

ANOMALIES

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The Philosophical Club of Cleveland, March 24, 2009

If we do not expect the unexpected, we will never find it. (Heraclitus)

Not long ago, a fellow scientist asked me why I was interested in weird stuff such as psychic phenomena. After all, he said, there is plenty of information and ideas out there in all fields of science that can occupy as many hours as you have available. It was a good question. I think there are four parts to my answer.

1. I consider science to be an attitude toward the world, not just a way to explain things with accepted methods. I try to construct models about areas that are not treatable with established scientific theory. Some areas may be weird, but they are real.
2. I believe that hints about tomorrow's settled knowledge keep appearing to us in today's unexplainable observations. This has certainly been true in the past, and there is no reason it shouldn't be true in the future.
3. My work history has helped form this point of view, as I will explain.
4. Finally, I seem to be getting older. Questions of a religious nature, about who we are and the universe we inhabit, have gradually become more interesting to me than digging deeper into well defined fields.

This is why I'm going to talk about anomalies -- facts or observations or data that deviate from the expected well in excess of normal variation. Let's start with three examples.

The first is from my work life, much of which was research and development in chemical catalysts for the process industries. Catalysts are typically small particles or tablets or honeycombs that contain active catalytic metals or oxides, and over which flow heated gases or liquids. The catalysts bring about chemical reactions of interest. In one specific case about 35 years ago, we were trying to improve a standard formulation of a petroleum desulfurization catalyst by adding a new component to the mix. We decided to prepare lab batches with 1, 2, 3, 4, and 5% of this component added. Preparation involved mixing the aqueous solutions, impregnating powder with the solutions, drying, forming pellets, and heating to a high temperature to form the oxides.

The five samples were then tested in a lab scale reactor. Results were puzzling. Virtually no improvements or differences were seen among four of the five samples, but the 4% sample gave significantly better results. We retested it, and again got superior results. Then we remade another 4% sample by the standard procedure and got no improvement. Three weeks had elapsed and Marketing wanted to know what was going on, as did we. I'll finish the story a bit later.

The second example is part of industrial history. In 1938, Roy Plunkett of DuPont in a New Jersey lab was looking for uses of Freon gases, in particular tetrafluoroethylene. He had compressed a sample and refrigerated it. Surprisingly, the sample turned into a white waxy solid with unusual properties after polymerizing spontaneously.

The third example is one of the best known examples of psychic or telepathic communication. It is very common for an identical twin to immediately sense a traumatic event experienced by the other twin, whatever the distance between them. I have spoken with an identical twin about this, and some of you probably have also. This is not the same as the many documented cases where twins separated at birth show many of the same life choices and habits years later. Most such observations are reasonably explained by genetics. My focus is on the instant communication experienced between identical twins, most evident at times of death or severe physical injury of one twin. In one study, about 30% of twins interviewed reported this occurrence. Obviously, genetics sets the stage for the communication, but current physics and biology have no explanation as to how it happens.

These three quite different observations are *apparent* anomalies, two from industry and one from everyday life. If the subject is of interest, most of us would first attempt to determine if the anomaly is real.

Perhaps the most frustrating fact about apparent anomalies is that most of them are not real. They are mostly flawed observations or data caused by human errors, wishful thinking, faulty instruments, inaccurate memory, statistical aberrations, or just plain fraud. These probably total well over 90%. So, the first task is to check and recheck the data. Discard the 90+% that aren't real, and move on.

This is the critical point where many people take a wrong turn. *They also dismiss data because the data don't fit existing models.* They lose the potential value of having an anomaly offered to them. If you are pursuing commercial objectives, one of the first things to do is write a patent disclosure even if you have no idea what is going on. The anomaly could be worth a lot of money.

How prevalent are real anomalies in the working world? I did a brief review of my 30 years in industry, where I mostly did product development, process design, and applied research. I selected my ten best accomplishments and listed the primary reason for each one. The reasons included appropriate use of theory and literature, reasoning by analogy, improvements in instruments and methods, and collaboration with other disciplines. These accounted for seven of the ten successes. The other three were based on attention to anomalies. 30% is a significant portion.

My first example was one of those. We established that one sample out of five prepared gave superior performance when tested a second time, but a duplicate batch made according to the same instructions did not. With the instruments available to us, we could not see any significant chemical difference between the superior sample and the ordinary one. Finally, we got everyone together who worked on the project and talked it through. The technician who prepared the samples looked through his notebook and discovered he had left early for a doctor's appointment the day he started the superior sample, and the mixture was not dried until morning. Aha! There must be some aging process where the catalyst is improved by delaying the drying step. More samples were prepared based on this new knowledge, and all were superior whether or not the new component was included. I don't recall if we ever understood what happened during the aging step, but the resulting product added millions of dollars to the company's sales. All because of a doctor's appointment.

Incidentally, technicians and other non-degreed people are often better at calling attention to anomalies than highly educated professionals. Forty years ago I was in charge of a research team trying to develop a new rechargeable battery. We had a roomful of test stands where various battery compositions were being recycled 24 hours a day. Each stand had a strip chart that recorded the declining voltage of the test cell with time. One morning a mechanical technician wandered through the lab and asked what certain spikes meant on the charts. He thought they may be short circuits, and perhaps we should modify a few things to get meaningful test results. The team of PhD's around me didn't think much of the comment until they dug deeper and found he was right. We made the changes and saved a lot of time on the project.

It's not too surprising that anomalies played an important role in my work, at least in the chemical part of it, as they are sprinkled through the history of chemical technology. My second example is one of those. Most of you probably recognized the 1938 story of Teflon, although it was not marketed by DuPont until 1945. I have no idea how many tens of millions that white waxy solid added to DuPont's profits.

Here are a few other inventions in chemical technology based on unplanned accidents and unusual observations. Some of them were partially guided by the Edison method of trying everything in the lab until something good happens. Maybe we can call those outcomes planned anomalies.

In 1843 Charles Goodyear invented vulcanized rubber, by accidentally exposing natural rubber and sulfur to stove temperatures. This new product would be usable in winter, waterproof, and not melt in summer. This led to the famous patent case in court with Daniel Webster defending Goodyear.

In 1907 Leo Baekeland, a Belgian immigrant, was trying to make a better shellac and ended up with the first manufactured plastic, Bakelite.

In 1930 Richard Drew at 3M was trying to improve masking tape. He put some adhesive on cellophane and found it to be pressure sensitive. Voila, Scotch Tape.

In 1933 Ralph Wiley was a college student cleaning glassware in a Dow Chemical lab. He found a vial that had contained polyvinylidene chloride, and he could not clean it. The coating was almost impervious to air and water, and highly resistant to chemical attack. This was the beginning of Saran.

In 1952 Patsy Sherman, a research chemist at 3M, was making formulations to improve synthetic latex for aircraft fuel lines. A lab assistant dropped a bottle whose contents splashed on his tennis shoes. They couldn't remove it nor soil it. Scotchgard.

In reading about inventions I came across one that was not caused by accident but by persistence in the Edison style. In the early 1950's, Bette Graham, a secretary and single parent in Texas, was so frustrated by typing mistakes that had to be corrected that she set up shop in her kitchen with a Waring blender to find a solution. She was also an artist and thought to try tempera paints as the base. After many trials to find something that would dry quickly and could be typed over, she came up with Mistake-Out, later called White-Out. She sold her company in 1980 for \$47 million. Perhaps the more interesting story is her timing, a few short years before word processors greatly reduced the market for her product.

I'd like to note one more story of discovery, this one by a former member of this club, Ralph Gardner-Chavis. Some years ago, Ralph came upon a correlation between the catalytic activity of metals and a much older table of atomic properties of metals published in handbooks issued by the Bureau of Standards. Such a correlation was not known by researchers in the field. If the correlation held up, it would facilitate the

prediction of catalytic activity for reactions of industrial interest, eliminating a large amount of trial-and-error research. He tried to promote this finding to the chemical industry for many years without any success. A major problem was the lack of good experimental data, which required substantial financial investment and laboratory availability. Perhaps Ralph's discovery is not quite an anomaly, but rather a surprising connection between different scientific pursuits. But it resembled the treatment of anomalous inventions in his willingness to look beyond existing ways to explain things.

Anomalies have played important roles in all scientific fields. Copernicus, Galileo, and Newton all saw things that did not fit the existing world view, and most important, *they did not dismiss them*. Instead, they expanded our understanding of the universe enormously by developing new models that took account of the anomalies. A stunning example of an anomaly a hundred years ago led to quantum physics, namely the observation that photons can behave like particles or like waves, depending on the experiment conducted. To this day, this counter-intuitive duality puzzles physicists, even though the theory and practical results have been developed for a century.

There are many anomalies in the social sciences but I'm leaving them out. They are harder to pinpoint because of the variability of humans and human actions. Anomalies in fields such as economics, sociology, and political science tend to be statistical rather than single data points.

My third example is one of many observations of commonplace but strange things that have no explanation within today's science. Immediate, unspoken communication of feelings between identical twins is well known. Similar communication, but less remarkable, is reported for other siblings, mothers and children, long-time partners, and pets and their masters. If one ranks these examples in order of strength or frequency of communications, the result seems roughly in line with the degree of bonding, genetic or otherwise. However, nobody knows how it occurs, nor why it seems to occur faster than the speed of light.

Of course, there are speculative theories about these communications, but no definitive experiments. About all we know is that the communication is not electromagnetic and does not depend on distance, which are also features of other telepathic phenomena. It is only a little bit helpful to know what something is not.

In one of my earlier papers, I briefly discussed a theory that might apply to these communications. That is the concept of a universal information field or fields suggested by Ervin Laszlo. Still, it is mostly a speculation. Physics is not yet there.

I'd like to summarize a few other anomalies under the rough heading of the nonphysical universe. I've talked about all of these in previous papers.

Remote Viewing (RV). In 1998 I had a strong positive experience in describing the nature of an unknown photograph in a magazine while in a meditative state. Subsequently, Susan and I attended two sessions of RV training. We learned how the Army and CIA used highly trained remote viewers over a 20 year period in projects such as finding hostages, locating lost submarines, and exploring underground installations in the Soviet Union. In my last paper I showed a remarkable correlation of RV results from several organizations around the world with sidereal time, i.e. star time. This last result is an anomaly within an anomalous field. In my view, there is no question that the phenomenon is real, but well outside today's scientific knowledge.

Carolyn Myss. Susan and I attended a weeklong workshop with Carolyn Myss, a psychic and medical intuitive. We watched her do psychic readings on dozens of people that were remarkably accurate, on their medical histories and family events. We talked with many of those who were read and confirmed the accuracy.

Pet Dogs. I've recounted the findings of research by biologist Rupert Sheldrake about dogs who know when their masters *decide* to come home, even hundreds of miles away – at which time the dogs get up and station themselves at the door or window.

Staring Experiments. This is one you can try yourself. Three people are involved: the sitter, the starrer, and a person who signals the starrer randomly whether or not to stare at the back of the blindfolded sitter's head. The sitter guesses which. Thousands of trials have shown that sitters are about 60% right when being stared at, 50% (random) when not. More bonded couples tend to do better, strangers less. I've done this for one evening with about the same results. These results are anomalous enough. But the remarkable anomaly within the anomaly is that when the experiment was conducted by a researcher who is a nonbeliever, the results were random – i.e. no effect. The believer, Dr. Marilyn Schlitz of California and the nonbeliever, Dr. Richard Wiseman of England got together and ran the same experiments using subjects from the same pool of people. The only difference was that Schlitz and Wiseman did the staring. Hers showed the effect, his did not. This unexplained finding seems to echo the fundamental puzzle of quantum physics: for a micro event, an observer is required to collapse a probability and create a reality. Still, it is very hard to grasp that the belief of the starrer or project director can influence the data. Consider the implication for pharmaceutical research!

It's time for some conclusions, and of course, some speculation.

A scientific anomaly in one age is usually incorporated in our expanding knowledge base a generation or so later. Max Planck was reported to say that a new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die.

The successful product I was associated with 35 years ago arose out of an accidental, unplanned finding about aging of mixtures of chemicals. I haven't kept up with the field, but I would guess that researchers understand the process by now, probably helped by much better instruments. It would no longer be an anomaly.

Polymer science has grown to a major field since 1938, so the creation of hard, waxy solids like Teflon by chain reactions has long ago stopped being anomalous.

By the same token, I don't think that instant communication of feelings between widely separated identical twins will be an anomaly very long. Rather, it will take up a few paragraphs in future textbooks on the physics of consciousness. Today it still seems a bit miraculous.

When I was a young professional I thought that being scientific was about applying all those equations and techniques I had learned, still fresh in my mind, to the problem at hand. As I got older, particularly as I learned good lessons from the non-degreed people I worked with, I became more interested in taking a scientific attitude, being curious about observations. I learned to cherish, not dismiss real anomalies. The big mistake I learned to avoid is to dismiss anomalies just because they don't fit existing models. As you can tell from my remarks, that has become my attitude about psychic phenomena.

Finally, just keep in mind that anomalies will continue to be hints about tomorrow's established knowledge, as they always have been. The breakthroughs will come from those scientists who don't dismiss the hints.

I have a brief postscript for your consideration as philosophers. It's a question you might want to add to your short list of the really big ones such as: Why am I here? Is there an afterlife? Is the universe infinite? Etc. The question has at least three parts: Why do we get tantalizing hints about the universe beyond what we can capture with our senses and our instruments, why are they so few, and why are they so hard to pin down? In a more orderly universe, we might grasp only our three-dimensional world described by Newton's laws, Faraday's equations, Schroedinger's wave function, and Einstein's relativity. No evidence of psychic communication, no dogs who know when their masters decide to come home, no strange ways of identical twins. Is there a purpose behind these hints? I suggest that this question belongs on your list.