What is science? - Theory, look for evidence?

Unedited posts from archives of CSG-L (see INTROCSG.NET):

Date: Mon Feb 13, 1995 4:56 pm PST
Subject: Re: What is science?

[From Bill Powers (950213.0845 MST)]

Mark Abrams (950212 and before)
. . . .
The rest of this is for both you and Susan Schweers (950212 etc).

For me, science is simply trying to know about things in a way that is influenced as little as possible by what I want to be true, hope is true, or believe is true. Scientific methods are mainly tricks and techniques that help to keep us from fooling ourselves, which even the most famous scientists have done quite frequently. People who don't take precautions against fooling themselves, of course, do it even more frequently.

Some people think that science works this way: first you think up a theory to explain some facts; then you look for as much evidence as you can find to prove that the theory is correct.

I think that if you want to know about things, this is the worst possible way to do it. The reason is that observations need interpretation, and if you only look for support for a theory you can always find it. There are always events that can be interpreted as supporting any theory, even if there are far more that would contradict it if you looked for them.

The real paydirt in science comes when you try to _disprove_ a theory, particularly your own theory. You say "If this theory is true, then by its own logic if I do X then Y HAS TO HAPPEN." So you immediately arrange to do X, and you look very critically to see if Y happens. If it doesn't, you're finished: you've at least put the theory into deep trouble, and at best have destroyed the theory. I say "at best" because if a theory can be so easily disposed of we should do so immediately to avoid wasting any more time on it. We can spend that time more profitably in looking for a better theory.

The problem is that doing this doesn't come naturally to human beings. If we have thought up a new theory, or received it as a huge insight from some other person we think is smart and successful, we are likely to fall in love with it, to believe it, to admire it. In other words, just because we found it convincing when we first heard it or thought it up, and just because we have seen some apparent support for it, we start to BELIEVE it. Once we start to BELIEVE a theory, it becomes very difficult to get up the motivation to try to disprove it. Why should I try to disprove something that's so obviously true? And the longer we use the theory, particularly if we've build a reputation or a following on the basis of our expertise with it, if it's given us some authority or status or a nice income, the harder it gets even to think of trying to undermine it. Quite the opposite: any suggestion by someone else that there might be something wrong with the theory is most likely to result in a strong defense or an immediate counterattack.

In my idealistic view of science, a real scientist is aware of these pitfalls and of his own urge to believe once and for all, and tries to follow a path that minimizes these tendencies to self-delusion. One way to do this is to be very tough on theories, particularly one's own. You can't know whether another person is being influenced by a desire that a theory be true, but you CAN know that about yourself, if you've learned to be honest with yourself. When you come up with a theory, if you understand this problem, your first reaction is "Oh, no ... what's wrong with this idea?" It helps if you have memories (as I do) of believing in other theories with great devoutness, only to have the whole structure come crashing down. If it can happen once, it's bound to happen again if I'm not careful, or maybe even if I am, so what can I do to avoid this or at least postpone it?

One thing you can do is to keep it as simple as possible. If you can think up a simple theory like PCT in which you can do tests involving only a few variables, and make predictions in a way that clearly shows failures if they occur, and if no test you can think of (within the rules of the theory) is failed, then you're more or less forced to accept the theory, for the time being, because you just don't see any way out of it. To me, that's the ideal position to be in: where you can't think of any alternative that comes even close to explaining the phenomenon, so you're backed up into reluctant admission that this theory does seem to do the job (today).

I think the ideal scientist looks at a theory the way he looks at a used car. When I go to a used-car lot, my primary thought is that the salesman is going to try to unload a lemon on me for as much money as he can get. So if I see any car that appeals to me, I give it a very hard look, from the engine and suspension to the wear on the brake pedal. If I buy it, I know that I'm not getting all that seems to be there on the surface; somebody, after all, got rid of it, and the salesman is making his living off people like me.

So do I look at other theories, but most of all at PCT. All right now, what is this logical brain of mine trying to get away with here? It all looks very pretty on the outside, but what will happen when we set up a real situation with a real person whom we can't control, and make the theory try to predict what will ACTUALLY happen? We can explain things that have ALREADY happened, using PCT, just by talking about them in the right words. But what about predicting something that hasn't happened yet, preferably something that wasn't anticipated when the original idea came up? That, as they say, is when the metabolic product encounters the air-circulation device.

A lot of my interaction with believers in other theories has been under the assumption that other scientists have the same idealized views that I do. In the basic literature of PCT you will find lots of examples and simple demonstrations, most of them selected to make it very hard for conventional theories to explain them. If I put a random disturbance (or three independent ones) from an invisible source between a person's action and the variable that person is supposed to control, the reason is not just to test PCT (although that's always there). When the person succeeds in controlling the remote variable quite accurately despite those invisible disturbances, the message is not just that PCT predicted this ability, but that NO OTHER THEORY IN WHICH SCIENTISTS CURRENTLY BELIEVE CAN PREDICT OR EXPLAIN IT.

For a real scientist, as I think of "real", all the basic experiments and demos of PCT are challenges to alternative theories. If other theories are to be sustained, they HAVE TO DEAL WITH THESE EXAMPLES. It's no good to say, "Yeah, but look at all this other stuff that my theory explains." We're not talking about the other stuff. We're talking about simple phenomena of behavior which your theory not only can't explain, but can't even allow to happen. But here they are, happening, and you can reproduce them easily, if you want to. If you're a real scientist, you will want to, if only to find the loophole. Look at me -- how I wish I really could talk to "you" this way, you bastards.

Real scientists, I have gradually come to realize over the years, are pretty thinly scattered. Most people who call themselves scientists think that you prove a theory by showing it is right. Most of them have solid beliefs which tell them that any contrary theory is ipso facto wrong. Most of them react to criticisms of their theories by defending against them and by counterattacking.

That's only human, of course. But it's also one reason that I don't mix much with humans: it's too frustrating. I like you folks on the internet because you're here voluntarily; you're ready to look at the demos and think about them and see what they mean for other theories, and nobody is twisting your arms to do so. You're all free to conclude that it's all bullshit and pull out any moment. So if you're still here (and most of the people on the list of 135 have been following this scientific soap opera for three or four years) it must be because you're real scientists (whether you use that title or not) and are willing to be tough on theories no matter how well-established they are. I hope you're just as tough on PCT as I would like you to be on the others.

Of course there are two sides to that: if you're going to bring your pet theory to CSG-L, you have to expect that others are going to be tough on it, too. How hard have you tried to find counterexamples, to find something wrong with your theory? What's the evidence that has backed you into a corner so you can't think of ANY alternative explanation of the phenomena? I stick my neck out every time I make a claim about PCT, and I expect anyone else with an alternative theory to be equally vulnerable. That's the only kind of theorizing I can respect: the kind that is willing to let the axe fall if it's going to.

So, Marc and Susan, I've answered the implicit question you ask about science and probably a lot more you didn't ask. But you asked.

Best, Bill P.