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Critical Study

Interrogative Moves, Logical Inferences, and Reasoning

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Hintikka, Jaakko and Bachman, James (1991). ***What If...? Toward Excellence in Reasoning***. Mountain View, CA: Mayfield. 465 pp. ISBN 0-87484-964-0. Paper. US $36.95.

What If...? is in many ways a cautionary tale.[1] The basic problem with the book is that it fails to be a *reasoning* text at all. The danger is that teachers will be tempted to try this book on the basis of Hintikka's deserved reputation in philosophy. Hintikka and Bachman write as if they are entirely unacquainted with the work that has been done on reasoning—and on the teaching of reasoning—in the last twenty years. This is a book that would have been mildly innovative in 1972.

The book contains four major parts, each about 80 pages long. The first three "complete the examination of the basic elements of reasoning as understood through the interrogative model," while the fourth covers what the authors call "advanced topics." The book is crammed with small print, technical vocabulary, semantical tableaux, a formidable logical apparatus, logical symbols, even (in the first advanced chapter) inverted A's, backward E's, and letters from the Greek alphabet—given all this, it is hard to imagine the reasoning course that will get beyond Part 3. This review, then, will concentrate on the first three Parts—the "basic elements of reasoning."

The authors' plan for the book is straightforward. Reasoning is characterized as an interrogative game, one which allows two and only two moves (36). Part I is an introduction to *interrogative* moves (IM). Part II covers *logical inference* moves (LI). Part III explores "Interrogative Moves in Detail."

The *interrogative approach to reasoning*, which constitutes the centerpiece of the book, is one that is difficult to describe succinctly in a way that accurately portrays how it works in practice. Hintikka and Bachman describe it (on p. 5 and in the glossary) as an "approach that stresses the importance of questioning in rational inquiry." But a persistent problem in the book is that the way the authors describe their methods and the way they use them in practice (and teach students to use them) are frequently at odds. In this case, their use of the interrogative approach is far more restricted than their characterization would lead one to believe. Of the large number of interesting and often vital questions a good reasoner asks of an arguer or argument, the interrogative approach considers only a few of the narrowest ones.

In Part I reasoning is described as an interrogative game in which—this constitutes the central metaphor of the text—an inquirer asks questions of an "oracle." We begin with the simplifying assumptions that we ask the oracle our questions "alone, not in cooperation with others," and that "the oracle's answers are all true." In terms of the metaphor, then, interrogative moves (IMs) are the answers we receive from the oracle; the logical inference moves are

those sanctioned by the familiar apparatus of formal logic (here taken as the sentential calculus, with a rendition of the predicate calculus as one of the Advanced Topics in Part 4). The authors further illustrate the use of IMs by means of what they call "interrogative tables" (their name for semantical tableaux). These tables constitute the major organizational tool the authors provide to students. With them, students learn to list the interrogative moves and the logical inference moves; the aim of this, as with truth-tables in many logic texts, is to help students see if they can "imagine" the conclusion false and the listed statements true.

The "interrogative approach" to reasoning—what exactly IMs are, and how IMs function in the highly structured treatment of argument analysis and evaluation—constitutes the bulk of Part I. There are, as we shall see, serious problems at the heart of all these topics.

Part 2 of the book is more familiar. It is titled "Logical Inferences in Detail" and it varies from the standard treatment of the sentential calculus primarily in using "interrogative tables" (semantical tableaux) in place of truth tables. It briefly covers the distinction between validity and truth; discusses how to translate "not," "and," "or," and "if-then" into -, &, v, and ⊃; goes through DeMorgan's equivalences; devotes a chapter to the table method; defines modus ponens and a few other argument patterns (all having exactly two premises and one conclusion); discusses some of the standard problems of translating the simplest English sentences into the sentential calculus.

What is more striking about Part 2, however, is what is missing: it omits the "Interrogative Approach to Reasoning." The very word "interrogative" virtually disappears. The "interrogative table method" through these five chapters simply becomes the "table method." Lines that before would have been called IMs are now labeled simply as "premises." It is as if Hintikka and Bachman expect students to keep intact everything they've learned about IMs in Part I, preserving it through 80 pages of dense, highly technical text—enough logic to constitute the whole of many courses—and to have it there, still intact, when they are abruptly brought back to interrogative moves in Part 3. But the real problem is deeper than a pedagogical one—Hintikka and Bachman do not see reasoning as an integrated enterprise.

Part 3 of the book, the one that "completes the study of the basic elements of reasoning" (232), surprisingly does not attempt to integrate the interrogative moves of Part 1 with the logical moves of Part 2 into a coherent, usable method. Rather, it concentrates on what its title says: "Interrogative Moves in Detail." That is, just as Part 2 dropped the interrogative to take up the inferential, so Part 3 drops the material from Part 2 and focuses only on IMs, this time in greater detail. The only logical inference move retained from the previous five chapters of text is the use of the disjunction.

Topics in Part 3 are numerous, and they vary widely. In addition to some fairly theoretical discussions of distinctions between conclusive versus partial answers to questions (described in terms of ruling out "alternative scenarios") and principal vs. operational questions, the main themes are the structure and rules for asking questions of oracles, the presuppositions of those questions, strategies for reasoning with uncertain answers, and some ways of evaluating oracles.

Described under headings like these, the themes sound incisive, apt, just what a conscientious teacher of reasoning would want to cover. But each of these topics is conceived of so single-mindedly within the narrow and artificial confines of listing moves within an interrogative table, that it gives an air of unreality to the whole account. At each stage, we seem about to cover a crucial part of learning to reason better, but before our eyes the topic turns

into a different topic, one that is small, apparatus-ridden, almost missing the point—like whether to list a sentence on the left or the right side of our table.

For example, the authors in Chapter 11 cover the seemingly central topics of the *kinds* of questions we can ask in an inquiry; how to determine the *structure* of such questions; how to explicate the *presuppositions* of such questions; and, finally, what are the *definitory rules* for asking such questions. It looks as if we are about to address substantive topics in learning how to reason better. But the authors' discussion of each of these topics somehow misses all substance.

Thus, Chapter 11 explores the *kinds* of questions we can ask in an inquiry. There are, the authors say, two kinds: statement questions (like "Is Mary staying on campus?") or "'wh-' questions" (like "Who stole my pickup truck?"). Each kind of question has a *structure*: the structure of a statement question is a request to "Bring it about that I know A v B v C..."; the structure of a "wh-"question is "Bring it about that I know who stole my pickup truck." The *presupposition* of a statement question is A v B v C...; the presupposition of a "wh-" question is "Someone stole my pickup truck." Finally, the *definitory rule* for statement questions is that if "A v B v C" appears on the left side of the table, we may ask the oracle which are true; the definitory rule for "wh-" questions is that if "Someone stole my pickup truck" appears on the left side of the table, we may ask the oracle who it was.

This technical and narrow discussion just summarized is not, it should be noted, an *introduction* to the topic; rather it constitutes the full treatment of the kind, structure, presuppositions, and definitory rules of questions. And the authors' treatment of each major topic is quite similar—technical, narrow, off-center. It is as if the book's audience was taken to be people who already knew formal logic, some philosophy of science, some epistemology, and a good deal about reasoning. For these people the authors are providing a slightly different way of looking at and formulating the most elementary reasoning moves.

Any number of similar examples can be given. Chapter 12, for instance, covers rules and "strategies for reasoning with uncertain answers" (207). Since virtually all cases of reasoning through actual problems involve uncertain answers, we want to know: What are those rules and strategies?

The "rules" are to bracket uncertain answers in our interrogative tables, to bracket further any lines derived from the uncertain answers, and to refrain from using such bracketed lines in our table. What then are the "strategies for coping with uncertain answers" (214), i.e., those that have been bracketed? The three strategies considered by Hintikka and Bachman are to "repeat the same question, hoping to receive the same answer," to make the answer "the subject of a separate inquiry," or to set aside the uncertain answer and try to "construct a new line of reasoning" for the conclusion—this time one that presumably *is* "certain" (216).

That is the full extent of the instruction on coping with uncertainties. Notice that the account entails that the only claims usable in reasoning are those that are *certain*. Given that virtually all interesting topics to reason about involve steps that are less than certain, the method in the book leaves little room for application.

What If...? in the end fails to be a *reasoning* book at all. In the first place—though ultimately the least serious of the book's problems—there are the grave difficulties with the authors' "interrogative approach," especially as a means of teaching reasoning. The first chapter of the book, on inquiry in general and its relation to reasoning, is gripping and full of promise. "*The good reasoner*," the authors say, "*must actively and imaginatively formulate questions* to make progress in his or her inquiry" (5); a key to reasoning is "asking the right questions" (7).

We expect, from these and similar remarks, that we will receive instruction in *how* to formulate questions better than we do now. In fact, however, we get nothing of the sort. What we do get are "definitory rules" about manipulating declarative sentences within the top-heavy apparatus of the sentential calculus plus semantical tableaux. Beyond that we get little, merely the authors' admonition that such "important parts of rational inquiry cannot be boiled down to definitory rules which once and for all tell us what is right to do" (218). But that, of course, hardly constitutes a reason for ignoring it and sticking only with topics that are artificially neat. Students will not learn how to ask better questions from *What If...?*

For a book that emphasizes the "interrogative approach," there are surprisingly few actual questions in the text. "Interrogative move" is in fact a term the authors simply apply to declarative sentences throughout. And the idea of interrogative moves is a very malleable one. Sometimes, IMs are merely claims stated in the argument (cf. #2 on pp. 59-60).[2] But IMs also include what would elsewhere be called missing premises or assumptions (cf. #6a, p. 61 and #7.2, p. 74.). Ranging still more broadly, IMs are sometimes construed loosely enough to include "possibly relevant information the inquirer had in mind" (65). Take, for instance, the authors' example:

> It is unthinkable that Americans should be asked to pay higher taxes so that do-gooder officials in our bloated federal government can squander it on aid to foreign countries (64).

Hintikka and Bachman tease from this the exchange:

> Why do [federal officials] give money away to foreign countries? Answer: They want to do good.

This *may* be what the arguer "had in mind," but of course it isn't what the person said, nor does it follow from what the person said. It is risky to assert what an arguer "had in mind" in a book that takes all inference to be deductive.

Indeed, sometimes IMs include what amounts to mere speculation about a possible (and implausible) background for the argument at hand:

> A doctor might observe a number of patients who all have similar symptoms and who all suffer from a vitamin-C deficiency. On the basis of these particular cases, the doctor might inductively infer the conclusion that all patients who have the same symptoms suffer the same vitamin-C deficiency. The doctor might think that the next time she or he sees a patient with those symptoms, that patient will definitely be suffering from a vitamin-C deficiency (85).

The authors analyze the case into

> Certain of the doctor's patients all suffer from vitamin-C deficiency,

and

> They all exhibit the same basic set of symptoms (87).

But since "the goal is to find reliable information that will permit a truth-preserving, logical deductive inference to establish the general conclusion," the authors then simply "assume"—out of the blue—that

> Only dietary factors are involved in producing such symptoms (88)!

This is of course not only mere speculation, but implausible speculation as well. The authors consistently conflate the kinds of question an *arguer* might (or should) have asked with questions *someone analyzing the argument* might (or should) ask. But writing down such speculation in our semantical tableaux (87) is no way to reason well.

Thus an interrogative move can be a stated claim, a missing premise, a claim perhaps presupposed by the arguer, a response to what the arguer could also have said. Lumping all these different moves together is not a very useful device for teaching students to ask relevant and incisive

reasoning questions—especially since these different moves are not even distinguished in the text.

One thing that makes this especially distressing is the inadequate fulfillment of the promise of the first chapter. The *idea* of an interrogative approach *could* have been a good one. The approach would key in on the kinds of questions students need to learn to ask about an argument:

- What does the arguer mean? (Is there bias? ambiguity? Is my understanding of the argument too simplistic?)
- Are the claims the arguer makes plausible? (Am I justified in believing them? What evidence do I have for and against the claims? Can I think of counterexamples to the claims?)
- Does the conclusion follow from the claims made? (To what extent? What assumptions is it reasonable to suppose the arguer is making? Are *they* plausible? Can I think of counterexamples to the inferences or missing premises?)
- What alternatives are there? (What are the opposition's views? What alternative ways are there of interpreting the arguer's meaning, claims and inferences?)
- What is the arguer's purpose? (Is there a hidden agenda? What does the arguer hope to accomplish?)
- What further presuppositions and implications does the argument have? (Does it fit within a larger theory, or does it stand on its own?)
- What other problems are similar to the one being argued about here? How would this argument answer those problems?
- In what context is the argument given? What do I need to know about the argument's context (historical, cultural, psychological...) to interpret it accurately and evaluate it fairly?

These are the sorts of questions students (and the rest of us) need to get better at asking, and giving reasonable answers to. They are also the kinds of questions that are often adaptable to reasoning about innumerable problems other than pure arguments—news reporting, how carburetors work, how to read a topographical map, how to take better notes in class, what to do if I think my child has ingested poison. Reasoning texts do not typically cover all these questions well, nor do they usually cover many of the kinds of reasoning problems that are not readily construed as arguments, but most reasoning texts cover at least the first three questions in some detail.

The most striking shortcoming of *What If...?* is that the only question from the list that it covers is the third one, the one about inferences, and then only with respect to deductive inferences.

Even with respect to deductive inferences, the coverage has huge gaps. For one thing, though all arguments are explicitly treated as deductive,[3] there is no attempt to show students *how* to fill in the claims needed to make the argument valid. (Teachers of reasoning know this is no small skill for students to accomplish.) Neither "assumption" nor "missing premise" nor even the authors' own "suppressed operational question" (172-74) is listed in the glossary. Second, each of the realistic arguments the authors reconstruct inevitably ends up containing one of those egregiously false premises that are so often the price paid to make an argument valid. Yet the authors neither mention nor acknowledge this. To the contrary, they consistently phrase such premises in a way that makes them seem far more plausible than they are, even sometimes at the cost of obscuring the argument's validity. Thus, three key models of arguments analyzed by the authors contain claims like:

> Only a course in reasoning and critical thinking will prepare me for the [LSAT] exam (74);
>
> Persons should be paid in proportion to the value of the work performed (51);

or, in their showpiece deductive reconstruction of a piece of Sherlock Holmes's reasoning,

> The only person any watchdog does not bark at is its master (14).

Phrased in this way, such claims may well appear quite plausible to students. But each claim rightly appears very doubtful when re-phrased in a way that understanding the argument in question actually demands:

> *No* course in *any* other field will prepare me for the LSAT;
>
> The *only* factor in determining what a person should be paid is the value of the work that person performs;
>
> The *only possible* cause for a watchdog's not barking in the night is that its master came.

If the book is concentrating on teaching students to reason, it should at least call attention to the fact that such highly dubious statements will appear. Hintikka and Bachman, though, do the opposite. Every single argument they reconstruct is of this sort: each contains at least one premise that logic teachers everywhere could give trenchant counterexamples to.

Consider the other two essential questions in reasoning out an argument: meaning and truth. Take *meaning* as a case in point. To evaluate an argument, in any substantive sense, I first have to understand what it means. I have to interpret it accurately, fairly. I at least have to be on the lookout for biased phrasing, for ambiguities of the type that are so prevalent in the real-life arguments that often guide social, political, ethical, and personal decision-making.

What If...? ignores the question of interpreting an argument, ignores it almost entirely. Ambiguity is not covered (nor, as far as I can tell, is it even mentioned) until page 337, one hundred pages into the "Advanced Topics," and then only in two scant pages. When it does finally come up, it is illustrated by silly examples like

> p1. Everything that runs has feet.
> p2. The Mississippi River runs to the Gulf of Mexico.
> c. The Mississippi River has feet (339).

Vagueness similarly gets a single belated page of coverage (340-41). Bias is not covered at all. Neither "ambiguity" nor "vagueness" nor any other term having to do with interpreting what an argument means is deemed important enough to be included as an item in the glossary.

Next, take the question of "truth." How do I reasonably evaluate the claims in an argument? How can I tell if they're true, or plausible, or rationally acceptable, or if I'm justified in believing them? The exact term to be used is not the point. The point is that making such judgments is a major part of reasoning well, every bit as important as evaluating inferences. This Hintikka and Bachman themselves say (209). But their treatment does not accord with their admission. On the contrary, the bulk of the book is devoted to dealing only with the neat, circumscribed task of listing—merely *listing*—the interrogative and logical moves.

It is not until we get to page 200—the three Parts that form the basic course on reasoning extend only to page 233—that we even begin to consider how to evaluate a claim. Only here are we ready to drop the assumption that "the oracle's answers are all true."

When we do finally get to the topic, the coverage is cursory and misleading. It is disorganized as well. Here for instance are all eight of the subheadings under "Various Sources of Answers to Questions": Witness in a Court of Law, Patient at a Diagnostic Interview, Experiments as Questions Put to Nature, Observations as Questions Put to One's Environment, Tacit Knowledge, Interpretive Observations, Computer Memory (!), and Imagination. Each is covered in a paragraph or two.

They form no coherent picture of what to do to evaluate a claim.

Similarly, Chapter 13, on "Strategies for Evaluating Oracles," could have formed a helpful section on reasoning about real problems. The theme of the chapter is that one of the ways we evaluate the "answers" of "oracles" is by evaluating the oracle itself. This could profitably have dealt with how a non-professional can reasonably evaluate professionals and their pronouncements. This would also be a good place to bring in a discussion of evaluating the media—surely one of the main "oracles" in our society, yet one that is not discussed in any important way in the book.

What Chapter 13 does contain is a lengthy philosophical discussion of how to interpret the fallacies of authority and *ad hominem*, a section on how to play a dialogical game, and long, artificial examples. All told, only three pages of the chapter are devoted to evaluating oracles, and these concentrate mostly on rarely usable strategies like finding that an oracle's answers are inconsistent (223), or comparing them with another oracle's "indubitable answers," or even "in an extreme case" the helpfulness of knowing "that a certain oracle always lies" (with the tired case of the two guides at a crossroads). While occasionally usable, these are hardly realistic or helpful ways to evaluate most sources of information.

The treatment of evaluating claims is so cursory, one gets the feeling, because it is really an afterthought to a book on logic. Figuring out what it is reasonable to believe is presented as if it were a search for isolated facts or a clever exposure of an inconsistency in a witness's testimony. "Wh"- questions, for example, potentially a rich source for generating questions that probe and assess evidence ("Why did the U.S. go to war in the Persian Gulf?" "What can I do to find out?"), are analyzed in a way that actually inhibits rather than furthers reasoning. Thus, of the "wh"-questions the authors mention, *why*, *when*, *where*, and *how* are ignored, while *what* and *who* are treated as if they were mere placeholders for names, a request for factoids like "What is the capital of Nebraska?" (190) or "Who is the president of France?" (192). This, once again, is not a helpful model for coming to grips with those real "wh"- questions that students need to learn to reason out on the basis of evidence.

Indeed, the very term, "evidence," hardly occurs in the book. Even the idea—that claims are to be judged on the basis of evidence—seems lacking. Neither the term "evidence," nor any other term having to do with truth (or judging truth, or any correlative notion) appears in the glossary.

It is customary in a review to point out the positive features of a book as well as its failings. And there *are* good features of the book. There are some concise and impressive analyses of philosophical or practical problems—like the quick, deft dissection of malpractice in terms of the distinction between definitory rules and strategic principles (288), or the nice discussion of how advisors can be used as sources of information (222). There is a hefty appendix of mostly real-life arguments to use in reasoning exercises and assignments. More questionably (because it seems to be taken too paradigmatically), there is the catchy use of murder mysteries as a device for introducing students to the idea of reasoning and using evidence.

These indeed show an astute philosophical mind at work. Unfortunately, they only leave us with an enhanced sense of regret—What If... such resources could have been applied to the actual teaching of reasoning?

Notes

[1] I would like to acknowledge the invaluable help given by Edward Johnson and Jean Nosich, and also the richer, deeper conception of reasoning I got from working with Richard Paul.

[2] Their whole presentation of this is confused and confusing. Sometimes, for example, IMs are sharply distinguished from premises. (Thus every single interrogative table in Chapter 2 has *three* (not two) headings: *premises*, *interrogative moves*, and *logical inferences*; some have lines labeled "IM" and other lines labeled "premise" (38).) This is never cleared up for students. Despite such distinctions, a stated premise does turn out to be a species of IM (as of course it must).

[3] Their defense of this odd move is on pp. 86-88 and 327-33. Characteristically, they think that the issue of deductive versus non-deductive inferences reduces to the question of where in our semantical tableaux we want to stick the uncertainty.

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