

# *The Things We Do*

*Using the Lessons of Bernard and Darwin to Understand the What, How, and Why of Our Behavior*

Review by  
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*By Gary Cziko*

This is a book about learning, that arrives at a new paradigm by merging ideas from biology, cybernetics and psychology.

The USA psychologist Gary Cziko takes inspiration from the 19th-century French psychologist Claude Bernard, who “discovered” the self-regulating nature of living organisms.

Bernard realized that each living organism is a system built to maintain a constant internal state in the face of changing external conditions. The regulation of this “milieu interieur” is life itself, because it is this stable state that gives the organism its independence from the environment, its identity. This is the dividing line that separates animate and inanimate matter: inanimate matter obeys Newton’s laws of cause and effect, animate matter tends to maintain its state no matter what external forces are applied. Unlike objects, whose state is changed when a force is applied, the state of a living organism is not changed by an external force. The living organism, as long as it is alive, maintains its state constant.

The “purposeful” behavior of a living organism is the reaction to environmental forces: the organism needs to act in order to continuously restore its state. A body seems to “want”, “intend”, “desire” to maintain its internal state (either by eating, moving, sleeping, etc), a state that, ultimately, is a combination of chemical content and temperature. Living bodies appear to act purposely, but they are simply reacting to the environment.

For Bernard “freedom” is independence from the environment. Control of the internal state allows a living organism to live in many different environments. The living organism is “free” in that is not a slave of its environment.

Bernard’s idea of self-regulation extended to all living organisms. Humans are not the only ones to have “goals”.

Now Cziko turns to another important precursor, although in a completely different discipline: cybernetics.

The American electrical engineer William Powers extended these ideas to a hierarchical organization of control systems. First of all, he realized that a control system controls what it senses: it controls its input (the perception), not its output (the behavior). A thermostat controls the temperature, not the gas consumed by the heater. Organisms change their behavior, but they do it in order to control a perception. Behavior is the control of perception.

Next, he envisioned a system which is made of a pyramid of control systems, each one sending its output to some “lower-level” control systems. The lowest level in the hierarchy is made of control systems that use sensors to sense the environment and effectors to act on the environment, and some “reference level” to determine what they have to maintain constant. For example, a thermostat would sense the environment’s temperature, effect the heater and maintain constant the measured temperature. At a higher level, a control system senses and effects the reference level of lower-level control systems. An engine could direct a thermostat to maintain a certain temperature. The reference level of the lower level is determined by the control systems of the higher level.

Living organisms are made of such hierarchies of control systems. “Instinctive” behavior is the control system (organized in a hierarchy) that the organism inherits at birth. They determine internally what parameters have to be maintained constant, and at which magnitude. Behavior is a backward chain of behaviors: walking up the hierarchy one finds out why the system is doing what it is doing (e.g., it is keeping the temperature at some many degrees because the engine is running at so many RPMs because... etc etc). The hierarchy is a hierarchy of goals (goals that have to be achieved in order to achieve other goals in order to achieve other goals in order to...)

Next, Cziko turns to modern neurology. This hierarchy can change dynamically thanks to neural darwinism.

Finally, by combining Bernard, Powers and Darwin, Cziko reaches a new concept of learning: learning is reorganizing a control system. This constitutes a departure both from Skinner’s cause-effect behavioral models and from Piaget’s stage-based cognitive models. Basically, Bernard explains the “what” of behavior, Powers explains the “how” of behavior and Darwin explains the “why” of behavior. There are, of course, evolutionary constraints: there is a limit to what an organism can learn, to how much it can change its behavior.

Along the way, Cziko compares his view of learning with Piaget’s and Skinner’s, and takes on modern thinkers of different disciplines (Chomsky, Dennett, Pinker). Chomsky comes through as particularly reluctant to endorse Darwinism.

See also the better book by Cziko:

Cziko Gary: “Without Miracles” (MIT Press, 1995)