

## PART IV

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# HIERARCHIES OF PURPOSE

We do many things that enable us to do other things. Usually, we care more about those other things than about the enabling things; that is, we usually care less about how we get to a goal than about getting to the goal. I get in my car because it offers me a way to get to 33<sup>rd</sup> and Donald Streets. (Using my car is not the only way I can get to 33<sup>rd</sup> and Donald Streets. I could take a bus or hike. Or if I were going with Claire, we could go in her car.) Let's suppose I want to go to 33<sup>rd</sup> and Donald because there is a theater there showing a movie I very much want to see. (I would be willing to see it at some other theater, but the theater at 33<sup>rd</sup> and Donald seems to be the only one showing it.) When I arrive in my car at 33<sup>rd</sup> and Donald, I look for a place to park, because I believe I would not be successful in getting my body safely into the theater without first stopping the car. I buy a ticket because I believe someone will eject me from the theater if I do not.

And of course there are actions that enable me to perform those other enabling actions. I go out of the house to get into my car because my car is outside, not in the house, and, unlike a dog, it will not come to me if I call it. I stand up before walking out of the house, because I am more skillful at walking when I do it upright. (I could crawl to the car, but it would be slower, and I might damage the knees of my trousers.) To rise from my chair, I lean forward to center my weight over my feet, and then straighten my hip-joints and spine. (I could ask Claire to lift me into an upright position, but she would only laugh.) To straighten my hip-joints, I contract various muscles of which I am ignorant. And to keep my balance, I continuously activate groups of muscles, some acting against others to maintain a continuous dynamic counteraction to the effects of gravity. And I do that continuous delicate balancing even though I am en-

tirely ignorant of the way my nerves and muscles and glands go about doing it.

To activate my muscles in a way that succeeds in getting me out of my chair and balanced on my feet—and across the room and into the car and off to 33<sup>rd</sup> and Donald and into my seat in the theater—my brain continuously responds to neural signals from my eyes, ears, fingertips, and so on by comparing those perceptual signals with internal reference signals that represent what I want to be perceiving—my leg muscles pulling, my posture upright, the distance to the door shortening, and so on.

One can think of controls of very small local variables such as the concentrations of chemicals at the synapses of nerves. Such controls enable controls of greater scope to succeed—the movements of muscles, the attainment of postures, and so on. And one can think of purposes that require control of variables that in turn require many sorts of acts over considerable periods of time. Why do I want to see that movie? That is, what might seeing that movie enable me to perceive? You can think of various possibilities. Perhaps it is chiefly the artistry of the production that I want to perceive and enjoy. Or perhaps I am a movie buff and want to expand my acquaintance with the repertoires of the actors. If I am myself a movie maker, I might want to become informed about the doings of a competitor. Or perhaps I perceive myself as a person of artistic sensibilities and judge this movie to be a movie my kind of person should be able to talk about.

As I mentioned in earlier chapters (not, I hope, ad nauseam) living creatures maintain stable perceptions by means of varying actions. The perception maintained can be not only a constant value of a variable, but also a constant rate of change of a variable, or a constant rate of change of a rate of change, or a constantly repeated pattern of change (such as

a sine wave), and so on. So a more encompassing statement would be that living creatures maintain a constant rate of change (including zero) or pattern of change in perceived variables by varying actions so as to counteract disturbances to those perceived variables. That means that a purpose (or internal standard or reference value) at a “high” level such as a continuing approach to the theater must be maintained by perceptions at “lower” levels that enable that approach to continue—parking at the theater, steering the car to get to that parking lot, getting into the car at home, and soon back to the neural signals to the muscles to get yourself out of the chair, and even back to the neural chemistry.

An indispensable part of PCT is Powers’s postulation of “levels” of control organized in a hierarchy. The outputs of the “higher” levels are not neural signals to muscles, but signals to “lower” loops that act as the reference values for those lower loops. I mentioned the hierarchy in Chapter 3 under “A Little Flesh and Blood,” in Chapter 4 under “Internal Processing,” and in Chapter 9 under “The Neural Hierarchy,” where I gave brief descriptions of the first six levels. In Chapter 8, under “Hierarchy,” I gave an example of research using more than one level. Here in Part IV, I will give much more detail about the hierarchy of control.

When we perceive ourselves acting in ways that serve as means to ends, we perceive the hierarchy of control. Notice that it is not the outside world that is organized into means and ends. As rocks roll down the mountainside, the result is eventually to reduce the height of the mountain. But they do not roll as the means of achieving the purpose of wearing down the mountain. The rocks just roll. The mountain just dwindles. The idea of eroding as a cause of dwindling lies in our minds.

In what I have said so far, I have illustrated several points:

- 1 Perceptions at a lower level of perception are necessary for the perceptions at the higher level to exist. The lower level is necessary to the higher, but not the higher to the lower.
- 2 Control at a higher level is achieved through *varying* the internal standards of the loops at lower levels.

- 3 Levels are orthogonal. That is, control achieved by loops at one level does not predict the kind of variables that will be controlled at the next higher level.
- 4 Each new level introduces new degrees of freedom. That is, each higher level introduces further ways the person can make use of the environment to control perceptions.

First is the idea of instrumentality, of means and ends, also called goals and sub-goals. Some actions enable other actions to occur. We forget, by the way, that our own ends can differ from the ends of others. I found this example in an acrostic puzzle:

In Staffordshire, England, it was reported that the buses no longer stopped at certain hamlets for passengers. Councillor Arthur C. Holerton then made transport history by stating that if these buses stopped to pick up passengers, they would disrupt the time-table.

That there are means to ends is a very old idea. What is new here is the idea that this relationship among acts appears in the same way in the relationship among levels of *control of perception* in human (and other) nervous systems. Also new are the orthogonality and the specification of particular levels or kinds of control, as we shall see later.

The second point is that there are many ways to skin a cat. Actually, I could get to the library by more ways than walking. If I break a leg, I could hop or crawl, but I’d be more likely to use crutches or a wheelchair. I will say more about the third and fourth points in the following chapters of Part IV.

If you want to read more reports of research on levels of control, try Marken and Powers (1989a); Pavloski and others (1990); and Bourbon (1994). For examples of control when intentions change, see Marken (1990), and Bourbon (1994, p. 11). For a somewhat more detailed design for a two-level model for controlling an arm muscle, see Powers (1979a, August, pp. 94–116). For careful observations of control at successively higher levels by infant humans and chimpanzees, see F. X. Plooj (1984, 1990), Plooj and Rijt-Plooj (1989, 1989b, 1990, 1994), or Rijt-Plooj and Plooj (1986, 1987, 1992, 1993), and Vanderijt and Plooj (2003).