

Two Kinds of Model Airplanes

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Some thoughts on "internal" vs. "external" models (B:CP, p. 18):

The distinction that Bill Powers makes in Chapter 2 between "'internal' and 'external' theories" and the models based on those theories brought to my mind the model airplanes that kids used to build, back before the days of computer games and iPads. In my distant youth, kids who were interested in airplanes had a choice of two kinds of model airplane kits when they went to a toy store.

The first kind of kit was the molded plastic model. When you opened the box, you found lots of plastic pieces that had to be glued or snapped together and step-by-step directions for assembling the model plane. When the plane was assembled, you could paint it or apply decals to make it look more realistic, and the model was ready to play with or (more likely) to sit as a decoration on your shelf.

The second kind was typically made of balsa wood instead of plastic and might require some carving or sanding to make the parts fit together properly, as well as some painting if you wanted to make it look pretty. Like the plastic models, it also came with directions for assembly, and it usually had a propeller and an engine of some kind, ranging from a twisted rubber band for the low-end models to an electric or gas-powered motor for the fancier models. If you were a dedicated hobbyist, you could even buy and build radio-controlled models that allowed you to send signals to change the direction of the plane in flight.

The first kind of model plane looked much more realistic. Although no one would ever mistake a little plastic model for a full-size 747 or X-15, it simulated all the surface details of the actual plane. Underneath the surface, however, the model was just a hollow plastic shell.

The second kind of plane was more fun to play with, because you could actually fly it. The motor, propeller, wings, fuselage, and tail assembly all worked together to put the plane in motion through the air. Had you been so foolish as to try to fly one of the plastic models, it would have just dropped like a stone and broken into smithereens. Of course, the wooden models often crashed, too, but they usually followed some kind of interesting flight pattern first.

A child playing with plastic models could learn a lot about the different parts of a plane and what different kinds of planes looked like, but the child would learn practically nothing about the mechanics of actually flying a plane.

Playing with the second kind of model, a child could learn a lot about how real planes fly, because physical forces like gravity, friction, and air flow acted on the parts of the model

plane in exactly the same way as they did on real planes. Adjusting the wing flaps and tail surfaces of the model planes, for instance, could produce the same kinds of stalls, loops, and turns as can occur with real planes in flight.

In Bill's terms, the first kind of model plane might be classified as an "external" model, because it deals only in surface appearances, and it lacks any of the "subsystems" (B:CP, p. 15) that are the essential parts of a functional airplane. The second kind of model plane is an "internal" model that, despite being simplified in many respects in comparison to a real airplane, has all the subsystems necessary for it to work in a similar way.

In Chapter 2, Bill is arguing that all the previous psychological theories listed in the chapter are based on external models, and that the theory he offers in the book is an internal model, a model that is much more revealing about how brains actually work.