SI Reader Survey | Trump's Conspiracies | Trust and Science | Zika Fears | Map of Heaven? | ESP Review | Obesity

Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

Vol. 40 No. 4 | July/August 2016

Does Astrology Need to Be True?

A CLASSIC CRITIQUE **UPDATED**

Does $E=mc^2$ Imply Mysticism?

A Skeptical Response to Science Denial

Geocentrism Documentary Deceptions

Skeptical Modern Art

Published by the Center for Inquiry in association with the Committee for Skeptical Inquiry

The Skeptical Inquirer (ISSN 0194-6730) is published bimonthly by the Center for Inquiry in association with the Committee for Skeptical Inquiry, P.O. Box 703, Amherst, NY 14226. Printed in U.S.A. Periodicals postage paid at Buffalo, NY, and at additional mailing offices. Subscription prices: one year (six issues), $35; two years, $60; three years, $84; single issue, $5.99. Canadian and foreign orders: Payment in U.S. funds drawn on a U.S. bank must accompany orders; please add US$10 per year for shipping. Canadian and foreign customers are encouraged to use Visa or MasterCard.

Inquiries from the media and the public about the work of the Committee should be made to Barry Karr, Executive Director, CSI, P.O. Box 703, Amherst, NY 14226-0703. Tel.: 716-636-1425. Fax: 716-636-1733. Email: bkarr@centerforinquiry.net.

Manuscripts, letters, books for review, and editorial inquiries should be sent to Kendrick Frazier, Editor, Skeptical Inquirer, EMAIL: kendrickfrazier@comcast.net. Mail: 944 Deer Drive NE, Albuquerque, NM 87122. Before submitting any manuscript, please consult our Guide for Authors for style and reference requirements and submittal instructions. It is on our website at www.csicop.org/publications/guide.

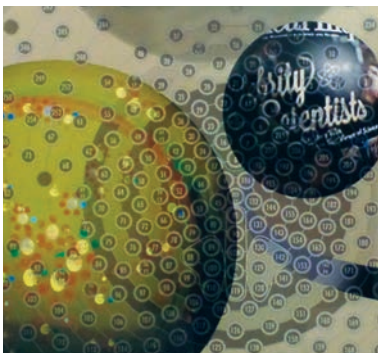
Articles, reports, reviews, and letters published in the Skeptical Inquirer represent the views and work of individual authors. Their publication does not necessarily constitute an endorsement by CSI or its members unless so stated.

Subscriptions and changes of address should be addressed to: Skeptical Inquirer, P.O. Box 703, Amherst, NY 14226-0703. Or call toll-free 1-800-634-1610 (outside the U.S. call 716-636-1425). Old address as well as new are necessary for change of subscriber's address, with six weeks advance notice. Skeptical Inquirer subscribers may not speak on behalf of CSI or the Skeptical Inquirer. Postmaster: Send changes of address to Skeptical Inquirer, P.O. Box 703, Amherst, NY 14226-0703.

Skeptical Inquirer July/August 2016 | Vol. 40, No. 4

FEATURES

COMMENTARIES



SPECIAL REPORT

COLUMNS

REVIEWS

Committee for Skeptical Inquiry
"... promotes scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims."

[FROM THE EDITOR

Curious Readers and Insightful Authors

The Skeptical Inquirer draws strength from our loyal readers, knowledgeable authors, longtime supporters, and our unique mission of providing you the best scientific evidence about all manner of extraordinary claims and assertions that tantalize and confuse the public.

You, our readers, are the reason we persevere against all the obstacles facing critical thinking and the scientific outlook in today's society. We have a symbiotic relationship with you—certainly an appreciative one on our part—and thought it time to learn more about you and what you think of us. Early this year a number of you (randomly selected) completed a detailed reader survey questionnaire. I enumerate results in this issue (page 30), but a few are worth reemphasizing here. First and foremost you are *curious*. This is the crucial starting point for all scientific thinking. The next most frequent terms you use to describe yourselves are *skeptic*, *critical thinker*, *atheist*, and *free thinker*. Most of you are well educated and well read. As for your attitudes about SI, we were pleased you consider us a credible source of information and to be both highly interesting and useful. Many of you have been with us a long time—nearly 40 percent of respondents have subscribed ten years or more, a welcome mark of strong reader loyalty. Nevertheless, I am pleased that 28 percent of you are new in the last one or two years, and we hope you also will be with us a long time. Most readers did not get the survey, but you may still share your thoughts with us. My email is kendrickfrazier@comcast.net.

* * *

We last featured CSI Fellow Geoffrey Dean in our pages with his marvelous 2012 cover article on the delusion of phrenology, examining how that pseudoscience gained such a stronghold on intellectual thought in the latter 1900s. But his even greater claim to fame is his classic comprehensive study of serious astrology that we published to considerable acclaim (except in astrological circles!) thirty years ago. In this issue, he updates that critique with all the many additional scientific studies of astrology (some "heroic") conducted since then. Astrology may not have quite the same hold on the popular imagination it did back then, but it nevertheless remains a core ancient belief system that many misleadingly think is scientific, and Dean's informed insights should help skeptics better deal with it.

Additional significant articles in this issue examine the misperceived mysticism surrounding Einstein's most famous equation; take a second major look at geocentrism, this time at a deceptive documentary promoting it; and offer a skeptical response to science denialism. Two important reviews critically examine a two-volume tome about ESP by parapsychology advocates and the gullible Dr. Eben Alexander's second book, *A Map of Heaven*. Ben Radford explores presumptive Republican presidential nominee Donald Trump's exploitation of conspiracy theories, science journalist Faye Flam considers the do's and don'ts of trusting science, and our regular columnists have at everything from partisan aspects of the Zika epidemic to mystery mongering surrounding Jesse James. We are nothing if not eclectic!

—Kendrick Frazier

Skeptical Inquirer™
THE MAGAZINE FOR SCIENCE AND REASON

Thirty years ago, although dozens of tests had been mostly negative, astrologers said critics had ignored serious astrology. Now there are hundreds of tests, some of them even heroic. Has anything changed? See page 38.

How Donald Trump Employs Conspiracies and Why It Works

Benjamin Radford

While there are many factors in Donald Trump's rise to the top of the list of Republican presidential nominees, one of the most bizarre is his use of conspiracies. Political conspiracies are nothing new, but Trump's endorsement of conspiracies is unprecedented in American politics. No modern politician has so successfully and routinely employed conspiracy theories as Trump.

Trump enjoys flirting with fringe and extremist elements, including conspiracy theorists. Trump has also appeared on the radio show of noted conspiracy advocate Alex Jones, who has repeatedly claimed that the Obama administration has faked or staged domestic shootings (including the Sandy Hook school massacre) as a pretext for confiscating Americans' guns.

According to a February 29 article in *The New York Times*, when asked by radio talk show host Michael Savage about conspiracy theories circulating soon after the death of Supreme Court Justice Antonin Scalia, Trump responded, "You know, I just landed, and I'm hearing it's a big topic. . . . They say they found a pillow on his face, which is a pretty unusual place to find a pillow." Even though there was no evidence of foul play (Scalia's family had known he was ill for some time, and a pillow was not in fact found over Scalia's face), this coy response allowed Trump to implicitly endorse the plausibility of the conspiracy while not explicitly associating himself with it.

Trump's best known conspiracy theory involves questions about President Obama's birthplace, which is of course an indirect but clear challenge to Obama's legitimacy as president under the Constitution. Trump, after investing what he claimed was millions of dollars on groundbreaking investigations of Obama's birth, stated that Obama's "grandmother in Kenya is on record saying he was born in Kenya." In fact, his grandmother is on the record as saying exactly the opposite, that he was born "in the state of Hawaii, where his father, his father was also learning there. The state of Hawaii."

Trump enjoys flirting with fringe and extremist elements, including conspiracy theorists.

Of course sometimes the conspiracies stick; other times they don't. Despite myriad questions raised about Obama—including the country of his birth, his alleged Muslim faith, and even his status as the Antichrist—he was re-elected. Trading in political rumors is one thing, but perhaps more alarmingly Trump has also endorsed discredited, antiscience conspiracy theories, including that childhood vaccines cause autism.

Trump regularly uses conspiracies in his rhetoric for the simple reason that it works. Controversial and inflammatory statements—whether true or even plausible—are guaranteed to get the attention of news media and keep Trump's face in front of voters. Trump also plays to the other side of the equation. Research has shown that while conspiracy theories span the political spectrum, there is a clear breakdown by ideology. Trump, running on the Republican ticket, endorses conspiracy theories that appeal to his base. For example, a 2013 survey by Public Policy Polling found that over a third of Republicans and Independents "believe that a secretive power elite with a globalist agenda is conspiring to eventually rule the world through an authoritarian world government, or New World Order," with fewer than half that percentage of Democrats agreeing. Conspiracies evoking that fear find traction with many voters.

Conspiracy theories are fundamentally about insecurity, a theme Trump has masterfully exploited. Conspiracies are psychologically comforting to many people because they provide a sense of

meaning, control, and security over their lives. Being "in the know" and smarter than the deluded "sheeple" makes conspiracy believers feel important. For many people, it's more comforting to believe that some powerful elite somewhere is pulling the strings than it is to accept that no one is in control and the world is essentially a random series of events, causes, and effects.

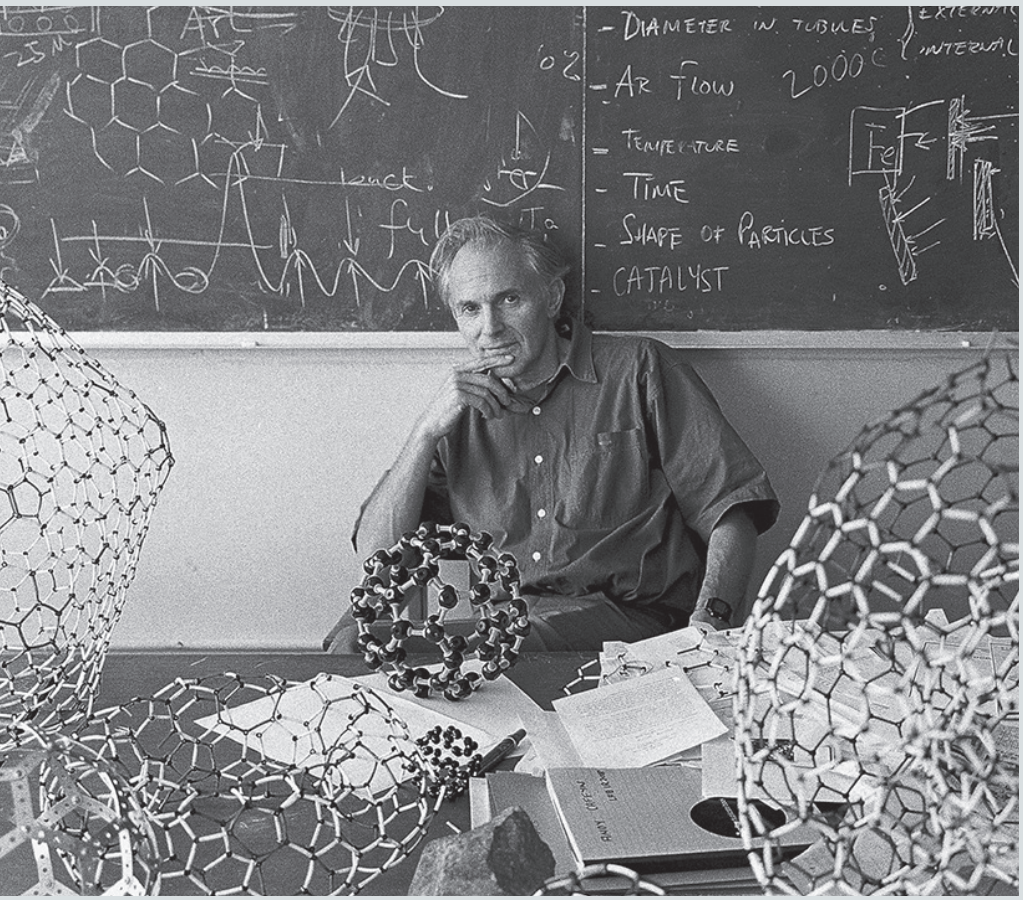
The American public doesn't want to believe that the fate of our great nation is subject to fundamentally random and uncontrollable (or difficult to control) influences such as terrorism, warfare, disease, drought, and so on. Trump offers an appealing alternative: a rich and powerful leader who confidently assures voters that his plans will solve the nation's looming problems—and not just any ideas but simplistic, easy-to-understand plans such as building a wall to keep out Mexicans, banning Muslims, "bombing the [hell] out of ISIS," and so on.

The polarizing worldview Trump offers, exactly paralleling that of conspiracy theorists, is neatly divided into dichotomous groups: winners and losers, good and bad, heroes and villains. You are either with us or against us, either part of the problem (that is, involved in the conspiracy or too stupid to recognize its threat), or part of a populist "grassroots" groundswell of ordinary citizens who feel manipulated and victimized by outsiders. Donald Trump has undeniably been a powerful force in American politics and has risen to be the Republican frontrunner based in part on conspiracy theories.

Benjamin Radford is the deputy editor of the Skeptical Inquirer.

Sir Harry Kroto, Nobel Laureate, Science Educator, Skeptic

Kendrick Frazier



The world scientific community and the skeptic and freethought communities have lost a great friend with the death of Nobel laureate Sir Harold Kroto. He died April 30 at age seventy-six of a neurodegenerative disease.

Kroto received the 1996 Nobel Prize in Chemistry with Robert Curl and Richard Smalley for their discovery of fullerenes, a new form of carbon in which sixty carbon atoms are arranged in a ball-shaped polyhedron, popularly called a "buckyball."

He did that work at Sussex University in his native England in 1985 (and was knighted in 1996), but in 2004, Kroto, a biochemist, was recruited to join the faculty of Florida State University (FSU) as its high-profile Francis Eppes professor.

Kroto was admired for far more than his world-class scientific research. The Nobel Prize allowed him to devote more time and energy to popular science education and to advocacy of critical thinking, skepticism, and atheism. He was known for leavening his messages with humor, and that made him all the more effective. In person, he was congenial, boyishly charming, and infectiously enthusiastic.

Steven Pinker Elected to National Academy of Sciences

Cognitive scientist Steven Pinker, a longtime fellow of the Committee for Skeptical Inquiry, has been elected a member of the U.S. National Academy of Sciences. Pinker is the Johnstone Family Professor of Psychology in the Department of Psychology at Harvard University. The Academy announced new members on May 3, elected "in recognition of their distinguished and continuing achievements in original research."

His Vega Science Trust, a British educational charity, provided science programming to teachers and students featuring interviews with other Nobel laureates on TV and the Internet.

"I think he's the greatest human being I've ever known," FSU physics professor Mark Riley, a close friend of Kroto, said, according to a May 2 article in the *Tallahassee Democrat*. "His never-ending desire to educate the whole world was just amazing. He knew that education is the answer, and that's why he built GEOSET and the Vega websites. He wanted to educate the world."

"Harry had a presentation style that matched no other," colleague Steve Acquah wrote on his Facebook page May 1. "His hyperlinked cache of PowerPoint presentations left everyone astonished and certainly impressed. . . . Beyond the presentations was his desire to make people really think about the world they live in, and learn something new about themselves."

Richard Dawkins, on his website, said Kroto had "the curiosity of a child" as well as a rebellious spirit and "an unstuffy instinct to defy convention." Added Dawkins: "Among other things he convinced me that, however alien and strange life elsewhere in the universe might be, we can be confident that it must be carbon based. No other atom has what it takes."

Kroto didn't mind speaking out against pseudoscience. In a 2008 newspaper op-ed, responding to a Florida creationist movement, he wrote, "It is disgracefully unethical for individuals who rail against the teaching of evolution to young people as a proven 'fact' to accept, either for themselves or their families, the humanitarian benefits accruing from medical scientific research underpinned by the theory. Evolution is the backbone of biology. . . ." He added, "It is truly criminal to interfere with the next generation of young scientists. . . ."

In person, Kroto was congenial, boyishly charming, and infectiously enthusiastic.

He rejoiced in calling himself a "devout atheist," confessing that he was "bewildered" by people who still believed in God.

Kroto and his wife, Margaret, had been married more than fifty years, and she served not only as his lifelong companion and business manager but, as Kroto acknowledged, his "moral compass." They have two sons.

Kroto was a fellow of the Committee for Skeptical Inquiry and a strong supporter of the Center for Inquiry and its programs. He was a speaker at CFI's World Congress in Beijing, China, in 2007 (where he spoke of, among other things, "the aesthetic beauty of science," SI, March/April 2008), and again at CSI's CSICon New Orleans in 2011. He also participated in conferences of the Council for Secular Humanism in 2005 in Amherst and 2012 in Orlando, and he took part in CFI's 2014 Galapagos Cruise. He also was among the first to sign CSI's "Deniers Are Not Skeptics" statement in December 2014.

"Harry was an inspirational scientist who engaged with experts and nonexperts alike," said Lesley Yellowlees, a former president (as was Kroto) of the Royal Society of Chemistry. "He motivated generations of would-be scientists through his tireless work with schools, clubs, science museums, and festivals, both online and in person."

Tweeted British professor Brian Cox: "RIP Harry Kroto—brilliant scientist and a strong, passionate advocate for science as a vital part of our culture."

Mass Hysteria Closes Fifty-Seven Schools in Bangladesh

Dozens of schools in Bangladesh were closed in January after hundreds of students began succumbing to a mysterious illness. According to the online Bangladeshi newspaper bdnews24.com:

> It was just another day at Shibram RD Academy School in Faridpur until student Ritu Saha started experiencing difficulty while breathing. Even as she was administered first aid, thirty-seven of her classmates also reported similar symptoms. Academy's teacher Susanta Kumar said all the students were evacuated from the classrooms and gathered in the playground. Meanwhile, thirty other students, mostly girls, also fell sick. . . . Supervisor Ganapati Biswas said that . . . hundreds of students, mostly girls between Class 6 and 10, have been affected. The disease starts with a student feeling out of breath, with the rest developing symptoms driven by anxiety that rippled through the school. (http://tinyurl.com/hc3ay64)

The students were taken to a local college hospital and examined, but doctors there could find no common cause or reason for the symptoms. In all the cases, the mysterious illness was minor and soon faded away. In all, fifty-seven schools in the region were closed for two days while investigators searched for a cause, but none was found. The Faridpur school mystery has all the textbook signs of a mass hysteria outbreak.

Mass hysteria is often misunderstood as being an illness that sufferers are making up. In fact, the symptoms are verifiable and not imaginary. The issue is instead what is *causing* the symptoms—whether some external environmental contaminant or instead a form of suggestion-driven social contagion. Humans are social animals, and we often take our cues from other people, both consciously and unconsciously. Research has shown, for example, that yawning and moods can be contagious. In the same way, people can unconsciously mimic the actions and reactions of their peers. If one or more of them start to faint or feel sick, it can create a domino effect, spreading to others. Outbreaks of mass hysteria (also known as mass sociogenic illness) are most common in closed social units such as schools (see, for example, "The Pokémon Panic of 1997" in the May/June 2001 Skeptical Inquirer and "Skeptical Inquirer Investigates High School Mass Hysteria," in the July/August 2012 issue).

Symptoms of mass hysteria are typically both minor (such as shortness of breath, fainting, nausea, and headache) and short-lived (lasting anywhere from a few minutes to a few hours). Because there is no physical irritant to treat or remove from the patient, there is no real treatment other than attention from doctors, parents, teachers, or other authorities.

The fact that no further reports have surfaced from the Faridpur district schools is strong evidence that the mass hysteria diagnosis was correct. This is because nothing had been done to the schools during the closing, so there was no change in the conditions before and after the outbreak. Had the breathing difficulties been caused by some environmental agent or toxin—a gas leak, chemical spill, or mold spores, for example—the students would have once again come down with the symptoms upon returning to the affected schools.

Since the illness was spread through social interaction, the most effective way to deal with the outbreak was to close the schools, thus limiting students' interactions with each other. The school's reaction serves as a model for other school administrators in dealing with suspected cases of mass hysteria: investigate thoroughly and shut down the school for a few days to calm the community's fears.

Quack Busters' Leader William Jarvis Dies at Eighty

William M. London

Skepticism has lost one of its most influential and accomplished promoters. Anti-quackery activist William Tyler Jarvis died March 1 after suffering an embolic stroke of the cerebellum on January 19 while playing tennis. He was eighty.

Bill Jarvis cofounded the now-defunct National Council Against Health Fraud (NCAHF) and two predecessor quack buster organizations that he led as president from 1977 until his retirement in 2000. Under his leadership, NCAHF became the nation's primary clearinghouse for information about health frauds and quackery. He edited the *NCAHF Newsletter*, archived online at ncahf.org, and a members-only newsletter called *NCAHF Bulletin Board*. By 2000, NCAHF had eleven state and local chapters and nine designated area network coordinators throughout the United States.

Bill emphasized that quackery (also called "health fraud") is not merely the *use* of false and unproven medical procedures. The key is their deceptive *promotion* in the marketplace as "alternatives" or "complements" to standard medicine—whether the deception is deliberate or done without adequate knowledge or understanding. He called for recognizing quackery as a public health problem to be combatted with systematic epidemiologic investigation, legislation, law enforcement, education, and improving patient care.

He made clear that quackery would always be part of the human condition and that attempting to eliminate it is futile; his realistic goal was to greatly minimize the harmful impact of quackery on public health.

His résumé noted that he had been "dubbed one of the antiquackery movement's 'Four Horsemen' by organized quackery" (along with the late Victor Herbert, MD, JD; the late John H. Ren-

Mass Hysteria Closes Fifty-Seven Schools in Bangladesh

Benjamin Radford

Dozens of schools in Bangladesh were closed in January after hundreds of students began succumbing to a mysterious illness. According to the online Bangladeshi newspaper bdnews24.com:

> It was just another day at Shibram RD Academy School in Faridpur until student Ritu Saha started experiencing difficulty while breathing. Even as she was administered first aid, thirty-seven of her classmates also reported similar symptoms. Academy's teacher Susanta Kumar said all the students were evacuated from the classrooms and gathered in the playground. Meanwhile, thirty other students, mostly girls, also fell sick. . . . Supervisor Ganapati Biswas said that . . . hundreds of students, mostly girls between Class 6 and 10, have been affected. The disease starts with a student feeling out of breath, with the rest developing symptoms driven by anxiety that rippled through the school. (http://tinyurl.com/hc3ay64)

The students were taken to a local college hospital and examined, but doctors there could find no common cause or reason for the symptoms. In all the cases, the mysterious illness was minor and soon faded away. In all, fifty-seven schools in the region were closed for two days while investigators searched for a cause, but none was found. The Faridpur school mystery has all the textbook signs of a mass hysteria outbreak.

Mass hysteria is often misunderstood as being an illness that sufferers are making up. In fact, the symptoms are verifiable and not imaginary. The issue is instead what is *causing* the symptoms—whether some external environmental contaminant or instead a form of suggestion-driven social contagion. Humans are social animals, and we often take our cues from other people, both consciously and unconsciously. Research has shown, for example, that yawning and moods can be contagious. In the same way, people can unconsciously mimic the actions and reactions of their peers. If one or more of them start to faint or feel sick, it can create a domino effect, spreading to others. Outbreaks of mass hysteria (also known as mass sociogenic illness) are most common in closed social units such as schools (see, for example, "The Pokémon Panic of 1997" in the May/June 2001 Skeptical Inquirer and "Skeptical Inquirer Investigates High School Mass Hysteria," in the July/August 2012 issue).

Symptoms of mass hysteria are typically both minor (such as shortness of breath, fainting, nausea, and headache) and short-lived (lasting anywhere from a few minutes to a few hours). Because there is no physical irritant to treat or remove from the patient, there is no real treatment other than attention from doctors, parents, teachers, or other authorities.

The fact that no further reports have surfaced from the Faridpur district schools is strong evidence that the mass hysteria diagnosis was correct. This is because nothing had been done to the schools during the closing, so there was no change in the conditions before and after the outbreak. Had the breathing difficulties been caused by some environmental agent or toxin—a gas leak, chemical spill, or mold spores, for example—the students would have once again come down with the symptoms upon returning to the affected schools.

Since the illness was spread through social interaction, the most effective way to deal with the outbreak was to close the schools, thus limiting students' interactions with each other. The school's reaction serves as a model for other school administrators in dealing with suspected cases of mass hysteria: investigate thoroughly and shut down the school for a few days to calm the community's fears.

Quack Busters' Leader William Jarvis Dies at Eighty

William M. London

Skepticism has lost one of its most influential and accomplished promoters. Anti-quackery activist William Tyler Jarvis died March 1 after suffering an embolic stroke of the cerebellum on January 19 while playing tennis. He was eighty.

Bill Jarvis cofounded the now-defunct National Council Against Health Fraud (NCAHF) and two predecessor quack buster organizations that he led as president from 1977 until his retirement in 2000. Under his leadership, NCAHF became the nation's primary clearinghouse for information about health frauds and quackery. He edited the *NCAHF Newsletter*, archived online at ncahf.org, and a members-only newsletter called *NCAHF Bulletin Board*. By 2000, NCAHF had eleven state and local chapters and nine designated area network coordinators throughout the United States.

Bill emphasized that quackery (also called "health fraud") is not merely the *use* of false and unproven medical procedures. The key is their deceptive *promotion* in the marketplace as "alternatives" or "complements" to standard medicine—whether the deception is deliberate or done without adequate knowledge or understanding. He called for recognizing quackery as a public health problem to be combatted with systematic epidemiologic investigation, legislation, law enforcement, education, and improving patient care.

He made clear that quackery would always be part of the human condition and that attempting to eliminate it is futile; his realistic goal was to greatly minimize the harmful impact of quackery on public health.

His résumé noted that he had been "dubbed one of the antiquackery movement's 'Four Horsemen' by organized quackery" (along with the late Victor Herbert, MD, JD; the late John H. Ren-

Take action with us.



You can help promote science, reason, and secular values.

Imagine a world where religion and pseudoscience do not influence public policy—a world where religion no longer enjoys a privileged position. The Center for Inquiry is working toward these goals and educating the public to use science, reason, and secular values rather than religion and pseudoscience to establish public policy.

The Center for Inquiry advances its mission through advocacy, education, and outreach programs. No other organizations advance science and secularism on as many fronts as CFI and its affiliates, the Committee for Skeptical Inquiry, the Council for Secular Humanism, and the Richard Dawkins Foundation for Reason & Science.

Donate today.

When you make a donation to CFI, you become a member of a worldwide movement of humanists, skeptics, atheists, and freethinkers—all working together to promote the secular worldview and give voice to your values.

Our major goals include:

- Protecting the rights of nonbelievers
- Advocating for science-based medicine
- Sustaining and expanding the secular movement

Make your most generous gift today, or request information on planned giving or making a bequest.

To receive a brochure elaborating on what we are doing to achieve our important goals and how you can help, please complete and return the attached card or contact us at:

Center for Inquiry
Development Office
PO Box 741
Amherst, NY 14226
1.800.818.7071
development@centerforinquiry.net
www.centerforinquiry.net/donate

cfi CENTER FOR INQUIRY
Richard Dawkins Foundation for Reason & Science
CSI
COUNCIL FOR SECULAR HUMANISM

Japanese Taxi Drivers Claim Ghost Passengers

Benjamin Radford

More than a half dozen Japanese taxi drivers claimed earlier this year to have had ghostly customers. They report that all seems like a normal fare until the phantom passengers mysteriously vanish from the back seat before arriving at their destination. According to a February 7 story on MSN.com:

> At least seven taxi drivers in Ishinomaki, north-east Japan, have reported experiencing a "phantom fare" in the wake of the devastating 2011 tsunami and earthquake. In each instance, the story is similar. A taxi driver picks up a passenger in an area devastated by the 2011 earthquake and tsunami. He starts the meter and asks for the destination, to which the customer gives a strange response. Either then, or sometime later, the driver turns around to address the man or woman—but the passenger has vanished. This is because, it is claimed, it was a "ghost passenger" who was, in fact, killed in the disaster five years ago. (http://tinyurl.com/j797z2n)

There are several red flags that the story is implausible, beginning of course with the question of why a ghost would need to take a taxi anywhere. The origins ascribed to the ghosts by the taxi drivers are also curious: none of the reports have the ghosts explicitly stating that they were victims of the 2011 disaster; that detail seems to be assumed by the drivers, likely because of the area's history.

Though the reports seem new, they are an interesting new twist on a very old story, in fact one of the best-known urban legends in the world. It's known as The Vanishing Hitchhiker, and the basic story goes something like this: During a road trip, usually at night, a lone figure is seen standing by the side of the road. A driver stops and offers the person a ride; the drive proceeds either in total silence or with only a few words spoken. The driver later arrives at a destination and turns to the hitchhiker, only to find that the mysterious guest has vanished. Sometimes the story ends with the driver speaking to someone at the destination who identifies his phantom passenger as the spirit of a person who had died somewhere near where they were picked up.

Folklorist Jan Brunvand notes in his book *The Vanishing Hitchhiker: American Urban Legends and Their Meanings* that "The specific 'proof' in the story of the hitchhiker's actual presence in the car and her status as the ghost of a particular individual is always a key motif. Besides the book she leaves behind . . . the object may be a purse, a suitcase, a blanket, a sweater, a scarf, or some other item of clothing, or simply footprints or water spots in the car." There are countless variations around the world, all of them told as true stories. While occasionally such spooky experiences are related as firsthand accounts, much more often they are told as second- or third-hand stories—what folklorists call "Friend-of-a-Friend" tales.

There are several red flags that the story is implausible, beginning of course with the question of why a ghost would need to take a taxi anywhere.

Though rare, in recent years a few others have claimed to experience real-life urban legends. In 2014, for example, a man in Seattle claimed he was attacked outside a bar by a mysterious woman with a needle who stabbed him and then said "Welcome to the HIV club," suggesting that he had just been infected with the AIDS-causing virus. In fact, AIDS-infected needles have long been the subject of unfounded rumors and legends (see "Man Claims AIDS Scare Legend Came to Life," SI, News and Comment, March/April 2015).

As for what's going on among Japanese taxi drivers, it's difficult to know. A few may have had some genuinely puzzling experience, but it's hard to believe that any passengers literally vanished from the back seat and exited the car without opening a door—or paying, for that matter. Interestingly, there exists a tradition of pranks involving Japanese taxi cabs and ghostly passengers, some of which can be seen on YouTube and may have inspired the stories (see, for example, https://www.youtube.com/watch?v=u3GcdxxVLn0).

Predictably, the taxi drivers who claim to have encountered the Japanese ghosts are anonymous, and therefore they can't be questioned. If what they say is true—and some of the thousands of tsunami victims in the Ishinomaki prefecture continue to hail cabs from the afterlife—then proving it should be as simple as installing inexpensive video cameras in the taxis. Either way, it's a fascinating look at modern folklore and how an old urban legend can be adapted for new generations.

Joe Nickell, PhD, is a former Pinkerton detective and historical sleuth. He has written articles and encyclopedia entries about Jesse James, and his books include *Crime Science* and *The Science of Ghosts*.

Jesse James's 'Haunts': Legends, History, and Forensic Science

An American embodiment of the Robin Hood legend, notorious outlaw Jesse James, with his older brother Frank, rode boldly into U.S. history in the wake of the Civil War, during which the two had trained for a career of daring bank and train holdups. Born in Missouri, they nevertheless had many connections to Kentucky, and it was these the editor of *The Kentucky Encyclopedia* (Kleber 1992) asked me to investigate—with special attention to the 1868 robbery of the bank at Russellville to determine if it was actually perpetrated by the James gang. I completed that assignment (Nickell 1992), as well as a longer, historical-journal article (Nickell 1993a), and produced other related writings (Nickell 1993b; 1999). The following is a summary that also looks into Jesse James ghostlore and other legends.

Background

The James boys, Frank (1843–1915) and Jesse (1847–1882), were born and reared in Missouri, the sons of Robert Sallee James (1818–1850) and Zerelda Cole James (1825–1911). Beginning in 1839, Robert attended the Baptist institution Georgetown College (where I once taught and examined the original records).

Zerelda's grandfather, Richard Cole, Jr., operated a stagecoach inn near Midway, Kentucky. I visited it and the home of Zerelda's guardian, Judge James Lindsay, where the couple was married on December 28, 1841. They then moved to Missouri. Following the births of Frank and Jesse, they had one more child, Susan Lavinia, born in 1849 (Nickell 1993a, 218–220). After Robert S. James died during the California gold rush, his widow remarried but was soon widowed again, and finally, in 1856, she wed Dr. Reuben Samuel, by whom she had four more children.

Figure 1. The Long Bank in Russellville, Kentucky, was robbed in 1868. Was it by the Jesse James Gang as legend holds? (Photograph by Joe Nickell.)

With the outbreak of the Civil War, Frank James joined a Confederate guerilla band, and his fifteen-year-old kid brother did likewise two years later. Jesse thus embarked on a course of outlawry that would end only with his violent death in 1882.

The James Gang

After the war, the so-called James Gang—largely a postwar band of former Quantrill's Raiders, originally led by Cole Younger—was held responsible for numerous robberies in several states. These included, in Kentucky, a pair of stagecoaches near Mammoth Cave and banks in Columbia and Russellville (Nickell 1993a; Beamis and Pullen n.d., 10–19, 45, 56–60).

The Long Bank (owned by Nimrod Long) in Russellville (Figure 1) was the scene of a "daring" robbery on the afternoon of Friday, March 20, 1868. Days before, a man using the apparent alias of "Thomas Coleman" attempted to sell a $500 bond, but it was suspected of being counterfeit. On the Wednesday before the robbery, he tried again with a $100 treasury note, which was also declined. He was accompanied by a man who appeared to be observing the layout of the bank. Finally, on March 20, "Coleman" and two others arrived at the bank from different directions, hitched their horses, and

walked inside. While they attempted to cash a $50 counterfeit note, two other riders came up and waited outside.

The robbery began when Coleman drew his gun, but owner Long sprang toward a rear door, receiving a bullet-grazed scalp in return. (A bullet hole was left in the bank's wall where I examined it during my visit to the historic building.) Nevertheless, Long escaped and ran to the street where the two sentries were now firing their Spencer repeating rifles at anyone who approached. The three robbers ran outside carrying saddlebags filled with greenbacks and silver and gold coins. The band then fled out of town and, although citizens soon pursued them, vanished in the woods (Nickell 1993a, 222–224). Were the bank robbers indeed the James Gang?

To answer this question, I approached it from several angles. One strategy was to assess the perpetrators' *modus operandi* (or M.O., "method of operation" [Nickell and Fischer 1999]) for which I had had special training (Nickell 2008). I also used additional clues, such as aliases, descriptions, and other factors. It is necessary, however, first to recognize that the group—at this time really the Younger-James gang—was a loosely constituted band whose membership could vary from robbery to robbery.

In fact, both of the James brothers had an alibi for the Russellville robbery: they were holed up in Chaplin, Nelson County, Kentucky, recovering from gunshot wounds. But the *modus operandi* of the crime was exactly that used and developed by the Younger Gang: "genteelly dressed" men arriving in town posing as cattle buyers or the like, then converging on the bank, with half going inside and the rest keeping guard with Spencer rifles—the two groups able to communicate with each other through a man inside the doorway. The desperadoes then fled on fast horses, splitting up to take preplanned routes, and disappeared. The 1872 Columbia bank robbery, for example, followed the same M.O., and the robbers escaped into Nelson County, a known James sanctuary (Nickell 1993a, 225–232).

Despite the alibi of the James brothers, Louisville detective D.G. Bligh, who investigated the case, believed they were nevertheless involved. Moreover, two of the actual robbers were identified: One, having a "defect in one eye," was George Shepherd, a Chaplin resident and compatriot of the James brothers; so was the other, George's cousin Oliver Shepherd, who had been away from home at the time of the robbery and who signaled his guilt by resisting arrest. Oliver was shot to death, and George was sent to prison for his role. The alias used by the leader of the band, "Thomas Coleman" (as given in the legal indictment against the five holdup men, probably having been taken from a hotel register), almost surely identifies Thomas Coleman "Cole" Younger (1844–1916), the original leader of the "James Gang" (Nickell 1993a, 228–232; "Russellville" 1868; Settle 1977, 30–44).

In death, the legendary Jesse James attracts mystery mongers—including buried-treasure enthusiasts and ghost hunters—like a magnet.

Riding into Legend

Although only five men robbed the bank in Russellville, popular writers would extend the number to eight or even a dozen and spur them into town at a gallop with guns blazing. Soon, the legend grew that the robbery was that of the James brothers.

Jesse's cowardly murder by Bob Ford in 1882 helped make him the focus of later legends. Pistols, often with his name carved thereon, proliferated. So did photographs "said to be" of the outlaws or their family members (Nickell 1994, 78). Among other artifacts, there are no fewer than three gold watches alleged to have fallen from dead Jesse's pocket.

In the legends, the James Gang's adventures multiplied. For example, Jesse was said to have robbed a bank in West Virginia in 1875 (more on this presently). Again, he has been seriously credited with another Kentucky heist—that of a Muhlenberg County coal mine office—although Jesse, his wife "Zee," and their two children were in Kansas City at that time, while Frank was in Texas (Nickell 1993a, 231, 236).

The James brothers' alleged hideouts were also ubiquitous. Said one writer, there were a reputed "thousand places where Frank James and Jesse James had been seen and it wasn't only Kentucky; it extended all the way to Florida, New York" (qtd. in Watson 1971, 75).

The Impostors

As artifacts and tales about Jesse James proliferated, so did the persons who—following his death on April 3, 1882—claimed to be the real, escaped-from-death outlaw, some seventeen by one count (Nickell 1993b).

Jesse had been living as "Thomas Howard" with his wife and children in St. Joseph, Missouri. On that fateful day, young Bob Ford and his brother Charles—new members of the James Gang—were at the home. Bob Ford intended to kill Jesse for the reward money offered by Missouri Governor Crittenden, so when the unarmed notorious outlaw and respectable family man stepped up on a chair to dust a picture, Ford quickly drew his pistol and shot Jesse in the back of the head, killing him instantly. The act inspired a ditty: ". . . Oh, the dirty little coward that shot Mr. Howard! And they laid Jesse James in his grave."

Almost immediately, however, came doubt that the dead man really was Jesse James. This was despite a positive identification by a coroner's jury—relying on people with personal knowledge of his features and on distinctive identifying wounds (including a pair of scars on his right chest and a missing left middle fingertip). Scarcely had a year passed when a Missouri farmer claimed he had seen Jesse James. Other sightings followed, not unlike those of Elvis Presley in more recent

times. Eventually, men claiming to be the "real" Jesse came forward (Nickell 1993a, 234–235). As American folklorist Richard M. Dorson (1959, 243) observed: "In the tradition of the Returning Hero, who reappears after his alleged death to defend his people in time of crisis, ancient warriors have announced that Jesse James lives in their emaciated frames."

The last—and best known—Jesse James claimant was one J. Frank Dalton. I recall him on a television program when I was a boy. I have an old book that was used to promote Dalton's claim—first made on May 19, 1948—that he was James; the book (Hall and Whitten 1948) was published in that year. According to Dalton—then said to be nearly 101 years old—the man killed as Jesse was Charley Bigelow, a former member of the James Gang. Jesse's wife acted her part in the conspiracy, the book says, crying out, "They have killed my husband."

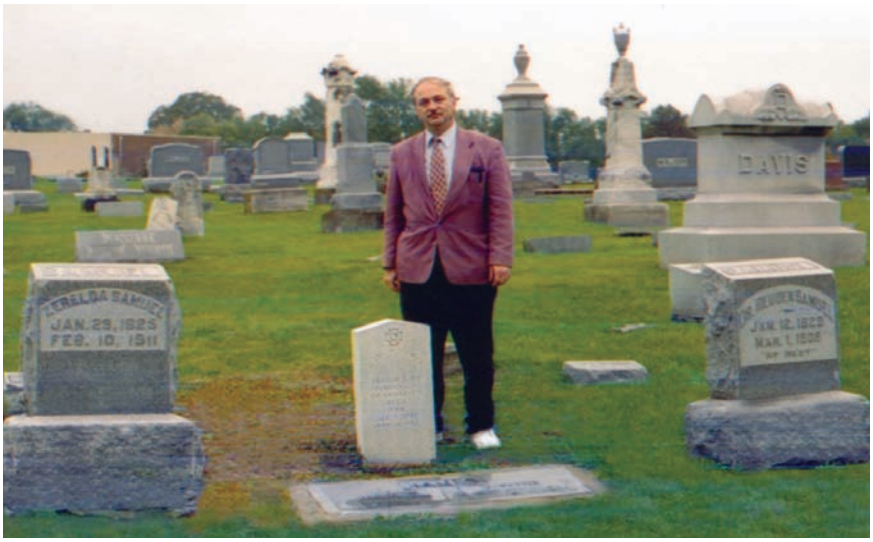


Figure 2. The author at the site of Jesse James's grave in the Mount Olivet Cemetery in Kearney, Missouri, where his remains were exhumed in 1995. (Author's photo.)

Investigating 'Jesse'

This is all fantasy and conspiracy nonsense of course, aimed at the credulous. I compared some of Dalton's "memories" (as related by the authors of his story in 1948) and found them absurd. For example, except for the date of the Russellville bank robbery, he gets almost nothing else correct, referring to the town as "Russell" and describing what had been a carefully planned act as a wild raid: "A group of mounted men, armed with revolvers and bowie knives, dashed through the streets of Russell, shouting and yelling. They rode up to the front of the bank and two lines of men were placed across the street to keep anyone from interfering." Then the James brothers went inside the bank, where Frank trained his pistol on the cashier while Jesse "took the money from the safe" (Hall and Whitten 1948, 19).

Other evidence discredits Dalton. Whereas writers cite his "damaged fingertip" ("J. Frank Dalton" 2015) and specifically the "mutilated tip on the left hand index finger" (Taylor 2014) as supposed proof that he was Jesse James—in fact, as we have already seen—the actual digit in question was Jesse's left middle finger, and its tip was missing (Settle 1977, 117–118). Then there is the handwriting. Forensic document examiner Duane Dillon determined that Dalton's writing characteristics were distinctly different from James's (Starrs 2005, 185).

As a historical document consultant (see Nickell 2009) and author of textbooks on handwriting (Nickell 1990; 1996), I independently compared Dalton's "Jesse James" signature (on the cover of the 1948 book by Hall and Whitten) with known signatures of James (Hamilton 1979, 89, 91).

In contrast to the real Jesse's "Jesse W James" and "JWJames," Dalton omits the middle initial, writes the first name above the last, fails to connect the first *J* with the following *e* and the second *J* with the following *a*, uses an entirely different form for the three *s* characters, adds an uncharacteristic final stroke to the last *s*, and more. The real James did not pen the words "Jesse James" written by J. Frank Dalton.

I also ran down two stories of old men in my hometown area who thought they had encountered Jesse James in 1875, about the time he supposedly robbed a West Virginia bank (mentioned earlier); one was in Morgan and the other in Elliot County, Kentucky. In 1950, the latter (then in his nineties) reportedly visited J. Frank Dalton in Missouri and declared, "He is Jesse James" (Nickell 1999). Dalton died the following year. His death left for many the question: Who is buried in Jesse James's grave?

Identifying Jesse James

That question has since been answered by James E. Starrs, a professor of law and forensic science at George Washington University in Washington, D.C. He headed the James identification project. (He and I were fellow speakers in 1998 at a forensic conference in Nova Scotia where we swapped investigative stories over lunch.) In July 1995, the project exhumed the remains from the grave in Mount Olivet Cemetery in Kearney, Missouri (having in 1902 been transferred there from Jesse's initial burial in his mother's front yard). (See Figure 2.)

The skeletal remains yielded evidence consistent with being those of Jesse James. For example, an anthropological analysis showed the remains to fit his known profile as to sex, age, height, and racial typing. A spent bullet was found amid fragments of the right ribs where Jesse was known to have carried an unremoved bullet. The skull—carefully reconstructed—yielded evidence of a single entrance wound behind the site of the right ear. Found later were traces of the lead from a bullet's passage on a fragment of an occipital bone. Many of the teeth had gold

fillings and evidence of tobacco chewing (nicotine staining and corrosive influence)—both expected from known facts of the outlaw's life (Starrs 2005, 181–185).

The definitive evidence came from mitochondrial DNA (mt DNA), i.e., genetic material passed from mother to child. A DNA specimen from one of the teeth matched that from blood samples taken from Robert Jackson and Mark Nichols, the two known descendants of Jesse's sister Susan. The remains thus proved to be those of Jesse Woodson James (1847–1882) with a significant degree of scientific certainty. The sequence of base pairs in the DNA matching was "so singular" that it was reportedly "the first time it was encountered in the entire mt DNA database for the Northern European population" (Starrs 2005, 185–186).

Ubiquitous Ghost

In death, the legendary Jesse James attracts mystery mongers—including buried-treasure enthusiasts and ghost hunters—like a magnet. Often the two topics are combined.

A large component of the lost-treasure genre consists of proliferating yarns about lost mines and outlaws' buried loot, including the alleged troves of the James Gang. As it became fashionable to identify places where Frank and Jesse had allegedly had a meal or hidden from pursuers, numerous caves were supplied with suitable "legends." Said one writer, "There was hardly a cave they hadn't hidden in" (qtd. in Watson 1971, 75). Buried treasure (real or hoaxed) was sometimes used to promote caves as commercial attractions. (For example, see Hauck 1996, 340.)

The same problems with lost-treasure tales are also true of haunting yarns—so many of them also beginning with the ubiquitous "It is said that." I have spent quality time in places allegedly haunted by the ghost of Jesse James. For example, as a board member I attended a meeting of the Historical Confederation of Kentucky at the old Talbolt tavern in Bardstown in 1993 that was, however, uneventful as to ghost activity. A display in the inn's upstairs foyer warned guests that they might experience ghostly phenomena (Holland 2008, 195), thus using the power of suggestion to set them up for a "haunting" experience.

Reportedly, there were various banging noises, common to the setting of old buildings and the effects of temperature changes on timbers and stairs; the sounds of people talking and laughing, possibly real people at the bar or nearby; the chiming of a bell eleven times at 4:00 AM, likely a clock needing resetting; and a dream of a man being hanged, perhaps the effects of alcohol, and the "eerie" atmosphere, together with the historical backdrop.

I have also toured the old James farm where Jesse's original gravesite still reposes in the front yard. (From there, his mother sold pebbles to souvenir hunters for a quarter each, replenishing them as necessary from a nearby creek [Settle 1977, 166].) The entire farm is haunted, according to sources citing the usual anonymous experiencers. The sounds of "low voices" and "restless horses" that were allegedly heard by *a single staff member* (possibly due to imagination or to sounds carried on the wind) were claimed in another source, exaggeratedly, to be from *multiple reports* (Taylor 2000; *cf*. "Missouri Legends" 2015). Supposedly, lights "have been seen" inside the farmhouse at night, one source claiming they are "moving" (Taylor 2000) and another that they go "on and off" ("Haunted" 2013); a common explanation for many such ghostly house lights is reflections on the window glass from various external sources (Nickell 1995, 50–51).

With ghost tales of Jesse James—as with buried-treasure and other legends of the notorious outlaw—we must remember the old skeptical maxim: Before trying to explain something, first be sure that it really occurred. ■

References

Beamis, Joan M., and William E. Pullen. N.d. [ca. 1970]. *Background of a Bandit: The Ancestry of Jesse James*, 2nd Ed. N.p.: privately printed.

Dorson, Richard M. 1959. *American Folklore*. Chicago: University of Chicago Press.

Hall, Frank O., and Lindsey H. Whitten. 1948. *Jesse James Rides Again*. Lawton, OK: LaHoma Publishing Co.

Hamilton, Charles. 1979. *The Signature of America*. New York: Harper & Row.

Hauck, Dennis William. 1996. *Haunted Places: The National Directory*. New York: Penguin Books.

"Haunted Jesse James Farm." 2013. Available online at http://seeksghosts.blogspot.com/2013/08/haunted-jesse-james-farm.html; accessed August 28, 2015.

Holland, Jeffrey Scott. 2008. *Weird Kentucky*. Toronto: Sterling Publishing.

"J. Frank Dalton." 2015. Available online at https://en.wikipedia.org/wiki/J._Frank_Dalton; accessed August 28, 2015.

Kleber, John E. 1992. *The Kentucky Encyclopedia*. Lexington: The University Press of Kentucky.

"Missouri Legends." 2015. Available online at http://www.Legendsofamerica.com/mo-hauntedjamesfarm.html; accessed August 28, 2015.

Nickell, Joe. 1990. *Pen, Ink & Evidence*. Lexington: University Press of Kentucky.

———. 1992. James, Frank and Jesse. In Kleber 1992, 462.

———. 1993a. Tracking Jesse James in Kentucky. *The Filson Club History Quarterly* 67(2) (April): 217–239. (See this source for additional references.)

———. 1993b. Outlaw impostors. In Stein 1993, 112–113.

———. 1994. *Camera Clues: A Handbook for Photographic Investigation*. Lexington: University Press of Kentucky.

———. 1995. *Entities: Angels, Spirits, Demons, and Other Alien Beings*. Amherst, NY: Prometheus Books.

———. 1996. *Detecting Forgery*. Lexington: University Press of Kentucky.

———. 1999. Jesse James in Morgan, in two parts. *Licking Valley Courier* (West Liberty, Ky.) (July 22 and August 12).

———. 2008. Forensic Trainee. Available online at http://www.joenickell.com/ForensicTrainee/forensictrainee/.html; accessed August 31, 2015.

———. 2009. Historical Document Consultant. Available online at http://joenickell.com/HistoricalDocs/historicaldocs1.html; accessed August 31, 2015.

Nickell, Joe, and John F. Fischer. 1999. *Crime Science: Methods of Forensic Detection*. Lexington: University Press of Kentucky.

"The Russellville Bank Robbery—Capture of the Gang." 1868. *Louisville Daily Courier* (March 23).

Settle, William A., Jr. 1977. *Jessie James Was His Name: Or, Fact and Fiction Concerning the Careers of the Notorious James Brothers of Missouri*. Lincoln: University of Nebraska Press, 18–33.

Starrs, James E., with Katherine Ramsland. 2005. *A Voice for the Dead: A Forensic Investigator's Pursuit of the Truth in the Grave*. New York: G.P. Putnam's Sons.

Taylor, Troy. 2000. *Haunted Missouri: Haunts of Jesse James*. Available online at http://www.prairieghosts.com/jessejames.html; accessed August 28, 2015.

———. 2014. The man who would be Jesse James. Available online at http://troytaylor-books.blogspot.com/2014/04/the-man-who-would-be-jesse-james.html; accessed August 28, 2015.

Watson, Thomas Shelby. 1971. *The Silent Riders*. Louisville, KY: Beechmont Press.

Sheaffer's "Psychic Vibrations" column has appeared in the SKEPTICAL INQUIRER for forty years. His new book, *Bad UFOs*, is available through his blog, BadUFOs.com. His website is www.debunker.com.

The 'Phoenix Lights' Become an 'Incident'

One of the best-known UFO sightings in recent years—the so-called "Phoenix Lights"—took place on the evening of March 13, 1997. They were very widely seen largely because that was one of the best nights to see the bright naked-eye Comet Hale-Bopp, and large numbers of people went outdoors to observe it. They were surprised to see something else in the sky. (There were later, unrelated Phoenix Lights events as well; see, for example, "The Mysterious Phoenix Lights," SI, July/August 2008.)

The Phoenix Lights episode actually consists of two unrelated incidents, although both were the result of activities of the same organization: Operation Snowbird, a pilot training program operated in the winter by the Air National Guard out of Davis-Monthan Air Force Base in Tucson, Arizona. In the first incident, something described as a large "flying triangle" was sighted during the eight o'clock hour. Five A-10 jets from Operation Snowbird had flown from Tucson to Nellis Air Force Base near Las Vegas several days earlier, and because this was the final night of the operation, they were now returning. The A-10 jets were flying under VFR (visual flight rules), so there was no need for them to check in with airports along the route. They were following the main air corridor for air traffic traveling that route, the "highway in the sky." (Why a UFO would follow U.S. air traffic corridors is a mystery.) Because they were flying in formation mode, they did not have on their familiar blinking collision lights but instead their formation lights, which look like landing lights (in any case, Federal Aviation Administration rules concerning private and commercial aircraft lights, flight altitudes, etc., do not apply to military aircraft). The A-10s flew over the Phoenix area and flew on to Tucson, landing at Davis-Monthan about 8:45 PM. Some witnesses claim that it was a single huge solid object, but the sole video existing of the objects shows them moving with respect to each other, and hence were separate objects.

In the second incident, starting around 10:00 PM that same evening, hundreds if not thousands of people in the Phoenix area witnessed a row of

A-10 jets like those whose flight with their bright formation lights on caused the first sighting.

The Phoenix Lights episode actually consists of two unrelated incidents, although both were the result of activities of the same organization.

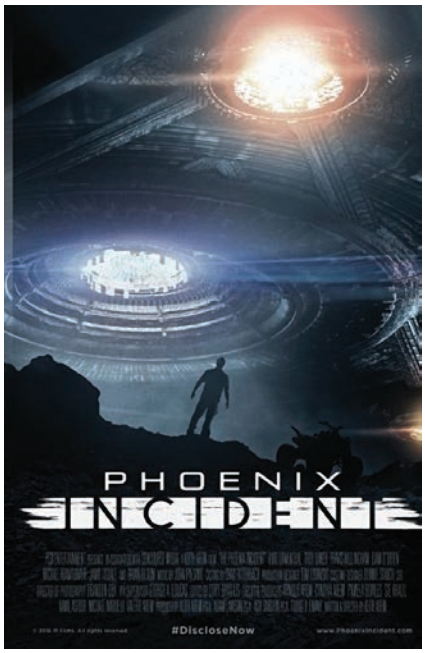
brilliant lights hovering in the sky, or slowly falling. Many photographs and videos were taken, making this perhaps the most widely witnessed UFO event in history. This was a flare drop practiced by different A-10 jets from the Maryland Air National Guard, also operating out of Davis-Monthan from Operation Snowbird. And since this was the last night of the operation, they seem to have had a lot of flares that needed dropping. On my *Bad UFOs Blog*, I have written a detailed analysis of each incident (see http://goo.gl/5g4zE5).

The "flare drop" explanation is less controversial than that for the "flying triangle," but even the former is often challenged. Dr. Lynne D. Kitei, for one, isn't having any of this "flare drop" business. On her website ThePhoenixLights.net (which claims to promote "Evolution to a New Consciousness," whatever that means), she claims she was watching the Phoenix Lights two years before everyone else, and that her research proves "we are not alone." By some complicated analysis, she claims to have proven that the objects photographed could not have been flares, although I haven't run across anyone who understands what she's saying.

I heard her speak at the 2012 International UFO Congress near Phoenix, and some of her photos of UFOs appeared to me to be lights on the ground. Giving up her medical practice to become a full-time promoter of the story, "Dr. Lynne" (as she is sometimes called) has made a documentary film, *The Phoenix Lights*, and has often appeared on *Coast to Coast AM*, the well-known late-night paranormal and conspiracy-fest hosted by George Noory, to tell her version of the story.

Each year in March around the anniversary of the incident ("We're coming up on the twentieth anniversary next year!" she excitedly told me at this year's UFO Congress), she hosts an event in an auditorium in Phoenix in which videos are shown, and witnesses new and old relate their stories. Dr. Lynne is a sweet lady who is unfailingly cheerful and polite, even if you disagree with her (or don't understand what she's saying). She has accumulated additional sighting reports from additional witnesses, including accounts of a giant UFO a mile wide hovering over Phoenix's Sky Harbor Airport.

But now the Phoenix Lights are growing to even more gigantic proportions, if that is possible. A new motion picture, *The Phoenix Incident*, was being promoted in a big way at this year's UFO Congress, with a large desk in the vendors' area proclaiming "The Truth is Coming" and handing out cheesy little boomerangs labeled with the film title. According to the movie's promotional material:



While everyone was inside watching the premiere of this silly movie, the Air National Guard was busy dropping flares again over the Barry Goldwater range. And we didn't see them.

> *The Phoenix Incident* is a fictionalized heart-pounding thriller based on this real-life event. Written and directed by gaming talent director Keith Arem (*Call of Duty*, *Titanfall*) and starring Troy Baker (famed gaming actor) this one-night event uses whistleblower testimony, recovered military footage and eyewitness accounts to create a sci-fi thriller that examines the US military's alleged engagement of alien spacecrafts. (http://goo.gl/RdMLDm)

The movie received its premiere public showing at the UFO Congress at the close of the Friday session. It's mostly shaky, dark "found footage," supposedly left behind by four guys who were eaten by aliens. The plot: As Comet Hale-Bopp passes Earth, it is followed by a companion object, a UFO, which falls to Earth and lands in Arizona. Out pour scary aliens, looking somewhat like the creatures in *Alien*, who start to eat people. Somehow the military covers it all up. The irony is this: while everyone was inside watching the premiere of this silly movie, the Air National Guard was busy dropping flares again over the Barry Goldwater range. And we didn't see them.

Until now, the Phoenix Lights were simply that: they were just lights in the sky, skeptics and proponents could agree. But this movie, by mixing actual photos and video of the lights and actual witnesses' accounts with dramatic fictional elements, has succeeded in muddying the waters. In the movie, four men disappear in the desert, becoming lunch for sinister-looking aliens, while the footage they supposedly left behind becomes the basis for this mockumentary. The military somehow knows all about these aliens and apparently drives them off. Operation Snowbird appears in the film—not as the pilot-training program it is but instead as a sinister coverup agency that is sent out to disseminate confusion and falsehood whenever aliens pop up. Relaxing outdoors at the UFO Congress the evening after the showing of this film, I heard a certain know-it-all discussing it and telling the people who had gathered around him, "Our planes engaged the Triangle!" In other words, he claimed that U.S. Air Force jets fought off a gigantic alien triangu-

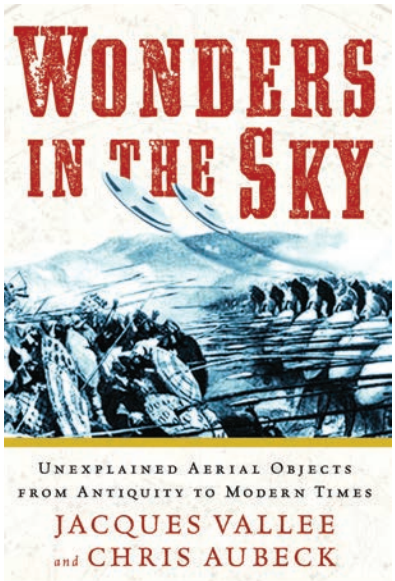
lar craft nineteen years ago.

The claims of a "companion object" following Comet Hale-Bopp were made by an amateur astronomer who claimed to have a photo of it. The claim was promoted on the *Coast to Coast AM* all-night, all-high-weirdness radio show, then hosted by Art Bell, and set off a sensation lasting two months. The photo shows nothing more than a misidentified star, but this was enough to trigger thirty-nine members of the Heavens Gate UFO cult, led by Marshall Applewhite, to take their own lives on March 26, 1997, so they could "rise up" and join the object supposedly following the comet.

* * *

Jacques Vallee, a Silicon Valley venture capitalist who sits on the board of a half-dozen such firms, wants you to send him money. Vallee, a leading UFO author for over fifty years, is crowdsourcing funds for 500 copies of the new (and hopefully revised) "collector's limited edition" of the 2009 book he coauthored with Chris Aubeck, *Wonders in the Sky*. The book deals with unexplained reports of things reportedly seen in the sky before the modern UFO era, going all the way back to ancient Rome and Greece. Vallee says that he will present the book, with its "facsimile commemorative coin" and "artistic beauty and scientific merit," "to science" to show that UFO sightings have been around for a long time and should be taken seriously. I don't think "science" will ever get to see this purportedly marvelous book, with only 500 copies of it ever to be printed, and all of them presumably in the hands of people who have contributed $220 to the effort. This fundraising scarcely seems necessary since the $110,000 this effort is hoped to bring in ought to be small change to someone like Vallee.

And that part about the "scientific merit" is also pretty dubious. Blogger Jason Colavito, who has been studying the claims in *Wonders in the Sky*, calls it a "demonstrably false and generally quite unreliable anthology of badly translated and frequently fictitious documents recording premodern UFO sightings. . . . [Vallee] wasn't able to sell more than 150 of the 500 future copies of *Wonders in the Sky* he put up for sale late last year" (http://goo.gl/dJYHZZ).



Since that was written, Vallee and Aubeck have sold two more; there are now only 348 copies remaining for subscription. For the specifics of Colavito's criticisms, see http://goo.gl/X1VrfN. Researcher Martin Kottmeyer noted that alleged sightings of "Neith," a supposed moon of Venus, were cited nine times in the book as unknowns. However:

> Neith had been debunked in *Nature* magazine back in 1887. The *Nature* author looked into 33 observations/claims that Venus had a satellite. All but one had a good solution along the lines of either the positions of known stars or suspicions of optical ghosts and artifacts of the telescope lenses in use. The final one was guessed to be a minor asteroid passing near Earth. (http://goo.gl/n8CSlt)

As for Vallee's coauthor Chris Aubeck, he recently posted this to a Facebook discussion of apparent errors in the book:

> Over the last eight years my interest in UFOs has changed so that I approach the subject as an observer/folklorist/historian/archivist of the evolution of ufology itself, not to defend individual cases. I am deeply involved in plotting the historical roots and development of UFO mythology, so whether anomalous phenomena have acted as stimuli or not isn't as relevant to me as it was in 2009.

This statement sounds like Aubeck backtracking and washing his hands of Vallee's claim that this material represents a *Challenge to Science* (an inside joke; that's the title of one of Vallee's early books). Kottmeyer has also shown that the "primary source" consulted for Vallee and Aubeck's description of a sighting of anomalous objects by the famous French astronomer Charles Messier (entry # 358) was not any contemporary eighteenth-century source but Charles Fort's *Book of the Damned*. The description of the incident in Vallee and Aubeck differs from that in actual primary sources but matches Fort's fanciful description of it. So much for a book boldly heralded by its authors as "a breakthrough in UFO research"!

* * *

In other news, UFOlogist Richard Dolan recently declared his belief in chemtrail conspiracies. On March 30, he wrote on his Facebook page:

> All day long, I have been watching the aircraft stream across Rochester's skies. Most of them have been leaving behind trails that do not go away, simply spreading across the sky. For those who do not pay attention, these look like ordinary clouds that have come in. But most of this is not natural. . . . I believe that geo-engineering is real. When I grew up in the 1970s, this type of nonsense did not occur. And I lived just outside New York City, watching major airline traffic every day go over my house. Such artificial clouds never existed back then. This phenomenon is real.

UFO buffs sometimes describe Dolan as "cautious" and "thoughtful," even though he has long been promoting loopy stuff such as the "secret space program." Last year, he took a big hit from his participation in promoting the "Roswell slides" (see this column, September/October, 2015). I don't think we'll be hearing that kind of talk about Dolan any longer. ■

Kenneth W. Krause is a contributing editor and "Science Watch" columnist for the Skeptical Inquirer and The Doting Skeptic at http://thedotingskeptic.wordpress.com. He may be contacted at krausekc@msn.com.

Obesity: 'Fat Chance' or Failure of Sincerity?

Man is condemned to be free.

—Jean-Paul Sartre

Beginning about five years ago, the chronically overweight and obese were offered a new paradigm, one more consistent with their majority's shared experiences in the twenty-first century. Emerging science from diverse fields, certain experts argued, complicated—perhaps even contradicted—the established view that weight maintenance was a straightforward, if not simple, matter of volitional control and balancing energy intake against energy expenditure.

As a host of potential complexities materialized, the frustrated members of this still-expanding demographic were notified that, contrary to conventional wisdom, they had little or no control over their conditions. The popular literature in particular began to hammer two captivating messages deeply into the public consciousness. First, from within, the overweight and obese have been overwhelmed by their genomes, epigenomes, hormones, brains, and gut microbiomes to name just a few. Second, from without, their otherwise well-calculated and ample efforts have been undermined, for example, by the popular media, Big Food, government subsidies, poverty, and the relentless and unhealthy demands of contemporary life.

In a 2012 *Nature* opinion piece, Robert Lustig, Laura Schmidt, and Claire Brindis, three public health experts from the University of California, San Francisco, compared the "deadly effect" of added sugars (high-fructose corn syrup and sucrose) to that of alcohol (Lustig et al. 2012). Far from mere "empty calories," they added, sugar is potentially "toxic" and addictive. It alters metabolism, raises blood pressure, causes hormonal chaos, and damages our livers. Like tobacco and alcohol (a distillation of sugar), it affects our brains as well, encouraging us to increase consumption.

Apparently, unimpressed with Americans' abilities to control themselves, Lustig et al. urged us to back restrictions on our own choices in the form of government regulation of sugar. In support of their appeal, the trio relied on four criteria—"now largely accepted by the public health community"—originally offered by social psychologist Thomas Babor in 2003 to justify the regulation of alcohol: The target substance must be toxic, unavoidable (or pervasive), produce a negative impact on society, and present potential for abuse. Perhaps unsurprisingly, they discovered that sugar satisfied each criterion with ease.

Lustig, a pediatric endocrinologist (and now television infomercial star), contends that obesity results primarily

from an intractable hormonal predicament. In his wildly popular 2012 book, *Fat Chance*, Lustig indicted simple, super-sweet sugars as chief culprits, claiming that sucrose and high-fructose corn syrup corrupt our biochemistry to render us hungry and lethargic in ways fat and protein do not. In other words, he insisted that sugar-induced hormonal imbalances cause self-destructive behaviors, not the other way around.

Failure is common in the context of any difficult task, and evidence of "don't" does not amount to evidence of "can't."

Lustig's argument proceeds essentially this way: In the body, insulin causes energy to be stored as fat. In the hypothalamus, it can cause "brain starvation," or resistance to leptin, the satiety hormone released from adipose tissue. Excess insulin, or hyperinsulinemia, thus causes our hypothalami to increase energy storage (gluttony) and decrease energy consumption (sloth). To complete the process, add an increasingly insulin-resistant liver (which drives blood insulin levels even higher), a little cortisol (the adrenal stress hormone), and of course sugar addiction. In the end, Lustig concludes, dieters hardly stand a chance.

Journalist Gary Taubes, author of the similarly successful *Why We Get Fat*, was in full agreement. Picking up the theoretical mantle where Lustig dropped it, Taubes expanded the list of nutritional villains considerably to include all the refined carbohydrates that quickly boost consumers' glycemic indices. In a second *Nature* opinion piece, he then blamed the obesity problem on both the research community (for failure to fully comprehend the condition) and the food industry (for exploiting that failure; see Taubes 2012).

To their credit, Lustig and Taubes provided us with some very sound and useful advice. Credible nutrition researchers agree, for example, that Americans in particular should drastically reduce their intakes of added sugars and refined carbohydrates. Indeed, most would be well advised to eliminate them completely. The authors' claims denying self-determination might seem reasonable as well, given that, as much research has shown, most obese people who have tried to lose weight and to keep it off have failed.

On the other hand, failure is common in the context of any difficult task, and evidence of "don't" does not amount to evidence of "can't." One might wonder as well whether obesity is a condition easily amenable to controlled scientific study given that every solution—and of course many, in fact, *do* succeed (see, e.g., The National Weight Loss Control Registry at http://www.nwcr.ws/Research/default.htm)—is both multifactorial and as unique as every obese person's biology. So can we sincerely conclude, as so many commentators apparently have, that the overweight and obese are essentially powerless to help themselves? Or could it be that the vast majority of popular authors and health officials have largely—perhaps even intentionally—ignored the true root cause of obesity, if for no other reason than simply because they lack confidence in the obese population's willingness to confront it?

Though far less popular, a more recently published text appears to suggest just that. In *The Psychology of Overeating*, clinical psychologist Kima Cargill attempts to "better contextualize" overeating habits "within the cultural and economic framework of consumerism." What current research fails to provide, she argues, is a unified construct identifying overeating (and sedentism, one might quickly add) as "not just a dietary [or exercise] issue," but rather as a problem implicating "the consumption of material goods, luxury experiences, . . . evolutionary behaviors, and all forms of acquisition" (Cargill 2015).

To personalize her analysis, Cargill introduces us to a case study named "Allison." Once an athlete, Allison gained fifty pounds after marriage. Now divorced and depressed, she regularly eats fast food or in expensive restaurants and rarely exercises. Rather than learn about food and physical performance, Allison attempts to solve her weight problem by throwing money at it. "When she first decided to lose weight," Cargill recalls, "which fundamentally should involve reducing one's consumption, Allison went out and purchased thousands of dollars of branded foods, goods, and services." She hired a nutritionist and a trainer. She bought a Jack Lalanne juicer, a Vitamix blender, a Nike Feulband, Lululemon workout clothing, an exclusive gym membership, diet and exercise DVDs and iPhone apps, and heaping bags full of special "diet foods."

None of it worked, according to the author, because Allison's "underlying belief is that consumption solves rather than creates problems." In other words, like so many others, Allison mistook "the disease for its cure." The special foods and products she purchased were not only unnecessary but ultimately harmful. The advice she received from her nutritionist and trainer was based on fads, ideologies, and alleged "quick-fixes" and "secrets" but not on actual science. Yet, despite her failure, Allison refused to "give up or simplify

a life based on shopping, luxury, and materialism" because any other existence appeared empty to her. In fact, she was unable to even imagine a more productive and enjoyable lifestyle "rich with experiences" rather than goods and services.

Like Lustig, Taubes, and their philosophical progeny, Cargill recognizes the many potential biological factors capable of rendering weight loss and maintenance an especially challenging task. But what she *does not* see in Allison, or in so many others like her, is a helpless victim of either her body or her culture. Judging it unethical for psychologists to help their patients accept overeating behaviors and their inevitably destructive consequences, Cargill appears to favor an approach that treats the chronically overweight and obese like any other presumably capable, and thus responsible, adult population.

Compassion, in other words, must begin with uncommon candor. As Cargill acknowledges, for example, only a "very scant few" get fat without overeating because of their genes. After all, recently skyrocketing obesity rates cannot be explained by the evolution of new genes during the last thirty to forty years. And while the food industry (along with the popular media that promote it) surely employs every deceit at its disposal to encourage overconsumption and the rejection of normal—that is, species appropriate—eating habits, assigning the blame to Big Food only "obscures our collusion." Worse yet, positioning the obese as "hapless victims of industry," Cargill observes, "is dehumanizing and ultimately undermines [their] sense of agency."

Education is always an issue, of course. And, generally speaking, higher levels of education are inversely associated with the least healthy eating behaviors. But the obese are not stupid, and they shouldn't be treated as such. "None of us is forced to eat junk food," the author notes, "and it doesn't take a college degree or even a high school diploma to know that an apple is healthier than a donut" (Cargill 2015). Nor is it true, as many have claimed, that the poor live in "food deserts" wholly lacking in cheap, nutritious cuisine (Maillot et al. 2010). Indeed, low-income citizens tend to reject such food, Cargill suggests, because it "fails to meet cultural requirements" or because of a perceived "right to eat away from home" consistent with trends in society.

Education is always an issue, of course. And, generally speaking, higher levels of education are inversely associated with the least healthy eating behaviors.

Certain foods, especially those loaded with ridiculous amounts of added sugars, do in fact trigger both hormonal turmoil and addiction-like symptoms (though one might reasonably question whether any substance we evolved to crave should be characterized as "addictive"). And as the overweight continue to grow and habituate to reckless consumption behaviors, their tasks grow only more challenging. I know this from personal experience in addition to the science. Nevertheless, Cargill maintains, "we ultimately degrade ourselves by discounting free will."

Despite the now-fashionable and, for many, lucrative "Fat Chance" paradigm, the chronically overweight and obese are as capable as anyone else of making rational and intelligent decisions at their grocery stores, restaurants, and dinner tables. And surely overweight children deserve far more inspiring counsel. But as both Lustig and Taubes, on the one hand, and Cargill, on the other, have demonstrated in different ways, the solution lies not in mere diet and exercise, per se. The roots of obesity run far deeper.

Changes to basic life priorities are key. To accomplish a more healthful, independent, and balanced existence, the chronically overweight and obese in particular must first scrutinize their cultural environments and then discriminate between those aspects that truly benefit them and those that were designed primarily to take advantage of their vulnerabilities, both intrinsic and acquired. Certain cultural elements can stimulate the intellect, inspire remarkable achievement, and improve the body. But most, if not all, of its popular component exists only to manipulate its consumers into further passive, mindless, and frequently destructive consumption. The power to choose is ours—at least for now. ■

References

Cargill, K. 2015. *The Psychology of Overeating: Food and the Culture of Consumerism*. New York: Bloomsbury Academic.

Lustig, R. 2012. *Fat Chance: Beating the Odds Against Sugar, Processed Food, Obesity, and Disease*. New York: Hudson Street Press.

Lustig, R.H., L.A. Schmidt, and C.D. Brindis. 2012. Public health: The toxic truth about sugar. *Nature* 482: 27–29.

Maillot, M., N. Darmon, and A. Drewnowski. 2010. Are the lowest-cost healthful food plans culturally and socially acceptable? *Public Health Nutrition* 13(8): 1178–1185.

Taubes, G. 2011. *Why We Get Fat: And What to Do About It*. New York: Knopf.

———. 2012. Treat obesity as physiology, not physics. *Nature* 492: 155.

Matthew Nisbet is associate professor of communication at Northeastern University and a Committee for Skeptical Inquiry scientific consultant. From 1997 to 1999, he was public relations director for CSI.

Partisan Pandemics

Political Divisions Will Affect American Beliefs about the Zika Threat

In the lead up to the 2016 Olympics in Brazil, global news attention has focused on the impact of the Zika virus in the country, including efforts to halt the spread of the mosquito-borne virus across Latin America, the Caribbean, and other regions.

People who contract Zika are unlikely to experience symptoms. Those who do develop signs of infection experience a few days of body aches, rash, and fever, though in some cases there are more severe neurological and autoimmune effects. For many experts, this makes the Zika virus a potentially less serious public health problem than the lethal mosquito-transmitted pandemics of malaria and dengue.

Yet it is the special risk to infants that has galvanized worldwide attention. Among pregnant women, contracting Zika increases the risk of birth defects, including microcephaly, in which an infant's head and brain do not fully develop. In Brazil, there have been more than 5,000 confirmed cases of microcephaly associated with Zika.

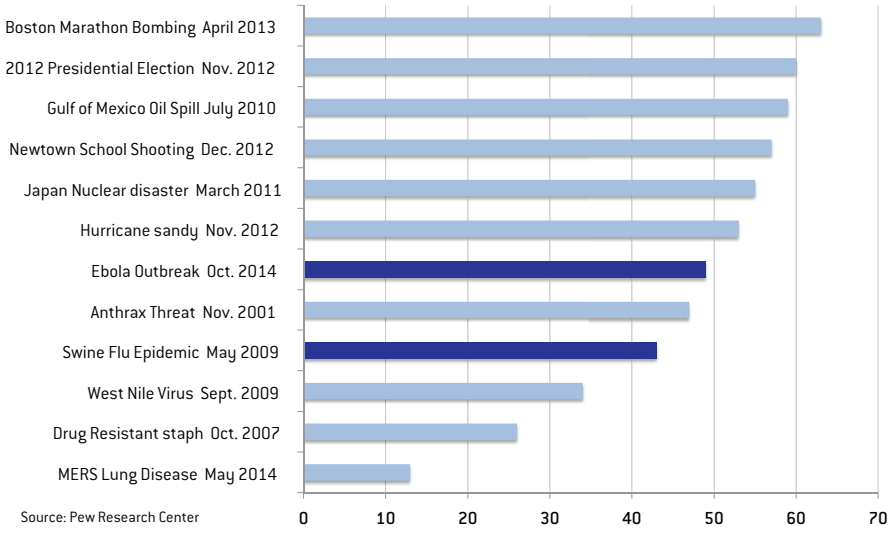
Summertime temperatures are likely to bring to the United States the first non–travel-related cases of Zika. The mosquito species that is the primary carrier of the virus ranges across the South and Southwest and stretches into states including Maryland, West Virginia, Kentucky, New Jersey, and parts of New York. But outbreaks in the United States are likely to be limited compared to other countries. Better housing, window screens, and air conditioning are far more common than in poorer countries, and the states that are most likely to be affected have substantial experience in preventing and containing such diseases.

Still, the public opinion dynamics surrounding the past pandemics of swine flu and Ebola suggest that worry among Americans is likely to escalate, intensifying across summer months and into the fall. Concern will be driven not only by saturation news coverage of the Olympics and a possible outbreak in the United States but also by a highly polarized presidential election campaign.

Doubts about a Swine Flu Vaccine

In spring 2009, the first cases of swine flu were reported in Mexico with other cases soon identified in the United States and around the world. By June 2009, the World Health Organization (WHO) announced that the swine flu outbreak was the first worldwide pandemic in forty years. When, several

Figure 1. Public Attention to Major Events and Health Threats
Percent Following "Very Closely"



Source: Pew Research Center

months later, an emergency vaccine was made available to the American public, whether or not an individual said they planned to be vaccinated depended strongly on their partisan outlook and their trust in government.

At the outset of the pandemic, surveys indicated that swine flu had quickly come to dominate Americans' attention, as 82 percent of Americans said they were following the story, making the pandemic one of the most followed news stories of the year. At the time, it was also the most followed story about infectious disease in history, topping SARS, West Nile Virus, and mad cow disease, though swine flu would soon be eclipsed in 2014 by Ebola virus (see Figure 1) (Pew 2009a).

The amount of public attention to swine flu during spring 2009 was not surprising given that a third of total news coverage across media outlets focused on the virus. No other issue came close. Even the still-faltering economy captured only 10 percent of total news coverage. Later that year in October, public attention spiked again as news coverage focused on the public availability of a vaccine (Pew 2009a; 2009b). But efforts to offer the vaccine to the public soon became politically controversial, as misleading claims about safety spread by way of talk radio and social media, leading many Americans to say they would forego vaccinations (Steinhauer 2009).

In the context of these false claims, there were strong differences in public perceptions. Half of Republicans said news reports were overstating swine flu's danger, compared to 35 percent of Democrats (Pew 2009a). More troubling, only 41 percent of Republicans said they would get vaccinated, compared to 60 percent of Democrats (Pew 2009a). Further analysis showed that trust in government was ultimately the key driver of decisions to be vaccinated. In contrast to their Democratic counterparts, Republicans were less likely to believe that the Obama administration could handle the swine flu problem, and as a consequence, were less likely to say that they were willing to take the vaccine (Mesch and Schwirian 2015).

The Ebola Outbreak and Election Politics

In December 2013, the first Ebola epidemic in history broke out in West Africa. By mid-2014, the epidemic had dramatically intensified. From July 2014 to October 2014, monthly reported cases in Guinea and Sierra Leone increased from 500 in each country to a peak of nearly 3,000. By January 2016, when the WHO declared the epidemic officially over, there had been more than 28,000 reported cases in West Africa and 11,300 confirmed deaths.

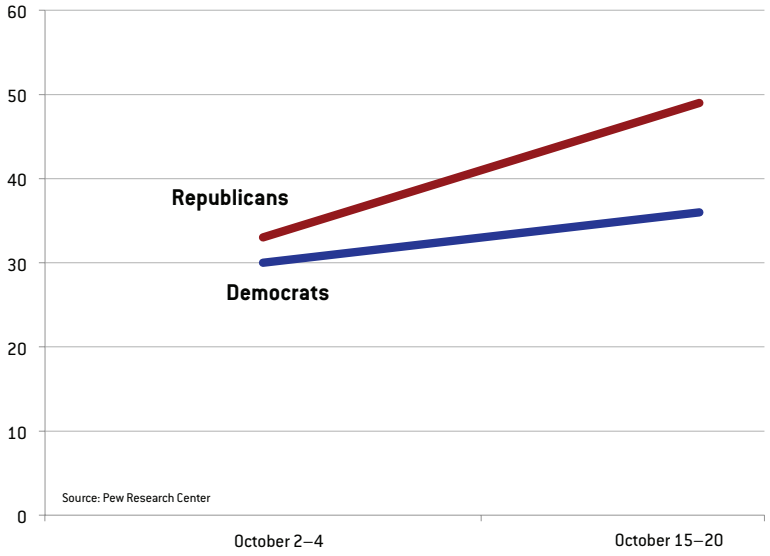
In the United States, there were a total of four confirmed Ebola cases and one related death. Yet by early October 2014, despite little to no risk of contracting the disease, 32 percent of the U.S. public said they were very or somewhat worried about Ebola. Two weeks later, as media attention to the epidemic intensified, worry had spread to 41 percent of the public. At the start of the month, Americans regardless of partisan identity expressed similar levels of worry. But two weeks later, worry among self-identified Republicans had grown from 33 percent to 49 percent. In comparison, worry among self-identified Democrats had shifted more modestly from 30 percent to 36 percent (see Figure 2) (Pew 2014).

In mid-October 2014, at the peak of concern, a review of polls shows that about half of the public (45 percent) said they were either very or somewhat worried that they or their family would become sick with Ebola. Fears of infection subsequently declined as no other U.S. cases were reported. Still, by November 2014, Americans ranked Ebola as the third most urgent health problem facing the country, just below cost and access to health care and ahead of cancer and heart disease (which combined to account for nearly half of all U.S. deaths annually; see SteelFisher et al. 2015).

Efforts to offer the swine-flu vaccine to the public soon became politically controversial, as misleading claims about safety spread by way of talk radio and social media, leading many Americans to say they would forego vaccinations.

Figure 2. Partisan Gap in Ebola Worries

Percent "very" or "somewhat" worried they or their families will be exposed



A review of polling evidence suggests several key factors that led to a public fear over Ebola that was substantially out of proportion to the actual nature of the threat.

First, surveys indicate that false beliefs about Ebola were widespread. For example, Ebola is not airborne and is not contagious until someone shows symptoms. Yet 85 percent of Americans believed that if sneezed or coughed on by a symptomatic individual, a person is either very likely or somewhat likely to get Ebola (SteelFisher et al. 2015).

In this new era of partisan pandemics, public health officials need to expand their investment in localized and regional communication strategies that can effectively reach the public below the level of national political debate.

A second factor was the saturation nature of news coverage particularly on network TV and cable news. By one tally, CNN, NBC, and CBS aired nearly 1,000 evening news segments about Ebola between mid-October and early November. The personalization of coverage around the two American nurses and one doctor who were infected with Ebola at the expense of more contextual, thematic coverage likely helped intensify public concern (SteelFisher et al. 2015). Cable news and talk radio also framed the U.S. government's response to Ebola in strongly political and partisan terms, making it easy for Republicans and others who disliked the Obama administration to discount reassurances from health officials that there was little need to worry.

Like in the case of swine flu, a third related factor was public confidence in the government. Although 57 percent of the public said they had a great deal or fair amount of confidence in the government to prevent an Ebola outbreak, there were predictably strong partisan differences in opinion. By mid-October, 67 percent of Democrats said they had confidence in the government compared to only 41 percent of Republicans who said the same (Pew 2014; SteelFisher et al. 2015).

Preparing for the Zika Controversy

As of spring 2016, similar public opinion dynamics to swine flu and Ebola were already observable in the case of Zika. Public attention quickly spiked in reaction to news of the threat. Nearly 60 percent of Americans in February 2016 said they were following news about Zika either very closely or fairly closely (DiJulio et al. 2016).

At the same time, public knowledge was low. Though nine out of ten Americans knew that the virus spread by mosquitoes, 40 percent did not know the virus could be sexually transmitted, and 31 percent incorrectly believed that the virus could be transmitted through coughing and sneezing (Joseph 2016). By March 2016, 68 percent said they were familiar with news reports of the issue and 50 percent said that the issue concerned them. Much of this concern, however, was likely rooted in false beliefs, as 42 percent thought incorrectly that it was likely someone would die from Zika if infected, and that the mosquito that carries the disease could be found in every state (Annenberg 2016).

As news coverage of Zika increases leading up to the Olympics and as the first cases are reported in the United States, the presidential election campaign is likely to intensify political conflict over Federal funding for prevention and possible limits on immigration. In this context, false claims and misinformation are likely to rapidly spread, and partisan messaging is likely to be strong. It would not be surprising, then, for Democrats and Republicans to start to split in their perceptions of the threat, in their trust in the response of government agencies, and in their support for different types of policy actions.

In this new era of partisan pandemics, public health officials need to expand their investment in localized and regional communication strategies that can effectively reach the public below the level of national political debate. This includes building relationships with local media and opinion leaders, and the capacity to rapidly respond to misinformation. The expert community should also continue to cultivate strong relationships with leaders across the political spectrum, including respected nonpartisan voices such as military and faith-based leaders who can affirm expert consensus on the nature of the risks and what is needed in response (see SteelFisher et al. 2015). ■

References

Annenberg Public Policy Center. 2016. More Than 4 in 10 Mistakenly Think Zika Is Fatal, Symptoms Are Noticeable. Available online at http://www.annenbergpublicpolicycenter.org/more-than-4-in-10-mistakenly-think-zika-is-fatal-and-symptoms-are-noticeable/.

DiJulio, B., J. Firth, A. Kirzinger, et al. 2016. Kaiser Health Tracking Poll: February 2016. Washington, DC: Henry J. Kaiser Family Foundation. Available online at http://kff.org/global-health-policy/poll-finding/kaiser-health-tracking-poll-february-2016/.

Joseph, A. 2016. 1 in 3 Americans think you can catch Zika from a sneeze. STAT News (March 29). Available online at https://www.statnews.com/2016/03/29/zika-poll/.

Mesch, G.S., and K.P. Schwirian. 2015. Social and political determinants of vaccine hesitancy: Lessons learned from the H1N1 pandemic of 2009–2010. *American Journal of Infection Control* 43(11): 1161–1165.

Pew Research Center. 2009a. Local TV A Top Source for Swine Flu News. Available online at http://www.people-press.org/2009/05/06/local-tv-a-top-source-for-swine-flu-news/.

———. 2009b. Growing Interest in Swine Flu, Many See Press Overstating its Danger. Available online at http://www.people-press.org/2009/10/15/growing-interest-in-swine-flu-many-see-press-overstating-its-danger/.

———. 2014. Most Are Confident in Government's Ability to Prevent Major Ebola Outbreak in U.S. Available online at http://www.people-press.org/2014/10/06/most-are-confident-in-governments-ability-to-prevent-major-ebola-outbreak-in-u-s/.

SteelFisher, G.K., R.J. Blendon, and N. Lasala-Blanco. 2015. Ebola in the United States—Public reactions and implications. *New England Journal of Medicine* 373(9): 789–791.

Steinhauer, J. 2009. Swine flu shots revive a debate. *New York Times* (October 16): A1. Available online at http://www.nytimes.com/2009/10/16/health/16vaccine.html.

[BEHAVIOR & BELIEF STUART VYSE

Stuart Vyse is a psychologist and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a fellow of the Committee for Skeptical Inquiry.

Good News for Grouches: Happiness May Be Overrated

Saying Americans are obsessed with happiness is like saying there is air. The pursuit of happiness is one of the unalienable rights established in the Declaration of Independence, and in recent decades an enormous happiness industry has risen up to help you succeed in your personal pursuit. The demand for books on happiness seems to be insatiable. Recent titles include *Happier*, *Even Happier*, *Stumbling on Happiness*, *The Happiness Hypothesis*, *Authentic Happiness*, and *Flourish*—and those are just the books written by famous academic psychologists.

Economists, too, have suggested that happiness is more important than previously believed, because money doesn't always buy it. Back in the 1970s, economist Richard Easterlin (1974) reported data showing that many countries experiencing substantial increases in gross national product showed no accompanying change in overall levels of happiness. The "Easterlin paradox" has been challenged a number of times, but there is a growing consensus that when measuring national development and progress, economic indicators—such as gross domestic product—should be supplemented by surveys of happiness and well-being.

Finally, positive psychology—a movement described as the "science of happiness and flourishing" (Compton and Hoffman 2012)—has grown rapidly in recent years, contributing to a burgeoning self-help movement. There are flocks of happiness authorities prepared to lecture you on the subject. Just type "happy" into the search field of the TED talk website (www.ted.com), and you will be rewarded with hours of upbeat presentations.

Grouches Live Just as Long

Many of the purveyors of happiness[1] point to research showing that happy people live longer, with the clear implication that if you want to extend your life, you should go out and find more bliss. But a new large-scale study throws serious shade on that claim—at least for healthy middle-aged women. In December 2015, Bette Liu of the University of New South Wales, along with collaborators there and at Oxford University, published an article in *The Lancet* (Liu et al. 2015) based on data from the "The Million Woman Study," a prospective investigation of women in the United Kingdom. The authors eliminated participants who at the beginning of the study already had life-threatening illnesses, such as heart disease, stroke, cancer, or chronic obstructive airways disease, which left them with a starting group of 719,671 women who averaged fifty-nine years old at the beginning of the study.

When follow-up measures were taken—an average of 9.6 years later—4 percent of the women (31,531) had died. Looking simply at the raw numbers, the results seemed to show the expected outcome: women who reported they were happy most or all of the time were more likely to be living ten years later. But after controlling for a number of other variables, such as age and the participants' self-reported health at the beginning of the study, the effect of happiness disappeared. Women who were unhappy at the beginning of the study were no more likely to die than those who were happy.

The most important variable turned out to be self-reported health, and Liu and her coauthors analyzed its effect a number of different ways with consistent results. For example, when they separated out just the women who said they had fair or poor health at the beginning of the study, they found that happiness had no effect on their mortality. Similarly, looking only at the women who reported generally good health, there was no effect of happiness on survival. So Liu and her colleagues concluded that a woman's health at the beginning of the study (as measured by her own assessment) was correlated both with her level of happiness and her survival ten years later. But happiness itself was not a causal variable.

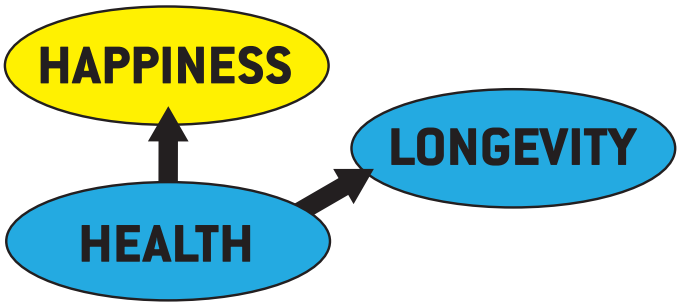
Looking back at the previous studies, Liu and colleagues found further support for their findings:

> Some, but not all, other prospective studies have reported that happiness or related subjective measures of wellbeing are associated with lower all-cause mortality. . . . Where other

> investigators adjusted for self-rated health, any apparent excess mortality associated with unhappiness was attenuated or disappeared completely. (Liu et al. 2015, 880)

According to Liu and her collaborators, most previous researchers missed a confounding variable and, as a result, confused cause and effect. Happiness and longevity are correlated because people who don't feel well are less happy and less likely to survive. But researchers who failed to measure participants' self-reported health at the beginning of their studies missed this relationship.

The conventional view. Happiness has a direct causal effect on longevity.



The more likely causal relationship found by Liu et al. (2015). Health (self-reported) affected both happiness at the beginning of the study and predicted longevity at the end of the study.

This is just one study conducted on middle-aged women in the United Kingdom, and as a result, further research will be needed to confirm and extend these findings. But the investigation by Liu and her colleagues has several strengths: it was a prospective study, using a very large sample that produced clear results. If these findings hold up in future research, they would not entirely undercut the happiness industry. All else being equal, most people would still prefer to be happy rather than unhappy, and as a result, happiness self-help books will remain popular. But one common claim of the happiness gurus faces a serious challenge: Contrary to popular opinion, happiness may not prolong your life, and unhappiness may not shorten it.

If there is an upside to this episode, it is that you are free of the burden of being happy. If you are a contented grouch, for whom the pursuit of bliss has little appeal, this study offers some consolation. If the results are valid, you can be relieved of any concern that your failure to be happier is killing you.

Maybe Ignorance Really Is Bliss

As I reviewed this article, I came across another finding that gave me pause. In the description of their participants, Liu and her coauthors presented an extensive table of demographic variables that were correlated with happiness. Many of the outcomes were as you might expect. For example, having children was not related to happiness, but those who lived with a spouse or partner were happier than those who did not. People who drank were happier than those who didn't, and smokers were less happy than nonsmokers. The relationship with hours of sleep was U-shaped, with those who got seven or eight hours being the happiest, and those getting either more or less being less happy. Not too many surprises there, but then my eye fell on the results for education.

Liu and her colleagues reported a strong association between education and happiness, but the direction of effect was the opposite of what I—perhaps naively—assumed it would be. The least educated women—those whose educational attainment was below the ordinary-level exam (O-levels)—were the happiest, and as education increased, happiness decreased. The lowest educational group was 38 percent more likely to be generally happy than those holding college and university degrees.

Intrigued by this finding, I went off in search of more information to determine whether this was a fluke or a consistent outcome. I discovered that the effect of education on happiness is a somewhat under-researched question, but several studies done in developed countries have shown this negative relationship. For example, a 2010 Australian study summed up the previous research this way:

> It is surprising to discover, then, that more educated people should be no happier or even less happy than people with lower levels of education. Instances of such a negative correlation between educational attainment and subjective wellbeing have been observed in a number of developed countries, including Australia. (Dockery 2010, 9)

It is unclear what causes this negative relationship, but the results of the Australian study contradict the hypothesis that people who pursue college are simply less happy in general. The results, based on 3,518 men and women from the Longitudinal Study of Australian Youth, show that those who pursue higher education are "relatively happy at school and while attending univer-

sity, and that it is in the years following completion of their university qualification that this relatively lower happiness sets in" (Dockery 2010, 41).

One theory suggests that planning for and attending college sets up a number of expectations about life after graduation and that when those expectations are not met, people become discontent. Given the amount of effort and money that goes into getting a college education, it is easy to see how expectations might be elevated and then dashed (Clark et al. 2015). Another theory suggests that education encourages critical thinking, which in turn leads to higher levels of dissatisfaction with the government and the current state of the world (Dockery 2010). But as the author of the Australian study put it, "there remains no convincing theoretical or empirical explanation" for the negative relationship between education and happiness (Dockery 2010, 41).

Like many scientific questions, this one is far from settled.[2] Some studies have found either no relationship between happiness and education or a positive relationship. But the Australian study, the U.K. study of middle-age women, and several previous investigations have shown this negative relationship.

So if this is a genuine phenomenon, what should we do about it? Should we discourage people from going to college because they might be happier if they simply got a job? I think not. There are many other benefits to higher education, both for the individual and for society. If education makes you a tad grouchier, then so be it. The bliss of ignorance is not worth the ignorance.

Happiness Backlash

Taken together, the happiness/longevity data and happiness/education data point to a similar conclusion: joyfulness is a good thing—even a great thing—but it isn't everything. Happiness may not save your life, and you may have to give up some of it to get an education.

In 2009, Barbara Ehrenreich, a much admired curmudgeon, wrote *Bright-Sided: How Positive Thinking Is Undermining America*. Having received a diagnosis of breast cancer, she was soon confronted with a disease culture that claimed "survival hinges on 'attitude.'" She went on to criticize the shifting of responsibility for recovery onto patients, who are implored to fight back with positivity.

Ehrenreich was also very critical of Martin E.P. Seligman, the founder of positive psychology, and his book *Authentic Happiness*, which touted many health benefits of cheerfulness. Seligman fought back in his next book—with the rather audacious title *Flourish: A Visionary New Understanding of Happiness and Well-Being*—calling her "Barbara ('I Hate Hope') Ehrenreich" (Seligman 2012, 203) and accusing her of cherry-picking the data she reviewed, highlighting studies that failed to show the health benefits of optimism and happiness. The controversy goes on, but with the arrival of the U.K. study by Liu and colleagues, an additional point can be assigned to the team of Ehrenreich and the grouches. At the very least it is safe to say the relationship of happiness to longevity has not been definitively established.

The Case for Melancholy

I end by offering a few words of support for emotions other than happiness, joy, and optimism. Let us remember that much of the most beautiful music ever written is sad—sometimes desperately so—and yet we love listening to it. Much of the world's best literature and art is similarly dark and compelling. There have been many defenses of melancholy written over the years, but the best I've come across lately is "The Case for Melancholy" written by Laren Stover November 8, 2015, for the *Style* section of the *New York Times*. It ends like this:

> Should melancholy descend, you may as well welcome it, wear your finest lounging outfit; give it your finest fainting couch or chaise to lounge in, or that hammock stretched between two elm trees. Let it settle in.
>
> You may as well enjoy it reclining with a pot of green thunder tea as you watch the rolled leaves unfurl their poetic fury as it steeps, as you listen to Ravel's "Daphnis et Chloé" or Jean Françaix's Concertino for Piano and Orchestra, 2a.
>
> I propose there be melancholy perfumes, fashions, footwear (no running shoes under any circumstances), music (Lana Del Rey is the melancholy diva du jour, and Joni Mitchell and Billie Holiday still work), elixirs (no alcohol; look what happened to Edgar Allan Poe) and furniture ideally suited for indulging in or succumbing to the deeply tinted blue moods.
>
> I want moonlight.[3] ■

Notes

1. For example, Martin E.P. Seligman, *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment* (Simon and Schuster, 2004). Ed Diener and Robert Biswas-Diener, *Happiness: Unlocking the Mysteries of Psychological Wealth* (John Wiley & Sons, 2011).

2. For example, the state-level analysis of Yakovlev and Leguizamon (2012) finds a positive relationship between percentage of college graduates and the average subjective well-being of the state.

3. http://www.nytimes.com/2015/11/08/style/the-case-for-melancholy.html.

References

Clark, Andrew E., Akiko Kamesaka, and Teruyuki Tamura. 2015. Rising aspirations dampen satisfaction. *Education Economics* 23(5): 515–531.

Compton, William, and Edward Hoffman. 2012. *Positive Psychology: The Science of Happiness and Flourishing*. Scarborough, ON: Nelson Education.

Dockery, Alfred Michael. 2010. *Education and Happiness in the School-to-Work Transition*. Adelaide, Australia: National Centre for Vocational Education Research Ltd.

Easterlin, Richard A. 1974. Does economic growth improve the human lot? Some empirical evidence. *Nations and Households in Economic Growth* 89: 89–125.

Ehrenreich, Barbara. 2009. *Bright-Sided: How the Relentless Promotion of Positive Thinking Has Undermined America*. London: Macmillan.

Liu, Bette, Sarah Floud, Kirstin Pirie, et al. 2015. Does happiness itself directly affect mortality? The prospective UK Million Women Study. *The Lancet* 387: 874–881.

Seligman, Martin E.P. 2012. *Flourish: A Visionary New Understanding of Happiness and Well-Being*. New York: Simon and Schuster.

Yakovlev, Pavel, and Susane Leguizamon. 2012. Ignorance is not bliss: On the role of education in subjective well-being. *The Journal of Socio-Economics* 41(6): 806–815.

[SKEPTICAL INQUIREE BENJAMIN RADFORD
Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry and author or coauthor of nine books, including *Bad Clowns*.

Egging the Equator

Q: I've heard that there are some special science tricks you can accomplish only at the equator, including balancing an egg on its end. Is that true?

—M. Favaro

A: On a recent trip to Ecuador, I spent a week at a jungle lodge near the borders of Colombia and Peru. The only access is by boat on the Napo River, one of the major tributaries of the Amazon. The protected preserve is home to several Indian tribes, and eco-tourism is popular; the days are filled with jungle hikes, kayaking, and watching monkeys, birds, and river dolphins.

Among the touristy things to do in Ecuador—a country named for its geographical location—is visit the equator. In the dozen or so countries though which the equator passes, a small but significant commercial industry has emerged associated with it, including equator tours, T-shirts, and hats (an impressive feat for an imaginary line). There are several claims about interesting or unusual natural phenomena said to happen only at the equator. Perhaps the most famous is that water goes down a drain in opposite directions above and below the equator due to the Coriolis Effect. Though this nugget of curiosa appears in many trivia books, it is dubious. While it is true that given a large enough body of water and a perfectly symmetrical basin and drain spout the water would empty in different directions, as a practical matter the curve of the container has a far greater influence on which way water drains (Bobick and Balaban 2003, 6).

One day during a jungle hike, my companions and I paused at a concrete

monument bearing a metal plaque declaring it "Monumento Mitad Del Mundo," or the monument at the middle of the world. After obligatory tourist photos were taken, our guide offered to show us an amazing sight. From a backpack at his feet, he produced an egg and a wooden stake. The stake was about eighteen inches long and had a nail hammered partway in at the top. He carefully centered the stake about two feet in front of the monument and drove it into the moist earth. As he did, he announced, correctly, that we weigh slightly less at the equator due to the centrifugal force of Earth's rotation. (A second effect is that Earth's slightly flattened shape means a person standing at the equator is slightly farther from the center of the Earth than he would be at the poles, slightly reducing the gravitational force. The combined effect is about 0.5 percent.) He then told us—incorrectly in my growing suspicion—that this effect would be demonstrated by a simple science experiment involving an egg.

Once he was satisfied that the stake was perpendicular to the ground and correctly aligned with the equator, our guide then placed an egg on top of the nail, and after about two minutes he stepped back so that we could all admire his achievement: the egg was indeed standing upright atop the nail on the stake. It was impressive, and we all took turns photographing this apparent quirk of physics.

I could not deny that it had been done; I had no reason to suspect trickery or legerdemain. When our guide removed the egg and handed it to me to try it for myself, I confirmed that it was indeed a genuine raw egg. (I attempted to duplicate the feat but gave up in under a minute, passing the egg to someone else whose patience was rewarded with another success, resulting in another ovulation-related ovation.)

However, there seemed no logical or scientific connection between the claimed principle and effect: Assuming an egg did in fact weigh less at that particular spot than another only a few meters or miles away, it wasn't clear why that would allow it to stand on its end. The mass of the egg was the same, and thus presumably the center of gravity over the nail head was the same regardless of its location. Did that mean that a lighter egg would more easily balance on

a nail? And if so, why? If anything, I assumed that the *more* an egg weighed the easier it would be to balance on a nail, having more mass than a lighter one.

On the trip, our guide was very knowledgeable, finding and identifying hundreds of birds, fish, insects, mammals, and plants in the jungle. His ability to locate seemingly invisible tracks and burrows was astonishing, and his information about the area was both firsthand (he grew up in the area) and encyclopedic. Thus, we had every reason to assume that he was right about the egg balancing; it wasn't presented with a wink and a nod but as a simple scientific fact, as obvious and irrefutable as photosynthesis or symbiosis. (This was not the first myth I encountered while in the jungle; in Costa Rica I heard—and promptly researched and then soon debunked—the legend of the so-called "walking tree"; see Radford 2009.)

Not wanting to embarrass our guide—but also not wanting to let apparent pseudoscience pass unremarked—I politely but pointedly asked him if he'd ever tried to balance the egg anywhere else except in that area. He said no, it only worked at this location on the exact equator. That of course didn't answer my question; if he had never tried to balance the egg away from the equator, then he had no way of knowing whether or not it could be done there. From a research design point of view what was missing from this "experiment" was a control.[1]

I made a mental note to test it when I got back home, but I realized that even if I got an egg to stand on a nail in the United States my experiment may be flawed: though the egg shape and size would be more or less standard I'd have to use a different nail, one that may have a slightly different width or slight bend, or something else that would change the conditions. We continued the jungle hike with the distant guttural hollers of howler monkeys in the air, seeing surprises such as the poison arrow frog and a deadly fer-de-lance snake that I very nearly stepped on—on the only hike I decided to wear open-toed sandals instead of jungle hiking boots (that oversight did not happen twice).

About an hour later, we took a canoe back to our camp and headed toward our cabins to relax before dinner. As we disembarked, I noticed that our guide still carried the stake with the nail on it. I asked him if I could borrow the stake and the egg, as I wanted to try the "egg-speriment" again. He grinned and happily supplied both before retiring to a shaded porch for a cold Coke. I wandered over to a grassy area and sat down to see if I could balance the egg. I shouldn't be able to, since we were at least a mile away from the equator. Though it wasn't clear exactly how wide the equator was considered to be for egg-balancing purposes (how wide is an imaginary line?), it was obvious that our guide believed that attempting it anywhere other than in front of the Monumento Mitad Del Mundo would be a fool's errand since the egg's normal weight would make it unbalanceable.

So it was that I spent several long minutes trying to balance the same egg on the same stake and nail. As a few companions watched with beer-enhanced bemusement, I tried to make the egg balance, but it kept falling off into my hand. Two, then three, then nearly five minutes of trial and error finally resulted in balancing the egg atop the stake. I gingerly stepped back, revealing the achievement to the small crowd who offered some scattered enthusiastic applause. I took some photos in case a stiff wind (or one of the feral three-foot lizards that freely roamed the area) knocked it over. I left it there for others to see, and about twenty minutes later when we assembled for dinner, one of my companions called our guide over to the grassy area. As my flashlight revealed the geographically anomalous egg, he seemed genuinely surprised.

He knelt down and inspected it closely with his flashlight, trying to see if I'd used any gum, adhesive, sand, grass, or other mechanical trickery. He asked me how I did it, and I just shrugged and said "with practice" (and Gringo saliva, since I'd licked the egg bottom as a joke). But it was genuine and done some distance from the equator. I didn't want to embarrass our guide by pressing the issue, so I diplomatically dropped the subject.

As for why our guide believed it, Martin Gardner, writing in Skeptical Inquirer about the myth that egg balancing can be done only on the first day of spring (a tradition he traces back to ancient China), explains that "Such self-deception is not hard to understand. If you are convinced that an egg will balance more easily on a certain day you will try a little harder, be more patient, and use steadier hands. If you believe that eggs won't balance on other days, this belief is transmitted subconsciously to your hands. It's the old Ouija-board phenomenon" (Gardner 1996, 9). Since our guide assumed it could be done only on the equator, it made sense that he'd never tried it elsewhere—because what's the point if you "know" it won't work? The fact that he (and others) had made the egg stand on the nail at the equator hundreds of times for thousands of tourists over the years at the Monumento Mitad Del Mundo confirmed his biases and expectations. There was no need to test the hypothesis because its outcome was both assumed and self-evident.

I'd tried diligently to avoid doing any skeptical work or investigations while on vacation, but in the end I couldn't resist. My inclination to research an extraordinary claim overcame my potent desire to lie in a hammock and nurse a cold pilsner beer. I assume our guide is still doing the egg trick, though perhaps he and the others in my group got an indirect caution (and maybe a humorous anecdote) about believing what you're told and about how to test a hypothesis. ■

Note

1. The conspicuous lack of a valid control group plagues many paranormal subjects. For example, if asked to predict a given person's future, two Tarot readers should simultaneously draw the same cards (or at least offer very similar information), just as two "aura photographs" taken at the same time should be identical, two "expert" dowsers operating under identical conditions should have similar results, and so on.

References

Bobick, James, and Naomi Balaban. 2003. *The Handy Science Answer Book.* Canton, Michigan: Visible Ink Press.

Gardner, Martin. 1996. The great egg-balancing mystery. Skeptical Inquirer 20(3) (May/June): 8–10.

Radford, Benjamin. 2009. The myth of the walking tree. Skeptical Inquirer 33(6) (November/December).

Dear Readers, This is about You . . . and Us

Skeptical Inquirer's 2016 Reader Survey Results

We always appreciate having a special relationship with you, our readers. We just completed our first professional survey of Skeptical Inquirer subscribers in a long time, and I thought I'd share the results. It was a thirty-nine–question mailed survey of current subscribers completed before mid-February. Most publications don't share their reader survey information; we're not like most publications.

To all those who got the survey questionnaire and took the considerable time to fill it out, we are grateful. If you weren't among the randomly selected sample to receive it, please feel free to email or write me with your own answers and comments. Even if not part of this formal survey, they will be highly useful to us.

There is a lot to be pleased and happy with in the results—and several things to be concerned about.

Perhaps the most important result is this: 44 percent of survey respondents "strongly agree" that "SI is a highly credible source of information," and another 44 percent "agree" with that statement: a total of 88 percent.

Since that's exactly what we strive to be, I am pleased with those high figures. In addition, 43 percent of respondents "strongly agree" and 51 percent "agree" that the information presented in SI "is very interesting." Thirty-three percent "strongly agree" and 55 percent "agree" that the information presented in SI is "very useful." Twenty-five percent "strongly agree" and 57 percent "agree" that the articles are well written.

One out of every two (48 percent) respondents are "very satisfied" with the magazine, 14 percent are "extremely satisfied," and 33 percent are "satisfied." So 95 percent of the responses fall into one of those three categories.

Most publications don't share their reader survey information; we're not like most publications.

An extraordinary 38 percent of respondents say they have subscribed for more than ten years. On the other end of the spectrum, about 28 percent are new readers (either one or two years).

Three-fourths of respondents say our tone and presentation is "just right." (This is gratifying and higher than I expected because the questionnaire offered seven choices of answers; "just right" was listed last, and the other six were all negative.) Of the other answers, they came down symmetrically, on one side or the other: 8 percent felt we were "too snide or dismissive," and 8 percent felt we are "too gentle toward pseudoscience." Presumably that means we are indeed positioned "just right."

Most read SI to gain knowledge, find information, or to feel connected to others who share their views. Forty-three percent of respondents say they have discussed an SI article with friends and family, and 27 percent say they have subsequently bought books on the subject.

Fifty-one percent say they read the latest issue cover-to-cover, section by section. Forty-one percent retain all their back issues. (This seems to fit a lot of anecdotal reports we get from readers.)

How our readers describe themselves also proved interesting.

The key terms used are, in this order, *curious* (61 percent), *skeptic* (54 percent), *critical thinker* (58 percent), *atheist* (50 percent), and *freethinker* (41 percent). These terms strongly resonated for roughly one in two subscribers.

The top five words used to describe respondents' core beliefs were *atheist*, *rational*, *curious*, *skeptic*, and *scientist*.

Politically, a third of all respondents (33 percent) describe themselves as liberal, a quarter (24 percent) as progres-

sive, 9 percent as libertarian, 6 percent as conservative, and 5 percent as moderate. No other political category accounted for as much as 5 percent of respondents.

Our readers tend to be heavy consumers of newspapers and magazines. *Scientific American*, *Smithsonian*, *National Geographic*, and *Free Inquiry* (our sister publication) were the top four other publications to which respondents subscribe. *Time*, *Science News*, *Science*, and *Discover* were the next most listed publications.

About a fifth of respondents are members of National Public Radio, and about one in ten are members of the Smithsonian Institution, Americans United for Separation of Church and State, the Planetary Society, and the American Association for the Advancement of Science.

As for online use, one of every ten respondents follow Snopes, *The New York Times*, Neil deGrasse Tyson, or *Scientific American* online. The next most popular sites are NASA, Freedom From Religion Foundation, *Skeptics Guide to the Universe*, and the Richard Dawkins Foundation.

Regarding social media, 46 percent of respondents are on Facebook, and 28 percent on LinkedIn. Only 12 percent are on Twitter. (Yet 78 percent do not follow SI on Facebook, and very few are aware of SI's availability in electronic versions.)

As for our readers' professional backgrounds, I am sorry our survey question inadvertently allowed the descriptor "retired" to trump an occupation. In other words, if respondents were retired, as 53 percent proved to be, they weren't easily allowed to specify what work/job/profession they were retired *from*. We wanted to know how many respondents were teachers, scientists, professors, management professionals, lawyers, businessmen, truck drivers, construction workers, or whatever. What we learned is that 53 percent are retired, 18 percent are professionals, 9 percent are academics/scholars, and 5 percent are managerial/executive. To reiterate, being retired doesn't mean you aren't still a member of whatever profession you were in, but in this case the question design didn't easily enable respondents to give that information. (That was our fault, as we all had input to the survey design.) Probably, we should have asked respondents to specify their field or occupation and then had a second question: "Retired? Still Active?" But adding still another question to an already long survey is always difficult.

As for what topics readers prefer to see in SI, the answers carry a few surprises. Not surprising are the top four: alternative medicine or health fraud, psychology of belief, current pseudoscience, and religion.

Respondents' educational backgrounds give a hint. Our readers are *very well* educated. Nearly a quarter (24 percent) of respondents have doctoral degrees, which indicates to me that many have scientific, academic, or medical backgrounds. An additional 33 percent have master's degrees. Twenty-six percent have a bachelor's degree as the highest attained degree.

Income levels broke out this way: The largest single group (18 percent) has a household income of $100,000–149,999. Sixteen percent have a household income of $50,000–75,999, and 14 percent reported an income from $75,000–99,999. No other income strata had more than 5 percent in it.

As for demographic characteristics, our readers are older than is typical of many periodicals (this is not altogether surprising since we know that 53 percent are retired). Forty-two percent of respondents are seventy or older, 35 percent are 60–69, and 15 percent are 50–59. Most magazines prefer a younger demographic, but that is mainly to appeal to advertisers. We don't have to do that. We treasure our seasoned readers. But we also want to make sure we have newer readers to be with us for the decades to come. (One point worth considering about the number: retired subscribers have more time to fill out and send in reader surveys.)

Eighty-eight percent of SI respondents are male.

As for what topics readers prefer to see in SI, the answers carry a few surprises. Not surprising are the top four: alternative medicine or health fraud (56 percent are "very interested," 34 percent "somewhat interested"), psychology of belief (51 percent and 34 percent), current pseudoscience (45 percent and 41 percent), and religion (44 percent and 32 percent). I expected relatively high levels of interest in these topics.

The first surprise to me is that 43 percent of respondents are "very interested" and 33 percent "somewhat interested" in articles about global warming. (Some critics who reacted so negatively when we started covering climate change nine years ago are probably no longer subscribers, but I'd like to think that as the evidence for a warming planet got stronger and stronger, some initial critics—like good skeptics—changed their minds!)

The real surprises, to me, begin with the comparatively low levels of stated interest in conspiracy theories (20 percent and 37 percent), superstitions (16 percent and 36 percent), UFOs (16 percent and 31 percent), cryptozoology (13 percent and 28 percent), and ghosts (11 percent and 32 percent). We carry a fair amount of material investigating these last five "classic" categories. Some reevaluation might be necessary, but many of our investigators and columnists are passionate about examining claims in

these areas.

The more I think about it, though, I've come to a slightly different conclusion. Note that the first categories above ("alternative medicine" and the like) that got the highest respondent approval ratings are much broader than the more specific topics that received the lower ratings. I suspect that grouping the latter under an equally broad category heading such as "Investigations of Specific Mysteries and Claims" would have resulted in a higher approval rating than the specific topics individually did.

Our survey asked readers to respond to the statement "The layout makes it difficult to read." Seventy-nine percent responded "disagree" or "strongly disagree" with that negative statement. Only 8 percent indicated "agree" or "strongly agree," meaning most of the respondents thought the layout makes for easy reading.

This makes the responses to the subsequent questions about artwork, graphics, and design a bit disappointing. Only 34 percent of respondents say the artwork is appealing ("agree" or "strongly agree"). But 59 percent say that the graphics and photos are appropriate, 64 percent say that the cover page is appropriately designed, and 63 percent say the overall design is attractive. (Most answers tended to fall into the "agree" or "neither agree nor disagree" categories.) So while there was not strong enthusiasm for our design and appearance, there wasn't much antipathy either.

I was initially somewhat disappointed in the survey response rate: 549 completed surveys received out of 3,000 mailings. I had hoped for a quarter to a third response, but Arun Vishwanath, head of the Avant Research Group, which conducted the survey, told us he considers it "rather good" for a single-mailing survey. And some more responses were coming in after the cut off date. (As a result of that response rate, they assign an overall margin of error rate of plus or minus 4.18 percent.)

Overall, the survey provides much important new information for us, shows considerable and gratifying reader loyalty and support, and indicates some things to try to improve.

Once again, let me express my gratitude to those who responded and reiterate my invitation to those of you who didn't get the survey to give us your thoughts and opinions.

Kendrick Frazier is editor of the Skeptical Inquirer. His email address is kendrick frazier@comcast.net

Survey Methodology: Survey firm Avant Research Group, LLC, conducted the survey for SI and the Center for Inquiry. A thirty-nine–question survey was mailed December 26, 2015, to 3,000 randomly selected current subscribers of SI from the full SI database. An online survey option was also offered. Data collection lasted through February 12, 2016. There were 549 completed surveys, giving an overall margin of error of plus or minus 4.18 percent.

The Do's and Don'ts of Trusting Science

FAYE FLAM

It's been a tough year for science. The American Statistical Association issued a statement scolding[1] scientists for misusing statistical analysis. Scientists continued to fight over an evaluation of 100 psychological studies,[2] most of which could not be reproduced. Critics have cast doubt[3] on a widely believed psychological theory of human willpower.

So yes, science is fallible. Scientists are only human and science is not a synonym for truth. It's a bumpy, meandering road that heads in that general direction.

That makes skepticism good, up to a point. Beyond that point lie nonsense and superstition. The earth really is round.[4]

So how do you tell what to believe?

It's a very old question. But there's no need to go back to Plato. Let's just start in the early 1950s, when the Nobel prizewinning chemist Irving Langmuir laid out a set of warning signs about identifying scientific ideas that might not conform to reality. He gave a handful of examples of what he called pathological science,[5] including N-rays and mitogenic rays, neither of which exist despite being observed and measured in dozens of peer-reviewed experiments.

Something similar may be happening now with a psychological phenomenon known as ego depletion. The theory holds that humans can store up limited supplies of self-control. In the seminal 1997 experiment[6] that seemed to confirm this theory, students who were allowed to eat radishes while foregoing a plate of cookies did worse on a subsequent task than students who were allowed to eat the cookies. Many more studies appeared to confirm the conclusion that will power weakens as it's used, like a tired muscle. But a new paper reports that recent attempts to replicate the evidence turned up no effect at all.

The American Statistical Association came out in March with a statement outlining ways that scientists were using statistical tools incorrectly.

An article in Slate[7] in March called this cause for alarm: "If something this well-established could fall apart, then what's next? That's not just worrying. It's terrifying."

The situation with N-rays was pretty similar, according to Langmuir. Multiple experiments not only appeared to confirm their existence but break them down into different components whose optical parameters were measured with great precision.

In the 1920s, hundreds of papers were published on mitogenic rays, which scientists thought radiated from plants. Statistical analyses seemed to confirm that rays from onion roots would bend the orientation of other nearby onion roots unless they were separated by glass, which was thought to act as a ray blocker. It took years for scientists to come to the realization that these phenomena did not exist.

But scientists in physics and chemistry have learned from their mistakes. Langmuir saw a pattern to suspect science, which he reduced to six symptoms. One of the most relevant pertains to statistics—essentially that findings that are later discredited tend to be subtle effects, hard to distinguish mathematically from random noise.

Modern statistical tools can tease out subtle phenomena, but if not used carefully, they can also fool people into seeing patterns and trends that aren't there.

The American Statistical Association came out in March with a statement outlining ways that scientists were using statistical tools incorrectly. The association's director, Ron Wasserstein, said the statement was prompted by concerns that misuse of statistics was

contributing to a proliferation of questionable results, especially in the social sciences.

It was, however, the psychology community that recognized there might be a problem. In 2010, a paper claiming evidence for extrasensory perception got into a respected journal. Alarmed psychologists wondered whether other unlikely results had squeezed through the filters. Sure enough, a controversial paper[8] published last summer claimed that of 100 psychology experiments, only 39 could be replicated. That figure has been disputed, ironically, on the grounds that the replicating team made statistical errors.

It's not that social scientists are bad at math. They're not. But statistical analysis can fail from wishful thinking and subtler forms of self-delusion.

It's not that social scientists are bad at math. They're not. But statistical analysis can fail from wishful thinking and subtler forms of self-delusion. Physical science has been around longer and has had more time to learn from past mistakes.

It's also harder for social scientists to recognize another of Langmuir's symptoms of pathology: "fantastic theories contrary to experience." This is related to the mantra that extraordinary claims require extraordinary evidence, which was apparently conceived of by the 18th-century philosopher David Hume but articulated succinctly by the 20th-century celebrity astronomer Carl Sagan.

Physicists today have broad, well-tested theoretical frameworks, and if a claim falls outside, they give it a closer look before believing it. That gives them an efficient means of expelling bunk.

For example, several years ago, physicists reported[9] that a particle called a neutrino might have moved faster than the speed of light. Since this would violate Einstein's theory of relativity, the community was skeptical despite mathematical calculations showing high statistical significance. The experimenters took a closer look and found a loose cable. Fixing it showed the neutrinos followed the laws of physics after all.

In the late 1980s, physicists claimed to have found a groundbreaking new form of energy known as cold fusion.[10] Immediately physicists around the world tried to replicate it, and some got positive results. It took awhile for the physics mainstream to agree it didn't exist, but when the stakes are high enough, things eventually get sorted out.

In February, scientists claimed they confirmed Einstein's theory in the form of gravitational waves, and that result has been more readily accepted. Climate change, while still uncertain in some of the details, is widely accepted because it's consistent with well-known physics and chemistry, not just because of some published papers. Carbon dioxide, oxygen, nitrogen and other gases interact with sunlight in well-defined and well-tested ways. We know how much carbon dioxide has increased in the atmosphere and how that decreases the amount of the sun's energy that gets radiated back to space.

Social science doesn't have that kind of framework. Theories have limited domains. ESP sets off alarm bells because it would require some extraordinary physical mechanism. Ego depletion's extraordinariness is harder to gauge.

The psychologist George Loewenstein,[11] who has also written on the reproducibility problem, says the recent attention is already catalyzing better practices. That was the purpose of Langmuir's warning half a century ago. He was not trying to flag cheating, but to explain instances in which scientists were "led astray by subjective effects, wishful thinking or threshold interactions." Loewenstein tells his students to consider not just how to look for evidence that an idea is right, but how they might discover it's wrong. That's a critical thinking skill we all can use. ■

Notes

1. http://www.nature.com/news/statisticians-issue-warning-over-misuse-of-p-values-1.19503.
2. https://www.sciencenews.org/article/psychologys-replication-crisis-sparks-new-debate.
3. http://www.slate.com/articles/health_and_science/cover_story/2016/03/ego_depletion_an_influential_theory_in_psychology_may_have_just_been_debunked.html.
4. http://www.bloombergview.com/articles/2016-01-28/in-b-o-b-versus-neil-degrasse-tyson-root-for-both.
5. https://www.cs.princeton.edu/~ken/Langmuir/langmuir.htm.
6. https://faculty.washington.edu/jdb/345/345%20Articles/Baumeister%20et%20al.%20(1998).pdf.
7. http://www.slate.com/articles/health_and_science/cover_story/2016/03/ego_depletion_an_influential_theory_in_psychology_may_have_just_been_debunked.html.
8. http://www.ncbi.nlm.nih.gov/pubmed/26315443?dopt=Abstract&holding=npg.
9. http://www.scientificamerican.com/article/faster-than-light-neutrin/.
10. http://www.sciencedirect.com/science/article/pii/0022072889800063.
11. https://www.cmu.edu/dietrich/sds/people/faculty/george-loewenstein.html.

Faye Flam writes about science, mathematics and medicine. She has been a staff writer for *Science* magazine and a columnist for the *Philadelphia Inquirer*. She is author of *The Score: How the Quest for Sex has Shaped the Modern Man*. Email: fayeflam@gmail.com. This article originally appeared on BloombergView at http://www.bloombergview.com/articles/2016-03-14/the-do-s-and-don-ts-of-trusting-science. Reprinted with permission.

Artistic Provocations from Skeptical Inquirers: An Exhibit

MASSIMO PIGLIUCCI

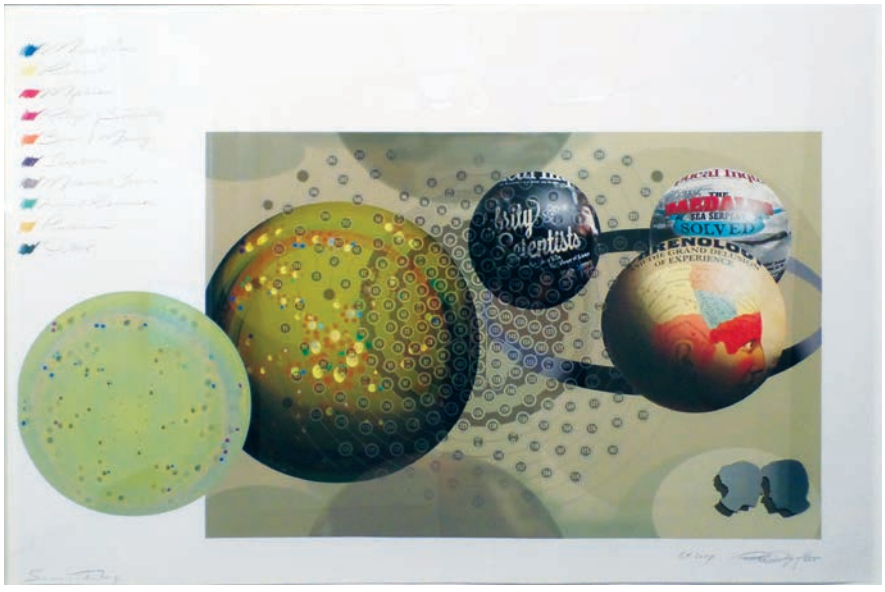
Art and science have a complex relationship. On the positive side, artists can be inspired by what philosopher Wilfrid Sellars calls the scientific "image" of the world, while scientists investigate the artistic experience from the points of view of evolutionary biology and neurobiology. On the negative side, artists may fail to actually grasp the science behind the flashy images or the catchy phrases, while scientists may talk as if art and aesthetics actually *reduce* solely to elements of Darwinian fitness and patterns of excitation of neurons.

It was therefore with a bit of trepidation that I went to the opening of a new exhibit at the Sidney Mishkin Gallery at Baruch College (part of the City University of New York), titled "Some Provocations from Skeptical Inquirers: Painted Prints, Photographs, and Videos by Ellen K. Levy and Patricia Olynyk." Before going, I did my homework and read the catalog, penned by Charissa N. Terranova, associate professor of aesthetic studies at the University of Texas at Dallas, that accompanies the exhibit. I wanted to know what I was about to see and asked to comment on.

Terranova begins her introduction to the Levy-Olynyk exhibit in an interesting fashion by comparing art, skepticism, and faith, and suggesting that "Skepticism and art, simply put, are an active means to knowledge, while belief is a declaration of what one claims to know. Art is like skepticism in that one uses art to understand the world by relations." I never quite thought of it that way; of course one could argue that if skepticism and art are both in the business of knowledge, then "knowledge" may mean different things in those two contexts. But I can definitely get behind the idea that both skepticism and art are ways for human beings to explore and understand, which still makes for a sharp contrast with faith, conceived as a declaration of what someone thinks he knows.

In terms of the actual art exhibited at Baruch, Terranova maintains that "Levy and Olynyk use scientific ideas, archives, and scientifically proven outcomes as the material to make art that helps make sense of the world past and present." This could be seen most obviously in Olynyk's "Isomorphic Extension I + II" and in the nineteen panels of her "The Mutable Archive." The first one deals with the transforma-

"Jellyrods2"



"Scenario Thinking" features three Skeptical Inquirer covers.

"Migrations"

tion of human anatomy into prosthetic form by presenting floating images of artificial legs of different genders. Terranova's notes explain: "Viewers experience an interrupted, dismembered sense of the uncanny valley, the space of revulsion and fear one enters when confronted by a lifelike robotic or cyborg version of the human." The second piece is a collaborative project in which the artist went through some memorial cards accompanying the skull collection put together by Josef Hyrtl, a nineteenth-century Viennese anatomist. Olynyk commissioned a number of artists, scientists, and philosophers (and, ahem, a "spiritual medium") to fill out the (very large) blanks about the lives of the people filed in Hyrtl's cards. Here is Terranova again: "These series of notations within Olynyk's cluster of nineteen subjects reminds us of the slippages in recording histories. That those subjects who occupied a higher position in society were afforded more elaborate documentation that did not simply reduce them to a 'scaphocephalus' or 'Japan Yedo' reminds us that the taxonomic system that binds them together is anything but value neutral."

Levy and Olynyk have collaborated on some of the pieces, particularly the one that has a very direct connection to Skeptical Inquirer. In their "Scenario Thinking," the two artists deployed a data visualization technique to display the patterns of articles published in SI over a period of twenty years. The piece presents the viewer with a series of large spheres, each including small circumferences that represent one year's worth of publication. Inside each yearly circumference there are six smaller spheres, one per individual issue, in turn referring to two to six articles. The articles are then coded by topic (rationalism, green; the paranormal, yellow; mind/brain and memory, orange; and so forth). The whole thing ends up looking like an annotated version of the solar system. Here is the curator's comment: "The planetary orbs of Scenario Thinking are at once macrocosmic and micro-cosmic, of the universe and cosmological while also instrumental in measuring the activity of the individual on the ground plane. As though a living being, the universe respires and pulsates in the form of flickering information."

Whether you find that sort of commentary enlightening or not (and quite aside from the unfortunate choice of the spiritual medium mentioned above), the art itself is interesting, although some pieces in the exhibit are admittedly somewhat more loosely inspired by skepticism or science than others. The question of the relationship between art and science remains fascinating and open, and walking through the works of Ellen Levy and Patricia Olynyk while talking to both art lovers and skeptics who had come to see them was an enjoyable excuse to ponder it further. ■

Massimo Pigliucci is the K.D. Irani Professor of Philosophy at the City College of New York and a long-time contributor to Skeptical Inquirer. His most recent book (coedited with Maarten Boudry) is *Philosophy of Pseudoscience: Reconsidering the Demarcation Problem* (Chicago Press). He blogs at PlatoFootnote.org.

Two Artists Combine Art, Science, and Skepticism

RUSS DOBLER

"Much of my work has been about what we see, what we don't see, and what we think we see," says Ellen Levy, artist and cocreator of the "Some Provocations from Skeptical Inquirers" art exhibit in New York City (pp. 35–36). Decades ago, when Levy's zoology degree got her a microbiology job to fund her art, the now debunked cellular feature dubbed the "mesosome" was still widely accepted as real. Mesosomes were observed as folds in the plasma membranes of bacteria and thought to serve a function in cell replication. In the late 1970s, mesosomes were revealed to be artifacts of how cells were prepared for microscopy—specifically the chemical fixation process—when researchers realized they did not appear in cells that hadn't been fixed.

"People could get the same results over and over again, but it didn't really mean anything," Levy says. Levy sprinkles some other bygone concepts such as "phlogiston" and the "luminiferous aether" into her animation "Anomalies and Artifacts." They are depicted alongside genuine cell organelles, but not to lend legitimacy to those discarded missteps.

"You see the attempt to distinguish signal and noise, and how difficult it is," Levy says.

Patricia Olynyk, the exhibit's other cocreator and director of the Graduate School of Art at Washington University in St. Louis, says her father giving microscopes as gifts is largely responsible for her "acute interest in science." It's been part of her profession, too. The School of Art and Design position she accepted at the University of Michigan in 1999 quickly became a joint appointment with the college's Life Sciences Institute, one of the first such overlaps in the country. Olynyk's "The Mutable Archive" tackles the topic of physiognomy, as addressed in the November/December 2012 issue of Skeptical Inquirer.

Levy sprinkles some other bygone concepts such as "phlogiston" and the "luminiferous aether" into her animation "Anomalies and Artifacts.

"The physiognomists were trying to ascribe personality traits to skull shapes," Olynyk says, "so they were using craniometers to measure the micro- and macrofeatures of the face, and based on the relative disproportion of that, [to] ascribe a personality type." Olynyk is fascinated that despite physiognomy being soundly disproved, "there's still a scientific desire to image personality," whether through fMRI or a Geodesic Sensor Net, which measures the brain's electrical activity.

The numbered circles in "Scenario Thinking," which features the cover of the November/December 2012 Skeptical Inquirer (and two other SI covers as well) correspond to the individual electrodes of the Geodesic Sensor Net. Olynyk says she and Levy chose the other two covers in the piece for contrast.

"We thought the mapping of the brain, with the monsters and aliens, with the celebrity scientists was really a kind of kooky and wonderful balance," Olynyk says. "Of course, the aesthetic of the work is paramount." ■

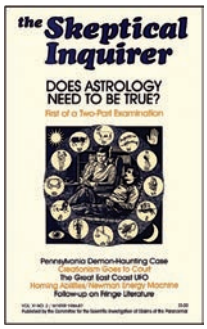
Russ Dobler is a geophysicist, journalist, and member of the New York City Skeptics. He writes about the intersection of science, skepticism, and pop culture for the websites AiPT! and the pulp press. He wrote "Skepticism in Popular Music" in the January/February 2016 issue of SI.

Does Astrology Need to Be True?

A Thirty-Year Update

Thirty years ago, although dozens of tests had been mostly negative, astrologers said critics had ignored serious astrology. Now there are hundreds of tests, some of them even heroic. Has anything changed?

GEOFFREY DEAN



The original article in Skeptical Inquirer Winter 1986–87 had a relaxed cover picture by artist Ron Chironna and this introduction by Editor Kendrick Frazier: "We begin publication in this issue of Geoffrey Dean's two-part 'Does Astrology Need to Be True?' a comprehensive investigation of the claims of *serious* astrology as defined by 'serious' astrologers. Although we are striving for shorter articles, so that we can cover a wider range of interests, we publish this lengthy inquiry because of its special significance. As one of our reviewers of Dean's manuscript wrote, 'It is without doubt the best article on astrology I have ever seen.'"

Other than its length, the original article had three claims on your rapt attention. It was the result of much recycling among colleagues and noted skeptics, including Susan Blackmore, Ray Hyman, Ivan Kelly, Andrew Neher, and Marcello Truzzi, whose critical comments kept it on the rails. It ignored the nonsense of sun sign astrology and focused on the *real thing* as used in consulting rooms, on why people believe in it (because it seems to work), and on the results of tests (astrology stops working when cognitive artifacts such as confirmation bias are controlled). And finally it asked, not is astrology true, but does it *need* to be true? A change that in one hit ended a centuries-old shouting match over claims of truth. The answer was no.

The real thing was not hard to find. In Western countries, it was the subject of roughly 100 periodicals and 1,000 books *in print* and was practiced or studied by roughly one person in 10,000. (The proportion today has been affected by astrology on the Internet but is probably not much different.) My conclusion in the original article was:

> In the last ten years various studies have addressed astrology (the real thing, not popular nonsense) on the astrologer's terms. The results of these studies are in agreement, and their implications are clear: Astrology does not need to be true in order to work, and contrary to the claims of astrologers authentic birth charts are not essential. What matters is that astrology is believed to be true, and that authentic birth charts are believed to be essential.

Business as Usual

Astrologers replied in their usual way to criticism, dismissing it as biased and ignorant. Their repeated claim—that their daily experience confirms their fundamental premise *as above so below*—is still heard from the rooftops. They still misinterpret cognitive artifacts in a chart reading as evidence of links with the heavens. And they still explain away all failures by the same old excuses, such as stars incline and do not compel; another factor is interfering (there is *always* another factor), and astrologers are not infallible. Astrology is thus made nonfalsifiable, whereupon belief and paying clients follow automatically. It then gets worse.

Unwelcome evidence is dismissed because, they say, research is biased; astrology is too nuanced to be testable by science, and (the ultimate clincher) research funding is nonexistent. Yet astrologers insist that looking at birth charts will convince us that astrology works. Just try it and our eyes will be opened at last! But they cannot have it both ways. Astrology cannot simultaneously be difficult to test and yet easy to prove. Their response to this contradiction is usually a scornful silence.

Nevertheless, the past thirty years have seen big advances in research design, the availability of data, and the use of computers to break the calculation barrier. At one time, astrologers using logarithms could take many hours to calculate a comprehensive birth chart; a home computer can do the same for dozens of charts while you cough.

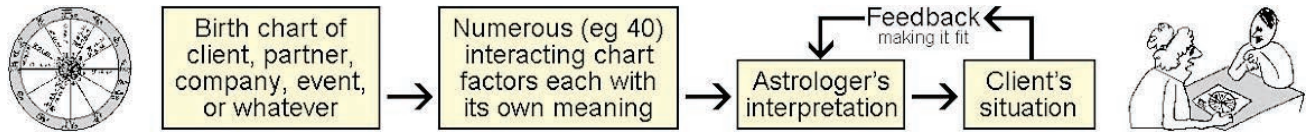
The result has been hundreds of controlled tests of astrology by both believers and critics. Most studies are little-known; so for forty years, my colleagues and I have been visiting astrology collections and searching academic databases for every useful study ever made. We have published the results in *Tests of Astrology: A Critical Review of Hundreds of Studies* (Dean et al. 2016).

Some of the notable studies we found are outlined below. They show how skeptical inquiry has advanced on astrological claims during the last thirty years.

meet astrology via a friend and become hooked. You start studying. But after a while you grow uneasy. It is not clear how Sun in Leo (*must shine*) differs from Moon in Leo (*needs to shine*). When asked to describe Saturn (*restriction*) in 8th house (*death*) you are not sure where to start. All you can say about a hard aspect is that it represents a challenge, whereas an easy aspect is, well, easy. As for a quincunx, you struggle just to pronounce it.

To clear up your confusion, you buy every recommended book. But they just make your confusion worse. Consider the interpretations given in those books. They are either *all the same* so they blur into one another as with Leo above. Or they are *all different*, thus Sun square Saturn varies from "a life of hardship" to "loss of father." Or they are *all useless*, being either amazingly general or amazingly specific, thus Mars in Libra varies from "lack of committment" to "passion for sword-dancing." Or they are *all evasive* as in "Neptune dissolves," which conveys nothing while pretending to convey everything.

Patterson concludes by pointing out that truth in astrology is tested by how well it matches the symbolism. Anything that passes this test is seen as true, not because it is actually true but because it could be true. Being able to say that the truth (whatever it is) is consistent with the symbolism is not terribly useful. Which is why astrology is so hard to learn (Patterson 1991).



Typical journey from birth chart on left to consultation on right, where the astrologer is famously saying to her client, Adolf Hitler, "With Libra rising you could find great satisfaction in your own home decorating business—or then again you may prefer to invade Poland."

Every astrological consultation involves feedback (as shown above) to help the astrologer pick chart factors that fit the situation. But how accurate are their meanings? The late Dr. Andrew Patterson lectured in engineering at the University of Witwatersrand. His interest in astrology began in the 1960s, and for many years he was a teacher and invigilator in South Africa for the U.K. Faculty of Astrological Studies. His scientific background resulted in that rarest of combinations—a fine critical sense plus an encyclopedic grasp of astrology—which he applies below to the challenge of learning astrology. As you read his account (abridged from 1991), remember he is a teacher of astrology, not a debunking skeptic.

Astrology is more difficult to learn than anyone realizes. Probably we have all had much the same experience. You

Which Zodiac to Use?

Western astrologers use the tropical zodiac tied to the seasons, while Eastern astrologers use the sidereal zodiac tied to the stars. Around 200 AD, the two zodiacs coincided, but today precession has put sidereal signs almost one sign ahead of tropical signs. So have their meanings changed?

British astrologer J.E. Sunley spent ten years comparing meanings between tropical sign X and sidereal sign X as given in astrology books. In principle, their meanings should be mostly different, but he found they were mostly similar—which is consistent with signs having no meaning at all except in the minds of astrologers. It explains why tens of thousands of Western tropical astrologers can agree that in their experience Scorpio is intense, while hundreds of thousands of Eastern sidereal astrologers can look at much the same piece of sky—which they call Libra—and agree that in their experience it is not intense but relaxed. So much for experience.

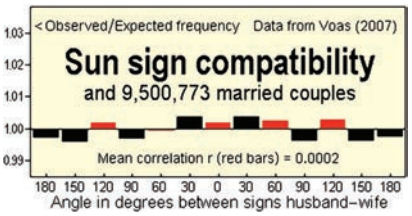
But if *relative* sign meanings are okay, as in Leos get on well with Sagittarians, what is there to worry about?

Sun Signs for Lonely Hearts

Sun sign compatibility was explored by Manchester University's David Voas (2007) using data gathered for the 2001 census in England and Wales. Traditionally, favorable angles between any two sun signs are said to be the conjunction 0º (Leo and Leo), sextile 60º (Leo and Libra), and the legendary trine 120º (Leo and Sagittarius). Despite possible conflict with other factors in the two charts (among sun sign astrologers this is the default explanation for awkward findings), if the claim is true then it should show up in a large enough sample: ten million marriages, for example.

Voas notes that completion errors

are problematic. Census forms are typically completed by one member of the household, who for some reason may enter their own birthday for that of their spouse. Others may enter January 1 or July 1 if an exact birthday is unknown, which is sometimes the case in old people's homes and for people born overseas. If dates of birth are illegible or missing (about 0.5 percent of all responses), the census office enters the day as the first of the month and assigns the months in rotation. Voas carefully removed all such artifacts but was unable to find evidence for useful sun sign effects.



Astrology predicts compatibility for the angles in red. Most are positive, but none are useful or statistically significant and all are explained by knowledge of sun signs biasing the outcome, as explained in the next section.

Thanks to his enormous sample, Voas's test was the most sensitive test of sun signs ever made. But none of the 144 possible sun sign pairings differed significantly from chance alone. In terms of predicting compatibility, sun signs absolutely did not work. You will not find this result in astrology books.

Experience 1, Science 0

British astrologer and former journalist Dennis Elwell (1930–2014) was noted for his eloquence. In an article in the *Astrological Journal* (1991), he restated the faith of astrologers in their experience as follows: "Like many others, I persevere with astrology because experience has shown that by and large its basic assumptions are correct. . . . If some piece of research proves a dead end, I do not question the authenticity of my experience, I question the competence of the research, or its underlying assumptions."

He held that failures to verify astrological claims were caused by the wrong approach because the right approach always worked. One of his favorite examples was how the birth chart for the Declaration of Independence on July 4, 1776, showed strong links with the Statue of Liberty. Thus the statue is big (Jupiter), made of copper (Venus), has a female form (Venus), and appears in the birth chart as Venus conjunct Jupiter exact within 3°. And so on through dozens of events

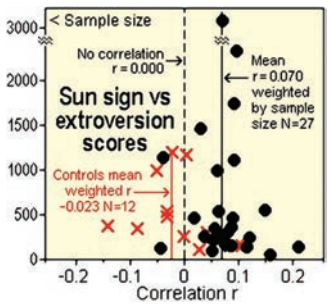
and associated people. It was "the kind of evidence that astrologers recognise and respect," and it convinced Elwell (as claimed in his 1987 book *Cosmic Loom: The New Science of Astrology*, which contains no science despite its title) that "science will eventually be obliged to embrace the astrological if it is to unify its picture of the universe." So please test astrology by case studies, not by statistical studies of groups.

Okay, let's do it. Suppose we've been told that the above chart has its Sun conjunct Uranus, whose meaning "very frequently indicative of great talent" could hardly be more apt—is astrology already discernible? Indeed, the statue is an innovative (Uranus) national monument resting on Sun-ruled granite and lit by electricity (Uranus). It is 151 feet high (equals 1° Leo, which sign is ruled by the Sun) on an eleven-pointed island (obviously the eleventh sign Aquarius, ruled by Uranus). Everywhere we look we find the predicted Sun-Uranus links. Yes, it's amazing!

Since this is "the kind of evidence that astrologers recognise and respect," we now have good reason to believe in astrology—except the chart has no actual Sun-Uranus conjunction (Uranus is 40° from the Sun, not 0° or any other aspect within traditional limits). Elwell's respected evidence is no evidence at all.

Sun Signs and Self-image

Odd-numbered signs from Aries onward are said to be extroverted. The rest are said to be introverted. Ask Sagittarians (odd-numbered and said to be sociable and outgoing) a question related to extroversion (such as "Do you like parties?"), and knowledge of astrology might tip their answer in favor of yes rather than no. In fact, this answer-tipping can be detected if people know their sun sign but not if they don't. When taken together with opinion polls, the results suggest that one in three people believes sufficiently in sun signs to measurably shift their self-image in the believed direction—of which a tiny fraction may believe sufficiently to bias their choice of partner as in the previous section.



The correlation between sun sign and extroversion scores is usually weakly positive and was once hailed as proof of astrology. But it disappears (red crosses) if subjects don't know sun sign meanings or are tested against their moon sign (which few people are aware of). So the effect is in fact an artifact of sun sign knowledge.

Astrologers Put to the Test

Charles Carter, the leading British astrologer of the 1930s, was noted for exceptional clarity of expression. Here is an example from his book *The Principles of Astrology* (1925, 14): "Practical experiment will soon convince the most sceptical that the bodies of the solar system indicate, if they do not actually produce, changes in: (1) Our minds. (2) Our feelings and emo-

Figure 1

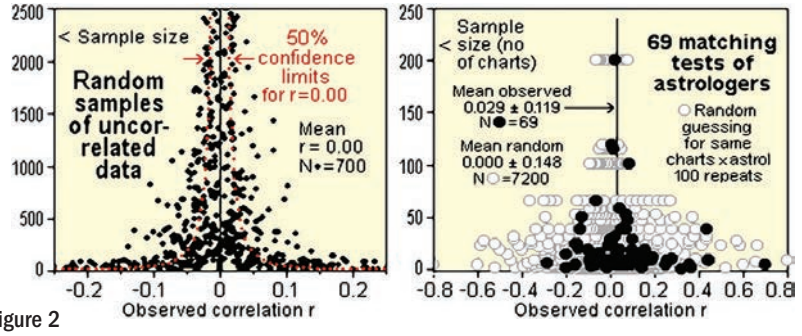


Figure 2

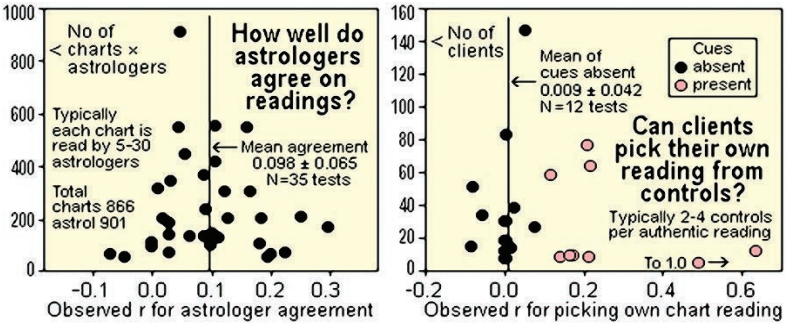


Figure 1. Left: Samples from uncorrelated data (r = 0.00) have sampling errors that produce nonzero correlations ($r \neq 0.00$) especially for small samples (common in astrology). Right: If astrologers could accurately match birth charts to their owners then the black dots would peak on the right. But they peak close to r = 0.0, or zero accuracy, and are skewed to the right indicating the presence of publication bias against negative results, hence the slightly positive mean (r = 0.029). Here and in Figure 2, all means are weighted by sample size. Discarding tests with small sample sizes or less familiar criteria makes no difference.

Figure 2. Left: Tests of agreement when reading the same chart avoid all problems of judging accuracy, such as errors in birth time. The agreement should be high because astrologers tend to read the same books, but it is only weakly positive (r = 0.098) and is nowhere near the 0.8 generally required for tests applied to individuals (as astrology is). What is astrology worth if astrologers cannot even agree on what a chart means? Right: Clients given several chart readings cannot pick their own reading unless it contains cues (as required by the experimental design), such as the name of their sun sign, in which case they do quite well.

tions. (3) Our physical bodies. (4) Our external … affairs and relationships with the world at large."

Thirty years ago, such claims began to be tested by jumbling up birth charts with things such as their owner's case histories and personality traits. Could astrologers match them correctly? The outcome was maybe yes but mostly no. Since then, more tests have been made that bring the total to sixty-nine, and new ways have been developed to analyze the results. For example, the correlation between a reading and reality can be plotted against sample size to clarify what is happening. The plots in Figure 1 show how it works.

The studies in Figure 1 are too numerous and too consistent with hundreds of other studies to be easily dismissed. Also, their subsequent meta-analysis shows that the differences between results are entirely explained by sampling errors, which leaves nothing for astrology and astrologers to explain; to paraphrase Pierre-Simon Laplace, we have no need of such hypotheses. But for completeness, we should still look at some of those other studies as shown in Figure 2.

The power and sensitivity of our tests so far are beyond anything the ancients could have dreamed of. But astrologers airily dismiss the results because, as one put it, "We have enough cumulative experience to know that it [astrology] works, whether the computer studies and the scientists agree with us or not" (Alexander 1983, xii).

Claims Tested on 3,290 People

For his PhD in psychology, German astrologer and psychotherapist Peter Niehenke (1984) circulated copies of a 425-item questionnaire for testing astrological claims. It was advertised in two newspapers and a New Age magazine and by notices at Freiburg University. He duly received 3,498 responses (requiring more than 110 reams of paper), of which 3,290 provided usable birth data, of which 62 percent were from birth certificates. The questions had been tested in a pilot study to make sure they were free of problems. Each was relevant to a given factor (planet, sign, house, or aspect) to see if the subjects identified with that factor regardless of whether it was actually in their birth chart. Thus Sun-Saturn aspects were explored by questions involving their supposed meanings such as disappointment, misfortune, pessimism, and guilt feelings.

Overall, no result was consistently in support of astrology. For example, subjects with four Saturn aspects (said to indicate heavy responsibility and depression) felt no more depressed than those with no Saturn aspects and showed no correlation with depression scores. Subjects with good trines to Jupiter (said to indicate optimism and good fortune) felt no sunnier than those with none. Aspects between aggressive Mars and the Sun, Moon, or Ascendant showed no correlation with aggressiveness scores. Responses to the question "I am unlucky in love: yes/no?" showed no correlation with aspects to Venus from Jupiter or Saturn, or with the house position of Saturn, all of which are said to be highly relevant. In the end, Niehenke decided there was more to astrology than being true or false: "a world in which astrology exists is surely a more enjoyable world than one without it. The need that astrology be a reality is much stronger than all the rational demonstrations against it" (1984, 15).

300,000 Chart Factors

In 1996, U.S. database engineer Mark McDonough wrote software to store and deliver the 30,000 birth data in AstroDataBank, the world's second largest collection of timed birth data. After several years of work, he could automatically analyze any subset of data for 300,000 chart factors (that's not a misprint; the large number is due to fashionable ideas such as asteroids and planetary nodes) taken individually or in combination and identify which factors differed the most from controls. But when applied to actual birth data grouped by, say, occupation or events, the results if positive (which was not often) failed to replicate. There was no evidence that astrological claims were valid: nothing actually worked. He asked for an explanation, but nobody had a clue. So he abandoned astrology to follow other interests.

Wrong Charts Make No Difference

Do astrologers get right answers from wrong charts? If they do, then their fundemental premise *as above so below* is disconfirmed. The idea might seem difficult to test—what astrologer wants to read *wrong* charts?—but it happens purely by accident and is surprisingly common. The astrologer gives a reading that satisfies the client *but the wrong chart has been used*. It makes no difference how wrong it is—by hours, days, or years—the chart still works. Astrologers recognize this but see it as some occult property of astrology that puts it beyond human understanding. Skeptics may disagree.

Les Gauquelins et leur Héroïsme

The most heroic studies in astrology were made by French psychologists Michel Gauquelin (1928–1991) and his wife Françoise (1929–2007). They used statistical testing and large samples mostly from the nineteenth century. Their results for traditional astrology (signs, aspects, transits) were consistently negative. Nothing worked. Therefore they were surprised to obtain positive results for what was later called the Mars effect (and, later still, planetary effects because the Moon, Venus, Jupiter, and Saturn were also involved): the tendency for eminent professionals to be born when the planet matching their occupation (such as Mars for sports champions, Jupiter for actors) had just risen or culminated. Planetary effects were new in that, unlike previous factors, they were critically dependent on the hour of birth.

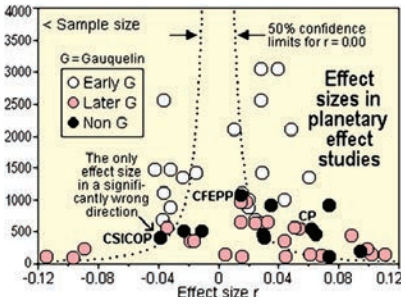


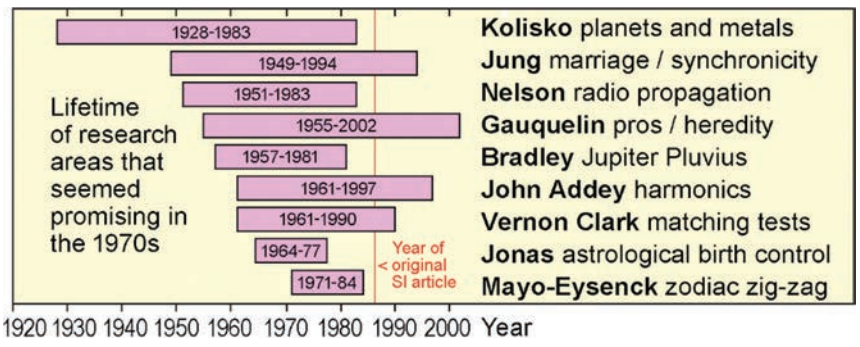
Figure 3. Effect sizes for the fifty-nine known studies based on computer-calculated data spread over five planets—Moon 12 percent, Venus 4 percent, Mars 38 percent, Jupiter 25 percent, Saturn 21 percent. Some results have negative effect sizes (e.g., Saturn for painters), so they do not cancel out positive effect sizes. What matters is the proportion of effect sizes that lie outside the 50 percent confidence limits. If significantly more than 50 percent, as is the case here, then planetary effects seem to be real.

Statistically, the effects were often very significant, which to astrologers meant strength. But their effect *sizes*, which for over thirty years nobody bothered to calculate, averaged a tiny $r = 0.04$ ignoring direction. So the effects were actually weak and were significant only because large samples were tested (typically more than 1,000). Indeed, the effects were so weak that if applied to 100 clients, on average only two would get readings more accurate than tossing a coin—and even then only if they were among the one in 20,000 who were eminent. Yet the effects replicated and were not explainable by faulty procedures (see Figure 3).

The Gauquelins in 1981

Ironically, planetary effects created baffling puzzles even for astrology. Why only five planets? Why no effect for the sun or for signs and aspects? Why occupation and not personality? Why contrary to all expectations are planetary effects *larger* for *less-precise* birth times? And why are there such strange effects in the first place?

For forty years, nobody had a clue. Astrologers predictably saw the effect



Last of the Astro Mohicans: Gauquelin planetary effects were the last of the astrological areas that had seemed promising in the 1970s and which still remained when my original SI article was published in 1986. The indicated end year is when the promise was lost due to the discovery of artifacts—poor control of chemistry (Kolisko), biased samples (Jung), inappropriate tests (Nelson), social artifacts (Gauquelin), astronomical artifacts (Bradley), sampling errors (Addey and Clark), unavailable data (Jonas), and sun sign knowledge (Mayo-Eysenck).

as proof of the higher realities in which astrology is said to operate. But after eight years of work, I uncovered a new artifact capable of explaining all the puzzles—namely the misreporting of birth times to match the pop astrology of the day (Dean 2002). The level of misreporting was very small, but then again so were the planetary effect sizes—and as opportunities for misreporting disappeared, so did planetary effects. Nobody knows if planetary effects still apply today, but that's only because privacy laws make new data hard to find. In any case, planetary effects are far too weak to be of practical use to astrologers.

But might consolation be found in Indian astrology, claimed by Indian astrologers to be vastly better than anything available in the West?

An Indian Test of Indian Astrology

Indian astrology is hugely different from Western astrology. It is more complex, uses the sidereal zodiac, and fortune-telling is the norm. The scientific revolution that eroded astrology in seventeenth century Europe did not happen in India, so it has had a free run ever since. Today it is firmly entrenched at all levels of Indian society. But no controlled test had been made in India until the one by Jayant Narlikar and colleagues at the Inter-University Centre for Astronomy and Astrophysics in Pune (Narlikar 2013).

They gave each of twenty-seven volunteering Indian astrologers (mean experience fourteen years) a different set of forty timed charts each, and a team of astrologers 200 timed charts (a larger number than in any Western test), to see if they could tell bright children from mentally retarded children. This is a commonly accepted claim in India, but neither group outperformed tossing a coin.

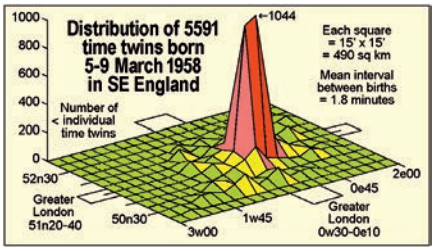
Nightmare on Time-Twin Street

"Time twins" are people born close enough in time and geography to have similar birth charts. At a given moment, the birth chart supposedly indicates trait X, the next moment it is trait Y, and so on. So time twins should be more alike in X than expected by chance, which makes them *the* definitive test of astrology, since all confounding reading artifacts are avoided.

In a city of one million people, more than 2 percent will have a time twin born within one minute, about the same proportion as people with an ordinary twin, and about 20 percent will have a time twin born within ten minutes. The numbers increase very rapidly with time difference and city size. Indeed, the number of time twins in Western history is so enormous (hundreds of millions) that many similarities in personality and events will occur by chance alone. So the handful of cases routinely cited by astrologers cannot hope to be convincing.

The systematic testing of time twins was explored by Ivan Kelly and me (2003) using cohorts from the National Child Development Study (NCDS) of 16,000 children born in the United Kingdom during March 3–9, 1958. To minimize variations in birth place, we analyzed only those born in Greater London. Birth times for 92 percent of cases were reported to the nearest five minutes, and the rest to the nearest minute. For each person, we selected a total of 110 variables measured at ages eleven, sixteen, and twenty-three that were said to be shown in the birth chart such as ability, accident proneness, behavior, occupation, personality, and physical data such as height, weight, vision, and hearing. Data collection had required whole armies of researchers well beyond anything astrologers could achieve. For the purposes of testing astrology, this database was a dream come true.

But for astrology itself the results were a nightmare: support for astrological claims was nowhere in sight. For example, Saturn sets every day momentarily exactly on the horizon, a position traditionally held to greatly boost its strength. At that time in London on March 6, 1958, it was also square the Moon within 0.1°, which is also held to boost its strength. It was not just a strong Saturn event; it was also the strongest Saturn event for the entire week. Saturn is held to indicate *restriction* and *limitation*, so its effect should show up as a dip in measures of ability. But it did not (see Figure 4).

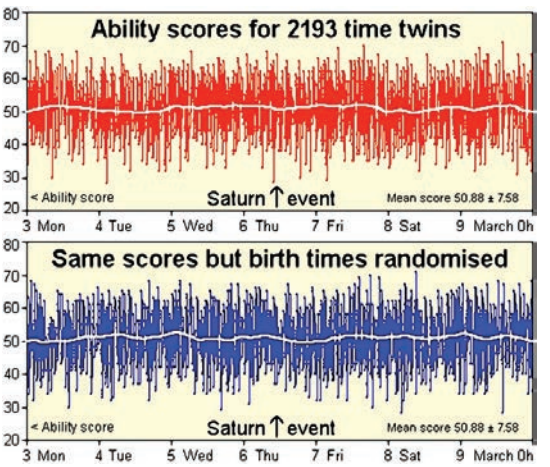


Distribution of 5,591 NCDS births in Southeast England during March 3–9, 1958 with the expected peak in the Greater London area.

A Strong Saturn Fails to Show Saturn Effects

Ability scores (a composite of fifteen tests such as intelligence, reading, and mathematics) plotted against time of birth for 2,193 births (Figure 4) shows no discernible effect from the Saturn event, no daily rhythm that might coincide with rising or culminating planets as in Gauquelin's planetary effects, and no clear difference from the same data when the birth times are randomized (lower plot). The white lines are forty-

Figure 4



one-point moving averages (forty-one points is about three hours). None of the other 110 variables fared any better when analyzed by a battery of tests. But can we be sure that the test is really appropriate? It may be that ability is too broad a measure to show Saturn effects, in which case we need something such as extroversion that is more definitely linked to Saturn (*caution*, *reserve*). Perhaps Saturn effects are too focused to be discernible during seven days, in which case we need a smaller time frame. All as in the next test (see Figure 5).

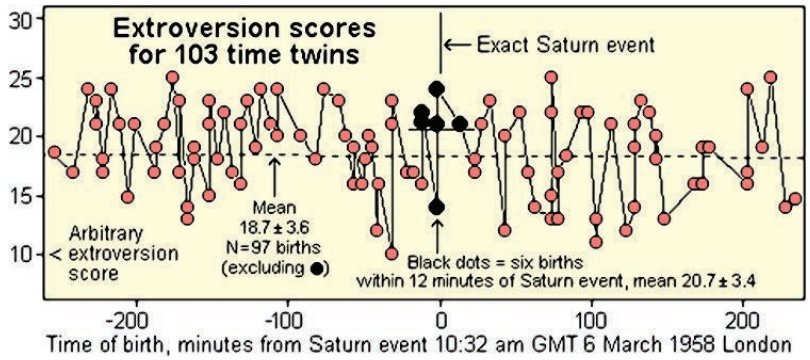


Figure 5

No Saturn Effect on Extroversion

Astrology predicts a drop in extroversion scores (here based on ratings on thirteen relevant scales such as impulsive–cautious) below the mean during the Saturn event (black dots in Figure 5). But if anything they increase, albeit not significantly (p by a t-test is 0.22). The extroversion scores show no tendency to group together. Enlarging the Saturn event window makes no difference, so the time twin similarities predicted by astrology are not detectable.

Could Lack of Resources Be the Problem?

At this point, the last hope for astrology's factual validity seems to disappear, but there are still straws to clutch at. Astrologers claim that with enough funding, research facilities, and right-minded researchers, astrology would soon regain its rightful place as queen of modern worldviews. This belief has been put to the test in each of more than a dozen PhD theses that have involved tests of astrology.

It did not work for Niehenke's PhD thesis. So let's look at the PhD thesis of Pat Harris, a British astrologer whose website offers you a £30 ($45) Astro Fashion Profile based on sun signs. Earlier, during twenty years of professional practice, one of her clients had conceived via IVF (in vitro fertilization) under astrological conditions that were absent during seven failed attempts. This seemed to suggest that astrology could improve the IVF success rate—an idea she explores in her thesis (Harris 2005).

Later in an article in the *Journal of Sexuality, Reproduction & Menopause* (2008), Harris claimed that "attempts to conceive during [astrologically] optimal times have an increased likelihood of success," even though an editorial note advised that her results were not statistically significant. The May 2009 issue contained a letter from Jacky Boivin, professor of health psychology at Cardiff University, who noted that Harris's two samples of twenty-seven and twenty-eight women were too small to escape sampling artifacts (for which about 400 would be needed), thus her claim "is completely unwarranted."

Unusually, her thesis was under an embargo (normally granted only if it contains commercially sensitive material) that for five years prevented its release. In due course, I found it to contain no birth data, no proper controls, no expectancies, no details that would allow an independent check, and success rates inflated in much the same way as predicting dryness in arid areas—exactly the sort of errors and omissions that in my day would get your thesis rejected. What was her university thinking?

Like Niehenke, Harris did not let her results influence her belief in astrology. And here we encounter astrology's dark side—on another website she now offers for £90 ($135) the best astrological dates for achieving conception plus a £148 ($220) telephone analysis of your birth chart to optimize fertility. In her 2009 letter, Professor Boivin had commented that Harris's paper "should not have been published because it falls short of the scientific standards adopted to create the evidence base for interventions in fertility. . . . People with fertility problems are willing to try anything to achieve pregnancy, and giving them false hopes is yet another way of taking advantage of this vulnerability."

This of course calls into serious question the scientific and ethical standards of Harris's actions. So let's try one more time with the PhD thesis of Keith Burke (2012), a former U.S. astrologer who went further than most by cofounding a for-profit institute for teaching New Age topics. He taught astrology classes and held workshops through the institute, wrote astrology articles and a textbook, and lectured at national conferences. Verily the definitive right-minded researcher!

He had noted that the Moon is generally held to be as important as the Sun but had received little attention by researchers. There was also a clear similarity between the Moon's meaning in each of the four astrological elements and four of the Big Five personality dimensions. So this became the subject of his PhD thesis at the Pacifica Graduate Institute, an accredited clinical training graduate school in California that was even better suited to astrology than a pure research school. According to astrologers, the results ought to support astrology. But the effect sizes for 192 subjects with timed births, mean age forty-nine, were not only at chance level, but three were in the wrong direction (see table below).

Element	Big Five	*r*	*p*
Fire	Extroversion	-0.082	0.49
Earth	Conscientious	-0.006	0.27
Air	Intellect	-0.074	0.31
Water	Neuroticism	0.050	0.94

The funding, research facilities, and right-mindedness (to say nothing of a promising hypothesis) had been to no avail. Unlike Niehenke and Harris, Burke had already stopped reading charts for clients, a decision helped by his concerns about people looking not for counseling but for major life answers that a chart cannot give. He is now a clinical psychologist and a professor of behavioral sciences, and he does not use astrology in his profession or personal life (Burke 2015).

The case for and against astrology can now be briefly stated. Since thirty years ago, the case against has become stronger. The case for remains unchanged.

Cases for and against Astrology

Astrology is among the most enduring of human beliefs and has undisputed historical importance. A warm and sympathetic astrologer can provide wisdom and therapy by conversation with great commitment that in today's society can be hard to find. To many people, astrology is a wonderful thing: a complex and beautiful construct that draws their attention to the heavens, making them feel they are an important part of the universe. However, to their discredit, astrologers fail to recognize astrology's many problems. They refuse to accept that experience can be unreliable; they brush aside negative evidence; and they dismiss critics as close-minded by definition. As a result, astrologers are promoting both an illusion and a deceit. They are astrology's own worst enemies. Ultimately, the issue is a personal one—whether factual truth is to be more important than personal meaning. Skeptics will no doubt have thoughtful responses to that one.

Answer to the Title Question

The tests outlined here lead to the same answer as do hundreds of other tests. They confirm that nothing in a birth chart is sufficiently true to support the meanings claimed by astrologers. Their books, classes, and conferences are not built on evidence but on opinions based on opinions based on opinions, thus perpetuating the seeing of faces in clouds. Millennia have not wearied them.

So the answer to the thirty-year-old question in the title remains the same. No, astrology does not need to be true in order to seem to work. It is simply a time-honored cover for artifacts that better explain the outcomes. Astrologers have had ample opportunity to prove otherwise by controlled tests but have not done so, a failure most easily explained by their being unable to do so. As a consequence, astrologers should not be surprised if they find themselves disqualified from positions of credibility in Western society.

Nevertheless, depending on who we are, we can still see astrology as beautiful, spiritual, helpful, controlling, lucrative, great fun, or simply stupid. But one final question.

How to React?

French social scientist Laurent Puech (2003, 267), in a book-length study of the pretensions of astrology, suggests that the best reaction to astrology lies in the provision of reliable information and critical tools:

> Whether we like it or not, astrology and recourse to astrologers is here to stay. I think they will never disappear because they fill a need. They will be simply more or less important according to the times. How to react? . . . [It is] not a question of censuring astrology but of helping people to find reliable information about it, and also to find the minimum critical tools for evaluating it.

The problem for astrologers who wish to promote their invalid views of astrology is how to stop people from finding out the truth, even though some may see astrology as having more to it than being true or false. ■

Acknowledgements

My thanks to Susan Blackmore, Wout Heukelom, Ivan Kelly, Arthur Mather, David Nias, and Rudolf Smit for helpful comments—for most of them a heroic repeat of their help with the original article of thirty years ago.

References

Alexander, R. 1983. *The Astrology of Choice*. New York, NY: Weiser.

Burke, K. 2012. *Big Five Personality Traits and Astrology: The Relationship between the Moon Variable and the NEO PI-R* [Big Five personality inventory]. PhD thesis, Pacifica Graduate Institute, California.

———. 2015. Personal communication with the author.

Carter, C. 1925. *The Principles of Astrology*. London: Theosophical Publishing House.

Dean, G. 2002. Is the Mars effect a social effect? Skeptical Inquirer 26(3) (May/June): 33–38.

Dean, G., and I.W. Kelly. 2003. Is astrology relevant to consciousness and psi? *Journal of Consciousness Studies* 10(6, 7): 175–198.

Dean, G., A. Mather, D. Nias, et al. 2016. *Tests of Astrology: A Critical Review of Hundreds of Studies*. Amsterdam: AinO Publications. For details, visit http://www.astrology-and-science.com.

Elwell, D. 1987. *Cosmic Loom*: *The New Science of Astrology*. London: Unwin Hyman.

———. 1991. Can astrology win through? *Astrological Journal* 33(1): 49–50.

Harris, P. 2005. *Applications of Astrology to Health Psychology*. PhD thesis, School of Social Sciences, University of Southampton.

———. 2008. Managing fertility treatments and stress with astrology. *Journal of Reproduction, Sexuality, and Menopause* 6(3): 43–44.

Narlikar, J.V. 2013. An Indian test of Indian astrology. Skeptical Inquirer 37(2) (March/April): 45–49.

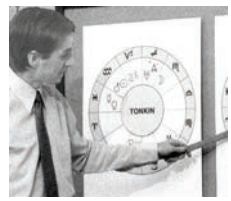
Niehenke, P. 1984. The validity of astrological aspects: An empirical inquiry. *Astro-Psychological Problems* 2(3): 10–15.

———.1987. *Kritische Astrologie*, 194. Freiburg: Aurum.

Patterson, A. 1991. Why astrology is so hard to learn. *Considerations* 6(3), 5–13.

Puech, L. 2003. *Astrologie: Derrière les mots* [*Astrology: Behind the Words*]. Sophia Antipolis: Éditions book-e-book.

Voas, D. 2007. *Ten Million Marriages: A Test of Astrological Love Signs*. https://astrologiaexperimental.files.wordpress.com/2014/05/voas astrology.pdf. A version without tables is available in Skeptical Inquirer 32(2): 52–55, Ten million marriages: An astrological detective story.



Geoffrey Dean, PhD, is a British technical editor living in Perth in Western Australia. He was once a professional astrologer seen photographed in 1974 on Australian ABC television incorrectly predicting the outcome of a state election. He is a Committee for Skeptical Inquiry fellow, a contributor of six articles to Skeptical Inquirer, a contributor to the anthology *Pseudoscience and Deception*, and to four Prometheus Books publications, including *Skeptical Odysseys* and *The Encyclopedia of the Paranormal*. Mailing address: PO Box 466, Subiaco WA 6904, Australia.

Does $E = mc^2$ Imply Mysticism?

No word stolen from physics is (ab)used in the woo literature more than *energy*. The most famous equation in physics is often cited as proof that matter and soul are one and the same, a tenet of mysticism. Analyzing the concepts of energy and mass in physics reveals the fallacy of this abuse.

SADRI HASSANI

Pseudoscience is adamant about attaching itself to science. After all, maybe if it zooms in on the second half of its name repeatedly and intensively, the first half of the name will have a chance of fading away. The most popular science among pseudoscientists is no doubt physics. If they use words such as *quantum*, *field*, *duality*, *complimentarity*, and *nonlocality*—no matter how much they mutilate the words—they and their discipline will sound more "scientific" and will sell better to the unsuspecting public. This inimical association of pseudoscience with science ought to be vigorously and publicly rebutted.

Mystical Energy

No word has been mutilated more severely in the woo literature than *energy*. Positive energy, negative energy, healing energy, organic energy, mental energy, and karma energy are just a few examples of "energies" adrift in the vast ocean of pseudoscience. Mystics and mystery-mongers have abused the word so often that it has now acquired a mystical halo comparable to words such as *holism*, *consciousness*, *natural*, and *wholesome*. There appears to be a good reason for this: energy is, after all, nonmaterial, and the most famous equation in physics, $E=mc^2$, equates it to mass, which is material. The equivalence of the nonmaterial spirit (or soul) and matter—which is at the heart of mysticism—is only one small step away! Take this example:

> Since the mass of a particle increases with velocity, a particle can have any number of relativistic masses. . . . In other words, particle accelerators are misnamed. They do not increase the velocities of subatomic particles (the definition of "acceleration") as much as they increase their mass. Particle accelerators are actually particle inlargers [sic] [massifiers?]. . . . Einstein's formula $E=mc^2$ says that mass is energy: energy is mass. Therefore, strictly speaking, mass is not a particular form of energy. *Every form of energy is mass*. Kinetic energy, for example, is mass. . . . Wherever energy goes, mass goes. (Zukav 1980, 203–204)

The first part of this quote reflects the confusion that arose in the early days of relativity, namely that mass is velocity-dependent. This confusion led to some absurd conclusions such as that a moving object exhibits two different masses (inertia) in reaction to a force, depending on whether the force is applied parallel or perpendicular to the velocity of the object! The confusion was so bothersome that Einstein, who at the beginning of relativity theory talked about a "relativistic mass," wrote in a letter to Lincoln Barnett—an American journalist—dated June 19, 1948:

> It is not good to introduce the concept of the [velocity-dependent] mass . . . of a moving body for which no clear definition can be given. It is better to introduce no other mass concept than the "rest mass" m. Instead of introducing [the velocity-dependent mass] it is better to mention the expression for the momentum and energy of a body in motion.[1] (Okun 1989)

The second part of the earlier quote from Zukav's book, which exploits the now-abandoned interpretation of mass mentioned above and emphatically equates it to energy, is a pressure sales pitch for the equivalence of soul and matter:

> In the East, however, there never has been much philosophical or religious . . . confusion about matter and energy. The world of matter is a relative world, and an illusory one. . . . Perhaps this accounts for the fact that the preposterous claim that mass is only a form of energy is unexpectedly palatable [in Buddhist literature]. (Zukav 1980, 155)

But it is another purveyor of woo

who takes full and personal advantage of Einstein's energy-mass equivalence. Gary Schwartz, well known to SI readers (Hall 2008), starts his book *The Energy Healing Experiments* with a quote he attributes to Einstein: "We may therefore regard matter as being constituted by the regions of space in which the [energy] field is extremely intense. . . . There is no place in this new kind of physics both for the field and matter, for the field is the only reality." In the most egregious violation of intellectual integrity, Schwartz inserts the word *energy* next to "field" to completely distort the meaning of the quote and the intention of the person to whom the quote belongs.

Prior to Schwartz's book, I had not seen the quote attributed to Einstein. I believe Michael Faraday may have said something resembling the quote above, in which he, the discoverer and a strong proponent of the concept of field, advocated the primacy of the electromagnetic field—*not* energy field—and the secondary role electric charge (and by implication, matter) played in reality. I looked to see if Einstein really said something similar, and found the quote—minus the inserted "energy," of course—in a book (Weaver 1987, 839), which had extracted it from another book on philosophy (Capek 1961). However, the authoritative book on Einstein's professional and personal biography, written by a well-known and well-respected physicist who was very close to Einstein, has the following quote from him:

> In [electrodynamics], the continuous field [appears] side by side with material particle [the source] as the representative of physical reality. This dualism, though disturbing to any systematic mind, has today not yet disappeared. (Pais 1982, 289)

This, which is much more reliable than the quote from Capek's book, is in complete contrast to Schwartz's quote, even if one removes the smuggled word *energy*. It is abundantly clear that Einstein is "disturbed" by the matter-field dualism (i.e., separation) and can find no mechanism to explain away this disturbing dualism.[2] The field *by itself*, and most definitely the pseudoscientific "energy field," has no place either in Einstein's mind or in physics.

Schwarz's misquotation of Einstein is only a prelude to what he really wants to sell to his readers:

> Mary Baker Eddy, the founder of Christian Science, came to the conclusion that "spirit is the real and eternal" and "the only true substance," while matter is "the unreal and temporal" and a "false belief or illusion." . . . Eddy's belief about spirit and the illusion of matter sounds curiously similar to Einstein's vision about energy being the basis of matter. (Schwartz 2007, 232)

If Schwartz is to be true to the subtitle of his book, *Science Reveals our Natural Power to Heal*, he has to find a connection between the pseudoscience of energy healing and scientific energy, even if he has to mutilate the professional character of the giant of twentieth-century physics to the point of making him sound like Mary Baker Eddy.

Energy is a *property* of a *material* object. It makes as much sense to say that energy is nonmaterial as to say that the greenness of grass or the blueness of the sky is nonmaterial.

It is therefore imperative to dissect the concepts of energy and mass *as used in physics* to reveal the vast difference between the precise, identifiable, and measurable energy in physics, and the vague, unidentifiable, immeasurable, and unobservable energy used in mysticism and healing.

Is Energy Nonmaterial?

To answer this question, consider kinetic energy as an example. Kinetic energy is the energy associated with the motion (velocity) of an object. Asking whether kinetic energy is material is tantamount to asking whether velocity is material. Now you can see the absurdity in even phrasing the question. Velocity is a *property* of matter in motion, and there is no sense in asking whether a property is material. A red apple is material. Does it make sense to say that redness is nonmaterial? This confusion of matter with one of its properties, energy, is a common pitfall in which even trained physicists can fall, and a dangerously effective tool that quack scientists use to promote their woo. Energy is a *property* of a *material* object. It makes as much sense to say that energy is nonmaterial as to say that the greenness of grass or the blueness of the sky is nonmaterial.

The most convincing example of the abuse of $E=mc^2$ is when it is applied to matter-antimatter annihilation, where matter—and its antimatter, which is also material—transforms completely into "pure energy." When an electron meets its antimatter, the positron, they disappear. However, something remains after their disappearance. That is the pure (nonmaterial) energy we commonly—and mistakenly—hear about. What really happens is that the masses of the two particles turn into the energy of two photons, particles of light, which happen to be *massless*.

Massless particles are another favorite of mystics stolen from modern physics and mutilated beyond recognition. "You can see [energy transforming into mass] happening in elementary particle processes. A photon is transformed into two material particles: an electron and an antielectron. Material is produced from pure energy, from a photon" (Zajonc 2004, 205). This quote is the epitome of misunderstanding modern physics, even though it is asserted by an

astrophysicist. A (single) photon can *never* create an electron and its antiparticle (positron) because a photon is not some kind of formless, metaphysical, pure energy. It is a *particle* that has *momentum*. And conservation of momentum does not allow the process to take place. To see this, consider an observer for whom the electron and positron move with the same momentum in *opposite directions* (such an observer always exists). For this observer, the total momentum of the pair is zero. But the momentum of the initial photon can never be zero because it always moves at the speed of light (by definition). If the process is prohibited for one observer, it cannot occur. This is the essence of relativity: physical laws, such as conservation of energy and momentum, must hold for all observers. You need at least two photons to create an electron-positron pair.

Here is another misrepresentation of photon by a devout Eastern mystic:

> A "massless" particle is the name [physicists] give to an element in a mathematical structure. . . . It is impossible [to describe that element] because the definition of an object (like a "particle") is something that has mass.
>
> Zen Buddhists have developed a technique called *kaon* . . . A *kaon* is a puzzle which cannot be answered in ordinary ways because it is paradoxical. "What is the sound of one hand clapping?" is a Zen *kaon*. Zen students are told to think unceasingly about a particular *kaon* until they know the answer. There is no single correct answer to a *kaon*. It depends on the psychological state of the student. . . .
>
> Physics is replete with *kaons*, i.e.,[sic] "picture a massless particle." Is it a coincidence that Buddhists exploring "internal" reality a millennium ago and physicists exploring "external" reality a millennium later both discovered that "understanding" involves passing the barrier of paradox? (Zukav 1980, 205)

To compare a massless particle, whose physical properties make it as unique as a fingerprint, with the sound of one hand clapping, which—despite its "thought provoking" folly—depends on the psychological state of the student, is a farce and a gross disfiguration of physics. And to say that the definition of a particle "is something that has mass" is either an indication of complete ignorance of what a particle is or a devious attempt at derailing the mind of the reader into the quagmire of the parity of physics and mysticism I stated in the previous paragraph.

Eastern mystics and pseudoscientists may delight in attributing paradoxes to modern physics to forcefully align it with their belief system, but if there are paradoxes it is only because we try to understand a physical phenomenon on the basis or our limited, incomplete, and mostly wrong *intuition*—and intuition is a hallmark of mysticism. An example of a paradox in physics is in order here.

When relativity discovered the notion of length contraction of moving objects, there seemed to be a paradox, which came to be known as "the pole and barn paradox." A runner moving at almost light speed and carrying a pole enters a barn through the front door. An observer standing in the barn—to whom the pole appears shorter due to its motional length contraction—notices that the pole fits snuggly between the front and back doors and concludes that the pole has the same length as the barn. The runner, on the other hand, with respect to whom the pole is stationary, sees the pole longer and the length of the barn shorter—because the barn is moving relative to the runner. He concludes that the pole is longer than the barn. Who is right?

It turned out that the paradox was the result of our *intuitive* notion of absolute time, and neglecting the fact that time is relative. The barn observer sees the two ends of the pole coincide with the two doors of the barn *simultaneously*. The runner does not, because simultaneity is relative. He sees—as a simple relativistic argument can show—the coincidence of the leading point of the rod with the back door *before* the coincidence of the trailing point of the rod with the front door. So, while the front end of the rod is exiting the back door, the back end is outside the barn. The runner concludes that the pole is longer. They are both right: Paradox resolved! Relativity is right, and our *intuition* is wrong, despite its primacy in mysticism. There is absolutely no room for *kaons* in physics. Every student of physics who is told to "think unceasingly about this paradox" will answer it—after he/she masters relativity—and the answer does not depend on "the psychological state of the student." It is a single unique answer obtained by all students from Albania to Zimbabwe.

Relativity is right, and our *intuition* is wrong, despite its primacy in mysticism. There is absolutely no room for *kaons* in physics.

Is Mass Material?

This question may seem self-evident, because many readers immediately answer "Of course!" But let's dig a little deeper and see how mass is measured. After all, if we want to know whether or not mass is material, we have to know how to "see" it, i.e., measure it.

The oldest instrument for measuring mass is a balance scale where you put one object on the right side of a scale and another on the left. If the two sides of the scale are leveled, the two objects have the same mass. To quantify mass, a unit of mass is needed. Kilogram is, by convention, the mass of one liter of water. So, if we put half a liter of water on one side and an unknown mass on the other and the scale is balanced, the unknown mass is half a kilogram.

But what is involved in balancing

the scale? Gravitational *interaction*. When the forces of the Earth's gravity on the two masses are equal, the scale balances, because mass is a *property* of an object that determines the strength of the gravitational force on that object. Gravitational scales are useful when objects have sufficiently large masses. One may be able to find such scales sensitive to fractions of a milligram, but if you want to measure the mass of atomic and subatomic particles, such as an electron, you have to look for other interactions.

When an electrically charged particle moves in a magnetic field, it experiences a magnetic force, which generally bends the path of the particle. If the field is uniform and the particle moves perpendicular to it with constant velocity, the path of the particle will be circular. By measuring the speed of the particle, the radius of the circle, and the strength of the magnetic field, one can determine the mass-to-charge ratio of the particle. This is precisely how J.J. Thomson (1897) measured the mass-to-charge ratio of the electron. To find the mass, the charge of the electron had to be measured. This was done by Millikan (1913) in his famous oil drop experiment in which electrical, gravitational, and drag forces—or *interactions*—were involved.

What about neutral particles? How do we measure the mass of, say, the neutron, a constituent of the atomic nucleus that has no electric charge? We cannot use the same method as we did for the electron because neutrons are not sensitive to electromagnetic interactions.[3] So, how do we do it? By measuring properties of neutrons and other particles that participate in *nuclear interaction*.

The mass of any particle is determined by certain interactions in which that particle participates. In other words, mass is simply a *property* of particles measured in the way they interact with forces and other particles. Thus if it's interaction that determines mass, then it's interaction that determines the materiality of an object. This is a very important conclusion that is often overlooked.

Just as the absence of electric charge does not make a particle nonmaterial because it doesn't interact electromagnetically, the absence of mass does not make the particle nonmaterial because it doesn't interact gravitationally on a scale. If a particle can interact with other particles in any form and shape, it is material regardless of the value of its mass. Photons have no mass. Yet they interact with atoms, electrons, protons, neutrons, nuclei, quarks, etc.; their (zero) mass can be measured as demonstrably and accurately as those of massive particles.[4] *Photons are as material as electrons, protons, atoms, billiard balls, and trucks even though they are massless!* In fact, Eugene Wigner (1939), the Hungarian-American mathematical physicist and the winner of 1963 Nobel Prize, proved mathematically that a material particle is described by its mass and spin, either of which *could be zero*.

In conclusion, the E of $E=mc^2$ is always the energy of material particles that can either produce the mass on the right or be produced by the latter. There is no instance in nature in which mass transforms into energy (or vice versa) without some material particles carrying that energy. No connection exists between the soul-matter equivalence of mysticism and the energy-mass equivalence of relativity. ■

Notes

1. Today, no physicist dealing extensively with relativity—such as a particle physicist or a cosmologist—uses the velocity-dependent mass concept. The concept of mass has been exclusively replaced by what used to be called the "rest mass," in accordance with Einstein's suggestion. Relativistic *energy*, of course, does depend on velocity, just as classical kinetic energy does. However, while the latter is zero when velocity is zero, the former goes to $E=mc^2$ when velocity goes to zero; m is just the mass of the object, and E is properly called the *rest energy*.

2. Einstein wrote this in 1931, decades before the advent of relativistic quantum field theory, which found the solution to dualism in showing that field, a mathematical entity describing the behavior of some particle, can be described in terms of (the creation and annihilation operators of) quanta, which represent that particle.

3. This statement is not entirely true. Although a neutron has zero net charge, it consists of charged quarks, causing it to have a dipole moment, which can interact—very weakly—with both electric and magnetic fields. But for the sake of our discussion, we can forget these subtleties.

4. To measure a physical property whose value is zero is a very tricky enterprise. You cannot measure zero exactly. All you can say is that the property has a value between a very small positive number and an equally small negative number, or—when the property is always positive, such as mass—that it has a value that is less than a very small number. The mass of the photon is reported to be less than 0.00… 0178 (with 53 zeros) kilogram (PDG 2012, 8).

References

Capek, M. 1961. *The Philosophical Impact of Contemporary Physics*. New York: Van Nostrand.

Hall, H. 2008. Gary Schwartz's energy healing experiments: The emperor's new clothes? Skeptical Inquirer 32(2) (March/April). Available online at http://www.csicop.org/si/show/gary_schwartzrsquos_energy_healing_experiments_the_emperorrsquos_new_clothe.

Millikan, R.A. 1913. On the elementary electrical charge and the Avogadro Constant. *Physical Review* 11(2): 109–143. See also https://en.wikipedia.org/wiki/Oil_drop_experiment.

Okun, L.B. 1989. The concept of mass. *Physics Today* 42(6): 31–36.

Pais, A. 1982. *'Subtle is the Lord …'*. London: Oxford University Press.

PDG. Particle Physics Booklet 2012. American Physical Society. Available online at http://pdg.lbl.gov/2014/listings/rpp2014-list-photon.pdf.

Schwartz, G. 2007. *The Energy Healing Experiments*. New York: Atria Books.

Thomson, J.J. 1897. Cathode rays. *The Electrician* 39(4): 104–108. Available online at https://books.google.com/books?id=vB-ZbAAAAYAAJ&pg=PA104#v=onepage&q&f=false.

Weaver, J.H. 1987. *The World of Physics*, vol. 1. New York: Simon and Schuster.

Wigner, E. 1939. On unitary representations of the Inhomogeneous Lorentz Group. *Annals of Mathematics* 40(1): 149–204. Available online at http://www.jstor.org/stable/1968551?origin=crossref&seq=1#page_scan_tab_contents.

Zajonc, A. 2004. *The New Physics and Cosmology: Dialogues with the Dalai Lama*. Oxford: Oxford University Press.

Zukav, G. 1980. *The Dancing Wu Li Masters: An Overview of the New Physics*. New York: Bantam Books.

Sadri Hassani is professor emeritus of physics at Illinois State University and author of several books at graduate, undergraduate, and introductory levels. His blog at skeptical educator.org is devoted to exposing misconceptions and distortions of science by professional scientists. His previous SI articles are "Deepak Chopra's 'Physics'" (January/February 2016) and "'Post-Materialist' Science? A Smokescreen for Woo" (September/October 2015). Follow @SadriHassani on Twitter.

Does the Universe Revolve around Me?

A Critical Review of the Geocentrism Documentary *The Principle*

In 2014, a group that believes Earth does not orbit the Sun released a documentary called *The Principle*. What's their science like?

MATTHEW P. WIESNER

In the January/February 2015 Skeptical Inquirer, I presented an article about the modern geocentrism movement ("Modern Geocentrism: A Case Study of Pseudoscience in Astronomy"). I mentioned that geocentrists had produced a movie titled *The Principle*. This movie brought more attention to the geocentrists than they had previously experienced, with media outlets from *Popular Science* (Lecher 2014) to Slate (Krauss 2014) to NPR (Neuman 2014) reporting on the movie. The news media were interested because the producers of the movie had managed to include interviews with noted scientists such as Lawrence Krauss and George Ellis, but these scientists (as well as narrator Kate Mulgrew) later indicated they had been deceived into participating. This movie was released in October 2014 and had a very limited theatrical run. It was released on DVD on December 8, 2015. In this article, I give a brief overview of the backstory behind the development of *The Principle*, summarize the movie's main points, and critically analyze the science presented.

The Backstory

The makers of *The Principle* are geocentrists—people who claim that the idea that Earth orbits the Sun is wrong and that Earth is in fact motionless at the center of the universe. The major movers behind *The Principle* are Robert Sungenis and Rick DeLano, although a number of other people were enlisted to direct and produce the movie. Robert Sungenis holds a master's degree in theology and is the founder of an organization called Catholic Apologetics International. Sungenis did not invent the idea that Copernicus was wrong and the universe is in fact centered on the Earth (Keating 2015), but he did reinvigorate the movement with the publication of his 1,200–page book *Galileo Was Wrong, the Church Was Right* (Sungenis and Bennett 2007). Rick DeLano is an associate of Robert Sungenis. He does not list any notable educational credentials, but he indicates he has extensive experience in film and music production.

The Principle was marketed not as a documentary about geocentrism but as a feature film questioning current cosmology, especially the eponymous Copernican Principle. The Copernican Principle says that Earth is not in a privileged location in the universe. Another principle—the Cosmological Principle—is a related but more general statement about cosmology. The Cosmological Principle says that the universe is homogeneous (the same in every location) and isotropic (the same in all directions) when viewed on large scales. These two principles are important to the primary theory of cosmology, called the Standard Model or ΛCDM, where the *CDM* stands for "cold dark matter" and the *lambda* describes dark energy.

The Principle was marketed as a doc-

umentary questioning the Copernican Principle and mainstream science. But it contains repeated suggestions that Earth is at rest in the center of the universe, and it was immediately followed by a straight-to-DVD movie version of *Galileo Was Wrong, the Church Was Right*. In *The Principle*, the producers mostly avoided using the word *geocentrism* in order to avoid alienating a general audience. These two movies were meant as a two-pronged attack on ΛCDM, with *The Principle* introducing doubt about the standard model of cosmology and the much lower budget *Galileo Was Wrong* movie providing a formal introduction to both the scientific and the religious dimensions of geocentrism. The fact that the geocentrists are motivated by religious fundamentalism means that they will not be dissuaded from their goal by inconveniences such as scientific evidence. They are, like Elwood Blues, "on a mission from God." Or so they think.

Summary of the Movie

The Principle is an impressively produced documentary, and to the average person it might seem like just another educational show about astronomy. Like many other scientific documentaries, it uses animations, astronomical imagery, and a collection of talking heads to express ideas. However, creationist scientists and full-fledged geocentrists are interspersed among the talking heads. In addition, the overall message is similar to that presented in geocentrist propaganda pieces such as *Geocentrism 101* (Sungenis 2014), just in a much more attractive and professional way.

The Principle starts out with Hologram Girl, who appears periodically throughout the movie to define terms. Next, there is a set of snippets from the talking heads, presenting the idea that there is a crisis in modern cosmology and suggesting that Earth is in a special place. Narrator Kate Mulgrew begins speaking about the Copernican Principle, discussing how scientists think Earth is not in a special place. She presents as a counterexample, "A baby's smile, the finale of a great symphony, the lights of all the cities of our Earth shining out into space. . . ." Who can argue with smiling babies?

We next meet the experts. They are Michio Kaku, Lawrence Krauss, Julian Barbour, John Hartnett, Bernard Carr, Max Tegmark, John Byl, Martin Selbrede, George Ellis, Robert Bennett, Ron Hatch, and Robert Sungenis. Michio Kaku and Lawrence Krauss are among the better-known physicists, and in the movie they are presented as the "bad scientists"—a la good cop/bad cop—the ones who strongly advocate for ΛCDM. Julian Barbour frequently appears in documentaries and is also

a renowned physicist. John Hartnett and John Byl are both trained physicists who are active creationists. Bernard Carr is a British physicist who holds a professorship at Queen Mary University of London. Max Tegmark is a well-known cosmologist at MIT. Martin Selbrede is a trained physicist and is president of the Chalcedon Foundation, an organization that promotes development of a Christian theocracy. George Ellis is a physicist from South Africa who is considered one of the world's foremost experts on theoretical cosmology. Robert Bennett is a physicist and a geocentrist; he is listed as coauthor of the seminal geocentrist work *Galileo Was Wrong, the Church Was Right*. Ron Hatch is the founder of NavCom Technology, a company that developed GPS systems. He is author of the book *Escape from Einstein* (Hatch 1992), attempting to refute relativity. Finally, of course, Robert Sungenis appears; he bills himself here as "Catholic Theologian and author of *Galileo Was Wrong*."

The movie continues with a summary of the history of cosmology. It presents Ptolemy and his geocentric model of the universe and then jumps to Copernicus and how he tried to revise the long-held Ptolemaic model. Michio Kaku is quoted at this point as saying, "The Copernican Principle is theological dynamite." Robert Sungenis states, "The Copernican Principle leads to ultimately the idea that there is no God," unintentionally demonstrating for us the meaning of the slippery slope fallacy.

The movie continues with its history lesson, discussing Tycho Brahe's model of the universe, then introducing Kepler and Galileo (who Sungenis claims repented of his scandalous heliocentric ideas). The video then tells us the story of heretic Giordano Bruno, animating his fiery demise. Next, the movie explores Newton and the *Principia Mathematica*, a point where Sungenis points out the importance of the concept of center of mass (he likes to argue that Earth is the center of mass of the universe).

Ernst Mach is the next scientist brought to our attention, where it is claimed that his ideas show that you could get the same effect from a rotat-

ing Earth as from a stationary Earth with a rotating universe. Next, we encounter the Michelson-Morley experiment, done in 1887 as scientists sought evidence for the ether wind. This experiment is used as a segue to Einstein and his development of the theory of relativity. The producers make no bones about their contempt for relativity, having the narrator say of relativity, "In order to maintain the Copernican Principle, the length, time, and mass of moving objects were altered."

The Principle continues with a review of Edwin Hubble and his observations of how the more distant spiral nebulae (galaxies) were moving away from Earth faster (Hubble's Law). The narrator quote-mines Edwin Hubble where he said he would not like to consider a model where Earth is in a special place in the universe, suggesting that this shows that astronomers have conspired to hide the correct conclusion that Earth is in the center. The movie continues with a discussion of the expanding universe interpretation of Hubble's Law. The whimsical background music and the talking heads discounting the expanding universe all give us the clear message that an expanding universe is a silly idea. Michio Kaku introduces the idea of a flat universe and the concept of inflation (rapid expansion of the universe right after formation) together, without too much explanation of either. Since Kaku is one of the "bad scientists," it is clear that inflation is another idea we're supposed to laugh at.

Next, we are introduced to flat rotation curves, the idea that objects in the outer regions of spiral galaxies are moving faster than expected. In this section there is a discussion of dark matter, dark energy, and energy of the vacuum. If you, like Lewis Carroll, were hunting for the snark, this is where you'd find it. In one place, responding to Lawrence Krauss's discussion of the properties of "nothing," the Hologram Girl defines "nothing" for us, trying to show how mind-bogglingly stupid all these scientists are. Lawrence Krauss exclaims at one point, "We don't understand anything, or rather we don't understand nothing." The next image is of a magician pulling a dove out of thin air. This section ends with a criticism of these ideas; John Hartnett claims that scientists are imposing their worldviews on the science, and Bob Sungenis pontificates that dark energy and dark matter were made up to make the "Big Bang universe" work.

The producers make no bones about their contempt for relativity, having the narrator say of relativity, "In order to maintain the Copernican Principle, the length, time, and mass of moving objects were altered."

We are then introduced to John Hartnett's results measuring galaxy distributions in the Sloan Digital Sky Survey (SDSS). A lot of time is spent discussing how Hartnett found what is referred to as concentric shells of galaxies surrounding Earth. What he found were somewhat periodic increases and decreases in density in the galaxy distribution at increasing distances from Earth. Next, Max Tegmark is shown discussing the discovery of the "Axis of Evil" in observations of the cosmic microwave background (CMB) by the Wilkinson Microwave Anisotropy Probe (WMAP) satellite. The Axis of Evil is a temperature difference in the CMB at the largest scales. The movie claims that the temperature differences are shown to align with the orbit of Earth.

Next, the movie argues that astronomers should be more open-minded. Bernard Carr is quoted as saying, "Cosmologists should be open-minded, and not suppress, if you like, the exploration of non-mainstream ideas." An analogy is made to Giordano Bruno, claiming that mainstream scientists will "burn at the stake" anyone who dares to question the status quo. Sungenis then goes off on a tangent, claiming, "As a matter of fact you can go on some websites of NASA and see that they've started to take down stuff that might hint to a geocentric universe." The idea of the Axis of Evil is hit really hard, as we go back to meet with Max Tegmark to discuss the status of this phenomenon after the Planck satellite released its results. He confirms that the Axis is still there. The movie really plays this up, stating that this could show that the foundation of science, the Copernican Principle, is wrong!

Finally, the movie concludes with a consideration of whether Earth is special. Of course, the "bad scientists," Krauss and Kaku, are quoted as saying that Earth is not special. Max Tegmark, George Ellis, and Bernard Carr are in the middle. John Hartnett and Martin Selbrede are emphatic about how special Earth is. Sungenis chimes in, "Science put up a brick wall. You must stay over in this category over here, you cannot go into the God category because that's going to destroy our science." Martin Selbrede connects the Copernican Principle with humanity having no purpose, and he claims that astronomy is ripe for a new Copernican revolution, one that overthrows that Copernican Principle. The movie ends with a song called "Sky Stand Still." Of course it does.

Critical Analysis of the Science

The Principle presents two major arguments: (1) Doubt can be cast upon the Standard Model of cosmology because of "shaky" ideas such as relativity, the expansion of the universe, and dark

matter and dark energy; and (2) There is evidence for a Geocentric Model because physics could be used to construct a geocentric universe and because of concentric shells of galaxies in the Sloan Digital Sky Survey and the Axis of Evil in the cosmic background radiation. I will briefly examine each.

Geocentrists have always had a bone to pick with relativity. Relativity had many detractors in its early days, with some opposing it because it seemed to imply philosophically that everything is relative (that's not what it implies). Geocentrists dislike it partly for this reason and also because it works against their idea of a geocentric universe. When they imply that it was a totally *ad hoc* solution to the Michelson-Morley experiment, they simplify reality down to an absurdity. They also don't mention the nearly endless series of experimental proofs of both Special and General Relativity. There was a debate about what it meant when Hubble found that the recession velocity of distant galaxies was proportional to distance. The expansion of the universe was found to be the model most consistent with both these observations and our understanding of cosmology.

The big bang theory was often opposed and sometimes ignored when it was first developed, but the discovery of the cosmic microwave background made it impossible to ignore. The nature of dark matter and dark energy is still uncertain, but the evidence of their existence is undeniable. From the solar system to the large scales of the universe, astronomers consistently find large amounts of mass that is evident through gravitational effects but that does not give off light. We call this dark matter. In the late nineties, astronomers found that the universe is expanding at an accelerating rate. We call the cause of this dark energy. We do not yet know the nature of dark matter and dark energy, but this is an area of very active research. The suggestion that geocentrism would quickly do away with dark matter and dark energy and solve current unanswered questions is both untrue and naive.

Geocentrists like to use Mach's Principle to suggest that there is no way to tell the difference between a spinning, orbiting Earth and a fixed Earth with the universe rotating around it. Mach's Principle says that local physical laws are determined by the large-scale structure of the universe. Geocentrists suggest that matter in the universe is distributed perfectly so that Earth is the center of mass. But no clear evidence is given for this distribution of matter; it is simply a statement of "It could be this way." But a lot of things *could be*, and we can only build a theory based on observations. It is also deceptive to propose a Geocentric Model versus the Standard Model. This is like proposing Steve Urkel versus Muhammed Ali. There is no geocentric theory. Modern geocentrism has no quantitative theory: it cannot explain the origin of elementary particles; it cannot explain why relativistic corrections work; it doesn't know how the planets formed. Geocentric theory simply does not exist.

What about the concentric shells of galaxies? This is pretty tenuous evidence, with the eye straining to see the overdensities of galaxies that are touted as being overwhelming evidence. In order to make the animation showing shells of galaxies with Earth at the middle, it was necessary to extrapolate extensively. The producers also failed to mention that we always look like the center of distributions when we observe things, because we are by definition at zero distance away from ourselves. The apparent periodicity in redshift (proportional to distance) may be a real effect, but it is not a smoking gun showing Earth at the center of the universe. What about the Axis of Evil and its apparent alignment with the orbit of Earth? It is definitely a *non sequitur* that we are at the center of the universe, but this large-scale anisotropy may have something interesting to tell us about cosmology.

The big bang theory was often opposed and sometimes ignored when it was first developed, but the discovery of the cosmic microwave background made it impossible to ignore. The nature of dark matter and dark energy is still uncertain, but the evidence of their existence is undeniable.

Is the Copernican Principle perhaps not totally correct? That's entirely possible. It isn't necessary to intellectually abduct cosmologists in order to bring this up. Are there things that ΛCDM cannot fully explain? Of course there are. Science is not finished! Maybe we do live in a local void. Maybe there is something unique about our neighborhood of the universe. But it is a very different thing to then conclude that Earth is the center of the universe, if such a thing even exists, or to argue that the universe is a gigantic sphere of matter rotating around us with no more evidence than "It *could* be that way!"

Conclusion

The Principle is pervaded by the idea that we must choose God or science—that modern science allows no place for the idea of God. How science and religion should relate to each other is

a debate that has gone on for centuries. The meaning of life and the significance of humanity and the planet Earth are also extremely deep ideas that ought to be considered at length. A movie such as *The Principle* contributes nothing to this dialogue. By implying that there must be a war between science and religion—a war that religion must win—the well of dialogue is poisoned. People such as self-styled "Catholic theologian" Robert Sungenis imply that Catholicism is at war with modern science; it would be far better to refer to real Catholic thinkers such as Father George Coyne, Brother Guy Consolmagno, Bishop Robert Barron, or Pope John Paul II to understand the Catholic Church's real position on modern science. I think we can all agree that bad science education is bad for everyone, and that is what *The Principle* provides in bulk.

Like all works of pseudoscience, *The Principle* tries to succeed by giving half the story. It presents the history of modern cosmology while failing to give a full context for the works of Bruno and Galileo. It presents relativity and modern cosmology as full of shaky ideas while not mentioning the huge amounts of theoretical and observational support for these ideas. It suggests that temperature differences in the cosmic microwave background show that Earth is the center of the universe, while simultaneously presenting big bang cosmology (which explains the origin of the CMB) as outdated and silly. It presents statements from major scientists out of context to support geocentrism while not mentioning that these scientists think geocentrism is nonsense. People who have nothing to hide are not afraid of confronting the entire truth and the complete set of reality—something the geocentrists need to do. ■

References

Hatch, Ron. 1992. *Escape from Einstein*. Wilmington, CA: Kneat Kompany.

Keating, Karl. 2015. *The New Geocentrists*. San Diego, CA: Rasselas House.

Krauss, Lawrence. 2014. I have no idea how I ended up in that stupid geocentrism documentary (blog entry). *Future Tense Blog* (April 8). Available online at http://www.slate.com/blogs/future_tense/2014/04/08/lawrence_krauss_on_ending_up_in_the_geocentricism_documentary_the_principle.html.

Lecher, Colin. 2014. The conspiracy theorist who duped the world's biggest physicists (blog entry). *Popular Science Blog* (May 7). Available online at http://www.popsci.com/article/science/how-conspiracy-theorist-duped-worlds-biggest-physicists.

Neuman, Scott. 2014. Why physicists are in a film promoting an earth-centered universe (blog entry). *The Two-Way Blog* (April 8). Available online at http://www.npr.org/sections/the two-way/2014/04/08/300609595/why-physicists-are-in-a-film-promoting-an-earth-centered-universe.

Sungenis, Robert. 2014. *Geocentrism 101*, Third Edition. CAI Publishing, Inc.

Sungenis, Robert, and Robert Bennett. 2007. *Galileo Was Wrong, the Church Was Right*, 2nd Edition. CAI Publishing, Inc.

Matthew P. Wiesner is a postdoctoral researcher in astronomy at Purdue University. His research is in galaxy clusters and gravitational lensing. He also has a strong interest in science education and teaching and has taught astronomy since 2007. He holds a BS in physics and an MA in education from Marquette University and an MS and a PhD in physics from Northern Illinois University. He may be contacted at matthewwiesner@aol.com.

A Skeptical Response to Science Denial

Science denial has a corrosive effect on delicately understood scientific concepts, and it is getting worse. But science itself holds an answer.

JOHN COOK

Science denial has significant consequences. AIDS denial caused over 300,000 deaths in South Africa. Vaccination denial has allowed preventable diseases to make a comeback. Climate science denial helped delay sorely needed mitigation policies, committing us to direr climate impacts for decades to come.

Skepticism (by which I mean an evidence-based approach) is the antidote to denial. But skepticism doesn't just apply to how we practice our science. It must also apply to how we communicate our science. There is a wealth of psychological research into the phenomena of denial and how to neutralize the influence of misinformation. To ignore this evidence when countering science denial and pseudoscience is, ironically, not a skeptical approach.

So what is an evidence-based response to science denial? To illustrate, allow me to use an example from my own area of research: the scientific consensus on climate change. The psychological principles emerging from this topic have implications that can be applied to many areas of science.

Scientific Consensus on Climate Change

What percentage of publishing climate scientists accepts human-caused global warming? This isn't just an academic question; the answer has real-world consequences. On complicated scientific matters such as climate change, the average layperson uses expert opinion as a mental shortcut or heuristic. Psychologists have identified perceived consensus as a "gateway belief" influencing their views on climate change and, most importantly, their level of support for climate action.

A number of studies have quantified the scientific consensus on human-caused global warming. A 2009 survey of Earth scientists found that among publishing climate scientists, 97.4 percent agreed that humans are significantly raising global temperature (Doran and Zimmerman 2009). A 2010 analysis of public statements about climate change found that among the scientists who had published peer-reviewed climate research, 97 to 98 percent agreed with the consensus position (Anderegg et al. 2010). I was part of a team that analyzed published climate research, finding 97.1 percent consensus among papers stating a position on human-caused global warming (Cook et al. 2013). In 2015, a survey of University scientists found 96.7 percent consensus among scientists conducting research about climate change (Carlton et al. 2015).

For what is arguably the definitive work on the scientific consensus on climate change, I was privileged to coauthor a study with scientists who authored six of the other major consensus studies published over the last decade or so (Cook et al. 2016). In synthesizing all the published research on the level of scientific agreement on climate change, we found a number of studies, adopting a range of independent methodologies, consistently finding around 97 percent consensus among publishing climate scientists on human-caused global warming.

Both Powell and the many studies into consensus all find an overwhelming scientific agreement among climate scientists on human-caused global warming. This is the key message that the public needs to hear.

So, study after study confirms an overwhelming scientific consensus on climate change. But what does the average person think about the consensus? A Yale survey of Americans found that on average, people think that 67 percent of climate scientists agree that humans are causing global warming. That already sounds disturbingly low, but it's even worse when you consider that only 12 percent of Americans are aware that the consensus is over 90 percent. There is a gaping chasm between public perception of consensus and the actual 97 percent consensus.

How do we explain this "consensus gap"? One contributor is misinformation. An analysis of opinion pieces about climate change by conservative columnists found that their most common argument was "there is no scientific consensus" (Elsasser and Dunlap 2012). Long before social scientists had identified perceived consensus as a gateway belief, opponents of climate action had pinpointed consensus as a key target of attack. A 2002 memo by Frank Luntz recommended that Republican politicians cast doubt on the scientific consensus in order to win the public debate on climate change.

Politicians follow this advice to this day. Former presidential hopeful Senator Ted Cruz argues that there is no consensus on climate change, claiming that the 97 percent consensus is based on "one bogus study." He ignores, of course, that the 97 percent consensus is in fact based on a multitude of independent studies.

Criticism of the 97 Percent Consensus from the Opposite Direction

Interestingly, the 97 percent consensus has also been criticized from the opposite direction. In an earlier issue of Skeptical Inquirer (Powell 2015) as well as a recent paper in *Bulletin of Science, Technology & Society* (Powell 2016), James Lawrence Powell argued that the 97 percent consensus was too low and is actually 99.9 percent.

Ironically, Powell's approach was similar to Senator Cruz's, dismissing the wide range of surveys and analyses all arriving at the same 97 percent consensus.

How does Powell reach a different result than the many studies into consensus? He assumes that any paper that doesn't explicitly reject the consensus in its abstract must therefore endorse the consensus. On the one hand, he has a point. As we discuss in our own paper, Naomi Oreskes predicted in 2007 that as a consensus strengthens, we should see fewer people bother to explicitly mention the consensus position in their paper's abstract (Oreskes 2007). This pattern was exactly what we observed in our own data.

However, our data also demonstrated that there are instances where Powell's assumption is false. There were a small number of papers that stated no position on human-caused global warming in their abstract, but also minimized or rejected the human contribution to global warming in the full paper. We can't assume that because a paper doesn't express a position on the consensus in its abstract, then the authors must endorse the consensus.

Ultimately, it's worth taking a step back and considering that this particular dispute is between a 97 percent or 99.9 percent consensus, while the vast majority of people don't even realize the consensus is over 90 percent. Both Powell and the many studies into consensus all find an overwhelming scientific agreement among climate scientists on human-caused global warming. This is the key message that the public needs to hear.

The Bull in a Teashop

Given the crucial role of perceived consensus as a gateway belief, it should come as no surprise that opponents of climate action have expended so much effort manufacturing doubt about the level of scientific agreement among climate scientists. But how do we respond to such misinformation campaigns? The answer lies in psychological research.

The psychology of consensus has been a topic of growing interest to researchers in recent years. Some of their research findings have significant implications, not just for climate change but also for science communicators in many different disciplines.

Mountains of research have been conducted into how to effectively communicate the realities of climate change. This is important work, and it is imperative that scientists heed this research when educating the public about science. But for too long, a deadly Achilles heel for science communicators has been overlooked.

Misinformation can undo the good work of science communication. In one study, Aaron McCright and his colleagues (2015) tested various climate messages, finding that the messages were effective in raising acceptance of climate change. They then tested the same messages accompanied by mis-

information that cast doubt on climate change. The misinformation cancelled out some of the positive influence of the accurate scientific information. This result is echoed by upcoming research from Yale University (van der Linden et al. 2016), which tested the effect of communicating the 97 percent consensus as well as misinformation about the consensus. The researchers found that the two conflicting messages cancelled each other out, with no net effect. The misinformation completely neutralized the 97 percent consensus message.

This research has grave implications for all science communicators. Even if we painstakingly craft the perfect piece of empirically tested, market-researched science communication, all our good work can be undone by misinformation. Science denial is the bull in our teashop of delicately understood scientific concepts. So long as science denial persists in generating misinformation, it will undermine public understanding of climate change and erode public support of climate action.

The corrosive influence of misinformation is more relevant than ever, in light of new research by U.K. scientists who analyzed tens of thousands of publications on climate change by conservative think tanks (Boussalis and Coan 2016). They found that over the last decade, science denial has been on the increase. Science denialists are doubling down on their science denial. The researchers posed the question: "Is the era of climate denial over?" The answer emerging from their data is sadly "no." Climate science denial has no intention of fading quietly into the night.

Stopping the Spread of Science Denial

Can we wrap our science in cotton wool as we send it out into the big, myth-infested world? The answer is yes, we can safeguard our science by applying a branch of psychological research known as inoculation theory (McGuire and Papageorgis 1961).

Inoculation theory borrows the metaphor of inoculation but applies it to knowledge. We develop resistance against a virus when we're exposed to a weak form of the virus through vaccination. In the same way, we can develop resistance against misinformation by exposing people to a weak form of the misinformation.

By "weak form" of misinformation, I mean the misinformation accompanied with an explanation of the techniques it uses to distort the science. What fallacy does the myth use? Does it cherry-pick the data? Does it rely on fake experts?

Science denial is the bull in our teashop of delicately understood scientific concepts.

Does it use a logical fallacy such as jumping to conclusions or red herrings?

Inoculation theory suggests that communicators should couple science information with inoculating messages. When you communicate a scientific concept, you should also explain the techniques or fallacies that might be used to distort that science. When people subsequently encounter the myth, they've acquired the critical thinking skills to discern how that myth attempts to distort the science and mislead them. The bull has lost its horns.

While my research has focused on inoculating people against misinformation about climate change, the principles of inoculation theory apply generally to any form of misinformation. If you're trying to communicate the benefits of vaccination, explain the science of evolution, or debunk some pseudoscience, adopting the approach of inoculation theory is an effective, evidence-based way to convey both the science and neutralize misinformation that casts doubt on the science. ■

References

Anderegg, W.R.L., J.W. Prall, J. Harold, et al. 2010. Expert credibility in climate change. *Proceedings of the National Academy of Sciences of the United States of America* 107: 12107–12109.

Boussalis, C., and T.G. Coan. 2016. Text-mining the signals of climate change doubt. *Global Environmental Change* 36: 89–100.

Carlton, J.S., R. Perry-Hill, M. Huber, et al. 2015. The climate change consensus extends beyond climate scientists. *Environmental Research Letters* 10(9): 094025.

Cook, J., D. Nuccitelli, S.A. Green, et al. 2013. Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters* 8(2): 024024+.

Cook, J., N. Oreskes, P.T. Doran, et al. 2016. Consensus on consensus: A synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters* 11(4): 048002.

Doran, P.T., and M.K. Zimmerman. 2009. Examining the scientific consensus on climate change. *Eos, Transactions American Geophysical Union* 90(3): 22–23.

Elsasser, S.W., and R.E. Dunlap. 2012. Leading voices in the denier choir: Conservative columnists' dismissal of global warming and denigration of climate science. *American Behavioral Scientist* 57: 754–776.

McCright, A.M., M. Charters, K. Dentzman, et al. 2015. Examining the effectiveness of climate change frames in the face of a climate change denial counter-frame. *Topics in Cognitive Science* doi: 10.1111/tops.12171.

McGuire, W.J., and D. Papageorgis. 1961. The relative efficacy of various types of prior belief-defense in producing immunity against persuasion. *Public Opinion Quarterly* 26: 24–34.

Oreskes, N. 2007. The scientific consensus on climate change: How do we know we're not wrong? In *Climate Change: What It Means for Us, Our Children, and Our Grandchildren*. Cambridge, MA: MIT Press.

Powell, J. 2015. The consensus on anthropogenic global warming. Skeptical Inquirer 39(6): 42–45. Available online at http://www.csicop.org/si/show/the_consensus_on_anthropogenic_global_warming.

———. 2016. Climate scientists virtually unanimous: Anthropogenic global warming is true. *Bulletin of Science, Technology & Society*, 1–4.

Van der Linden, S.L., A.A. Leiserowitz, S.A. Rosenthal, et al. 2016, in revision. Inoculating the public against misinformation about climate change.

John Cook is climate communication fellow for the Global Change Institute at the University of Queensland, Australia. He is a Committee for Skeptical Inquiry fellow.

Heavy with Praise, Light with Skepticism

JAMES E. ALCOCK

Extrasensory Perception: Support, Skepticism, and Science. By Edwin C. May and Sonali Bhatt Marwaha, editors. Praeger, Santa Barbara, CA, 2015. ISBN 978-1-4408-3287-1. Two volumes. 829 pp. $131.00.

Extrasensory Perception is divided into two volumes, the first titled *History, Controversy, and Research* and the second *Theories of Psi*. It is introduced by Professor James Fallon, who describes himself as a "basic sciences hard-boiled neuroscientist" who generally considers psi (psychic power) to be little more than wishful thinking. However, he is so impressed by what he refers to as the sophistication demonstrated in this work—in terms of experimental design, statistical analysis, protection against fraud, and so forth—that he plans to make it required reading for his first-year graduate students. Such a positive endorsement by a self-described skeptic—combined with the work's subtitle, *Support, Skepticism, and Science*—raises expectations of a rigorous and dispassionate examination of the evidence for extrasensory perception (ESP) and of the major methodological criticisms that it has engendered.

And therein lies the disappointment. While ESP proponents will no doubt be delighted by the parade of apparent data and theory in support of psi, skeptical criticism of parapsychological research is given short shrift indeed. Given that the first volume is titled *History, Controversy, and Research*, one might expect to find a detailed discussion and possible rebuttal of the many careful methodological criticisms leveled at ESP research by Ray Hyman, Susan Blackmore, David Marks, Richard Wiseman, and others, including me. However, of the fourteen chapters in this first volume, only three present a critical perspective, while the second volume virtually ignores criticism altogether.

While those three chapters are well-presented and make valuable contributions in their own right, none focuses on the many specific *methodological* shortcomings that plague such research. In the first of them, philosopher Richard Corry concludes that while there is nothing impossible about ESP, "evidence for ESP must meet a high standard, a standard that it does not seem to have reached." He goes on to offer a thoughtful analysis of the difficulties involved in interpreting parapsychological data, but he does not address in any detail why he believes that such a standard has not been met. Next, a chapter by psychologist Christopher French provides worthy insights into how people with similar backgrounds in science can differ so much in terms of their acceptance or rejection of supposed evidence for psi. He also discusses how cognitive biases and neuroscience can best explain many ostensibly paranormal experiences.

In the last of the three skeptical chapters, Eric-Jan Wagenmakers and colleagues argue that there has been an unintended benefit from parapsychological research and the criticism it has engendered: "The substantial credit for the current 'crisis of confidence' goes to psi researchers. It is their work that has helped convince other researchers that the academic system is broken, for if our standard scientific methods allow one to prove the impossible, then those methods are surely up for revision." In my mind, this gives too much (albeit negative) credit to psi research; in fact, the concern has come largely from within science itself. Wagenmakers and colleagues go on to provide valuable criticisms of the statistical evaluation of psi data and suggest some ways to improve psi research. However, as in the preceding two chapters, particular methodological problems in psi research are not the focus.

If one were to judge by the remaining chapters, one would hardly think that there has been any responsible

criticism of parapsychological research at all. This is made loud and clear in J.W. McMoneagle's chapter on remote viewing, which opens with a quick dismissal of "much critique and hostile skepticism about the validity of precognition." He then goes on to describe an apparently remarkable remote-viewing success that provided critical military intelligence. Lance Storm and Adam Rotman provide an overview of parapsychological research in Australia and Asia, without any acknowledgement of methodological criticisms of parapsychological research. Loyd Auerbach, Dominic Parker, and Sheila Smith survey parapsychological research in the United States. In this case, rather than addressing the serious methodological criticisms made by a number of critics, including me, of Daryl Bem's research methodology as described in his publication in the *Journal of Personality and Social Psychology*, these authors argue that such criticism displays bias "not only against the very idea of publishing such research in mainstream journals but against the concepts being researched." Bem's research was methodologically unsound, and it is unfortunate that rather than addressing the criticisms of it, the authors simply reject them out of hand.

Dean Radin describes studies of presentiment (a supposedly unconscious form of precognition in which physiological activity—"pre-feeling"—occurs with regard to an unpredictable future event) and refers to numerous replications of presentiment studies. He concludes that "it is the *repeatability* that gives us confidence that the effect is genuine" (emphasis in the original). However, he wisely cautions that methodological loopholes in such research might yet be found and that "the potential for other biases to be lurking is ever present." Of course, to the critic, it is not repeatability *per se* that is the important criterion but repeatability by neutral scientists. This is because design flaws and errors in interpretation are also likely to be repeated when replications are carried out by the same experimenters or by researchers who share their conviction that psi is real.

Yet parapsychologists argue that a neutral scientist, lacking in the belief that psi exists, may never be able to demonstrate psi, and so replicability in that sense may be unattainable. This is because of the so-called *psi experimenter effect*, which explains away failures to replicate through reinterpreting such failures as indirect evidence for psi. Tressoldi and Duggan, in their chapter focused primarily on psi research in Europe, argue that there is "clear and strong evidence for the role of experimenter belief in manifesting psi. . . . It asks the question whether the experimenter or the subject is using his or her precognitive ability to derive the response. Either way, it still indicates the existence of precognition!" A similar attempt to turn a sow's ear into a silk purse is presented in the chapter written by statistician Jessica Utts:

> The whole situation is complicated by the possibility of experimenter effects enhanced by psi abilities. It may be impossible to conduct a true replication unless two experimenters have identical beliefs and desires about the outcome. This realization may be the greatest legacy that psi research can contribute to the scientific enterprise. If true, it will require a major rethinking of the scientific method and the value of replication in science.

So, damn the torpedoes and full speed ahead. According to these writers, a failure to replicate a psi experiment not only does not weaken the evidence but may actually provide further evidence for psi, as a manifestation of the experimenter effect! This is certainly a win-win proposition. As incredible as this will appear to scientists outside parapsychology, Utts nonetheless argues that science may have to discard replication—one of its most important safeguards against error and self-delusion—in order to acknowledge and accommodate the psi experimenter effect.

Overall, there is a significant failure in this volume to acknowledge and deal with the many methodological criticisms that have been leveled at parapsychological research. The three "skeptical" chapters aside, methodological criticism is at times reviled, but generally it is just ignored. So much for the "skepticism" part of *Support, Skepticism, and Science*.

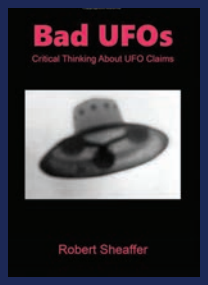
Volume 2, *Theories of Psi*, is dedicated to explaining psi phenomena by harnessing concepts from modern physics. Skepticism is not addressed to any significant degree. Chapter titles such as "Physics beyond Causality," "Remembrance of Things Future: A Case for Retrocausation and Precognition," and "Consciousness-Induced Restoration of Time Symmetry" provide a good idea of what the reader will find here. Yet these efforts are premature: one need first to establish that the phenomena undergoing theoretical analysis actually exist before trying to fit them into theory. For the scientific community at large, such establishment has yet to occur.

Overall, despite the subtitles of "History, Controversy, and Research" and "Support, Skepticism, and Science," neither controversy nor skepticism is given their due in this work. It is in large part a celebration of parapsychology by parapsychologists, a celebration freed from the shadow of methodological criticism. Left unaware of such criticism, it is not altogether surprising that Professor Fallon was favorably impressed. However, for responsible critics of parapsychology, there is little in this work that will enlighten them. ■

James E. Alcock is a professor of psychology at Glendon College, York University, Toronto, and the author of numerous skeptical works about parapsychology, including *Parapsychology: Science or Magic?* and *Science and Supernature: A Critical Appraisal of Parapsychology*. He is a member of the Executive Council of the Committee for Skeptical Inquiry.

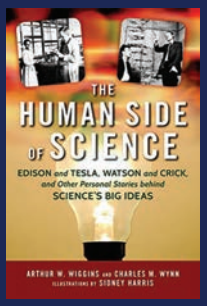
[NEW AND NOTABLE

Listing does not preclude future review.



BAD UFOS: Critical Thinking about UFO Claims. Robert Sheaffer. Sheaffer says this is the first skeptical book examining the broad UFO phenomenon published in the United States since his previous book *UFO Sightings* (Prometheus Books, 1998)—although we note that his recent *Psychic Vibrations* compilation (2011) has a lot about UFOs in it. His intent is to bring readers up to date concerning the most important claims in UFOlogy since his 1998 book. It contains mostly new cases, as well as updates on important older ones. Sheaffer has inherited the mantle of Philip J. Klass as the most prolific and knowledgeable UFO skeptic, certainly in the United States, and this is a welcome and valuable contribution to the skeptical literature. Order through www.BadUFOs.com. 2016, 279 pp., $18.95 (Kindle version through Amazon.com $8.95.)

HERE'S TO MY SWEET SATAN: How the Occult Haunted Music, Movies, and Pop Culture, 1966–1980. George Case. A sweeping history of how American society became fascinated with the occult, supernatural, and irrational, creating the cultural framework for the rise of the religious right and today's widespread rejection of science and rationality. Quill Driver Books, 2016, 210 pp., $19.95.

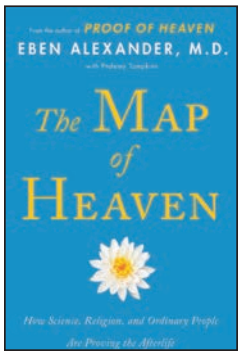


THE HUMAN SIDE OF SCIENCE: Edison and Tesla, Watson and Crick, and Other Personal Stories Behind Science's Big Ideas. Arthur W. Wiggins and Charles M. Wynn. Cartoons by Sidney Harris. The authors' previous excursions into science for the lay reader (such as Wiggins's *Joy of Physics* and Wynn's *The Five Biggest Ideas in Science*) focused primarily on ideas. Here, they reverse the priority and focus primarily on the people doing science. They reveal contentions among scientists, cooperation among some of them, and passion, greed, espionage, commitment, jealousy, sexism, impatience, obsessions, animosity, envy, and audacity—all illustrating that science is a very human enterprise. Prometheus Books, 2016, 275 pp., $25.00.

NEAR-DEATH EXPERIENCES: Understanding Visions of the Afterlife. John Martin Fischer and Benjamin Mitchell-Yellin. A new appraisal by two philosophers offers a deeper understanding of near-death experiences. They neither dismiss them as "unreal" nor leap to a supernatural interpretation. Instead, they acknowledge their deep importance. They discuss and critique prominent cases such as those of Pam Reynolds, Eben Alexander, and Colton Burpo. They provide a general blueprint for naturalistic explanations of these profound-seeming experiences. Oxford University Press, 2016, 200 pp., $24.95.

Bad Medicine

BERNARD M. PATTEN



The Map of Heaven: How Science, Religion, and Ordinary People Are Proving the Afterlife. By Eben Alexander, MD. Simon and Schuster Paperbacks, New York, 2014. ISBN 978-1476766409. 208 pp. Paperback $16.99.

Following up his book *Proof of Heaven*, Eben Alexander gives us another book on the same subject titled *The Map of Heaven*. But if you expect an actual map, you will be disappointed: There is no map. There are not even coordinates for us to train high-power telescopes on the area in question and see what's what. That's too bad, because I wanted to be prepared. I wanted to know the lay of the land, the people to talk with about accommodations, what's to eat and drink, and so forth. I enjoy playing the piano, and I was hoping for information about the availability of a Bosendorfer Imperial piano; or if that is not available, how about a Steinway D artistic series?

Instead of a map of heaven, we get a rehashed description of the vision of heaven that Alexander claims he had while he was in a coma with meningitis. That vision in this, his latest book, has been enhanced and expanded. Memories usually fade with time but not his. Perhaps the enthusiasm for the message, and its many repetitions at lectures, interviews, and book signings, has caused the doctor to embellish his previous vision with more details and a happier landscape.

So, what does heaven look like? It is not the happy hunting ground, nor is it the longhouse of the American Indian where you eat strawberries and smoke tobacco. It is not the heaven that so many religious suicide nuts hope to get to. It is a heaven that seems a tad Christian. It looks pleasant, with lots of light, green rolling hills, choirs of angels, and wonderful music, which is called the "Spinning Melody." Alexander tells us that the Spinning Melody is "pure white light that

rescued me from the Earthworm's-Eye View, serving as a portal into the ultra-real Gateway Valley . . . through higher dimensions" (p. 139). Huh? If I heard that kind of talk in a psychiatry clinic, I would be thinking of possible psychosis or borderline personality disorder. Does he actually believe this stuff, or is he hoaxing us? Is he like Alex Malarkey, *The Boy Who Came Back from Heaven*? Alex confessed, "I did not die. . . . I said I went to heaven because I thought it would get me attention." Tyndale House, Alex's publisher, has pulled his book, which sold over 100,000 copies and was on the *New York Times* best seller list. Heaven might not be real, but the money made from writing about heaven is real. (See, "Boy Who 'Visited Heaven' in Best Seller Admits He Didn't," News and Comment, SI, May/June 2015.)

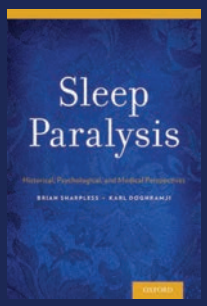
On p. 139 of *Map of Heaven*, Alexander tells us that one of the most common questions after his presentation is whether he remembers the music, especially the Spinning Melody. The answer is no. He has lost the memory of those magical sounds, and he has been working with others to try to recover the melody.

If you expect an actual map, you will be disappointed: There is no map. There are not even coordinates for us to train high-power telescopes on the area in question and see what's what.

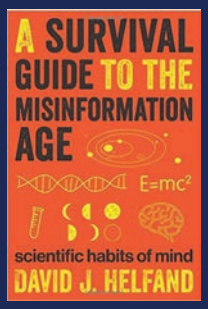
During his illness, Alexander believed that his doctors and his wife (now ex-wife), Holley, were trying to kill him. He believed he was flying. He believed he was skydiving. He believed the Florida police were chasing him. He believed ninja photographers were on cable pulleys. He knows *those* visions and delusions were crazy, but he still insists that his vision of heaven was real.

The subtitle of Alexander's book sets another stage for disappointment. Nowhere do we find scientific evidence proving the afterlife. To prove something, you need evidence, and that evidence needs to be relevant and adequate. The only evidence submitted is Alexander's visions while in his coma. That is hardly sufficient evidence for such an important conclusion. In fact, a lot of the overly long introduction in *Map of Heaven* is a diatribe about scientists not

THE NONRELIGIOUS: Understanding Secular People & Societies. Phil Zuckerman, Luke W. Galen, and Frank L. Pasquale. What do social scientists actually know about nonreligious men and women, whose numbers have been dramatically on the rise in recent years? The authors seek to provide a thorough and empirically grounded answer to that question, summarizing and analyzing existing research and presenting their own ongoing, original research findings. They thus attempt to fill a gap; there are countless studies of religious people, but nonreligious people have been a neglected and undifferentiated category, with different forms, types, and shades of secularity overlooked. Oxford University Press, 2016, 327 pp. $24.95.



SLEEP PARALYSIS: Historical, Psychological, and Medical Perspectives. Brian A. Sharpless and Karl Doghramji. Two clinician scholars in psychology and psychiatry provide a deep and broad array of perspectives on sleep paralysis, one of "the most unusual vicissitudes of human experience." This experience of either falling asleep or waking up and finding oneself unable to move, often accompanied by hallucinations, offers a naturalistic explanation for otherwise anomalous beliefs in fantastical creatures and paranormal situations across different times and cultures. (Several are still with us, such as extraterrestrial aliens, a malevolent presence, and shadow people.) The authors provide a comprehensive summary of current research into the phenomenon, but they also explore its appearances in art, literature, and popular culture. Oxford University Press, 2015, 287 pp., $55.00.



A SURVIVAL GUIDE TO THE MISINFORMATION AGE: Scientific Habits of Mind. David J. Helfand. Veteran Columbia University astronomy professor David Helfand (a CSI fellow) provides a welcome and readable homage to science and a guide to how to use it to winnow through the glut of information and misinformation that mark our age. His lament is that information today is virtually unlimited but often of low reliability. But he also celebrates the scientific habits of thinking and the scientific tools that can help us simultaneously cope with those practicalities and enrich our lives. Scientific habits of mind—which scientists have used in producing their unique and powerful models of the world—are the core of the book. It grew out of a section he prepared for a Frontiers of Science course that has recently become a permanent part of the Core Curriculum for Columbia College students. Helfand seeks to offer a glimpse of both the enriching experience science offers to those who understand a bit of its workings and the productive ways it provides to navigate the modern world. Columbia University Press, 2016, 344 pp. $29.25.

—Kendrick Frazier

taking the spirit world seriously and demanding more material evidence of its existence, preferably something that can be measured, touched, tested, and examined in detail. Those scientists are, according to the author, too concentrated on material things. According to Alexander, "Love, Beauty, Goodness, Friendship, In the world view of materialist science, there is not room for treating these things as realities" (p. XVII).

The sad experiences of ordinary people and their reactions to them are natural and probably explained by active imaginations and the deeply human wishes to have their loved ones return.

Is he kidding? There are plenty of scientific studies of these topics in the literature of science. Consider the studies of those dolphins that refuse to eat after the death of a mate. Consider the studies of those geese that search for the lost mate until they themselves become disoriented and die. The scientists I know all believed in love, beauty, and friendship. To say that scientists don't believe in such things is silly.

Alexander's view of organized religion appears just as dismal as his view of science. He claims that dogmatic religion resolutely ignored near-death experiences as moments of apparent contact with departed ones.

As a neurologist, I would say that near-death experiences are natural and not evidence of an afterlife or higher power. They are in fact precisely consistent with oxygen deficit that occurs as blood flow to the brain decreases. People whose blood pressure drops suddenly report "everything went white" before they faint. Those bleeding externally or internally say "all the color drained out" at the moment when blood loss goes critical.

An interesting feature of *Map of Heaven* is testimonials. These all have a similar structure, tone, pace, and diction, as if they were all written by the same person. They tell of sick people who died. The plot is that something bad happens and then a mysterious thing happens that puts some hope into the bad situation. For instance, Don Entich (p. 40) tells about his feeling that his dead wife, Lorraine, came back to him in the form of a monarch butterfly. Another correspondent notices a black dot in the bedroom and assumes his dead wife is back. But how do we know for sure that the butterfly is not, well, just a butterfly? There are some in my backyard as I write this review, and my wife is still alive. And why is the butterfly necessarily the spirit of the dead wife? What's the evidence? And why is the black dot not just a black dot? A black dot could be a scotoma. There are many causes of scotoma, including the aura of migraine with or without headache. Conclusion: The sad experiences of ordinary people and their reactions to them are natural and probably explained by active imaginations and the deeply human wishes to have their loved ones return.

Because Alexander paraded medical and scientific qualifications as a reason for us to believe him, it is now my unpleasant duty to examine his credentials. He is in fact not licensed to practice medicine in any state. His Massachusetts license lapsed, so the medical board there will not give access to his profile. Virginia and North Carolina do have his profile available as public documents. On March 23, 2009, the Virginia Board of Medical Examiners fined Dr. Alexander $3,500 and publicly reprimanded him for unethical and unprofessional conduct. On July 10, 2007, he did a disk operation and spinal fusion at the wrong level and neglected to inform the patient of his mistake. A payment was made for that mistake on July 9, 2009. A similar mistake occurred June 29, 2009, and that too was paid for. On August 25, 2003, he did a retromastoid craniotiomy for microvascular decompression for hemifacial spasm. The operation did not go well and recovery was poor. Payment for that was made on October 3, 2011. On August 22, 2002, he left a foreign body in a patient's neck. Payment for that took place on March 9, 2009. On June 21, 2010, the North Carolina Medical Board made him sign a consent order in which he admitted unethical and unprofessional conduct. That order is six pages and may be viewed on the board's website.

Whew! That's a lot of bad medicine and a signed confession admitting unethical and unprofessional conduct. Knowing how things are arranged in medical land, I think those mistakes and unethical behaviors are just the tip of the iceberg.

On the basis of probability, the existence of an afterlife is remote. The dead don't come back. If God wanted us to know about heaven, why can't she just arrive on a white cloud and make an announcement on all the TV and radio stations. That would shape us up fast and would make a believer of me. ■

Bernard M. Patten, MD, teaches courses on memory, neuroscience, and logic at Rice University and at the Women's Institute of Houston. Formerly, he was vice chair of the Department of Neurology and Chief of Nerve and Muscle Diseases at the Baylor College of Medicine.

Biological Race and Human Diversity

I wonder how much experience those who say race is a "social construct" have of different ethnic groups ("Biological Race and the Problem of Human Diversity," March/April 2016). No one with such experience could doubt the reality of racial difference.

The taboo is old. Anthony Smith, in *The Body* (1968), begins his chapter on race by saying that the word must be dismissed almost as soon as it is brought forward.

Krause unsurprisingly makes only one mention of Arthur Jensen (calling him "Jenson"), only the briefest reference to *The Bell Curve* (most of which *isn't* about race), and no mention of Hans Eysenck, J. Philippe Rushton, Richard Lynn, etc., who presented evidence of real racial differences.

Nicholas Wade contends that academics fear for their careers, but more than careers are at stake: as well as demands that they be dismissed, some were vilified, forced from their homes, threatened in writing, by telephone, and in person—and even physically assaulted—*for saying things that were well-known in the scientific world*.

I detest racism and am utterly opposed to racial discrimination. I was a member of the Anti-Apartheid Movement and boycotted South African products. But I agree with Anthony Daniels: "That the concept of race has been used to justify the most hideous crimes should [not] inhibit us from examining it dispassionately." Any such objective examination will confirm the reality of racial difference.

Ray Ward
London, United Kingdom

Do Guns Make Us Safe?

Editor's Note: Psychologist Stuart Vyse's Behavior & Belief column "Guns: Feeling Safe ≠ Being Safe," March/April 2016, provoked a strong reader response—not surprising given the intensely contentious nature of this issue in the United States. Some letter writers appreciated his analysis, which was about gun deaths and "the myth that guns make you safer," not gun control; most did not. One called it "an ideology-driven propaganda piece" and canceled his subscription. Here is a sampling of others, followed by Vyse's response.

The article by Stuart Vyse advocating additional gun control shows a lack of skepticism about the relationship between association and causation. He cites studies that show an association between owning a firearm and being at increased risk of homicide or suicide. He then makes the incorrect claim that owning the firearm causes the increased rate of homicide or suicide. Association does not imply causation.

There are several possible links between these factors:

(a) Owning the firearm causes the homicide (Vyse's claim).
(b) The threat of homicide causes the person to buy a firearm.
(c) Both factors are caused by some third factor (e.g., living in a violent environment).

Other examples of misinterpreted associations abound. People taking heart drugs are much more likely to die of heart attacks than people who don't take them. Does that mean that heart drugs cause heart attacks? No, because people who have heart diseases, and are more likely to have heart attacks, are more likely to take the drugs. By the same token, people who fear for their lives are more likely to buy firearms to protect themselves. To take away their right of self-protection based on a statistical association would be like denying patients their heart medication, hoping that would make them less likely to die of a heart attack.

L.G. Wade
Walla Walla, Washington

Vyse's article focuses on the United States. Wikipedia has lists on the subject of gun ownership and death by firearms in many countries. These data vary enormously. The United States has more than 1,000 guns per 1,000 people, but Japan only 0.6. The number of gun deaths per gun show much less variation.

Per 10,000 guns, the overall annual average number of deaths by firearms is 1.2, that is, if one excludes the data on Latin America, South Africa, Swaziland, the Philippines, and Kyrgyzstan. These countries average twenty-five annual gun deaths per 10,000 guns. It is not clear whether in these countries gun registration is poor or the people murderous or both. Among the remaining fifty countries, two thirds fall between 0.5 and 2. Both Japan and the United States score about 1. Germany and the United Kingdom score well below 0.5; Georgia and Israel above 2.

Likewise, the numbers about suicide by gun show little variation between countries with about 0.75 per 10,000 guns per year. Latin America doesn't deviate much in this respect.

Summarizing, worldwide, it is in fact guns that kill people. Because everybody has a chance to become insane or suicidal, each year one in every 10,000 guns kills a person. In developed countries, cars are about equally lethal, but cars have other uses, whereas guns have almost none.

J.W. Nienhuys
Waalre, Netherlands

I have been a reader of Skeptical Inquirer and a supporter of what is now called CSI for decades but was very disappointed in the publication of Stuart Vyse's "Guns: Feeling Safe ≠ Being Safe." Vyse's conclusion seems to be based on the Kellermann study from 1993, which has been much discredited for its poor methodology and Kellermann's refusal to release some of the data upon which he based his conclusions. Anyone interested in researching the flaws in Kellermann's study will have no trouble finding a plethora of articles on the Internet, but Vyse fails to even mention any of the criticisms. However, he was quick to point out the fact that the Kleck/Gertz research on the use of firearms for self-defense has its detractors. Vyse also decries the fact that funding for CDC research on gun violence has been curtailed but never mentions the fact that the CDC "research" was riddled with anti-gun propaganda and it was using public funds for its own political agenda. This is not to say that there is no validity to the Kellermann study or that funding shouldn't be restored to the CDC (or to some organization to legitimately study gun violence), but it was disappointing to see SI publish such a one-sided view of such an important topic.

Joseph M. Heery
Stoughton, Massachusetts

Stuart Vyse's article on guns troubled my sleep. That households that have guns suffer more gun-related injuries is a fact demonstrated by several extensive expensive studies. So what? Households that have automobiles and use them suffer more

car-related injuries. But we know with cars there is a benefit that few of us would give up. How about guns? To really resolve the issue, we would need a scientific study comparing two American cities matched for demographics (age, sex, income, etc.). In one city selected by chance, guns would be strictly forbidden and in the other, it would be guns ad lib. After a while, the data on crime in city A could be compared to city B. My guess is that once the bad guys know which city has the guns, they will concentrate their energies on the city that does not have them. But I don't know that for sure, so I am willing to reserve judgment on the issue until we have more data. In my view, the real benefit of private ownership of guns is not that guns prevent crime but that they give the people power to throw off an abusive government as happened in the American Revolution.

Bernard M. Patten, MD
Seabrook, Texas

In his well-intended article, Vyse supplies generalized statistics tending to show that, on average, people without guns are safer than people with guns. Fine. Incredibly, however, he then leaps to the unsupported conclusion that "you are safer if you don't have a gun at home than if you do" (p. 28). Here, Vyse commits the common mistake of imposing generalized statistics on individual persons. The truth, of course, is that every individual's education, training, intelligence, foresight, insight, and unique circumstances matter. Generalized statistics notwithstanding, individual strategies can produce individual results, which might help explain why the vast majority of gun owners live without incident, a fact Vyse conveniently ignores. Regardless, he clearly has no idea whether "you," as an individual, would be better off with or without a gun. He is, however, correct to note that this is ultimately a gun control and Second Amendment issue. But what he fails to acknowledge is that the Bill of Rights was intended to protect the options of actual individuals—not to extrapolate recklessly from generalized statistics.

Kenneth W. Krause
La Crosse, Wisconsin

Please do not claim that gun owners are 2.7 times more likely to be murdered as non-gun owners. Kellermann made no such claim in his report. The 2.7 is an odds ratio based on a stratified, experimental population. It is not a risk ratio for a whole population. Kellermann demonstrated that murder victims were more likely to own handguns than their unmatched controls. This is a chicken and egg thing. Some of the murder victims must have known they were in danger.

If it is any comfort, I regard the Kleck/Gertz report as complete nonsense.

Thank you for an otherwise great magazine.

Howard Gibson
hgibson@eol.ca

"Gun Ownership as a Risk Factor for Homicide in the Home" (Kellermann et al. 1993), which Stuart Vyse uses to support his belief, never actually established causality. When Vyse states that households where a gun was present somewhere in the home were 2.7 times more likely to experience homicide, he is careful to use the word "homicides" rather than "gun deaths." The fact is that the majority of those homicides were not caused by guns, let alone by the home owner's gun. That same study found other things, such as living alone, using drugs, or being a renter, to be even greater risk factors.

As for suicide, the World Health Organization ranks the United States forty-seventh in suicide rates worldwide. Countries with far less gun ownership due to far greater gun restrictions have far greater suicide rates. Is this overwhelming evidence that not having a gun in the home causes people to kill themselves?

I suppose if Arthur Kellermann and his colleagues had studied professional sports, they would have found that playing with basketballs causes people to be extra tall, whereas riding race horses has the opposite effect.

Ken Terry
Albuquerque, New Mexico

Although the rash of mass killings are only the tip of the iceberg of gun related deaths in America (about 500 out of 30,000 gun deaths per year), they have aroused public concern about the need to control gun violence. Stuart Vyse's timely "Guns: Feeling Safe ≠ Being Safe" provides an excellently documented and well-reasoned account of the greater hazard of having a gun in the house compared with the protection it provides. It should be sufficient to persuade most Skeptical Inquirer readers of the folly of owning a gun.

However, it will take more to influence this country, which is saturated with and addicted to guns. Our nation's attitude toward guns is a big part of the problem. Carrying guns has a Western cowboy macho image, with which that little West Coast town of Hollywood constantly bombards us in movies and on TV. We need to reverse that image to view carrying a gun for self-defense as more cowardly than walking bravely without a gun.

There also appears to be pleasure in owning and collecting guns and a paranoid feeling of threat that they may be taken away, which sounds like an addiction. Besides depending on the NRA and GOP for support, gun owners might benefit from a GOA (Gun Owners Anonymous). In addition to questioning the manliness of carrying a gun, we should mock the organizations upon which gun owners depend.

Gun regulations have been shown to reduce gun deaths. States with the strongest gun laws have the lowest levels of gun violence.

David W. Briggs
Marion, Massachusetts

Stuart Vyse replies:

Several writers (L.G. Wade, Bernard M. Patten, Howard Gibson, and Ken Terry) correctly point out that the studies I cited are not definitive indicators of a cause and effect relationship between gun ownership and homicides or suicides. The gold standard for establishing cause is the randomized controlled trial (RCT), which would require that households be randomly assigned to either a gun-possessing group or a gun-free group. To accomplish this, those in the experimental group would be forced to accept a gun whether they wanted one or not, and those in the control group who might already own guns would be required to give them up for the duration of the study. For reasons both practical and ethical, such an experiment will never be attempted. So, it is possible that the people who owned firearms in these studies differed in some other important way that was not captured by the studies, and this other factor is the true culprit, not guns. It is possible but, for a number of reasons, unlikely.

Elsewhere in the field of public health, ethical obstacles to RCTs have not prevented researchers from making important recommendations for promoting health. The classic example is smoking and cancer. For the same kinds of ethical reasons, there are no RCT cigarette studies. What we have are randomized experiments with nonhuman animals showing that cigarette tar is a carcinogen and epidemiological studies on humans showing that smokers develop cancer at higher rates than nonsmokers. These epidemiological studies are strengthened by measuring a wide variety of additional demographic and behavioral data (gender, age, level of exercise, diet, etc.) so that the effects of these potentially confounding factors can be statistically removed. In addition, once many studies have been conducted, they can be combined in a meta-analysis that draws general conclusions from several investigations rather than relying on the results of any one study.

All of this was true of the studies I summarized in my article. The conclusions about the risk of

homicide and suicide were based on a recent meta-analysis that summarized the results of thirteen studies of suicide risk and five studies of homicide risk.

Joseph M. Heery takes issue with the Kellermann (1993) study of homicide risk and with my criticisms of the Kleck and Gertz (1995) study of guns and crime deterrence. However, my primary mention of the Kellermann study was in connection with its historical role in the elimination of CDC funding of firearm violence research. My claim that gun ownership increases the risk of homicide and suicide was based on a more recent meta-analysis that summarized several studies—one of which was Kellermann et al. Similarly, my criticism of Kleck and Gertz was based on a more recent and far more extensive study with contradictory findings.

Mr. Terry also points out that 50.2 percent of homicides in the Kellermann study did not involve a firearm and that some other factors were even more strongly related to homicide in the home, including being a renter. But none of these observations weakens the conclusions of the study.

Kenneth W. Krause takes issue with my use of the pronoun "you" in the sentence "you are safer if you don't have a gun at home than if you do" (p. 28). I admit to a bit of literary license there. I did not mean to refer to any specific reader. It was a collective you. It is true that many people own guns and live long and healthy lives. Similarly, many people smoke without getting cancer and overeat without contracting diabetes or other obesity-related health conditions. But how should we decide whether or not to engage in these activities? I think peer-reviewed health research data should be an important part of that decision. I also suggest that, with respect to guns, the consequences of overconfidence about how your unique "education, training, intelligence . . ." will protect you could have tragic consequences. Without referring to any published studies, J.W. Nienhuys and Ken Terry make comparisons among countries with respect to the rates of homicide and suicide. Differences in firearms laws, culture, economics, and politics make it very difficult to draw meaningful conclusions from national-level data.

Scientific Method in the Bible?

Both Brian Bolton ("Does the Scientific Method Have a Biblical Origin?" March/April 2016) and Hugh Ross should have mentioned a much more convincing piece of evidence for the biblical basis of the scientific method: the story of the prophet Daniel's controlled dietary experiment, related in the Book of Daniel, dated 530 BCE:

> The king ordered Ashpenaz, chief of his court officials, to bring into the king's service some of the Israelites from the royal family and the nobility. . . . The king assigned them a daily amount of food and wine from the king's table. . . . But Daniel resolved not to defile himself with the royal food and wine. . . . Daniel then said to the guard whom the chief official had appointed over Daniel . . . "Please test your servants for ten days: Give us nothing but vegetables to eat and water to drink. Then compare our appearance with that of the young men who eat the royal food. . . ." So he agreed to this and tested them for ten days. At the end of the ten days they looked healthier and better nourished than any of the young men who ate the royal food. So the guard took away their choice food and the wine they were to drink and gave them vegetables instead. (1:3-16, NIV)

This episode might well have influenced contemporary Greeks.

Nelson Hoffman
Los Alamos, New Mexico

Brian Bolton replies:

The Daniel episode illustrates a basic component of the scientific method, which is the comparison of groups of subjects to reach a conclusion about different conditions. It should be noted that the essential experimental requirement for randomization was absent from assignment of both participants and treatments to groups. Yet, this was a reasonable approach under the circumstances to address the question of benefits of a vegan diet.

Also, the precursors of scientific inquiry in Babylonia, Egypt, and Phoenicia predate the Greeks of the classical period by several millennia. Furthermore, as far as I know, there is no evidence that the Hebrew Bible impacted in any way early Greek scientists. The burden of historical documentation is on those who make the claim of biblical influence.

Moreover, the claims of biblical origins of the scientific method is disputed by Louis Liebenburg in his recent book The Art of Tracking: The Origin of Science. *The author argues that animal tracking skills and techniques constitute the foundation of scientific thought, including observation, hypothesis, evidence, prediction, and causal reasoning. Liebenburg asserts that this prehistoric development dates back 70,000 years!*

Mesmer Myths

I agree with Benjamin Radford on his article "Beware Mesmer Thieves" (November/December 2015) that hypnosis is simply an induced sleep and not some trance-like state that thieves can use to their advantage. This myth of "trance-like state," where the victim's actions can be controlled by the hypnotist, is to an extent the influence of crime thriller fiction. It is the ignorance and innocence of the common people that criminals use to misguide them and get away with crimes. Such research-backed articles can inspire and guide readers to question many such myths and misconceptions prevailing in the society today. In this era of advanced information and technology, when we are constantly being bombarded with attractively packaged new information, it is essential to be inquisitive and skeptical rather than accept all concepts at their face value. I look forward to more such thought-provoking articles in this enlightening magazine. Thank you.

Mitali Chakraborty
Greenville, South Carolina

Correction

An article about Francis Collins's *The Language of God* in our May/June 2016 issue was erroneous in saying Collins was a Nobel laureate (p. 54). He *is* a prominent biologist and has received the National Medal of Science and the Presidential Medal of Freedom—but not a Nobel Prize. Our author is blameless; I made the error in editing.

—Kendrick Frazier, Editor

[FEEDBACK

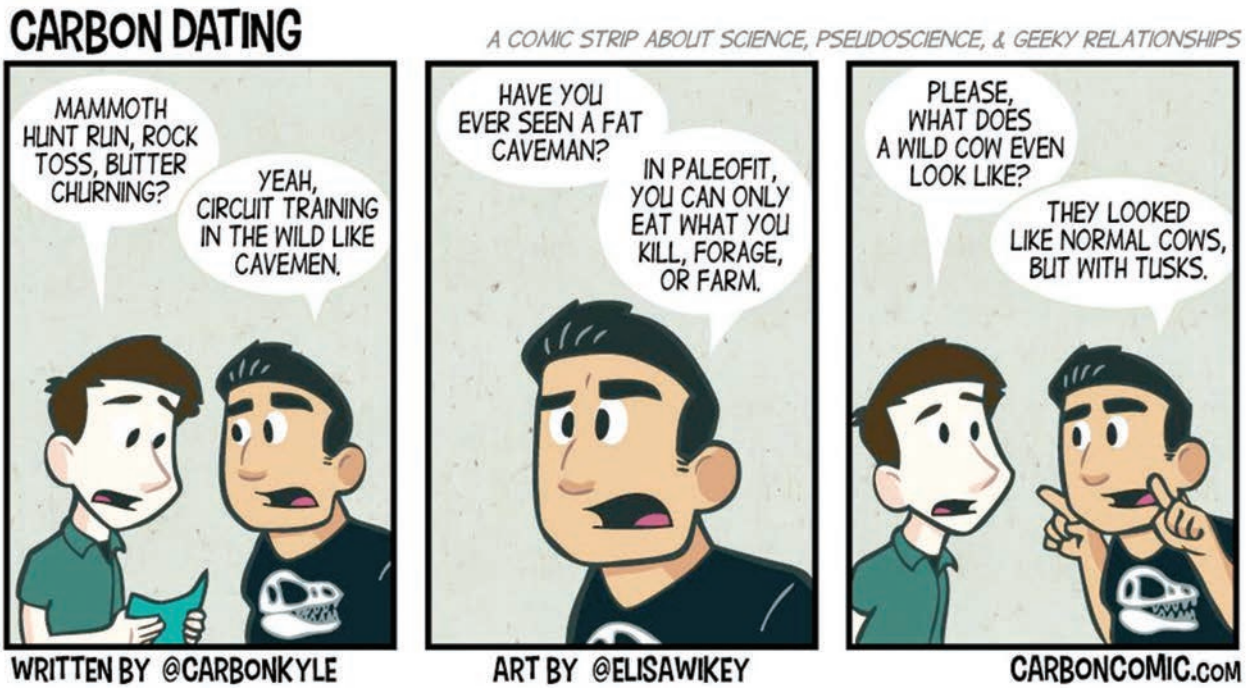
The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words**. Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

SKEPTICAL ANNIVERSARIES

by Tim Farley

July 1, 1926: Parapsychologist J.B. Rhine attends a séance by spirit medium Mina Crandon (aka Margery) in Boston. His report calling her a fraud greatly angers Arthur Conan Doyle and other Spiritualists.
July 11, 1991: A total solar eclipse in Mexico produces many UFO reports—likely explained by Venus and Jupiter becoming visible during totality.
July 14, 1951: Lachlan Stuart's photo of mysterious humps in Loch Ness is taken. It is later discovered the location is too shallow for any sort of "monster" to have been there.
July 26, 1971: *The New York Times* publishes an article by Pulitzer Prize winner James Reston titled "Now, About My Operation in Peking," which is credited with widely popularizing acupuncture in America.
August 7, 1926: G. Kingsley Noble debunks Paul Kammerer's toad experiments supporting Lamarckian evolution in an article in *Nature*. Scandal erupts, and Kammerer later commits suicide.
August 10, 1901: The "Ghosts of Versailles" incident, in which two British tourists claim to have seen characters from the past (including Marie Antoinette), occurs on the grounds of Versailles.
August 13, 1956: The Lakenheath-Bentwaters UFO incident in England begins. Involving reports from RAF and USAF personnel, it is one of the few incidents considered "genuine" in the Condon Report.
August 17, 2006: Irish company Steorn runs an ad in *The Economist* claiming to have an invention that would solve the world's energy problems. Ten years later, the world is still waiting.
August 18, 1986: An *amicus curiae* brief on behalf of seventy-two Nobel Laureates is filed in the *Edwards v. Aguillard* case (on the teaching of creationism in public schools in Louisiana).
August 20, 1976: Several men on a camping trip near Allagash, Maine, report their abduction by aliens.

Tim Farley is the creator of the website whatstheharm.net and blogs at skeptools.com. He is a past fellow of the James Randi Educational Foundation.



Committee for Skeptical Inquiry

Scientific and Technical Consultants

Gary Bauslaugh,
writer and editor,
Victoria, B.C., Canada

Richard E. Berendzen,
astronomer, Washington, DC

Martin Bridgstock,
senior lecturer, School of Science,
Griffith Univ., Brisbane, Australia

Richard Busch,
magician/mentalist, Pittsburgh, PA

Shawn Carlson,
Society for Amateur Scientists,
East Greenwich, RI

Roger B. Culver,
prof. of astronomy, Colorado State Univ.

Felix Ares de Blas,
prof. of computer science,
Univ. of Basque, San Sebastian, Spain

Nahum J. Duker,
assistant prof. of pathology,
Temple Univ.

Taner Edis,
Division of Science/Physics
Truman State Univ.

Barbara Eisenstadt,
psychologist, educator, clinician,
East Greenbush, NY

William Evans,
prof. of communication,
Center for Creative Media

Bryan Farha,
prof. of behavioral studies in
education, Oklahoma City Univ.

John F. Fischer,
forensic analyst, Orlando, FL

Eileen Gambrill,
prof. of social welfare,
Univ. of California at Berkeley

Luis Alfonso Gámez,
science journalist, Bilbao, Spain

Sylvio Garattini,
director, Mario Negri Pharmacology
Institute, Milan, Italy

Susan Gerbic,
founder and leader of the Guerilla Skepticism on Wikipedia (GSoW) project

Laurie Godfrey,
anthropologist, Univ. of Massachusetts

Gerald Goldin,
mathematician, Rutgers Univ., NJ

Donald Goldsmith,
astronomer; president, Interstellar Media

Alan Hale,
astronomer, Southwest Institute for Space
Research, Alamogordo, NM

Clyde F. Herreid,
prof. of biology, SUNY Buffalo

Sharon Hill,
geologist, writer, researcher, creator and
editor of the *Doubtful News* blog

Gabor Hrasko,
chairman of the European Council of Skeptical Organizations (ECSO), president
of Hungarian Skeptics

Michael Hutchinson,
author; Skeptical Inquirer
representative, Europe

Philip A. Ianna,
assoc. prof. of astronomy,
Univ. of Virginia

I.W. Kelly,
prof. of psychology, Univ. of Saskatchewan,
Canada

Richard H. Lange,
MD, Mohawk Valley Physician
Health Plan, Schenectady, NY

William M. London,
California State Univ., Los Angeles

Rebecca Long,
nuclear engineer, president of Georgia
Council Against Health Fraud, Atlanta, GA

John R. Mashey,
computer scientist/executive (Bell Labs, then
Silicon Valley), analyst of climate-change
denial, contributor to *DeSmogBlog* and
Skeptical Science,
Portola Valley, CA

Thomas R. McDonough,
astrophysicist, Pasadena, CA

James E. McGaha,
astronomer, USAF pilot (ret.)

Joel A. Moskowitz,
director of medical psychiatry, Calabasas
Mental Health Services, Los Angeles

Matthew C. Nisbet,
associate professor of communication
studies, public policy, and urban affairs at
Northeastern University

Julia Offe,
neurobiologist, science journalist, creator
of German Science Slam

John W. Patterson,
prof. of materials science and
engineering, Iowa State Univ.

James R. Pomerantz,
prof. of psychology, Rice Univ.

Gary P. Posner,
MD, Tampa, FL

Tim Printy,
amateur astronomer, UFO skeptic, former
Navy nuclear reactor operator/division chief,
Manchester, NH

Daisie Radner,
prof. of philosophy, SUNY Buffalo

Robert H. Romer,
prof. of physics, Amherst College

Karl Sabbagh,
journalist, Richmond, Surrey, England

Robert J. Samp,
assistant prof. of education and
medicine, Univ. of Wisconsin-Madison

Steven D. Schafersman,
asst. prof. of geology, Miami Univ., OH

Chris Scott,
statistician, London, England

Stuart D. Scott Jr.,
associate prof. of anthropology,
SUNY Buffalo

Erwin M. Segal,
prof. of psychology, SUNY Buffalo

Carla Selby,
anthropologist / archaeologist

Steven N. Shore,
prof. of astrophysics, Univ. of Pisa, Italy

Waclaw Szybalski,
professor, McArdle Laboratory, Univ.
of Wisconsin–Madison

Sarah G. Thomason,
prof. of linguistics, Univ. of Pittsburgh, PA

Tim Trachet,
journalist and science writer, honorary
chairman of SKEPP, Belgium

David Willey,
physics instructor, Univ. of Pittsburgh, PA

Affiliated Organizations | United States

ALABAMA

Alabama Skeptics, Alabama. Emory Kimbrough. Tel.: 205-759-2624. 3550 Watermelon Road, Apt. 28A, Northport, AL 35476

ARIZONA

Tucson Skeptics Inc. Tucson, AZ. James McGaha. Email:mcgaha@skepticus.com. 5100 N. Sabino Foothills Dr., Tucson, AZ 85715

Phoenix Area Skeptics Society (PASS) http://phoenixskeptics.org Email: phoenixskeptics@gmail.com

Phoenix Skeptics, Phoenix, AZ. Michael Stackpole, P.O. Box 60333, Phoenix, AZ 85082

CALIFORNIA

Sacramento Organization for Rational Thinking (SORT) Sacramento, CA. Ray Spangenburg, co-founder. Tel.: 916-978-0321; Email: kitray2@comcast.net. PO Box 2215, Carmichael, CA 95609-2215 http://home.comcast.net/~kitray2/site/

Bay Area Skeptics (BAS) San Francisco–Bay Area. Eugenie C. Scott, President. 1218 Miluia St., Berkeley, CA 94709. Email: scott@ncse.com. www.BASkeptics.org

Independent Investigations Group (IIG), Center for Inquiry–Los Angeles, 4773 Hollywood Blvd, Los Angeles, CA 90027. Tel.: 323-666-9797. www.iighq.com

Sacramento Skeptics Society, Sacramento. Terry Sandbek, President. 4300 Auburn Blvd. Suite 206, Sacramento CA 95841. Tel.: 916 489-1774. Email: terry@sandbek.com

San Diego Association for Rational Inquiry (SDARI) President: Tom Pickett. Email: pickett.thomasj@gmail.com. Program/general information 619-421-5844. www.sdari.org. Postal address: PO Box 623, La Jolla, CA 92038-0623

CONNECTICUT

New England Skeptical Society (NESS) New England. Steven Novella M.D., President. Tel.: 203-281-6277; Email: board@theness.com. 64 Cobblestone Dr., Hamden, CT 06518 www.theness.com

D.C./MARYLAND

National Capital Area Skeptics NCAS, Maryland, D.C., Virginia. D.W. "Chip" Denman. Tel.: (240) 670-6227. Email: ncas@ncas.org. PO Box 8461, Silver Spring, MD 20907-8428 http://www.ncas.org

FLORIDA

Tampa Bay Skeptics (TBS) Tampa Bay, Florida. Rick O'Keefe, contact person. Tel.: 813-505-7013; Email: tbs@centerforinquiry.net. c/o O'Keefe, 4011 S. Manhattan Ave. #139, Tampa, FL 33611-1277. www.tampabayskeptics.org

ILLINOIS

Rational Examination Association of Lincoln Land (REALL) Illinois. Bob Ladendorf, Chairman. Tel.: 217-546-3475; Email: chairman@reall.org. PO Box 20302, Springfield, IL 62708 www.reall.org

Chicago Skeptics Jennifer Newport, contact person. Email: chicagoskeptics@gmail.com. www.chicagoskeptics.com

LOUISIANA

Baton Rouge Proponents of Rational Inquiry and Scientific Methods (BR-PRISM) Louisiana. Marge Schroth. Tel.: 225-766-4747. 425 Carriage Way, Baton Rouge, LA 70808

MICHIGAN

Great Lakes Skeptics (GLS) SE Michigan. Lorna J. Simmons, Contact person. Tel.: 734-525-5731; Email: Skeptic31@aol.com. 31710 Cowan Road, Apt. 103, Westland, MI 48185-2366

Tri-Cities Skeptics, Michigan. Dr. Gary Peterson. Tel.: 989-964-4491; e-mail: peterson@svsu.edu. www.tcskeptics.blogspot.com

MINNESOTA

St. Kloud Extraordinary Claim Psychic Teaching Investigating Community (SKEPTIC) St. Cloud, Minnesota. Jerry Mertens. Tel.: 320-255-2138; Email: gmertens@stcloudstate.edu. Jerry Mertens, Psychology Department, 720 4th Ave. S, St. Cloud State Univ., St. Cloud, MN 56301

MISSOURI

Skeptical Society of St. Louis (SSSL) St. Louis, Missouri. Michael Blanford, President. Email: info@skepticalstl.org. 2729 Ann Ave., St. Louis, MO 63104 www.skepticalstl.org

St. Joseph Skeptics
P.O. Box 8908
St. Joseph MO, 64508-8908

NEVADA

Reno Skeptical Society, Inc., Brad Lutts, President. Tel.: (775) 335-5505; Email: info@RenoSkeptics.org. 18124 Wedge Parkway #1052 Reno, Nevada 89511. www.RenoSkeptics.org

NEW MEXICO

New Mexicans for Science and Reason (NMSR) New Mexico. David E. Thomas, President. Tel.: 505-869-9250; Email: nmsrdave@swcp.com. 801 Fitch Ave., Socorro, NM 87801. www.nmsr.org

NEW YORK

New York City Skeptics Michael Feldman, president. PO Box 5122 New York, NY 10185. www.nycskeptics.org

Central New York Skeptics (CNY Skeptics) Syracuse. Lisa Goodlin, President. Tel: (315) 636-6533; Email: info@cnyskeptics.org, cnyskeptics.org PO Box 417, Fayetteville, NY 13066

OHIO

Central Ohioans for Rational Inquiry (CORI) Central Ohio. Charlie Hazlett, President. Tel.: 614-878-2742; Email: charlie@hazlett.net. PO Box 282069, Columbus, OH 43228

Cleveland Skeptics Joshua Hunt, Co-Organizer, www.clevelandskeptics.org

South Shore Skeptics (SSS) Cleveland and counties. Jim Kutz. Tel.: 440 942-5543; Email: jimkutz@earthlink.net. PO Box 5083, Cleveland, OH 44101 www.southshoreskeptics.org

Association for Rational Thought (ART) Cincinnati. Roy Auerbach, president. Tel: (513)-731-2774, Email: raa@cinci.rr.com. PO Box 12896, Cincinnati, OH 45212. www.cincinnati skeptics.org

OREGON

Oregonians for Science and Reason (O4SR) Oregon. Jeanine DeNoma, president. Tel.: (541) 745-5026; Email: wilkinsa@peak.org; 39105 Military Rd., Monmouth, OR 97361. www.04SR.org

PENNSYLVANIA

Philadelphia Association for Critical Thinking (PhACT), Bob Glickman President. 653 Garden Road Glenside PA 19038. 215-885-2089 E-mail: President@phact.org. Website: www.phact.org

TENNESSEE

Rationalists of East Tennessee, East Tennessee. Carl Ledenbecker. Tel.: (865)-982-8687; Email: Aletall@aol.com. 2123 Stonybrook Rd., Louisville, TN 37777

TEXAS

North Texas Skeptics NTS Dallas/Ft Worth area, John Blanton, Secretary. Tel.: (972)-306-3187; Email: skeptic@ntskeptics.org. PO Box 111794, Carrollton, TX 75011-1794. www.ntskeptics.org

VIRGINIA

The James Randi Educational Foundation. James Randi, Director. 2941 Fairview Park Drive, Suite 105 Falls Church, VA 22042 Email: jref@randi.org Telephone: 571-318-6530

Science & Reason, Hampton Rds., Virginia. Lawrence Weinstein, Old Dominion Univ.-Physics Dept., Norfolk, VA 23529

WASHINGTON

Seattle Skeptics
www.seattleskeptics.com

The organizations listed above have aims similar to those of the Committee for Skeptical Inquiry but are independent and autonomous.
Representatives of these organizations cannot speak on behalf of CSI. Please send updates to Barry Karr, P.O. Box 703, Amherst NY 14226-0703.
International affiliated organizations listed at www.csicop.org.

CENTERS FOR INQUIRY

www.centerforinquiry.net/about/branches

Transnational
3965 Rensch Road, Amherst, NY 14228
Tel.: (716) 636-4869

Austin
PO Box 202164, Austin, TX 78720-2164
Tel.: (512) 919-4115

Chicago
chicago@centerforinquiry.net

Indianapolis
350 Canal Walk, Suite A, Indianapolis, IN 46202
Tel.: (317) 423-0710

Los Angeles
4773 Hollywood Blvd., Hollywood, CA 90027
Tel.: (323) 666-9797

Michigan
3777 44th Street SE, Grand Rapids, MI 49512
Tel.: (616) 698-2342

New York City
33-29 28th St. Astoria, NY 11106

San Francisco
email: sf@centerforinquiry.net

Tampa Bay
4011 S. Manhattan Ave. #139, Tampa, FL 33611-1277
Tel.: (813) 505-7013

Washington, DC
1020 19th Street., NW, Suite 425
Washington, DC 20036
tel.: (202) 629-2403

Argentina
Buenos Aires, Argentina
alejandroborge@gmail.com
www.cfiargentina.org

Canada
55 Eglinton Ave. East, Suite 307
Toronto, Ontario, M4P 1G8, Canada

China
China Research Institute for Science Popularization,
NO. 86, Xueyuan Nanlu Haidian Dist., Beijing,
100081 China
Tel.: +86-10-62170515

Egypt
44 Gol Gamal St., Agouza, Giza, Egypt

France
Dr. Henri Broch, Universite of Nice, Faculte des Sciences, Parc Valrose, 06108, Nice cedex 2, France Tel.: +33-492-07-63-12

Germany
Arheilger Weg 11, 64380 Rossdorf, Germany
Tel.: +49-6154-695023

India
46 Masi garh, New Friends Colony
New Delhi 110025
Tel.: 91-9868010950

London
Conway Hall, 25 Red Lion Square,
London WC1R 4RL, England

Nepal
Humanist Association of Nepal,
PO Box 5284, Kathmandu Nepal
Tel.: +977-1-4413-345

New Zealand
email: bcooke@centerforinquiry.net

Nigeria
PO Box 25269, Mapo, Ibadan, Oyo State, Nigeria
Tel.: +234-2-2313699

Peru
D. Casanova 430, Lima 14, Peru
email: cipsiperu@yahoo.com

Poland
Lokal Biurowy No. 8, 8 Sapiezynska Sr.,
00-215, Warsaw, Poland

Romania
Fundatia Centrul pentru Constiinta Critica
Tel.: (40)-(0)744-67-67-94
email: CenterforInquiry.Romania@gmail.com

Russia
Dr. Valerii A. Kuvakin, 119899 Russia, Moscow,
Vorobevy Gory, Moscow State Univ.,
Philosophy Department

Senegal
PO Box 15376, Dakar – Fann, Senegal
Tel.: +221-501-13-00