PCT includes and explains emotion and feelings.

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

Date: Fri Oct 01, 1993 9:28 am PST
Subject: left brain bushwah

[From Bill Powers (931001.1030 MDT)] Hal Pepinski (930930) --

> ... I only hear confirmed that control is somebody else's endeavor rather than their own in interaction with others.

The problem with having an interpretation beforehand and then just looking for confirmation of it is that you will find the confirmation whether your interpretation is right or not.

In fact, control theory is ENTIRELY about individuals controlling THEIR OWN experiences, in interaction with the world.

> Leaving out emotion, basing one's model on purely material measures, is another manifestation of the same distancing of self from one's control problems.

PCT does contain a model of emotions: see Living Control Systems II, p. 31 ff. Emotion is an intrinsic part of every behavior. You may not like the model of emotion, but it is there.

> To borrow one metaphor, PCT appears to be all left-brain, except for shifts in levels of reorganization for which the model cannot account. There is no modeling of emotion in PCT, am I not correct?

Bullshit! Or is that too emotional a comment?

Best to all, Bill P.

Date: Sun Oct 03, 1993 1:34 am PST
Subject: Dormitive principles

[From Bill Powers (931003.0030 MDT)]

I am conducting a sort of low-level Gregory Bateson Memorial War Against Dormitive Principles. This was Bateson's way of referring to explaining a phenomenon by using its description, somewhat transformed, as its explanation. Thus, Seconal makes you sleepy because it contains a dormitive principle. By switching from the English "sleep" to the French/Latin "dormir" you make it sound as though you are naming a cause, whereas in fact you are simply repeating the description in a sentence that has the form of an explanation.

This method of explanation is popular in medicine: you have red itchy eyes because of conjunctivitis, and a red itchy nose because of rhinitis, and are cross-eyed because of strabismus. You break out in red spots and have a fever because you have measles. In fact this is a popular mode of explanation in any field where people keep pestering you for explanations and you find it embarrassing or impolitic to keep saying "I don't know."

We have seen two examples of the dormitive principle recently on CSGnet. One is in the discussion of phonemic contrasts, and the other -- somewhat more subtle because more widespread -- in the discussion of emotions.

Phonemic contrasts have been exemplified recently by two pairs of vocalized words: pin and bin, and spin and sbin. In the first pair, subjects say that there is a difference in the words that are heard, while in the second pair this difference is not heard, even when pains are taken to make sure the actual objective sound-waves of pin and bin are preserved.

The explanation offered for this experienced phonemic difference is that there is a phonemic contrast between bin and pin, while there is none between spin

and sbin. This is a dormitive explanation, because "difference" and "contrast" mean essentially the same thing. The explanation could just as easily be given this way: there is a perceived contrast between pin and bin but not between spin and sbin because in the former case there is a phonemic difference, while in the second there is not. The second way of putting it sounds, on the surface, just as explanatory as the first.

The truth of the matter is that people perceive a contrast or difference between pin and bin, but not between spin and sbin, and nobody knows why, not even a linguist.

The second example, emotion, is a little harder to untangle because some people set great store by emotions and don't like to think that emotions might have a rather simple explanation. Emotions, traditionally, are treated as a separate branch of motivation, reaction, or experience, having a somewhat mysterious kind of existence that is neither physical nor mental. Scientists decry arguments that appeal to emotion rather than reason. Their opponents often sneer at emotionless scientists for their coldness or indifference to feelings. Both, when asked to explain what they mean, fall back on dormitive principles.

Consider the emotion called anger. How do you know when you're feeling anger? On _Star Trek: The Next Generation_, the android Commander Data recently asked this question of Geordi, the blind Chief Engineering Officer. To make this point, Data asked Geordi to describe anger without using the word "angry." Geordi (and presumably, the show's writers) were at a loss. You just -- you know -- feel _angry_. If you don't know what anger is, how can you understand a description of it? Geordi, admirably, refused to fall back on a dormitive principle, and admitted that he couldn't describe anger. Eventually, Commander Data understood that he had in fact experienced anger for the first time (due to remote- control meddling by his evil brother-android Lor) and therefore _did_ know what Geordi meant, even though he couldn't define it rationally. This, too, puzzled Data, by violating his concept (as well as mine) of explanation as something different from description .

Well, what does happen when you feel angry? You feel a surge of sensations from your body, and an urge to do something energetic to something. If you have no self-control you may well lash out and do damage to something or somebody -- anger most often has an object at which you're angry, and it's usually a person.

At one time in psychology there was one of those Scholastic debates about emotion. In the terms just laid out, one side argued that you feel a surge of sensations and an urge to strike out because you're angry, while the other side argued that you're angry because you feel the sensations and an urge to strike out. Both sides were using the same dormitive principle with the terms swapped.

The term anger refers to an experience of a surge of bodily feeling and an urge to so something extreme. Anger is just the short way of saying " bodily feeling and an urge to do something." "Anger" isn't an explanation: it's a word referring to a phenomenon that needs an explanation. You don't feel the sensations and the urge to act BECAUSE OF anger, or vice versa. You feel the sensations and the urge to act, or alternatively, you feel anger. The two ways of putting it say the same thing. The word "anger" and the phrase "a surge of bodily feeling and an urge to so something extreme" refer to the same experience.

How would we explain this experience in terms of the PCT model? Clearly, "a surge of bodily feeling" is a perception, and an "urge to do something extreme" implies a control system containing a large error signal. Why, we may ask, would the occurrence of a large error signal in a neural control system be accompanied by a surge of bodily feeling? One answer that seems reasonable is that the same output of the control system in question that would set reference levels calling for extreme action by the lower motor systems would also set reference levels calling for an altered state of the biochemical systems that support action. Thus we would expect blood sugar to rise,

respiration to increase, heart-rate to increase, and so forth -- the so-called "general adaptation syndrome." These sudden changes in somatic state can obviously be sensed; they are experienced as bodily feelings.

So when a reference signal is suddenly changed to a relatively extreme value, or a large disturbance suddenly appears, the result is an error-signal-driven urge to change the state of the motor systems and the state of the biochemical systems by a large amount. There is thus a surge of sensation from the body as the biochemical systems are called upon to change to a significantly different state.

Under normal circumstances and in a well-balanced system, the heightened state of preparation of the body is immediately "used up" by the accompanying motor action. There is a momentary sense of elevated somatic state that is simply part of the sensed action. The word "anger" would not be likely to be used to refer to the result.

If, however, the person who experiences the large error has good self-control, a conflict immediately ensues. One control system receives a reference signal implying an immediate change of state of the whole system, and at the same time a second control system says "No, a civilized person like me does not punch a boor in the nose, whatever the provocation." The "civilized" system cancels the reference signals going to the motor systems, and the punch does not take place.

However, the control system gearing up for the punch is still there, and it is still telling the somatic systems to prepare for violent action. This state of preparedness is now not dissipated by the appropriate motor behavior and disappearance of the error signal; it is maintained by the same error signal that would throw the punch if lower systems were not receiving canceling reference signals from the "civilized" system. The reference signal calling for extreme action is not matched by the appropriate perception, so the urge to act continues and the sensation from the body persists, too. NOW the person would say "I am angry!"

Moreover, the person would say "I am angry AT HIM." The person still wants to see and feel a fist mashing the other's nose, the other person crying out in pain, falling, becoming abject and apologetic and tearful and otherwise suffering all the embellishments of a thoroughly satisfying retribution. All these desires are the immediate source of the reference signal that suddenly changed so as to call for an energetic punch. As long as these desires are in effect, the "civilized" system will have to keep canceling the actual motor reference signals, and the anger and hatred and whatever else we call it will continue. The emotion will persist until the source of the reference signal is turned off. One ceases to be angry when one ceases to want retribution.

This is a PCT explanation of anger that does not rely on a dormitive principle. The same can be done for all the other experiences we label with emotion-names. The feeling component is the perception of a change in the biochemical state of the body, or more generally, somatic state. The goal-component is the reference signal that is calling for both motor action and the somatic state appropriate to the action. If the goal is to get the hell out of there, the same somatic changes take place as in anger, but now the combination of goal and feeling is called alarm, fear, fright, terror, panic, and so on. When the action is prevented from succeeding in achieving the goal, the emotion is felt the most strongly.

True connoisseurs of emotion have as large a vocabulary for describing emotions as epicures have for describing tastes and smells. We can speak of feeling annoyed, offended, irritated, provoked, exasperated, angered, incensed, aroused, inflamed, infuriated, and enraged. I've just arranged the terms under "anger" from good old Roget more or less in order of increasing error signal and increasing shift in somatic state, as I understand them.

Notice how those adjectives imply the passive voice. It isn't common to attribute emotions to one's own desires. Emotions -- particularly the somatic feeling part -- seem to arise as though they're being done to us by something else, as if they're being received from outside us. They _are_ being received from outside our understanding; that's why we need models. But in this case

the model tells us we gambled on the wrong voice: we produce our own emotions, which arise from what we want. All these terms should be used in the active voice, which sounds really strange when you do it. I'm exasperating at you?

Psychological explanation is riddled with dormitive principles. PCT can eliminate them by offering, right or wrong, real explanations.

Best to all, Bill P.

Date: Sun, 4 Jun 1995 09:10:19 -0400
Subject: Fear

I'm new to PCT and a new subscriber to CSG-L. Am puzzled about how PCT might account for and/or attempt to explain the phenomena of fear (or any perceived emotion for that matter). Anyone care to comment?

Greg Wierzbicki

Date: Sun, 4 Jun 1995 20:40:51 -0600
Subject: Re: Welcome, Greg; Emotion

[From Bill Powers (950604.1005 MDT)] Greg Wierzbicki (950604)

Welcome to CSG-L, Greg.

Emotion.

There is no "official" PCT theory of emotion, but we have had some ideas. You can find a chapter on emotion (that was editorially deleted from my 1973 book) in Living Control Systems II (see the reference materials in the Intro to PCT that is posted near the first of every month). Here's a current version I how I see emotions.

The basic idea is that emotions, or some of the experiences we call emotions, are created by the hierarchy of control systems when goals are set or changed and the system goes about correcting the resulting error signals. Depending on the goal, the brain-hierarchy adjusts reference signals in different patterns not only for the behavioral systems that act with muscles, but for the somatic control systems: the major organ systems that back up overt behavior and are near the top of a biochemical hierarchy of control systems.

The changes in reference signals for the somatic systems are those appropriate for the kind of action that will be needed to correct the error. These changes occur in parallel with setting reference signals for the behavioral systems, the ones that use muscles and act via the outside world. Thus an emotional state contains both a preparation for physical action, and an alteration of the bodily control systems as appropriate for the action. There can be depressed bodily states appropriate for hiding or giving in to external forces or avoiding notice, or elevated bodily states appropriate for supporting energetic action.

Fear, for example, might arise from setting a goal for rapidly getting away from something. This is translated into specific goals for moving the arms and legs, and also into increased reference signals for such somatic conditions as heart rate, breathing rate, vasoconstriction, blood pressure, blood glucose, and so forth. Many of these physiological changes can be sensed directly and indirectly. The totality of experiences that arise from inside the body and from the action systems forms a familiar pattern that we label "fear."

If the goal is, instead, to act aggressively toward something, the behavioral aspect of the situation is different, but the changes in body state that result are essentially identical to those that arise when we feel fear: this constellation of physiological changes has been called the "fight-or-flight syndrome". The bodily pattern of sensations is the same as in fear, but the cognitive component is different, for the goal is to move toward the object of the emotion rather than away from it. So we use a different label for this

total pattern of goal plus internal feelings: irritation, anger, or rage, depending on how large the error is.

The intensity of an emotional state depends on the size of the error that is driving the action and changing the somatic reference signals. In normal successful behaviors, errors are never allowed to get very large; behavior starts as soon as any error is detectable, and prevents it, normally, from getting much larger. So while there are bodily sensations accompanying all actions, they are not very noticeable under normal circumstances.

What creates an intense feeling of emotion is a very large error signal. Large error signals can arise from larger-than-normal disturbances from the environment, or from internal conflict that turns one set of behavioral control systems against another inside the same person.

As an example of conflict, if you want to flee but don't wish to appear cowardly you will prevent yourself from going away from the source of the problem, and thus leave the error signal produced by the desire to flee completely uncorrected. This large error signal will be canceled by the conflicting control system before it can result in action. However, the same large error signal will be changing reference signals for the somatic control systems by a large amount, the amount normally appropriate to support an energetic action such as fleeing. You will therefore experience a large deviation of bodily feelings from their normal neutral states, and this, together with the desire to flee, will be recognized as an intense emotion, an intense "fear."

The same happens if for some reason you want to attack, but for some other reason choose to hold back from overt action. Again, the bodily states will depart from neutral, but the error will not be corrected because of the internal conflict; the emotional state, now probably called "anger", will be intense.

Essentially the same intensity of emotion will be felt if the desire is thwarted by external circumstances. You want to get away from the railroad tracks, but your foot is stuck under a tie. Or you want to hit someone in the nose, but through "self-control" you hold yourself back. Your body is prepared for strenuous action, but the error that drives this preparation is not quickly corrected as it would normally be.

Large errors can also be created by large disturbances or by failure of the environment to be moved by normal efforts. This could account for the three-iron you might find discarded on a golf course, bent double.

This principle seems to apply to a number of emotional or arousal states to which we give emotion-names. It's more difficult to see the pleasant emotions this way, except that the same sorts of bodily sensations are often involved -- excitement and exhilaration, for example, don't actually feel, physically, a lot different from terror, although the cognitive aspects are certainly different.

The general idea is that emotion naturally accompanies action, and indeed is a kind of action, an internal action that adjusts the body to support the muscle-actions involved in visible behavior. It is created by our own desires and intentions, or rather by departures that we are experiencing from what we desire or intend to experience. Just as we feel greater efforts taking place when our behavioral goals become difficult to reach, so do we feel more intense bodily sensations in the same situations. Many different patterns of goals and bodily sensations result, to which we give different emotion-names.

A few observations.

Some people, it is said, are more "emotional" than others. In the light of the above theory of emotion, we would interpret this as meaning that some people have more difficulty than others in satisfying their goals and carrying out their intentions: that they suffer larger chronic errors than others do. Their hyperemotionality is not, however the problem; it is only a sign that there is a problem.

This state of hyperemotionality might reflect considerable internal conflict, which makes any effective control difficult. Or it might be that the conflict is external -- it could be that because of some accident of birth or situation such as race, gender, age, physical constitution, religious beliefs, or social status, a person finds that normal efforts to get respect, help, encouragement, or simple cooperation, which most people who do not have these "handicaps" take for granted, are continually frustrated.

For example, it has not been very long since women were expected to stay home and take care of children, cook and sew and clean, be fornicated upon, and be content without any education about the world or any say in how the world is run. When they expressed resentment, anger or grief, nobody asked what goals were being frustrated, what opposition was encountered to every attempt to shape a world closer to the heart's desire. Instead, women were accused of being "hysterical" (meaning that they had a problem because of having wombs) or of being innately emotional rather than content and rational. A man, of course, had no right to be discontent or irrational, and considering the relative ease in reaching goals, not nearly as much reason. As the women's movements have been trying to say in recent times (what seem to me to be recent times), emotionality is not the problem: the problem is in the obstacles to striving for and satisfying the goals that any normal human being wants to reach. It is loss of control that is the problem.

Irrationality, I might add, seems to go with emotionality, for a reason that PCT can also somewhat plausibly explain. A person who suffers large and chronic errors will be in a state of more or less continual reorganization (which see, in the PCT literature). This means that the person's perceptions, goals, and means of action will continually be in a state of change; the goals of one moment may give way to new goals at the next moment. What is happening is that the system as a whole is looking for solutions to control problems by trial and error, all learned methods having produced no desired result. As chronic emotionality signals problems with achieving control by available means, so does inconsistency and erratic change of goals signify the chronic errors that reflect a persistent difference between what is wanted and what is experienced. We should therefore look on a person who is hyperemotional and seemingly irrational as a person who is experiencing serious and continuing difficulties in creating acceptable experiences. And perhaps we should ask ourselves to what degree our treatment of such a person is a source of the problem.

Best, Bill P.

Date: Thu, 10 Oct 1996 11:11:02 -0600
From: Bill Powers <powers_w@FRONTIER.NET>
Subject: Re: I second that emotion

[From Bill Powers (961010.0915 MDT)]

Rick Marken (961009.1600) --

>In the example above, there is no anger because there is nothing
<(like internal conflict or marked external resistance)
<preventing achievement of the goal (a slugged face).

What I've said about emotion is based on my observations of me, plus things others have said about their emotions. If someone else observes something different, then my neat theory has to be modified, doesn't it? Here's more or less how I worked it out. If others experience emotions differently, of course, then I am alone in this kind of experience.

First, I noticed that emotions are felt -- that is, they are perceptions of something happening inside of me.

Second, I noticed that emotions seem to be caused by things happening to me. That seemed strange; I wondered why there should be this apparently useless hookup so that my perceptions simply cause feelings to arise. Naturally I thought of the cause-effect illusion, and wondered what might be disturbed by the external events that are being opposed by some control process. I didn't

get an immediate answer to that, but that thought led to another -- could the sensations of emotion be part of an action that is opposing, or trying to oppose, some disturbance?

For at least one emotion -- anger -- the answer was easy to see: yes. When something "makes me angry" the _first_ thing that happens is that I want to DO something about it. If I don't have any urge to push back, there's no feeling of anger. The tipoff really came from an incident when I was a little slow on the uptake and didn't realize that someone had just insulted the hell out of me. My first reaction was simply puzzlement: did this reviewer (of my 1971 Rat Paper) really not understand that the data in that paper were real? Then I realized that he was accusing me of making it up, and POW, I wanted to strangle the son of a bitch!

In this case it was obvious that the reviewer's words were not simply a stimulus connected to my adrenal glands. Before those adrenals kicked in, I had to _understand_ what was being said, and then realize that it was something that violated my earnest desire to be and be thought an honest person. What triggered the emotion was not the words, but the fact that I experienced a GREAT BIG GALLOLLOPING ERROR. And the immediate result of that big error was for my whole body to get revved up to provide the energy it would take to rip that reviewer limb from limb. I was all ready to go into action, just as if my very life had been threatened -- which it had.

Of course, since we don't directly experience reference signals or error signals, the first thing I knew consciously about this reaction was the sudden flood of feeling and the ensuing imaginary scenario of getting in this reviewer's face and shouting my outrage at him. It wasn't at all obvious which was the chicken and which the egg. It was only much later, after I had sent my (successful) outraged objection to the editor, that I could step back and reflect on the incident, and tease out the sequence of events that had taken place. If I had not initially misunderstood what the reviewer was getting at, I probably would not have seen the role played by my goals and perceptions, and the fact that the feelings arose only AFTER I had done a double take and re-read the passages in the review several more times. Then I thought, "What? Why that -- but he's saying -- my God, does the editor think I fudged the data?" By that time I was shaking with tension, literal muscular tension, muscle pitted against muscle. If that reviewer had been in front of me at that instant I might well have slugged him.

So for that incident at least I had an answer: the emotion of anger arises as a consequence of an error big enough to call for drastic aggressive action against something. First the error, then the emotion.

With that picture in mind, it wasn't hard to visualize the general arrangement. A high-order system experiences a large error. The error signal is routed in two general directions: toward lower-order behavioral systems that will produce the motor behavior that corrects the error, and to lower-order biochemical or organ systems that will prepare the body to support energetic action. Of course all these preparations for action generate sensations, sensations from the musculature and from the sensory monitors that tell us of our own biological states. The whole constellation of changed perceptions is what we call an emotion. For the emotion of anger, this is perfectly clear to me. It's not so clear how it applies to other emotions, but the general proposition seems worth pursuing.

After this initial insight (what I thought was an insight), I remembered what others have said about common emotional experiences. In combat, for instance, it has been said that a soldier suddenly confronted with a powerful threat to life will act instantly and very energetically to escape, and only after a successful avoidance of danger will begin to feel the "fear." "I was too busy saving my ass to think about being afraid," is one way it's been said. The woman who lifted the car off her child, as I remember it, said that she wasn't worried about the child; all she could think of was getting the car off her. The prizefighter who pulverizes his opponent would not say he is angry at the opponent; he is too busy pulverizing him to indulge in feelings.

Common anecdotes like these made me wonder why it is that sometimes we act very energetically but without experiencing anything we would call an emotion.

It's not that there's no feeling; it's just that the experience we have doesn't seem to belong among the emotions. That observation led to the next: that we feel the emotions most strongly when the action needed to correct the initiating error is ineffective, or even worse, impossible to carry out. The most frustrating situation is the one in which we are all ready, behaviorally and biochemically, to take a drastic action, but are stopped from even trying to take it because of conflicting goals. In general, we feel the emotion the most strongly when the error doesn't get corrected.

Suppose you're in Africa on a safari (an experience I'm sure we all have frequently), and you're standing just outside your car watching a herd of rhinoceroses (good Lord, how do you spell that?). You see one of them eyeing you, and then it starts trotting toward you, faster and faster. Feeling a little frisson of apprehension, you decide to get back into the car and drive away. And the door is locked, with the keys inside.

THAT'S when you really feel fear.

If that reviewer had made his suggestion to my face, I probably would have immediately hauled out Verhave's data and letters and shown him that the data were perfectly real. I might have been annoyed, but the error would have been corrected immediately. But there I was holding a review in my hand, with no way to make an objection or a correction, and the editor had the very same review and for all I knew believed the accusation. What I felt was not just rage, but _helpless_ rage. There wasn't a damned thing I could do but bash out a letter on the typewriter, rip the page out, stuff it into an envelope, slaver onto a stamp, and jam the whole thing into a mailbox. And wait.

THAT'S when you really feel anger.

What all this leads me to think is that "emotion" is just one of those old-fashioned words that refers in a vague way to some particularly noticeable kind of experience, but doesn't have any important meaning of its own. Obviously, in order to do anything physical, we have to be in a physiological state that is right for supporting the motor behavior. The same states that we call emotions when they are blasting away at full strength are present when we do anything. Athletes getting ready for a race or a jump deliberately induce heightened states of physical preparedness, but they don't refer to them as emotions: they call the process "psyching up." Actors and other performers do the same thing. The body, the entire complex of organ systems and other biochemical processes, responds quickly and sensitively to the demands made on it; every organ system receives reference signals from the brain and even the hormone systems are governed, somewhat less rapidly, by neural and chemical signals from the hypothalamus. And there are sensory endings everywhere, which continually present us with a picture of our own internal states.

When the states become relatively extreme, we recognize patterns and give names to them, like fear, anger, love, hate, anxiety, jealousy, or excitement. It's been known for a long time that many of the physiological states that go with different emotions are really quite similar -- the fight-or-flight syndrome, for example. What really distinguishes one emotion from another, one feeling from another, is the _goal_ that is involved, which specifies that some experience is to be brought into being. To be angry is to want to attack; to be afraid is to want to get away. If you do attack immediately, or flee, the extra adrenaline and glucose are quickly burned up and the sensations attached to them dissappear. The anger and fear are fleeting, if they are noticed at all. It's only when the preparation goes to completion and the resources thus called up are not used that we go on experiencing the feelings, crashing around the house, belting walls, and endangering our loved ones and typewriters.

At least all that makes sense to me.

Best, Bill P.