

philosophy. (Note: this is not a fallacious appeal to authority, but merely a point of information!)

4. Adapted from an argument in the Toronto Globe and Mail, appearing sometime in January, 1980.
5. That is, unless we insist on adding as a missing premise, 'You should do everything you promise to do', in which case the argument is deductive.
6. See Scriven, Reasoning, pages 78-81, and Thomas, Practical Reasoning in Natural Language, pages 37-40.
7. He does note that the concept of conductive argument has wider application, saying, "Wherever some descriptive predicate is ascribed on the basis of a family resemblance, conductive reasoning takes place." (page 54). But he does not make enough of this point, nor does he tell us how many descriptive predicates are ascribed on the basis of family resemblance. (If most are, as Wittgenstein seems to have thought, then conductive reasoning would be very common, and conductive arguments an extremely important type. Compare D. C. Yalden-Thomson, "The Virginia Lectures", in Wisdom: Twelve Essays, edited by Renford Bambrough.)
8. Wellman specifies three different patterns of conductive argument; one where only one relevant factor is adduced; one where several are adduced; and a third where both 'pro' and 'con' factors are adduced, and the claim is made that the former outweigh the latter.
9. Compare Susan Haack, Philosophy of Logics, Chapter II.
10. See Objections to the Meditations (II), and Descartes' reply, in which he insists that a general proposition is not required and that, indeed, "general propositions are formed out of the knowledge of particulars" (page 38, Volume II, in Haldane and Ross edition.) A similar response is made by Descartes in a letter to Clerseilier (page 127 in Haldane and Ross, II.)
11. Compare Francis Dauer, "The Diagnosis of an Argument", Metaphilosophy, 1974.

UNDERSTANDING SCIENTIFIC REASONING

Ronald N. Giere

William Berriman
University of Regina

Suppose one could gather together about a hundred university professors of philosophy and suppose furthermore that they represented a fair sample of today's philosophers with respect to contemporary thinking about the teaching of logic and philosophy. To these people one now reads the first four paragraphs of Giere's Preface.

By the end of the reading the philosophers would have become decisively divided on their attitudes to the book. Giere speaks of "new courses in 'applied philosophy'", of the "students' demand for 'relevance'" and of his reluctant rejection of his idea of subtitled the book "A Consumer's Guide to Scientific Method". He claims that students can become intelligent consumers of scientific information not by learning science (or in his words "how to be scientists") but by learning

merely how to read and interpret reports of scientific findings, especially reports that appear in the popular magazines, newspapers, and even supermarket tabloids.

Some of our philosophers would denounce the book as "light weight", "not academically respectable" and condemn the book outright. The others would find that the book arouses their interest. This aroused interest may have three (possibly overlapping) sources: a) an awareness of the possibility that the book may form the basis of an attractive (pop?) class. b) On the basis of one's knowledge of today's students plus the nature of many media reports one may have concluded i) that most people know very little about science but that ii) they are prepared to believe the most outrageous stories provided these are in the realm of "science". Finally c) Giere's book appears to offer the opportunity to extend one's work in informal logic into the area of the logic of science, and reports about science in the media.

A cursory glance through the book reveals material that should arouse student interest. Giere's chapters deal with Haley's long-range forecast of the appearance of his comet, the World II model which uses a computer to predict disaster for mankind by the year 2100 unless great changes are made in the world socio-economic system by 1985. Additional (to informal logic) fallacies such as Vague Predictions (or the Delphi Fallacy), The Jean Dixon Fallacy (multiple predictions),

Patchwork Quilt Fallacy (and the Chariots of the Gods) are also introduced as well as material on probability, causation, testing statistical hypotheses and so on. The exercises at the end of each chapter also provide a plentiful array of interesting material which can be easily added to (almost on a daily basis) from the mass media.

If one begins to read the early chapters one comes to see that Giere's exposition is lucid and his frequent reassurances that really this is all quite easy satisfies one that this is indeed a useful text.

The problems only begin when the book and students are brought together. In spite of Giere's assurances that it is easy, the students encounter problems because they find the book difficult.

I think there are at least two basic reasons why the students find the book difficult and neither reason is unique to Giere's book. The first problem arises from the fact that authors of "easy" texts in philosophy are conscious that at some places at least, they are dealing with issues which are most controversial. There is a need for the author to show that he is aware of these difficulties even if he cannot fully explain them. So he mentions the difficulty and the fact that controversy exists, states his position, then proceeds.

For example, in Chapter 5, using Newton's Theories as one of his examples of a scientific theory, Giere states that the question "What is a theory?" is a much discussed question. After stating Newton's four laws using the terms "force" and "mass", he explains that those terms are not clearly defined. However, (he says), one can take the four laws as definitions of mass and force. Indeed, the concept of theories as definitions accounts for their protected epistemic and logical status. But definitions, while they are true, say nothing about the world, so the question is how can theories apply to the world? Giere's answer is that they do not, but that they are very closely related to theoretical hypotheses, which are contingent and about the world.

The connection between theories and theoretical hypothesis is made in Chapter 6. Giere there asserts that "in general, for any theory, a theoretical hypothesis has the form:

such and such real system is a system of the type defined by the theory."
(p. 70)

Theoretical hypotheses are thus contingent statements serving to link theories as definitions to the world.

When Giere shifts his attention to the crucial matter of justifying theoretical hypotheses, he introduces two conditions which are later (Chapter 8) used to distinguish between acceptable scientific thinking and unacceptable (pseudo) scientific thinking. The two conditions are:

1. If [H and IC and AA], then P.
2. If [not H and IC and AA], then very probably not P. (H = the theoretical hypothesis, IC = initial conditions, AA = auxiliary assumptions and P = the prediction).

In Condition 1 the prediction is thought of as being a deductive product of the antecedent with the auxiliary assumptions seen as a "catch all" to secure this deductive relationship. Condition 2 is meant to eliminate any obvious "predictions" and to ensure that the hypothesis is not "empty" but really does add to the conjunction of IC and AA. If the predicted event does not occur it is shown that on deductive grounds the hypothesis is falsified (provided both IC and AA are true), but if the predicted event comes to pass only inductive support is given the hypothesis.

After understanding these conditions and their logical support clearly, the student should be able to use them to distinguish between satisfactory and unsatisfactory scientific claims as reported in the mass media. However, additional logical insight is required to understand that the so-called Jean Dixon Fallacy using multiple predictions can be regarded as either a conjunction or disjunction of predictions. If it is a conjunction then one false prediction falsifies the set and if it is a disjunction then just one correct prediction (which may be made by any reasonably informed person) makes the total set true. Taking the set as a series of conjunctions is too rigorous given her success rate but taken as a disjunction does not provide evidence that she has what Giere calls "a futureseeing system".

Enough has been said to make it evident what the second basic reason why students find the book difficult. For all Giere's assurances to the contrary, the subject matter is not easy unless one has a considerable background in philosophy. So the professor who uses the book will find himself having to provide the necessary philosophical and logical background which Giere assumes.

Even with Giere's exposition and the provision by the instructor of additional material, the light only seems to dawn for most students as one works one's way through Giere's excellent exercises applying the previous material. A major reason for this "dawning light" is that the student perceives that having dealt with the nature of theories in enough detail to puzzle the student, Giere, after introducing the concept of theoretical hypotheses, ignores theories entirely and both uses and invites, in his exercises, the use of the concept of theoretical hypotheses in a much broader sense than that given above quoting from Giere (p. 70.) The two conditions are phrased entirely in terms of theoretical hypotheses. So, most students openly wonder, why did we even concern ourselves with the difficulties of theories or even models? The answer is, of course, that these are important in understanding scientific thinking and the difference between that kind of thinking and pseudo-scientific thinking; but Giere, in his effort to make everything easy, invites the students' question and the general criticism that the book's treatment of scientific thinking is inadequate. Yet perhaps one understands Giere's dilemma: an "adequate" treatment perhaps stands in the way of successfully leading the average non-specialist student through to the point where he can distinguish between acceptable media reports

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and those which are obviously unacceptable. Perhaps! But one wonders if students, who successfully use the two conditions to discuss media reports, will have learned from Giere enough about the nature of science to distinguish good reports from bad when, years from now, he has forgotten the two conditions.

As I completed this report, this criticism of both Giere and my teaching was given an added point when I told one of my students who completed the class very successfully just two months ago that I had finished the report. He asked: "Did you criticize Giere for getting into all that complicated stuff about theories when all along he was merely making a very simple point about the use of the two conditions?"

It really is very difficult to make some things easy in a satisfactory way or to convince others that some things ought not to be thought of as simple.

REASONING Michael Scriven

A. S. Carson
University of Alberta

Into a growing market of informal logic texts, many of which are either interminable and boring lists of argument fallacies or watered-down formal logic manuals, Michael Scriven introduces *Reasoning*, an engaging alternative. With a conscious attempt to avoid making argument analysis a witch-hunt for fallacies or an over-technical glossary of logic terms, he endeavours to explain the nature of reasoning and argumentation and to demonstrate, step-by-step, how arguments are structured and a systematic means by which this structure can be drawn from prose and examined. The enterprise is as much a positive tuition in the construction of sound practical arguments as it is skill training in the rather more negative art of critical analysis. It is, most commendably, a teaching device to the last.

Scriven makes a considerable departure from a number of accepted views in logic and an even greater distancing move from standard approaches to informal logic. On the former, he gives up on talk of "validity" in favour of "sound inferences" and "true premises"; he eschews the use/mention distinction and its quotation mark symbolization; he makes a number of attacks against the utility of formal logic in "real reasoning", Scriven points out, for instance, that formal systems can have value to natural language arguments only

if (a) the natural language can be encoded into the symbolism (b) transformations can be made within the calculus (c) the symbolism can then be decoded into the natural language; the value in this process being in the reliability of the transformations. However the encoding step, he maintains, is as problematic in all but trivial cases as the assessment of the original argument would have been. And he goes on to claim that formal systems have never developed a satisfactory way of dealing with assumptions, something which real arguments are rarely without. Equally, formal systems are rife with paradoxes such as that of "material implication"; and the willingness of logicians to substitute formal simplicity for practical utility is evident from the work of C. I. Lewis, and of Anderson and Belnap who simply do not tackle the need to distinguish "guarantees of truth for p" from "good reasons for believing that p" from "allows the derivation of p". Says Scriven: "The truth of p guarantees the truth of p, but it sure isn't a good reason for believing it" (p. xvi). To contrast with this, and to introduce the approach to be taken to informal logic (the latter point mentioned above), Scriven states: "This book is about good reasons, not repetitions or transformations. It's just a start on what shouldn't be but is, almost an untouched subject" (*ibid*).

What Scriven is after in this book, then, is to show the reader what real reasoning is and how to do it well. Specifically, his aims are to improve one's skill in "analysing and evaluating arguments and presentations" and in "presenting arguments, reports and instructions clearly and persuasively." To be improved as well are one's "critical instincts" and "knowledge about the facts and arguments relevant to a large number of important contemporary issues in politics, education, ethics, and several practical fields" (p. ix).

These aims are to be brought about by doing what other texts of this sort do not. For one thing, reasoning is to be construed more broadly than simply argumentation. Reading with understanding, for instance, is to be taken as a form of reasoning. Moreover, reasoning is shown to be a social enterprise --something that has to do with language, rational persuasion, open-mindedness, a commitment to truth and even a moral commitment to respecting other people's rights to make up their own minds on the basis of reasons or evidence. For another thing, the analysis of arguments is to be taught, not as is often the case, solely by a combination of principle and demonstration, but through a series of seven procedural steps, each of which is carefully explained and illustrated. These procedures direct the student's attention to careful reading (or listening), to distinguishing between reasons and conclusions and the particular relations among them, to drawing out assumptions or unstated premises (and being "charitable, i.e. fair," to the arguer in so doing), and to evaluating the argument, not just in light of the truth of premises and soundness of inference, but in view of, and this is important, other possible arguments that might be brought to bear. It is, perhaps, this last point that