



Rational Inquiry

Dare
to
think

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The San Diego Association for Rational Inquiry Newsletter

WINTER, 2008

The San Diego Association for Rational Inquiry (SDARI) is dedicated to the encouragement of rational thought in all areas of human affairs. Composed of citizens from every walk of life, and with a variety of technical, scientific, legal, and humanistic backgrounds, the association strives to encourage rational discourse in the life of San Diego. For more information, see page seven.

Editor Needed!

We are looking for a person who is willing to become editor. The position is presently vacant. The newsletter has been published quarterly in the past, and we would like to maintain this schedule.



How Science Works Is a theory *just* a theory, or ...?

By Edvard A. Hemmingsen

Rational approaches for exploring the natural world go back thousands of years, but not until the Renaissance period did science begin to develop effective tools for this exploration. Making observations, often with newly developed instruments, then moved into the foreground as an effective way to learn about phenomena and features that surround us, starting the scientific revolution. The observation-based *inductive* method for such inquiries, commonly referred to as the scientific method, has been spectacularly useful for these endeavors. In just the tiny span of human history in which the method has existed, it has transformed our knowledge and understanding of natural processes to a degree that is almost unfathomable, even to experts in their field. Historically, it was preceded by the *deductive* method, for which logic rather than facts or evidence is the authority. Thus logic is deemed sufficient to develop theorems from simple axioms of truths. The recognition that it could not be applied to many problems in nature, and that axioms may not be truths, led to the modern dominance of the inductive method in nearly all areas of science, outside of theoretical physics and mathematics. Yet, deductive reasoning remains part of the inductive method.

The scientific method is simple in principle. It is taught in many science classes in schools and colleges, viz., (1) observe some aspect of nature; ask questions; define

what needs to be answered; (2) develop a hypothesis to explain the observations; (3) do experiments and make observations suitable to test the hypothesis; and (4) further test it by making specific predictions; go back to (2) if the tests fail to support the hypothesis or predictions based on it.

However, budding scientists soon discover that this scheme is too simplistic. Because scientific knowledge is cumulative and ever expanding, projects often do not have a clear beginning or a clear end. Finishing one study just tends to raise more questions. In practice, the scientific method is more of an evolving process and a way of reasoning than it is a formal method. Certainly, not all scientists work in the same way. The rapid expansion of knowledge, the diversity and complexity of solved and unsolved inquiries, the specializations into ever narrower fields, and other factors have led scientists to follow different paths in order to answer the questions they first posed. However, in the end, the results and conclusion are rigorously scrutinized by using the accepted rules of science, and they are accepted or rejected.

A scientific inquiry often starts with an idea precipitated by curiosity, questions, speculations, or intuition based on experience. This early thought process may not be subject to formal, rational boundaries. Knowledge related to, or surrounding, the idea is taken into account. Postulates may be made, with "if ... then ..." scenarios tested. The probabilities of

various outcomes are assessed. And so forth.

From this informal thought process emerges a hypothesis. This is a bit more than an educated guess, but still a tentative proposition to be verified. Real evidence and observation must be considered in evaluating the ideas behind the hypothesis. The hypothesis gradually moves from working assumptions and becomes more formal and explicit. It is discussed with colleagues and peers. An unreasonable hypothesis rarely survives this step.

Resources to test a reasonable hypothesis are needed. Peer reviews will be required. The persons, institutions or agencies that may provide financial support want assurance that the hypothesis has merit. Preliminary experiments may provide such assurances. Experimental methods and procedures are designed, and a research plan laid out.

If all goes well, the scientist moves from this most creative phase into making observations or doing experiments. It is essential that replications of the experiments yield identical or very similar results after extraneous factors are minimized or eliminated, and that bias is avoided throughout the process. Questions are asked constantly: How good are the experimental designs and, hence, the data obtained? Do the findings support or contradict data from other related studies? Can the experiments be repeated by others? Finally, when the data have been analyzed, and the hypothesis has been thoroughly tested, conclusions are drawn. To gain final

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Scientific Method

(Continued from page 1)

acceptance, the hypothesis must be *falsifiable*, i.e., it should be possible to test it to demonstrate whether it is true or false when it is challenged by evidence.

If a hypothesis holds up after the extensive scrutiny that follows publication in peer-reviewed professional journals and in public reports, by presentations as lectures to scientists, it is accessible for evaluation in other ways, and if it is found useful in a larger context, it becomes not only acceptable, but may reach the status of validated theory. This process certifies that the theory has a solid foundation of experiments, it is not contradicted by any relevant scientific evidence, and it is in principle approved by the broad scientific community. Details may be argued, and new evidence later may lead to modifications.

The move from a hypothesis to a theory is a small jump in concept, but a larger jump in the solidity of their foundations, or how the solidity is perceived. A theory usually takes form over time as it emerges from a well-supported hypothesis, or groups of hypotheses, that have been confirmed repeatedly. A broader theory only rarely will be derived from the knowledge gained in an individual study nowadays, but to be involved in developing a theory is the aspiration of every scientist. Yet, reaching this goal is not the end; refinements and expansions will continue to strengthen the general validity of the theory. The beauty of a scientific theory is that it represents the best explanation possible using all the known relevant facts. It is the explanation of related observations usually verified multiple times by researchers in independent laboratories. But regardless how well theories are justified and verified, they can never be used for absolute proofs. Such proofs are not part of science; only probabilities can be inferred. For example, the claim that global warming is occurring now due to carbon dioxide released from human activities is still in its infancy as a theory, though it is seen by experts in the field as having near 95 per cent probability of being correct. This theory is gaining strength steadily as more evidence that supports it is found. At times, more than one explanation may fit the same observations and experimental data. In such cases, none of the explanations can be accepted unconditionally. With additional observations and studies,

a single explanation may emerge as correct and will be challenged only if new evidence contradicting it is acquired.

Scientific theory and scientific law are similar concepts; they are sometimes used interchangeably. They differ mainly in that a theory is more encompassing and dynamic, with wider applicability, than a law. Whereas a law deals with a single phenomenon that often can be expressed with mathematical equations (e.g., Newton's Laws of motion), a theory may explain a larger group of related phenomena (e.g., the Theory of Gravity). Depending on how they are applied, a law can become a theory, and vice versa. Both can be used to make predictions.

Within the community of the classical sciences, the word *theory*, therefore, has specific connotations that convey a level of quality, certainty and acceptance. Outside this community, the meaning of *theory* becomes muddled. For example, in philosophy and philosophy-oriented fields, where hard evidence comparable to that of science may be scanty or missing, *theory* carries connotations of uncertainty or even of speculation. Even within areas considered science by most people, such as cosmology or sub-particle string physics, where theories tend to be derived by deductive means, the term is used too loosely. Here, some theories would be better termed hypotheses due to the lack hard facts and common consensus. In colloquial use by lay persons, *theory* tends to be viewed as a concept without certainty, for which there may be little evidence or factual support. It is considered to be vague and fuzzy, which, of course, is contrary to its scientific meaning.

Many fundamental scientific theories have stood the test of time in splendid fashion. For example, Newton's Theory of Gravitation, which was first used to explain and predict planetary motions, is as valid today as in 1687 when it was published, though, Einstein's Theory of Relativity supercedes it in certain cases involving space and time. Dalton's Atomic Theory from 1805 remains as correct today as when it was proposed, even though it has undergone major expansions and now offers a much more detailed and sophisticated description of atoms, their structure and properties. Darwin's Theory of Evolution, of fundamental stature in biology, was based on

strong evidence for natural selection when it was first published in 1859. Since then it has been shown repeatedly by numerous scientists to be the only rational explanation for all of the observed facts. It may be the most tested of all scientific theories, as it has shown its usefulness in all areas of biology, e.g., taxonomy, ecology, physiology, microbiology, biochemistry and genetics. Modern genetics has made marvelous strides in explaining how organisms are interrelated and have developed from one form to another, a fact not yet generally appreciated by the lay public. Wegener's Continental Drift Theory is another example of a radical new idea that met a lot of doubts when first proposed, even though it, like Darwin's theory, explained all relevant observed phenomena. Continental drift is now part of the more expansive Theory of Plate Tectonics. Darwin's and Wegener's contributions have become accepted without any doubts by the *scientific* community, as well as by most of the world.

Unintentional errors and misguided experiments or conclusions are part of the scientific process on occasion, but usually, these get weeded out in the early stages of the process. In some cases, deliberate fraud has been used by individuals. These may slip by the oversight process – for a while. Fortunately, the safeguards embedded in the scientific method eventually catch the fraud, a reassuring thought. If a claim or discovery appears to have merit and to offer a contribution that may be of clear significance, it will either be repeated by others, or stay around until other studies that depend on the claims reveal that they are, in fact, wrong. A scientist grudgingly will admit to an embarrassing inadvertent error, but all would abhor the disgrace of being caught in fraud. The demand for total honesty in the profession has been a crucial factor in bringing us the marvelous knowledge that we now have about nature, and the exponential expansion of such knowledge we can look forward to in the future.

The author is an Emeritus Physiologist at UCSD and editor of *Rational Inquiry*.



The SDARI Social Hour

Some of the active members of SDARI meet for conversation before our public lectures; often the evening's speaker joins us. We meet at 6:00 p.m. in our regular meeting room at the Joyce Beers Center. Please join us. Bring your own dinner or snacks.



We notice that many of our members are avid readers of books concerning philosophy, religion, politics, science and almost everything else. Opinions about the more interesting books are often brought out during our social gatherings. Some members are generous enough to bring their "collections" to our meetings for other to peruse or borrow.

We are encouraging these readers to take the time to write short book reviews for *Rational Inquiry* so that their opinions can be shared with a wider audience. We also like to remind our members that articles in the form of essays, as well as interesting notes and news items are welcome submissions. Without such contributions, the editor's work becomes more difficult. ■

The Amazing Meeting 6

will take place June 19-22, 2008, at Flamingo Hotel & Casino, Las Vegas. The event is held every year by James Randi's organization JREF. The theme this year will be *I, Skeptic: Modern Skepticism in the Internet Age*. Speakers will include James Randi, Dr. Neil DeGrasse Tyson, Matthew Chapman, Sharon Begley, Penn & Teller, Dr. Richard Wiseman, Dr. Michael Shermer, Adam Savage and Steve Novella, and many more. There will also be a number of workshops and shows. Registration is \$450 for non-members and \$375 for JREF members, before April 21. The event is recommended by this Editor, a previous participant. More information about the meeting can be found on JREF's website: www.randi.org. ■

Rational Musings by the President

Do you like being lied to? Do you enjoy being deceived? Do you find it entertaining to have your time wasted by nonsense? Then Skepticism is not for you.

When I see, in the TV listings, another one of these documentaries on, for example, the Bermuda Triangle, it really annoys me. The Bermuda Triangle myth has been thoroughly debunked, but they won't tell you that in the documentary. They claim it's entertainment, but they've stolen an hour of your time and given you only lies in return. Hardly a fair trade.

It's sad to see all the time and resources wasted on ghosts, UFOs, crop circles, ESP, the Bermuda Triangle, and such. I recently read an interesting article in the June/July 2007 *Free Inquiry* magazine (yes, I'm a little behind in my reading) about Truth, written by Ophelia Benson. She suggested that if you could find twenty people who would be willing to claim that the Earth orbits Jupiter, the media would cover it as though it were a genuine controversy, giving both sides equal time.

At first glance, giving everyone equal time seems fair. But think about all the crackpots and wacky ideas floating around, and imagine what would happen if we gave them all "equal time". It would be a colossal waste of time, time that could be spent finding real solutions to real problems, time that could be spent on pursuits that actually improve our quality of life. It is both necessary and desirable to know which issues and ideas are worth our time, and which are not.

Why do skeptics and scientists reject supernatural explanations and look for natural explanations to explain everything? Sadly, large segments of the public don't know the answer to this question.

One reason why they don't know the answer is propaganda. The public is told over and over again that scientists and skeptics are dogmatic and biased, and that science's facts and truths are no better than anyone else's facts and truths. This was well illustrated in a recent interview with Jonathan Wells (a proponent of Intelligent Design). The interviewer asked how one decides between competing scientific

theories, and Wells responded, "I would not trust the consensus of the experts, as I wouldn't trust the consensus of experts on almost any other topic." I've heard this "don't trust the experts" nonsense before, and it's just stupid. I guess you should ignore your dentist, your mechanic, and your plumber, because they are "experts". Dr. Wells is advising us not to trust Dr. Wells. Really dumb—but some people buy it!

Perhaps the main reason people don't understand why we reject the supernatural in favor of the natural is ignorance of the history of science (and the history of Skepticism). Mathematician Jason Rosenhouse wrote, "it has never once happened that supernatural hypotheses have led to scientific progress." Astrophysicist Neil DeGrasse Tyson does an interesting presentation (you can watch it on the "Beyond Belief 2006" website) of great minds who have invoked the supernatural when they could not solve a problem. The natural explanations were discovered later by other scientists, but much time was lost because the supernatural explanations halted further inquiry. The history of science clearly demonstrates that supernatural explanations produce nothing useful, are eventually replaced by natural explanations, and that natural explanations allow us to manipulate matter and energy and make incredibly accurate predictions with tremendous success. In other words, the exclusive use of natural explanations is a strategy that leads to success in science, while resorting to supernatural explanations is a strategy that leads to failure.

One last thing, I was pleasantly surprised by a two-hour documentary, titled *The Kennedy Assassination: Beyond Conspiracy*, that was shown on the History Channel. Using the Zapruder film, a 3-D virtual re-creation of the event was created and analyzed. It demonstrated conclusively that John F. Kennedy was shot by Lee Harvey Oswald. The program then went on to debunk all the other conspiracy theories. It was refreshing! We can only hope that this will be the beginning of a trend on TV—telling the truth.

Paul Wenger.



From the Editor's Desk

The Science Fair is almost upon us. The Greater San Diego Science and Engineering Fair for senior and junior high school students will be held in the Activity Center in Balboa Park the week of April 1st. SDARI is participating the judging and awarding of prizes for the eighth consecutive year. SDARI will award prizes to students who present projects of scientific merit, and in particular deal with the rational testing of pseudoscientific claims, discrediting of irrational thinking, and testing claims of authorities. This is SDARI's main effort to encourage rational thinking among our youngsters. Our prize winners will be invited to our April meeting to pre-

sent their projects and receive their prizes. Barbara Hemmingsen is the Chair person of our Science Fair Committee. If you are willing to help judge on April 2nd, please contact her. We are also hoping for donations to SDARI's Science Fair Prize fund.

The Earthworks Fair takes place on Sunday, April 20, 2008, from 10 am to 5 pm in Balboa Park. SDARI will again have a table there to disseminate information about our organization to the general public. We have attracted new members by our participation in the past. Paul Wenger and Walter Carver are organizing this event for us. They will be manning the table, distributing printed information, and talking with people. They do need help, and they would ap-

preciate the participation of some of our members. Please contact Paul. It is important that SDARI has this exposure, and it is a lot of fun as well.

SDARI's Board of Directors met on February 3, 2008, to discuss this year's operations. Several very interesting speakers have been lined up for our monthly meetings, and other speakers were proposed. We can look forward to an exciting year. The first two speakers will be Vanessa Cooney of Planned Parenthood and Tory Christman, a previous member of the Scientology church. The Board also decided to continue its participation in the Science Fair and the Earthworks Fair this year.

My One and Only Magic Trick

By Keith Taylor

Nothing fascinates, or baffles, me more than magic tricks. I can watch magician after magician pull the same trick without catching on. That fascination led to my buying a magic kit, all sorts of tricks in there. Unfortunately once I learned how mundane the trick was I got bored with it. So did the grandies. Each said, "Oh papa that was a trick." I hope they forgot my inept performance, but not that it was a trick.

I thought of that some time back when I read an article in *Skeptical Inquirer*, by Massimo Polidoro. Polidoro told of how the hero of all skeptics, James Randi, pulled off the trick of reading what was sealed in an envelope.

How satisfying it is to do that and get the recognition that goes along with it! I did that once, long ago, and I'm proud of it. I have to be. It was the only trick I originated. My career as a magician wasn't quite as illustrious as Randi's, but it was satisfying nonetheless. It consisted of merely one whiz-bang trick. Best of all it was improvised right on the spot.

I was an insurance agent, and had a knack of figuring out approximate rates

in my head rapidly. This was in the days before hand held calculators would enable us to figure them out precisely. Once an educated guess made in a sales pep meeting was so close to the actual figure my boss figured I might be some kind of mathematical genius. All I was doing was applying a bit of common sense.

I let a mediocre sales performance dispel that notion. Still I had my big day, thanks to a hand held calculator. I was one of the first to buy one of the things in the early 1970s. It was a nifty Texas Instrument thing that cost nearly a hundred bucks and seldom made it past a week before it crapped out. My boss and I were enjoying a beer in one of San Diego's finest taverns. On a whim I punched my boss's phone number into memory.

Then I cleared the display and handed him the calculator.

"Punch in your age," I told him. He did. Then I told him to multiply that by his wife's age. We were underway. I had him do such things as "add the year that Columbus discovered America, subtract the games you think the Padres will win next year. Up and down we'd go. It didn't matter that some of the numbers were random or something only he could have known. This was magic at its best.

If the number got close to overloading the display I'd have him take the

square root of it. Adding, multiplying, subtracting. I'd have had him put in the Gettysburg Address if the calculator would have accepted it, and if I thought he had heard of it.

Finally I said, "Now let's total it all up." I reached over and hit memory recall, MR on the calculator.

Up popped his phone number.

I think thereafter he worried that I was just too smart to sell insurance. My performance as a salesman, or perhaps as a beer drinker, bore that out.



New Foundation of Interest

Richard Dawkins, the noted author and speaker, has established a new tax exempt foundation: The Richard Dawkins Foundation for Reason & Science (A Clear-thinking Oasis). The website is <http://richarddawkinsfoundation.org>. The website has a number of videos available for viewing free with Quicktime as well as DVDs for purchase. The videos present lectures, discussions and interviews. Articles are also available. Dr. Dawkins is a forceful and eloquent writer and speaker who has many fans here in San Diego and around the world.



Membership Application

I would like to join the San Diego Association for Rational Inquiry. Enclosed is my annual membership fee of \$20 (\$12 for students, seniors, and disabled people, \$6 if younger than 18). Name: Address: City: State: Zip+4: Special interests: Expertise: Mail to: San Diego Association for Rational Inquiry P. O. Box 623 La Jolla, CA 92038-0623 Phone: Email: For information contact contact Keith Taylor at 619-421-5844, or see our Website at sdari.org

We need your support! Please renew your membership. It costs to print and mail this newsletter and promotional fliers, award Science Fair prizes, and occasionally, to defray a small expense for the speaker. The membership gives moral support for our cause. SDARI has been granted federal tax exempt status. Donations are deductible under section 170 of the Internal Revenue Code.

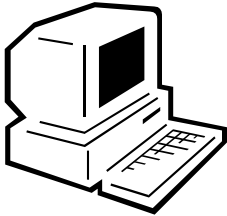
Lecture Schedule and Meeting Location

Public lectures are held at 7 p.m. on the fourth Sunday of the month (except December). The location of all meetings is the Joyce Beers Community Center, Vermont Street, 2 blocks north of University Ave., in the Hillcrest area. (The Center is near Ralphs and Trader Joe's markets in Uptown District Shopping Center. The parking is free, but please park underground).

The lectures are free, but a donation of \$5 is suggested.

Submission of Manuscripts Articles, essays book reviews and other written material may be submitted to Rational Inquiry. Pertinent announcements and clippings are welcome also. The submissions are subject to editing and abridgement. The approval of the author(s) will be sought for changes that materially affect the content. The Editorial Board, as appropriate, may evaluate each submitted work before publication for its suitability. Published material becomes the property of SDARI unless copyrighted by the author. Submitted articles that contain copyright material must have the permission from the copyright owners before publication. Such permission must be submitted to the editor in writing. Anonymous material will not be considered. Please send the material for publication (preferably on a medium compatible with Microsoft Windows) to: San Diego Association for Rational Inquiry P. O. Box 623 La Jolla, CA 92038-0623

Visit the webpage of SDARI to get the latest information on lectures and other events sponsored by the Association. You also will find other interesting facts and links to other organizations with goals similar to, or related, to ours. The Webmaster is Harry Sutton. We are at sdari.org



**The San Diego Association
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***We are on the Web!*
sdari.org**



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Up-coming events

in the **Joyce Beers Community Center** (See page 5 for directions):

Sunday February 24, 2008.

6 p.m. Pre-meeting social hour.

7 p.m. Lecture: Vanessa Cooney, *Politics of Choice: The War on Science*. Ms. Cooney is the Grassroots Coordinator for Planned Parenthood of San Diego and Riverside Counties.

Sunday March 23, 2008.

6 p.m. Pre-meeting social hour.

7 p.m. Lecture: Tory Christman, *Scientology, Is it a Religion, a Cult, or a Scam?* Ms. Christman was a scientologist before she left this church.

Sunday April 27, 2008.

6 p.m. Pre-meeting social hour. Free pizzas and sodas for all.

7 p.m. Lecture: The Science Fair student winners of the SDARI Awards for 2008 will receive their prizes. The students will present and answer questions about their projects. Dr Elie Shneour will be Master of Ceremony.

