been fine-tuned just for humans. (They have not. As Christopher Hitchens will be quick to adjudge, the human has been fine-tuned for the universe![3])

In the a priori method, we just "think up" the answer, but we must play by very precise rules. "Suppose an event E can occur in s ways out of a total of n equally likely possible ways. Then p = s / n"[4], where E is an outcome of an experiment (say throwing sixes), and p is the probability.

We must be very precise about n being equally likely. Let us define a sample space[5] as the set of all possible outcomes to an experiment, and n as the number of elements in the set. Note sets do not allow duplicate entries. The sample space for flipping a coin twice is {HH, HT, TT, TH}, where we abbreviate by first letter. Similar, but importantly different, is flipping two indistinguishable coins simultaneously, {HH, HT, TT}. Here we lost TH! The coins were indistinguishable, TH = HT, and sets do not allow duplicates. In the first set, the order of the letters specifies temporality; we get HH flipping the same coin at two different times. In the second set we arrive at HH in a single throw; two events happen at the same time. Now let us flip a nickel and a penny simultaneously, {HpHn, HpTn, TpTn, TpHn}. Back to four elements, and a set comparable to our first, but with the loss of temporality and addition of distinguishing

subscripts. Can you convince yourself that all three sets are filled with equally likely outcomes?

An actual experiment flipping two coins 60 times simultaneously resulted in 12 cases of HH, 12 cases of TT, and 36 cases of HT or TH (we can't physically differentiate in the experiment). So the answer to our question is no—it was a dirty trick to illuminate a point! Is the problem that our sample space should not be a set? This is definitional, which means we could change our definition to fix this problem, but we should ponder that perhaps TH = HT was not really true. Consider our third set of pennies and nickels. This set is filled with equally likely outcomes, as experimentation would show. We can clearly see we will have HpTn 1/4 of the time, and TpHn 1/4 of the time. So, using a result we elucidate just below, HpTn or TpHn should happen 1/2 of the time. When we make both coins the same we lose our ability to see the difference, but the laws of Probability still know. The sample space should still have been {HH, HT, TT, TH}, with n = 4. It is very easy to think up a probabilistic system where determining the probabilities a priori is either tedious or difficult.

1852 Illustration of "The Mystery of Marie Roget" by Edgar Allan Poe. Scanned from original at Oxford University.

Now that we have some thoughts on properly deciding n, how about E? The event E must be a subset of the sample space. For example, when flipping indistinguishable coins simultaneously, E = {HT, TH} for the event of getting neither both heads nor both tails. So how many ways can E happen? The answer is two, HT or TH, and this is s from our equation. Now, a priori, we can say p = s/n = 2/4 = 0.5. From the measured data, we see p = 36/60 = 0.6. Not so bad for only 60 trials. Recall for perfect agreement we need an infinite number of trials, and we could use statistics to show how being 0.1 off after 60 trials is not utterly unreasonable.

To come to the point, if we generate the sample space for two dice, treating them as ordered pairs and thus keeping in mind (x, y) and (y, x) must both be in the set, we find n = 36. Choosing E = {(6, 6)} implies s = 1 and we find p = 1/36 a priori for getting sixes on any given throw. The same probability holds for any x in E = {(x, x)}, where x is an integer from one to six. For any throw where the dice read differently, E = {(x, y), (y, x)} so s = 2 and p = 2/36 = 1/18.

So let us examine sentence one. Here Poe indicates that after two throws of sixes, we should have special reasons to assume not having sixes the third time. Before we get into it, what do you think? The probability of throwing one pair of sixes is 1/36. Therefore, taken individually, the probability of sixes on the first throw is 1/36, the probability of sixes on the second throw is 1/36, and the probability of sixes on the third throw is 1/36. If true, there is no reason to treat the third throw any different and that makes Poe glaringly wrong. He addresses how eminently reasonable this seems in sentences three and four. Why would he think differently? As mentioned above, he doesn't really spell it out but we will hazard a guess at what he might have thought, or at least highlight some common errors (this is a "reverse" gambler's fallacy).

As far as sentences two and five, Poe is indicating he thinks the average person would not give special significance to the third throw, based on the first two. This author disagrees. From his anecdotal evidence, he would guess that many people would treat the third throw differently. He also disagrees with Poe's perception of the everyman's grasp of probability—people, by nature, tend into Poe's error. We can half-heartedly ponder if Poe is not pulling our leg; was he grinning through his teeth as he wrote sentence five? Recognize that a pillar of critical thinking is to distrust personal anecdotes. A properly conducted large random survey of average people, concerning the question of whether the third throw is special, would be much more reliable. So, we will leave this topic for now, awaiting more data.

In the interest of highlighting the error, instead of treating the throws individually, let us chain them together. First, we need some more fundamentals. Back to the coins! What is the probability of getting the sequence HHTHTTTHTH when flipping a single coin 10 times? We know the drill; first we must generate our sample space, a set of all the equally likely outcomes. This is considerable work, but doing the experiment could be worse. We have HHHHHHHHHH,

HTHHHHHHHH, HHTHHHHHHH, etc… Tediously filling up the sample space, we find n = 1024. Our event set E contains just HHTHTTTHTH, so s = 1 and thus p = 1/1024. Let us notice something. Every element in the sample space is unique in the sense we could tell the difference in doing the experiment (no TH = HT issues here). This implies if we wish to know the probability of any specific 10 coin flip pattern, it will be 1/1024 as well. This will be a very useful thing to know!

Observe that our coin has two states, we flip it 10 times, and it just so happens that 1024 = 210. Can we prove a simple concept, that since the probability of getting a particular side of the coin is 1/2 on any flip and that multiple flips are independent, therefore the probability of getting a certain run of heads and tails over x flips is (1/2)x? We can and will, but first we must examine what it means to be independent. If the probability of event B happening, given that event A has happened, still has the same probability as B happening without A (event A has no effect on B's probability), then A and B are independent. An equivalent form is: if the probability of A and B happening together is equal to the products of the probabilities of A and B, then A and B are independent events[5].

For example, let event A be getting heads on the first throw, and event B heads on the second throw. From our first discussion of sample space, we see the chance of getting two heads in a row is 1/4, which is 1/2 ´ 1/2, the product of the probabilities of getting heads on the individual throws. This shows independence by the second definition. We can also come to this by a third concept: nothing in the laws of Physics admits of any way for the first flip to influence the second. "In the experiment of tossing a fair coin twice … Intuitively A and B are independent[5]". Well, we ought not to trust intuition, so I warn that independence cannot be assumed, it must be shown. It is easy to develop systems that have dependence. For example, let us say that in our political system we elect a Republican or Democratic President with equal probability. Given the President is from party x, is the party of the Vice-President independent? Not since the 12th Constitutional amendment from 1804 came to pass, when we decided we do not want these to be independent!

It should not be hard to see by our third method, understanding the laws of Physics, that all of the coin flips will be independent but if we distrust that we can prove it by either definition as well. For this we wish to extend our second definition of independence to any number of events. Sadly, and though we will not show it, counterexamples can be found to the following statement: If the probability of events A, B, and C happening together equals the product of their individual probabilities, then A, B, and C are independent. We need to stipulate that when taking any number of the events, the probability of them happening together is equal to the product of their individual probabilities. So we need not just consider A, B, and C together, but also A and B together, A and C together, and B and C together. If we find the equality holds in all cases and for any number of events, then we have proven independence of the events. Flipping this around and taking independence as already known, we can state the useful theorem that the probability of any number of independent events happening together is the product of their individual probabilities. We have proved what we were after, that getting a specific pattern of coin flips in x flips is (1/2)x, since the flips are independent and each has probability 1/2.

Arguing from the laws of Physics we will claim the different throws of dice to be independent; how could one affect the next? One should certainly check this with the definitions, but even our relatively small sample space size of 36 makes it cumbersome. Upon doing so, independence is shown. Our claims on dice independence have again highlighted what we earlier said makes Poe glaringly wrong, so we could say we are finished. Instead, let us run some numbers to show a way Poe may have been confused.

The probability of sixes on the first throw is 1/36 = 2.77%. The probability of sixes on the second throw as well is (1/36)2 = 0.08%. The probability of sixes on the third throw also is (1/36)3 = 0.002%, 1296 times smaller than 2.77%. We calculate in this manner only since we have shown independence. We would indeed feel tempted to bet against these odds, and this could be what Poe contemplated. And yet we know, considered by itself, the third throw still has just a 2.77% chance of sixes. It makes a difference psychologically whether we look at the probability of the string of events, or the events singularly. We shall endeavor to remove this difference.

Remember that useful thing to know we pointed out? Since every element in our coin sample space was differentiable in the experiment, the probability for any specific length flip pattern was the same as for any other pattern of the same length. We would like to say a very simple, similar thing about the dice, that any specific pattern of throws of length three has the same probability as any other, all being 0.002%. That would again shut the door on Poe rather nicely. We encounter a slight snag in that with the dice some throws, call them the EQUAL case, have probability 1/36, with the UNEQUAL case having probability 1/18, twice as much. By the way, doesn't this imply one would always want to bet against an EQUAL case? Since we have limited ourselves to three throws, we can say something true and valuable without taking up too much space.

Pattern	Probability	Percent	Number of Cases
EQUAL,EQUAL, EQUAL	$(1/36)^3$	0.0021%	$6^3 = 216$
EQUAL,EQUAL, UNEQUAL	$(1/36)^2$ (1/18)	0.0043%	$6^2 \cdot 15 \cdot 3 = 1620$
EQUAL,UNEQUAL, UNEQUAL	(1/36) $(1/18)^2$	0.0086%	$6 \cdot 15^2 \cdot 3 = 4050$
UNEQUAL,UNEQUAL ,UNEQUAL	$(1/18)^3$	0.0171%	$15^3 = 3375$

Abbreviating by first letter, EEU is not the same as EUE or UEE, which is why the second and third rows have a factor of three in the "number of cases" column—the probability works out to be the same for all three cases due to the commutative property of multiplication. A fundamental rule of Probability, and one of its three starting axioms (definitions), is that the probability of any something happening in the sample space must be 1 (or 100% if you wish). This implies that adding the individual probabilities of all cases must equal one. We can check this is true: (1/36) 3 ´ 216 + (1/36)2 (1/18) ´ 1620 + (1/36) (1/18)2 ´ 4050 + (1/18)3 ´ 3375 = 1.

We should examine why we must use 15 instead of 30 to calculate the number of cases. In our sample space, there are 30 elements of form (x, y) and 6 of (x, x). For every (x, y) there is a corresponding (y, x), undistinguishable to us after our throw, so with our formula we calculated the probability of a single UNEQUAL throw to be 2/36 = 1/18. Consider a single throw and see if the probabilities add to one using 30: 1/36 ´ 6 + 1/18 ´ 30 = 11/6 > 1. This is a no-no. Unlike one's ability to give 110%, nothing can be more likely to happen than absolutely likely. Let us try again, using 15: 1/36 ´ 6 + 1/18 ´ 15 = 1. We must use 15 instead of 30 to calculate the number of cases, again since (x, y) and (y, x) are indistinguishable to us. Another way of looking at it is if we really wanted to use 30, we would need to adjust the probability to 1/36 as well. But the whole reason we claimed the probability of an UNEQUAL to be 1/18 to begin with is because we cannot tell the difference (with fair, clean dice anyway). The table is correct.

From our table, it appears we have reason to bet against any three EQUALS in a row versus any other outcome. We now have our nontrivial answer to Poe. After two throws of sixes, it might make sense to bet against the third throw being sixes or fives or fours or threes or twos or ones with equal vigor. But hold on now, even treating the third throw as independent we still have reason to bet against any of those (1/36 versus 1/18). The more pertinent question is do we have more reason to bet against EQUALS after having seen two than if we just consider a single throw? With a single throw we find the difference is a factor of two in the ratio of the probabilities. Look at rows one and two in the table. This highlights the differences in probabilities considering all three throws. Again, it is just a factor of two in the ratio. The prior throws mean absolutely nothing! This is what we thought all along, but natural human intuition is not to be trusted, so we worked it out. A recommended habit.

So while we cannot say that any specific pattern of throws of length three has the same probability as any other, we have shown how the ratio of the probabilities in this case is a constant. And that ratio holds for the other cases as well. In the table every row has twice the probability of the row above it, and the same would extend to any number of throws. This is our answer to Poe.

While we are finished with responding to Poe, we are not done with Probability. We mentioned one of the three axioms of Probability; it would be lax not to complete the topic and introduce some formalism. These axioms, and derived theorems, constitute the third, and best, way of calculating probabilities compared to either the a posteriori or a priori method, of the latter of which this could be considered a more rigorous extension.

Let us call our sample space S. For every event E, which must be a subset of S, assign it a value (its probability, hopefully) which we will denote as P(E) = value. The axioms[5]:

1) P(E) ³ 0 (we define probabilities to be positive values)

2) P(S) = 1 (as mentioned, any something from the sample space must happen)

3) For any arbitrary length sequence of mutually exclusive events, E1, E2, … , Ei then P(E1 or E2 or … Ei) = P(E1) + P(E2) + … + P(Ei) (probability of any of the events occurring is the sum of their individual probabilities). Mutually exclusive, as you might guess, describes two events that cannot happen concurrently; one or the other—maybe neither—but not both[4]. The events in S need not be mutually exclusive, but any that are must hold to axiom three.

Here is how this works: if we define S and every P(E) properly so that all the axioms hold true, then we may say P is a probability function and that P(E) is a probability (why we used hopefully above). Axioms two and implicitly three were used above to check the table for accuracy. The events where indeed mutually exclusive; for example, you cannot

throw EEE and EEU simultaneously. Along with every defined probability being positive, this validates our heading of "Probability" in the second column. It is very beautiful to see how the theorems of probability are all derived from these axioms, vaguely similar to how all of Electricity and Magnetism is peeled away from the four Maxwell equations, but with important differences. In this excellent book, Fundamentals of Probability[5], there is an explanation of what axioms are as a general concept and some of the history of how it took time to come up with these three as being the right ones. While there, you should investigate counting principles, which also have much to do with the "number of cases" column and Probability in general.

Finally, is there a better way to prove Poe's main point, that the kind of parallels he used in his story is not to be trusted? We have another dirty trick here. In the second Poe quote an ellipsis hides this, a hint towards another argument:

> *"... it should be considered that the most trifling variation in the facts of the two cases might give rise to the most important miscalculations, by diverting thoroughly the two courses of events; very much as, in arithmetic, an error which, in its own individuality, may be inappreciable, produces at length, by dint of multiplication at all points of the process, a result enormously at variance with truth ..."*

[1] Consilience: The Unity of Knowledge, E. O. Wilson, 1998, page 58-59

[2] Random House Webster's Unabridged Dictionary 2001.

[3] God is Not Great, Christopher Hitchens, 2007, pages 2 and 3.

[4] Introduction to Probability and Statistics, Seymour Lipschutz and John Schiller, 1998.

[5] Fundamentals of Probability, Saeed Ghahramani, 2000.

M. Paul Menga *long ago in his high school senior yearbook quote sarcastically stated "Use your illusions!" but now more directly proposes "Lose your illusions!" He spends his time freelance writing and programming.*

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Trick or Treatment: The Undeniable Facts about Alternative Medicine
by Simon Singh and Edzard Ernst

Publisher: W.W. Norton & Co.; 1 edition (August 17, 2008)
Hardcover: 352 pages
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Noted science writer Singh and British professor of complementary medicine Ernst offer a reasoned examination of the research on acupuncture, homeopathy, chiropractic, herbal medicine and other alternative treatments. Singh (Fermat's Last Theorem) and Ernst work hard to be objective, but their conclusion is that these therapies are largely worthless. As they examine the research on various alternative therapies, the authors explore the principles of evidence-based medicine on which their conclusions are based, including clinical trials and the placebo effect; they also explore related ethical issues. The authors report that many patients will improve with any alternative remedy—but no more than those given a placebo. Exceptions exist; some herbal remedies (e.g., St. John's wort, echinacea) can be helpful though not always advisable, and chiropractors can relieve low back pain under certain circumstances. This is a stimulating and informative account that will be indispensable to anyone considering an alternative treatment, though it may not dissuade true believers.

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ALL money collected for this project will be used for student prizes. PhACT members and others are invited to participate as judges. Contact Eric Krieg for more information: erickrieg@verizon.net

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