Tom Bourbon a.o. about ”feedforward”

Date: Mon Jul 11, 1994 12:38 pm PST

Subj: PCT as paradigm

[Jeff Vancouver 940711]

Okay, the rubber has hit the road and I am seeking your input. As Imentioned the paper I referred to in my introductory post has been invited forrevision and resubmission. Basically, the paper argues that my field(organizational behavior) needs a paradigm and that living systems theoryshould be that paradigm. Living systems theory (LST) is very PCT-like(this post is about some of the differences as I see them). In fact, many ofthe reviewers think LST is simply PCT with a different name. Given theprominence of Powers in my paper, this assessment is not far off base. However,I am advocating some things I do not see PCTers advocating, so I assume you allappreciate my use of another name.

1. I have focused a great deal of attention to the feedforward process. AsI understand it and explain in my paper, feedforward is the process ofanticipating discrepancies via memory of effector and perceptual signals. Ibelieve this is in line with PCT. However, I go on to say that plans are madeand even choices to engage are made based on those anticipated discrepancies.That the anticipated discrepancies are used to assess potential environmentaldisturbances and head them off. This is consistent with Ashby, if not PCT. Iguess my question is: why this is \_not\_ consistent with PCT? Let me anticipatethe possible answers:

a) anticipated \_disturbances\_ are not possible, regardless of how imperfectthey may be (this last phrase counters the argument that the anticipateddisturbances are merely conjectures on the part of the individual, becauseactually knowing the disturbances is beyond the system);

b) we have not gotten around to modeling it yet because it is too difficultto model or other things have taken priority;

c) anticipated disturbances and their effects on the system have been modelin PCT, see (cite).

2. I think the main counter-argumentto the PCT way of doing science (i.e., modelling), is that social interaction,meaning, and other higher-levelprocesses, do not lend themselves to precise, quantitative equations. This iswhat I mean in b) above. Also, this is the intrigue of neural nets and fuzzylogic for many. They are quantitative, but not precise. I too lend toward thoserepresentations as possibly necessary when modeling the higher-levelprocesses. Where does PCT stand on the issue of precision in it'smodels?

3. The distinction between the perceptual hierarchy and an individualsconcept of that hierarchy seems to be a critical issue that separates PCT frommost of psychology. That is, most of psychology concerns itself with conceptslike self-conceptand beliefs, but not with the actual system concepts, principles, etc. thatdrive behavior. Some do, but many do not. If I understand the psychologist'sposition, self-conceptsand beliefs are available to the conscious. If I understand PCT, referencesignals are not directly available, but perceptions are. What I am not sureabout is whether the perceptions that are available to the conscious are beforeor after filtering through the input function and do those perceptions from themodel that the psychologist study?

When I warned to I was going to make this post, Marken [940708.0820]replied with a comical post. Attempting to understand the behavior ofreviewers, editors, etc. he vacillated between random and political, with alittle writing style and content thrown in for good measure. (Marken, can yousimulate this oscillating behavior -a control system trying to predict the behavior of other controlsystems).

Ironically, I agree, that all the factors are involved (weights change toprotect the innocent). But one specific thing I want to highlight. Markensaid:

> This could get pretty confusing for you; having papers rejected byjournals because they have a PCT flavor and then getting lashed by loonies(like me) on the net who say yours papers don't have nearly enough PCTflavor.

Building communication links between schools of thought that have not beenable to communicate well before is exactly the niche I am carving for myself.It is not an easy task, but if it was, there would be no need.

Later Jeff

Date: Mon Jul 11, 1994 4:56 pm PST

Subj: Re: PCT as paradigm

From Tom Bourbon [940711.1655] >[Jeff Vancouver 940711]

> Okay, the rubber has hit the road and I am seeking your input. As Imentioned the paper I referred to in my introductory post has been invited forrevision and resubmission. . . . However, I am advocating some things I donot see PCTers advocating, so I assume you all appreciate my use of anothername.

You assumed right. :-)

You do have an interesting job in store, trying to satisfy thosereviewers.

> 1. I have focused a great deal of attention to the feedforwardprocess. As I understand it and explain in my paper, feedforward is theprocess of anticipating discrepancies via memory of effector and perceptualsignals. I believe this is in line with PCT. However, I go on to say thatplans are made and even choices to engage are made based on those anticipateddiscrepancies. That the anticipated discrepancies are used to assess potentialenvironmental disturbances and head them off. This is consistent with Ashby, ifnot PCT. I guess my question is: why this is \_not\_ consistent with PCT? Letme anticipate the possible answers:

> a) anticipated \_disturbances\_ are not possible, regardless of howimperfect they may be (this last phrase counters the argument that theanticipated disturbances are merely conjectures on the part of the individual,because actually knowing the disturbances is beyond the system);

Do you mean \_anticipation of disturbance\_ is not possible? I think that'swhat you intended and will reply as though that's the case. If I'm wrong,disregard everything I say, which you might do anyway. ;-)

To \_know\_ disturbances in advance of their occurrence is not possible. Toanticipate (imagine) them in advance of their occurrence is possible, but theanticipating occurs in the present and that is where all of the actions to wardthem off also occur --in the present. If that is the case, then actions I take \_now\_ to create theperceptions of preparedness that I intend to experience \_now\_ can be modeled aspart of a present-timeprocess of negative feedback control: no future event is involved, only present-timeimagination and intention and perception and action. Carrying an umbrella whenI leave the house after hearing a weather report that predicts rain is present-timeperceptual control, not feedforward. The fact that it is not now raining seemsto lead some people into thinking that my actions are directed forward into thefuture, when they are in fact happening right now.

Also, in hierarchical PCT systems, higher levels have longer time constantsthan lower ones. An observer who notices the actions of lower-levelloops sometimes "sees" those loops "taking action in advance of environmentalevents:" a person leans forward before taking a step forward --a clear case of feedforward, is it not? Or before taking a long trip a personplans an itinerary, decides what private "stuff" to pack and carry, and makesarrangements for the care and feeding of pets, plants and other dependentcreatures --a clear case of feedforward, is it not?

In either case, I believe the answer is, "It is not." What is easilyoverlooked in either case is the "bigger picture" of what the person iscontrolling. The body does not "lean" independently of the person "taking astep." Leaning and stepping are not two discrete, isolated events; one thinghas happened and an observer has treated it as though it were two (or more)things.

Part of the problem for an external observer who watches the behavior of ahierarchical, high-gain,negative-feedbackcontrol system is that activity at the lower end of the hierarchy of perceptualcontrol occurs on a time scale that is easy to see in a glance; when thingslook different to us in successive glances, we easily see different "things"happening, then give them different labels, then explain them by differentmechanisms. When actions happen close in time to what the external observeridentifies as the purpose of the actions, the observer often says they involvefeedback control; when actions happen in advance of what the observer says isthe purpose of the actions, at least some observers say they involvefeedforward. All the while, hierarchical, high-gain,negative-feedbackcontrol is probably lurking in the background, ready to confuse the innocentobserver.

> b) we have not gotten around to modeling it yet because it is toodifficult to model or other things have taken priority;

See my reply to a).

> c) anticipated disturbances and their effects on the system have beenmodel in PCT, see (cite).

See my reply to a).

> 2. I think the main counter-argumentto the PCT way of doing science (i.e., modelling), is that social interaction,meaning, and other higher-levelprocesses, do not lend themselves to precise, quantitative equations.

You have identified a frequent comment from reviewers and editors. Tocounter them, I think you (all of us who try to spread the news about PCTscience) need to redirect their attention to the phenomenon of control. Forexample, if you can show (empirically, not theoretically or in a model) that aparticular social interaction includes controlled variables and that theactions of each social actor affect variables controlled by other actors, thenyou establish the fact of control in a social setting. Once you establish thefact --the phenomenon --of control, the nature of the game changes, or at least it should. Now anyonewho wishes to explain the observed social interaction must demonstrate that, atleast in principle, the suggested explanation can explain the phenomenon ofcontrol. Any "explanation" that cannot in principle explain control \_should be\_dismissed. (All of this is easier to say than to do --if you discover a way to make our interactions with reviewers and editors workthe way they \_ should\_ work, share the news immediately!)

> This is what I mean in b) above. Also, this is the intrigue of neuralnets and fuzzy logic for many. They are quantitative, but not precise. I toolend toward those representations as possibly necessary when modeling the higher-levelprocesses.

This is where some of us part company with you, not necessarily because youare wrong and we are right, but because we don't want to allow ourselves anyway out. We want to see just how far we can get using nothing other than thePCT model. Our activity is driven by our belief that we see evidence of controlin phenomena where others think they need to talk about "higher-levelprocesses." Our way of working has a lot in common with that of scientists whorefuse to allow "the hand of God" as part of their explanations of nature; thechallenge they set for themselves is to see how far they can get without"giving up" and invoking principles or powers from outside their scientificmodel.

> Where does PCT stand on the issue of precision in it's models?

Precision is our guiding p-star.

Oops! Time to run. We are finishing the plans for our daughter's wedding onSaturday and I'm almost late for a fitting! I'll try to get back to theremainder of your post tomorrow.

Later, Tom

Date: Mon Jul 11, 1994 8:49 pm PST

Subj: Re: feedforward: planning perceptions

[From Bill Powers (940711.2115 MDT)] Jeff Vancouver (940711)

> As I understand it and explain in my paper, feedforward is the processof anticipating discrepancies via memory of effector and perceptualsignals.

But if you anticipate discrepancies, all you have done up to that point isto extrapolate from the present and perceive a calculated future. What happensnext? A perceived discrepancy, whether it be in present time, calculated, orimagined, does not tell you what action you will have to take to correct it.When the time comes to act, you will still have to deal with the world as it isat that instant.

What you're overlooking is that ALL behavior, at ALL levels, is control ofperception. You can't plan actions; you can only plan the perceivableconsequences of actions.

You can plan to stop at the newsstand on the way home to buy a paper.Superficially, that might seem like planning actions: stopping at thenewsstand; buying a paper. But the actions that lead you to perceive yourselfas being at the newsstand are not predictable. You may park your car in frontof it, if there's a space empty, or five spaces away in either direction, or inthe next block. You may have to walk if your wife just drove off with the car.Wherever you start, you will have to walk toward the door of the newsstand fromthe exact spot in which you find yourself and not from where you vaguelyimagined you would be, past the people standing around and going in and out,not on the empty stage you imagined. You must actually carry out every lastdetail of every muscle contraction that is required to get you through the doorand up to the counter. When you "buy a paper", you can't plan where theproprietor will be standing, or whether the newspapers are sold out, or whetherthe proprietor has change for a ten, or which hand the proprietor will reachwith to receive your money, or where the newspaper will be --on the counter, or handed to you. You can't plan the actions needed to buy apaper well enough even to end up inside the newsstand and not crashing throughits window.

The best you can do is form a very incomplete picture of the generalsituation you hope to experience; being somewhere at the newsstand, walkingaway with a newspaper held in one hand or the other, then being back home withit. You don't plan the means of achieving any of these perceptual goals. Youcan't. The world is too unpredictable. All you can do is plan \_goals\_, andleave it up to your control systems to bring them about in real-timeperception, dealing with the world as it actually is, in all its detail.

Best, Bill P.

Date: Mon Jul 11, 1994 9:34 pm PST

Subj: Replies to Jeff

[From Rick Marken (940711.2200)] Jeff Vancouver (940711) --

> 1. I have focused a great deal of attention to the feedforwardprocess.

> I guess my question is: why this is \_not\_ consistent with PCT? Let meanticipate the possible answers:

> a) anticipated \_disturbances\_ are not possible,

You got it right off the bat --though it would be more correct to say "the actions that will compensate fordisturbances cannot (and need not) be anticipated". I see Tom B. and Bill P.explain this rather nicely.

> 2...Where does PCT stand on the issue of precision in it'smodels?

Precise is nice. But the main point of PCT is that behavior is CONTROL.Since conventional behavioral science data provides no precise evidence of thevariables people control, PCT does not apply to this data of conventionalbehavioral science.

> 3. The distinction between the perceptual hierarchy and an individualsconcept of that hierarchy seems to be a critical issue that separates PCT frommost of psychology.

I think this is really irrelevant. The critical issue that separates PCTfrom most (all?) psychology is the issue of control. Conventional psychology isabout the control of behavior; PCT is about the behavior called "control".Conventional psychology tries to determine the variables that controlorganisms; PCT tries to determine the variables that organisms control.Conventional psychology and PCT are not talking AGAINST one another; they aretalking PAST one another.

> When I warned to I was going to make this post, Marken [940708.0820]replied with a comical post.

Thanks for thinking it was funny, but I was actually trying to give serioussuggestions about how to get published. What was so funny about it? I wasreally trying to help --and encourage you to be persistent in your efforts to publish. I rooting foryou to get tenure; once you're safe and secure THEN you can go ahead and do PCTright.

I said:

> This could get pretty confusing for you; having papers rejected byjournals because they have a PCT flavor and then getting lashed by loonies(like me) on the net who say yours papers don't have nearly enough PCTflavor.

Jeff says:

> Building communication links between schools of thought that have notbeen able to communicate well before is exactly the niche I am carving formyself. It is not an easy task, but if it was, there would be no need.

I'm glad that you want to build communication links but I also want to besure that you're putting the right message over the wires. Carver and Scheierand their ilk have gotten conventional psychologists to listen to the messageof PCT by providing the wrong message; this is called lying. I'm happy tocommunicate with other schools of thought; but if they will only listen whenyou tell them that PCT is something other than what it is then whatcommunication has there been?

Bill Powers (for one) has been communicating to the other schools ofthought quite clearly for many years; it's seems to me that the other schoolsof thought have not shown any serious interest in the message of PCT --and for good reason; it would mean the end of psychology as they know it, avery unpleasant experience for people who have built careers on psychology aswe know it. Revolutions are not fun --just ask Galileo. Should Galileo have placed the earth at the center of themodel solar system just because it would have gone down better with the "otherschools of thought" of the day. I don't think so.

Best Rick

Date: Tue Jul 19, 1994 12:02 pm PST

Subj: free will, feedforward, misc.

[From Jeff Vancouver 940718]

Well, getting to my office once a week certainly puts me behind the times.I can only skim the posts. Several posts where RE: Replies to Paul and Jeff,but were actually only to Paul. Please be careful, the subject headings on oneway I reduce information overload. Incidently, Paul, glad to see a kindredspirit on the net. Our kindred is not in our professions (I am a psychologist),but in our message (seek similarities with others, not differences).

Ironically, to seek that goal I am still seeking to understand some of thedifferences. Tom [940711.1655] thanks for the post regarding feedforward, ithelped somewhat. But I am beginning to worry that Locke is right, or we arearguing semantics.

You said "Carrying an umbrella when I leave the house after hearing aweather report that predicts rain is present-timeperceptual control, not feedforward." Does it matter if the weather report wasgiven that morning or the night before? Surely you are not saying theperception of impending rain, compared to a reference signal would produce a"get umbrella" output. Instead, you are saying the weather report triggers amemory of the perception of walking in the rain which is compared with a desirenot to get wet to produce the output "get an umbrella when you are going out."The use of a memory store, an not real time perceptions is what I mean byfeedforward.

Bill P. [940711.2115] says "You can't plan actions; you can only plan theperceivable consequences of actions." and later "All you can do is plan\_goals\_, and leave it up to your control systems to bring them about in real-timeperception, dealing with the world as it actually is, in all itsdetail."

This is exactly what I mean by feedforward. We do not propagate theplanning too far down the hierarchy. Such detail would get us into the troubleof over specifying a situation that is too variable. In a private post fromCharles Tucker, he seemed to be saying that Bill P. has a precise definitionfor feedforward that 1) requires the propagation and 2) is therefore notrelevant. He suggests using the term planning. How does this sound?

P.S. That the plan are goals (reference signals), not actions is often,though not always missed by cognitive psychologists.

Back to Tom. You said you would address the rest of my questions afterfixing your tux, but I never saw a followup. Did I miss something?

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Date: Fri Jul 22, 1994 1:03 am PST

Subj: Re: free will, feedforward, misc.

From Tom Bourbon [940721.1803]

Still catching up after the wedding. >[Jeff Vancouver 940718]

> Ironically, to seek that goal I am still seeking to understand some ofthe differences. Tom [940711.1655] thanks for the post regarding feedforward,it helped somewhat. But I am beginning to worry that Locke is right, or we arearguing semantics.

I'm afraid I don't catch your allusion to Locke. I know his work, but /idon't catch what you mean when you say you "worry that Locke is right?" Rightabout what? Why does whatever he said worry you?

> You said "Carrying an umbrella when I leave the house after hearing aweather report that predicts rain is present-timeperceptual control, not feedforward." Does it matter if the weather report wasgiven that morning or the night before?

Not a bit, except that the accuracy of weather reports drops offexponentially with time! Carrying the umbrella is present-timebehavior, no matter how long ago I heard the weather report.

> Surely you are not saying the perception of impending rain, comparedto a reference signal would produce a "get umbrella" output.

I'm not? Maybe I am; maybe I'm not. I \_am\_ curious about why you wouldn'twant me to say that --why my saying that would perturb you. Can you let me know?

> Instead, you are saying the weather report triggers a memory of theperception of walking in the rain which is compared with a desire not to getwet to produce the output "get an umbrella when you are going out."

But aren't you saying here that, if there is a discrepancy when present-timeperceptions are compared with present-timereference signals, then there will be a change in actions? That was what I wassaying --it's all in the present. The past does not exist now; the future does not existnow; now exists now.

> The use of a memory store, an not real time perceptions is what I meanby feedforward.

Oops. Where did feedforward come from? "Memories" are present-time"things," aren't they? And so are perceptions, and comparisons, anddiscrepancies (error signals) and actions. Maybe it would help me understandyou better if you were to give me your definition of "feedforward."

> Bill P. [940711.2115] says "You can't plan actions; you can only planthe perceivable consequences of actions." and later "All you can do is plan\_goals\_, and leave it up to your control systems to bring them about in real-timeperception, dealing with the world as it actually is, in all itsdetail."

> This is exactly what I mean by feedforward.

This example doesn't help me very much, as a clue about your definition offeedforward. I see Bill talking about present-time"planning" of the expected results of unplanned actions. I plan to experiencesome dinner soon --I've had nothing to eat since breakfast, which was long ago. I "plan" toexperience myself logging off, locking the office, taking the elevator down,waiting for my wife to stop by on her way home, and so on. All of theseimaginings are right now; all of my actions (which I cannot plan in advance)will be happening "now;" all of my perceptions will be controlled "now."

> We do not propagate the planning too far down the hierarchy.

I don't think we propagate a plan for \_actions\_ at all.

> Such detail would get us into the trouble of over specifying asituation that is too variable.

The variability is precisely the problem. ;-)

> In a private post from Charles Tucker, he seemed to be saying thatBill P. has a precise definition for feedforward that 1) requires thepropagation and 2) is therefore not relevant. He suggests using the termplanning. How does this sound?

Planning perceptions, yes. Planning actions, no.

> P.S. That the plan are goals (reference signals), not actions isoften, though not always missed by cognitive psychologists.

I'll drink to that! Or maybe I'll eat a few bites of dinner tothat.

> Back to Tom. You said you would address the rest of my questionsafter fixing your tux, but I never saw a followup. Did I misssomething?

I'm still looking for them. I'm not yet caught up on the past week ofmail.

> Marken [940711.2200]

> on the feedforward question you say: "the actions that will compensatefor disturbances cannot (and need not) be anticipated."

> I say that we (complex systems) need not, cannot completely, but cangrossly anticipate disturbances.

Jeff, \_why\_ do you say that? Can you give some examples we could model,quantitatively? How would we test for whether a person is doing what you sayhere?

> As I reread some of Locke and other psychologists I see the issue offree will raised as central to their problem with PCT. They often go too far -action is a function of conscious will. Do you take the other extreme -action is random?

Did you ever see anyone (PCT modelers) say action is random? (You mighthave --I'm just asking.) If so, what were the conditions under which they said actionswould be random --or at least \_appear to be\_ random, to an observer?

> Locke seems to think you do.

Can you quote Locke on that? I have a small sampling of his writing and I'dlike to see if I have that quote, or if I can locate it for my file of mistakenideas about PCT.

> I think the answer is in between. Action is indeterminable, butrelated to the perceptions one is controlling.

You are onto an important theme here. Indeterminable from whoseperspective? That is the crux of the matter.

> I certainly agree with you Marken [940711.2200] "Conventionalpsychology and PCT ... are talking PAST one another." You say because theydon't study control. Humor me, I say they do sometimes study it, just notalways exactly like you.

Again, all you need to do to convince us on this point is show us, chapterand verse, where they themselves say they study the phenomenon in whichindividuals control their own perceptions and, incidentally, control variablesin their environments. I think Rick is saying there isn't evidence thatpsychologists study that phenomenon.

> I say a difference is the emphasis on an individual's concept of theirplace in the world versus the actual hierarchy. The concept is a perverserendition particularly because it rarely uses a PCT image. But, psychologist,me among them, say that concept is relevant to how they act \_and\_ perceive. Ithink some in PCT think that as well. Again I ask, where does PCT stand on theself-concept?

Rick and Mary have already answered you on this point. I concur.

Time for dinner! Now, what was that plan? First twitch the extensorsattached to that bone over there ... . ;-))

Later, Tom