Figure 1.6. DATA-BASED ANSWERS TO QUESTIONS: A Case of Continuing Dispute

EM9218: The Globe and Mail, October 10, 1992, page D8

MIND & MATTER

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Gong, it's round 43 of the brain-size slanging match

TODAY, let's play science Jeopardy. I'll give you the right response and then you have to guess the question it is the answer to.

Answer: Freddy, cockroaches and debates about sexual and racial brain-size differences.

Question: Name three things that refuse to die.

We are now into at least round 43 in the brain-size slanging match. While some of the most recent disagreements have been played out in pages of this newspaper, a vigorous (that is, all the curse words have been excised) discussion has been on going in the letters pages of the august science magazine *Nature*.

By way of context, I don't know how to capture the soberness of London-based *Nature* for those who are unfamiliar with its high science mien. But I did once flummox a *Nature* reporter by saying I had always wanted to meet someone who worked for a journal that published extremely significant but completely incomprehensible findings.

Anyhow, since July 16, when *Nature* editor John Maddox published a lengthy editorial on what he perceived to be elementary statistical errors by controversial University of Western Ontario psychology professor J. Philippe Rushton, *Nature* has been awash in cerebral arguments.

In an editorial headlined, "How to publish the unpalatable," Dr. Maddox hypothesized that "a person claiming to be able to stand generally accepted views on their head has an urgent claim on public attention, but .... he or she must bring to the task evidence which is overwhelmingly compelling."

Prof. Rushton's analysis of head-size data collected from 6,325 U.S. soldiers suggested that on average orientals had bigger brains than whites and whites had larger brains than blacks. It also indicated that men's brains were bigger than women's and officers' brains larger than enlisted men's.

Bogus, claimed Dr. Maddox. The data are inherently tainted because prejudice in U.S. society means that statistically different groups of blacks and whites and men and women join the army. Thus Prof. Rushton's argument is like comparing apples, oranges and peaches. "The more serious complaint is that an argument putting forward a politically incorrect conclusion in a manner likely to be widely and generally misinterpreted has not been required to meet the test that the proof should be especially compelling," concluded Dr. Maddox, explaining why *Nature* would not publish Prof. Rushton's findings.

Four letter writers responded to what in fact was a kind of publication-through-an-editorial-about-why-we're-not-publishing. Among them Dr. Rushton maintained that his findings were upheld by others' work, and besides Dr. Maddox's thesis was all wet.

UWO zoologist C. Davison Ankney also weighed in with his now notorious re-analysis of male-famale, brain-size variation in corpses autopsied in Cleveland in the 1970s. The original study had concluded that "differences between the sexes is not clear-cut." However, when Dr. Ankney compared men and women of equal height or weight he found that on average the men's brains weighed 100 grams more than the women's. His analysis of height and weight was a way to compensate for the self-evident truth that men are on average bigger than women.

In the Sept. 17 issue of *Nature* four more letters re Ankney-Rushton appear.

The most telling one comes from Dolph Schluter, a zoologist at the University of British Columbia, who re-examines the data that Prof. Ankney re-interpreted and then re-interprets the re-interpretation. Prof. Schluter argues that if you have truly accounted for body-size differences, then men and women with the same brain size should be equally tall. But no, when you compare white men and women with equal-size brains the men are on average 10 centimetres taller. "By this criterion woman have much larger brains (for their size) than men," he concludes. "Furthermore, the racial differences disappear when the data are analyzed in the same way."

Seems pretty straightforward, but even as you read this column both Prof. Ankney and Prof. Rushton have posted letters to *Nature* refuting the refutation. Prof. Ankney argues that at "age 25 years, brains of white men were calculated to be 17-per-cent heavier than those of white women, but men were only 8-per-cent taller. Obviously, even Schluter's statistical smoke and mirrors cannot make women have brains that are proportionally as large as men."

Prof. Rushton in his unpublished letter says that when white women and black women of equal height were compared in the military study, the brains of the white women weighed 94 grams more.

I draw your attention to all this brain-related academic fisticuffs for two reasons. The first is to let you know the debate is ongoing. The second is to underscore a reality that is almost never discussed in the non-science media: Experimental science isn't facts or truths – it is argument. It is always people marshalling suspect data to support a line of reasoning. It is always other people saying hogwash, my data or my re-interpretation of your data shows just what a dunderhead you are.

The rarest thing in science is real agreement.

The truest thing is that context in everything.

In addition to the discussion in the article EM9218 reprinted above of the statistical issues involved in deciding what Questions can be answered from the brain-size data, the final three paragraphs raise the key statistical idea of the *uncertainty* associated with many Answers in even experimental science (or in what is called 'data-based investigating' in Figures 1.1, 2.1 and 2.2, for example). The same point is made by Dr. John Polanyi, University Professor at the University of Toronto and

(*continued overleaf*)

the 1986 Nobel Laureate for Chemistry, in a commentary entitled *The Responsible Scientist* in the Royal Society of Canada publication *OYEZ*[3] (Fall, 1992, Volume 4, No. 2, pages 12-14):

> Scientists are citizens possessing an important form of literacy. It takes the form of numeracy and an acquaintance with what, in more innocent times, was called "the scientific method."
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> .....
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> The obligation that we (*i.e.*, scientists) have is to pay the tax of citizenship to the rest of society – a tax on our time, a tax on the wealth of knowledge that is ours. We must be willing, on occasion, to contribute our particular type of literacy to the public debate on some of the issues that have a technological component. We understand how science advances. We know that there is no moment of scientific discovery but that there is an accumulation of evidence that eventually, as in a court of law, convinces reason- able people.
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> Many who lack direct experience of science believe that at the moment of proof a bell rings. Later, they discover that supposed proof was invalid, and they lose faith in the scientific process. *Had they realized that proof represents no more than diminished uncertainty*, they would have understood that risk is inescapable. It is a damaging thing if society demands that risk be abolished. What we have to do – and it is enormously important that we do it – is to prioritize risk so that we do not squander our wealth trying to diminish trivial hazards. (Emphasis added)

1 Outline *reason(s)* for the uncertainty that is the common theme of the final three paragraphs of the article EM9218 reprinted overleaf on page 1.11 and the italicized part of the quotation given above from Dr. Polanyi.

- What areas, if any, of knowledge allow for *certain* Answers? Explain briefly.
  - Briefly indicate the *relationship* to 'experimental science' (*i.e.*, 'data-based investigating') of area(s) you identify.

2 In an article entitled *Don't knock rhetoric* in *The UW Correspondent* (Fall/Winter, 1992-93, Volume 12, No. 1, page 2), Professor Sally Haag describes the elementary learning-package of the school curriculum of late antiquity and the Middle Ages, called the *trivium*, a package of three roads or three ways which started the student off down the path towards the universal goal of the freeborn adult citizen, the mastery of the liberal arts; the three ways, or subjects of study, were logic, grammar and rhetoric.

Near the end of her article, Professor Haag quotes from D.L. Clark's book *Rhetoric in Greco-Roman Education* (Columbia University Press, New York, 1957, 1959, page 265): [Arts Library call number PA 3265.C55]

> For we must never forget that rhetoric debates, not what has been demonstrated scientifically, but those issues which are uncertain and contingent. In the absence of certain knowledge, it can only hope to arrive at informed and probable opinion as to what in a given situation is just, honourable and expedient.

Compare and contrast Clark's statement with those of Stephen Strauss and John Polanyi which are under consideration in Question 1 above.

3 Explain briefly what you understand, in the context of the article EM9218 reprinted overleaf on page 1.11, by the sentence in the first paragraph of the right-hand column: *.... prejudice in U.S. society means that statistically different groups of blacks and whites and men and women join the army.*

4 Explain briefly what you understand, in the context of the article EM9218 reprinted overleaf on page 1.11, by the sentence in the first paragraph of the right-hand column: *.... an argument putting forward a politically incorrect conclusion in a manner likely to be widely and generally misinterpreted .....*

5 The right-hand column of the article EM9218 reprinted overleaf on page 1.11 gives information about the data analytic issues involved in the limitations on Answers to Questions about the relative brain sizes of men and women and different racial groups. On the basis of this information, briefly suggest way(s) in which reducing these limitations might be pursued in terms of one or more of the following approaches:

- further analysis of *available* data;
- collection and analysis of *new* data;
- other *questions* which might be asked.
  - Referring to the sixth-last line of the right-hand column overleaf, describe briefly the implications of the adjective *suspect* as it is applied to 'data' in the context of the article.

REFERENCES: *Nature*: 16 July, 1992, Volume 358, No. 6383, page 187; [D.C. Library call number Per Q1.N2]
13 August, 1992, Volume 358, No. 6387, page 532;
17 September, 1992, Volume 359, No. 6392, pages 181-182;
29 October, 1992, Volume 359, No. 6398, page 768.

NOTE: Copies of the complete articles by Professors Polanyi and Haag are available on request from the instructor.