Dormitive principles: Non-explanations

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

See also the file EMOTION for a definition and discussion of dormitive principles.

Date: Fri Feb 18, 1994 9:49 am PST
Subject: A drive to organize

[From Bill Powers (940218.0800 MST)] Bill Leach (940217.2212)

Me:

> ...largely what a baby is engaged in: creating objects and other perceptions by forming and reforming perceptual functions that produce new levels of perception that are amenable to control.

You:

> (and from elsewhere), this implies a strong organizational drive.

So you're saying that we should explain the growth of organization by positing a strong organizational drive. Using this kind of argument, we should explain the widespread ownership of automobiles by saying there is an automobile-owning drive, and the universal tendency of people to grow taller during their early years by positing a tallness drive (which varies in strength from person to person and tends to die out in the late teens).

You can always come up with what sounds like an explanation of a phenomenon by naming the phenomenon and then saying there is a corresponding drive to produce that phenomenon. This is how the Scholastics and alchemists tried to explain natural phenomena. Objects fell to earth because they had an affinity for Earth. Air rushed into an evacuated container because nature abhorred a vacuum. For each major phenomenon, there was a Principle which had the sole property of being able to produce that phenomenon. Even B. F. Skinner, with whom I have agreed about few things, saw what is wrong with this approach in his scoffing at "trait" psychology and intervening variables. To say that a man exhibits aggressive behavior because he contains something called "aggression" says precisely nothing except that the man behaves aggressively.

The early years of psychology produced endless lists of instincts, propensities, proclivities, aptitudes, tendencies, biases, preferences, characteristics, drives, and traits, each used to explain some externally visible phenomenon of behavior. This approach has predominated in psychology and other fields of behavioral science -- even Skinner himself had to fall back on it, when he explained the fact that some things are reinforcing and others are not by saying that organisms have special "susceptibilities to reinforcement."

In PCT we use the method of modeling, which amounts to proposing underlying mechanisms which, behaving according to the rules we build into them, produce phenomena like those we observe. A control system controls because it contains an input function, a comparator, and an output function organized to create a negative feedback loop through the environment -- not because it contains a "drive to control" or a box labelled "controller."

In PCT, the growth of organization is created not by a drive to organize, but by what we call a "reorganizing system." The reorganizing system contains no single element that creates organization; rather, organization is the outcome of its operation. What it does is to (a) monitor the states of some set of "intrinsic" variables connected to the basic well-being of the organism (like blood Ph, blood CO2, glycogen levels, circulating thyroxin, pain, and probably a lot of variables of less mundane nature); (b) compare the sensed state of those variables with inherited reference levels defining a reference state for each one; and (c) convert the total amount of intrinsic error signal into a rate at which random changes in organization are created in the brain. These

random changes amount to changes in the strengths of neural connections and even in the existence of synaptic connections.

When intrinsic error exists above some threshold amount, random changes begin. When suprathreshold intrinsic error is small, the changes occur only at long intervals. As intrinsic error increases, the changes come closer together. In fact, in our modeling of this process, the best relation between intrinsic error e and rate of reorganization r seems to be r = e*de/dt, or approximately d/dt(e^2). We have shown in several different kinds of situations that this kind of law relating intrinsic error and rate of random change will cause a rather amazingly fast decrease in the intrinsic error. As Tom Bourbon mentions this morning, using this method to find the optimal integration factor in a control-system model works extremely well. I have shown that it can stabilize a collection of 10 control systems, each sensing a variable that is a weighted sum of 10 environmental variables and acting by affecting all 10 variables, in several thousand iterations. In effect, it solves a system of 10 equations in 10 unknowns. I have made this work with up to 50 equations in 50 unknowns (although convergence is slow and my patience runs out). All this happens through a biased random walk, with no formal algorithms being applied to achieve the solution. The principle is extremely simple and extremely powerful. It's probably not the only principle at work in the creation of organized behavior, but it's probably a fundamental and workable one. And it doesn't use any "drive to organize."

The point here is that the PCT explanation of the growth of organization appeals to underlying processes, not simply to naming a "tendency to organize." This is true in all PCT explanations of behavior: we never just say that there is a tendency toward producing a given behavior; instead, we try to propose a mechanism that would actually produce that sort of behavior as an inevitable outcome of the way the mechanism works. Where we have learned how, we actually program models designed to exemplify the mechanism, and test the way they run against real behavior. This method of modeling has been used for a very long time in the hard sciences and engineering, but it has been essentially unknown in the behavioral sciences (except where engineers and physicists have got into the act). You will not find it described in any introductory psychology text.

I think that the strongest commitments to PCT come from people who have actually tried this method and seen how it works. Even though the behaviors we can model are very simple, the quality of the predictions is almost unprecedented in behavioral science. Particularly for scientists who have done "normal" behavioral investigations, the reliability and accuracy of the results is a revelation. Once having seen how a control model can predict behavior, it is simply impossible to imagine going back to the old way. There are many kinds of behaviors we do not yet know how to model in this way, but the simple models are an existence theorem: they show us what can be done if we just persevere. For us, the days of explaining behavior in terms of traits, drives, and tendencies are simply over. We are on the track of a post-Galilean approach.

Best, Bill P.