PSYCHE

A Review of Ruth Byrne, *The Rational Imagination: How People Create Alternative to Reality*

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Introducing *The Rational Imagination*, Ruth Byrne tells us that rational thought has turned out to be "more imaginative than cognitive scientists…supposed," and—more to the point here—that "[I]maginative thought is more rational than scientists imagined" (xi). It would be unwise to take this mini-manifesto (or the book's title) too seriously. The claim to which Byrne actually gives sustained attention is less philosophically sexy and more solidly empirical. This book is primarily concerned with experimental evidence (much of it Byrne's own) in support of the thesis that the particular counterfactual conjectures people entertain—'If Mary had asked Peter to pick the peppers, he would have picked the peppers'—are governed by the same small set of psychological principles that influence inferential reasoning about them—'Peter *didn't* pick the peppers? Well, then, it stands to reason that Mary didn't ask him to' (214-215). Byrne conjectures that this same small set of principles might also help in understanding how people creatively generate new members of a category (190–191), interpret novel phrases like 'cactus fish' (192–193), and solve insight problems (194-195). By contrast, Byrne's discussion of criteria for the rationality of counterfactual thought comes close to the end of the book and is notably modest and tentative. Perhaps counterfactual thought counts as rational if it is capable of producing the "best" judgments; perhaps the best counterfactual judgments are those that strike us as most plausible; perhaps plausibility is a hallmark of rationality because it is grounded in recognition of "fault lines in reality" (208–212). On the other hand, perhaps not. Counterfactual thoughts that paralyze people with regret are often compellingly plausible. (Try to deny 'If only I had looked in on the baby, I would have noticed that something was wrong.') Despite their plausibility, Byrne characterizes

such "dysfunctional" counterfactuals as "irrational." Perhaps this can be harmonized by the competence/performance distinction; perhaps a canny reader would be better advised to settle for the psychology.

Byrne's approach in *The Rational Imagination* is unabashedly pedagogic. After pointing out that logicians call an "If…then" premise a material conditional and distinguishing these from biconditionals, Byrne asks the reader, "What did you think about when you understood…'If Alice went to the stables she rode Starlight'?" and instructs them, "Take a moment to list what is possible (and what is impossible) given the truth of the conditional" (19). Similarly, after an explanation of 'subjunctive mood', the reader is asked, "Do you think that if Oswald had not killed Kennedy someone else would have?" (32). Readers who anticipate that such prompts will be distracting might prefer to consult the award winning Mental Models website http://www.tcd.ie/Psychology/Ruth_Byrne/mental_models/ for references to other of Byrne's publications

The Rational Imagination takes us through the following steps (29, 215).

[1] Human reasoning is rational;

[2] Human reasoning depends on the mental representation of possibilities;

[3] Which possibilities are selected for representation in reasoning is guided by a set of principles;

[4] The set of principles that guide the possibilities people think about when they reason also guide their imaginative thoughts (215);

[5] Imaginative thought is rational.

In Chapter 2, Byrne addresses [1] in the context of deductive reasoning. "Rational thought is thought that leads to reasonable conclusions" (29); carried out correctly, deductive reasoning yields a conclusion that is eminently reasonable—one that is "not just plausible or possible… [but that] *must* be true, if the factors it is based on…are true" (15, stress in the original). People are deductively rational "because they can appreciate a simple semantic principle: an inference is valid if there are no counterexamples to it" (17). Systematic flaws in deductive reasoning pose no challenge to the existence of such competence: like lapses from grammatically, they reflect only constraints on performance. Readers will recognize [2] as the central axiom of mental model theory (henceforth, MM) that provides the conceptual framework for the book. According to MM, people understand a claim by imagining states of affairs consistent with its truth— "true possibilities"—and test deductive inferences for validity by canvassing these imagined possibilities for counterexamples.

For [3], Byrne identifies a set of principles that influence which possibilities will be represented in reasoning, first, about "factual" conditionals and then about counterfactual ones. People initially keep in mind just a few of what they take to be true possibilities—perhaps only one; some ideas, however, require that two possibilities be represented; counterfactual thought involves the representation of two possibilities, one identified as 'imagined' or 'conjectured', the other as 'presupposed' or 'factual';

counterfactuals are easier to generate when two alternatives are represented from the start (40); in understanding obligations, people think about forbidden possibilities as well as permitted ones; representations of possibilities include information about the temporal order of events in the world (161).

Chapters 3 through 7 utilize the same groundplan to support [4]. First, some puzzling facts about counterfactuals are displayed, e.g., that counterfactual thoughts are more likely to undo an action than to alter an inaction, as assessed by judgments about which would result in greater regret or satisfaction. Next, Byrne turns to studies of studies of counterfactual reasoning for evidence of selection principles in operation there—for example, studies that compare the inferences people draw from counterfactual as opposed to "factual" premises, indicating that people represent two possibilities when they understand a counterfactual conditional and only one in the case of a "factual" conditional. Finally, Byrne discusses how, in conjunction with "corollaries," these principles can explain the candidate phenomenon. A relevant corollary here is that people are more likely to represent actions than inactions with two possibilities.

> Inactions are mentally represented more economically than actions…There is no change in state for inactions, and so the preaction and postaction possibilities remain the same…There are more things to keep in mind when someone does something than when they do nothing…Because people keep in mind more information for actions than for inactions, they can mentally change actions more easily than inactions…People can readily imagine a counterfactual alternative to an intentional action because they have envisaged two possibilities when they understand the action…(pp. 53-54).

Chapter 4, Thinking About What *Should* Have Happened, is likely to be of particular interest to readers who have been following the debate about so-called "content effects" on Wason-type selection tasks. Byrne firmly rejects explanations that invoke either familiarity with permission schemas or the operation of mental modules specialized for reasoning about social contracts. She offers, instead, an account in terms of MM and the dual representation of "forbidden" and "permitted" possibilities (92–96), concluding that

> [I]f any sort of thinking did evolve…[it] is the ability to think about certain possibilities readily. Perhaps what evolved is the ability to understand obligations by thinking about not only the permitted possibility but also the forbidden possibility. This suggestion…also explains why people keep these two possibilities in mind for indicative conditionals placed in contexts that elicit forbidden possibilities (96).

Chapter 5 takes up complex relationships between counterfactuals and causal thinking, asking, among other things, why an aspect of reality that has been targeted for alteration in the antecedent of a counterfactual will not necessarily be accorded causal clout with regard to the consequent. Chapter 6 continues the discussion of causal

reasoning with consideration of "even if…" semifactuals that deny causal influence. Chapter 7 addresses observations that people are more likely to alter the last event in a series than an earlier one, as shown by our tendency to blame a player more when she misses a free throw in the last minute of a game than in the first quarter. This chapter also describes the creation of a LISP program that successfully simulates what Byrne calls "temporal anchoring" (169–171). (If generation of alternatives to reality counts as imagination, imagination does not appear to require anything resembling consciousness.)

Throughout, Byrne provides generous support for a reader attempting to negotiate this material. Counterfactual phenomena are introduced with clear and engaging examples; corresponding sections of each chapter are headed "Clues from Reasoning." Psychological experiments are presented without disciplinary jargon and parenthetical notes tactfully show what is being referred to by 'affirmation of the consequent,' 'denial of the antecedent,' '*modus ponens*' and '*modus tollens.*' Boxed tables in each chapter help readers keep track of the steadily growing list of principles and corollaries in play; others make it possible to keep complicated comparisons in mind. Substantial repetition and crisp summaries render most chapters self contained: readers who have used the first three chapters to orient themselves will probably be able to enter others without regard for their order.

A leading member of the international cognitive science community, Byrne also teaches university undergraduates; my guess is that she is a very effective teacher. Nonetheless, readers who have to think twice about which premises are major or minor, affirmative or negative, or who are not already familiar with alternative theoretical approaches to human reasoning, are likely to find *The Rational Imagination* what my own students would call a "crunchy" book. It would probably be a good idea to browse a bit before taking it home.