

Moreover, no reference to any mathematical source is given, and also references to secondary literature are generic; it is notable that not only marginal questions, like the problem of the gnomon (chapter 11), but also highly controversial topics such as the system of concentric spheres and the Eudoxian contribution to proportion theory are presented as apodictic claims.

But leave the mathematical content aside, and suppose that the Eudoxian theory of proportions is exactly as the author describes it: Why would it be univocally related to mechanics, and to the moving radius principle in particular, as De Groot claims? What about harmonics? Is the theory of proportions not the ‘dominant mathematical frame’ (xx) of harmonics too? And what about the other applications of the theory, which was at the time the most widespread mathematical tool? Undoubtedly Aristotle’s works are full of references to proportion theory, but there is no sign to conclude that these come from mechanics. By the very same way of reasoning, and compatibly with the textual data, we could in fact conclude that harmonics, and not mechanics, is at the basis of Aristotle’s physics.

To conclude, the aim of De Groot’s book is appreciable, and the philosophical part is original and rich in interesting ideas. Unfortunately, the mathematical part is not up to this standard.

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Advances in Experimental Epistemology

JAMES R. BEEBE (Ed.)

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The methodology of mainstream epistemology relies partly on thought experiments about whether subjects in particular hypothetical cases have knowledge (e.g. whether Fred knows that the animal in front of him is a zebra rather than a painted mule, whether Mary knows that her lottery ticket is a loser by merely considering the odds, whether Hannah knows that the bank is open when it is very important for her that it be so, and so on). Ordinary intuitions about such cases are supposed to guide us to the truth and thereby help us adjudicate complex philosophical disputes. Unfortunately, philosophers sometimes have conflicting intuitive judgements about the relevant cases. Experimental epistemology comes in at this point, employing experimental methods to test folk intuitions about these cases with the aim of providing data that could help in settling or at least advancing the debate. *Advances in Experimental Epistemology*, edited by James R. Beebe, is a collection of papers by some of the main experts in this area of research. Some of these papers provide original

empirical studies, while others provide insightful discussions about the methodology of experimental philosophy (hereafter ‘X-Phi’).

In the introduction, Beebe illustrates the connection between the various contributions in the volume and important previous studies on the topic. In the following, I will introduce and comment upon the eight contributions included in the volume. I divide them into three groups on the basis of topic.

Contextualism and anti-intellectualism. One of the most active research areas in experimental epistemology concerns testing whether folk knowledge ascriptions vary with conversational and/or practical situations of the ascriber (as predicted by contextualism) or the practical interests of the subject (as predicted by anti-intellectualism). Evidence both supporting and undermining these views has been reported in previous studies. Three contributions to the volume address this debate: two provide new empirical studies; one criticises the common design of the surveys.

Ángel Pinillos and Shawn Simpson’s chapter, ‘Experimental Evidence in Support of Anti-intellectualism About Knowledge’, following Pinillos (2012), presents further positive evidence for anti-intellectualism. According to participants in their tests, subjects with high stakes need stronger evidence in order to know (they need to check the basis for their beliefs more times) than their counterparts with low stakes. Moreover, the experiments provide *prima facie* support for a normative connection between knowledge and action. According to the authors, the results indicate that people tend implicitly to hold that knowledge of a proposition *p* is a necessary and sufficient condition for appropriately relying on *p* in their actions. In the last part of the chapter, the authors attempt to address objections to their studies put forward by Wesley Buckwalter and Jonathan Schaffer (2015).

In his contribution, ‘The Mystery of Stakes and Error in Ascriber Intuitions’, Buckwalter provides further evidence that the salience of error possibilities is the primary factor responsible for variations in folk knowledge ascriptions. His study detects an impact of error possibilities on judgements about knowledge ascriptions when the error possibility is depicted in the vignettes in a concrete and vivid way (e.g. by adding to the usual Bank case, ‘Just imagine how frustrating it would be driving here tomorrow and finding the door locked’). Furthermore, he takes his studies as not revealing any tendency of the subject’s stakes (i.e. practical consequences of being wrong) to influence participants’ judgements. According to Buckwalter, this result supports a certain ascriber contextualism and is problematic for anti-intellectualism and for all those views that attribute a central role to practical factors in variations in such judgements.

However, Buckwalter does not consider two alternative explanations of the results compatible with a role of stakes in judgement variations. First, according to Keith DeRose (2011, 97), concrete and vivid descriptions of an error possibility can substantially raise the stakes. In particular, it seems that the specific description of error possibilities in Buckwalter’s studies does not merely indirectly raise the stakes by making the error possibility salient. It also directly makes salient the practical consequences of an error (cf. Gerken 2012, 141; Gerken 2013, 44). It is thus illegitimate to conclude from the results of Buckwalter’s studies that no impact of stakes is detected. Second,

according to Chandra S. Sripada and Jason Stanley (2012), the low-stakes condition in Buckwalter's studies could fail to convey that stakes are low, hence neutralizing the contrast between low-stakes cases and high-stakes cases.

Despite the fact that in the philosophical discussion the cases supporting contextualism and anti-intellectualism are constituted by two vignettes representing low- and high-stakes contexts presented together (within-subjects design), most experiments in the X-Phi literature provide only a single vignette to each participant (between-subjects design). There is a reason for using the between-subjects design: according to DeRose (2009), the best ground for accepting contextualism comes from how knowledge-ascribing sentences are used in ordinary, non-philosophical talk, and he holds that between-subjects design accurately represents subjects' ordinary use of 'knows' and avoids possible shifts to higher standards of assessment. In his contribution, 'Contrasting Cases', Nat Hansen argues that empirical data about within-subjects experiments are at least as important as between-subjects ones to understand ordinary people's epistemic judgements. Against DeRose, he argues that more informed judgements based on the joint evaluation of different contexts provide better grounds for assessing contextualism. Drawing on psychological research in heuristics and biases, Hansen illustrates that being presented with both low- and high-stakes contexts at the same time could elicit more informed, reflective, and rational epistemic assessments and help the participants assess certain contextual features difficult to evaluate when the cases are presented separately (e.g. the subject's stakes).

New directions. Three contributions in the volume explore issues not previously considered in the X-Phi literature, and some also anticipate possible directions for future experiments.

John Turri and Ori Friedman's chapter, 'Winners and Losers in the Folk Epistemology of Lotteries', investigates folk intuitions about lottery cases. Their results confirm the usual epistemologists' insights about lottery cases. On the one hand, participants tend to deny knowing that a lottery ticket lost based on purely statistical considerations ('sceptical lottery judgement'); on the other hand, they tend to ascribe knowledge that the ticket lost based on testimony such as news reports, even though the chance that these reports are wrong can be higher than the probability of winning the lottery ('non-sceptical lottery judgement'). Moreover, Turri and Friedman carefully examine various available explanations of the sceptical lottery judgement and report evidence that undermines each of them—however, quite curiously, the authors do not consider John Hawthorne's (2004) account of lottery cases, one of the most influential in the contemporary literature. Based on empirical research on formulaic language, they propose and support with empirical tests an alternative account according to which formulaic expressions—characterised by stereotyped intonation and rhythm, familiarity, predictability, and unreflective automaticity—used in the basic lottery cases would inhibit knowledge ascription. Roughly, according to this account, knowledge ascriptions in lottery cases are like cliché answers that people give in stereotypical situations. As their tests show, these intuitions do not generalize to other cases involving non-stereotypical situations.

In the contribution, ‘Salience and Epistemic Egocentrism: An Empirical Study’, Joshua Alexander, Chad Gonnerman, and John Waterman suggest that, as recently proposed by Jennifer Nagel (2010), our epistemic judgements are subject to egocentric biases such as tendencies to mistakenly project our mental states, including our own epistemic positions, on others. The four studies in this chapter show that mention of error possibilities in the survey cases affects the participants’ judgements about the epistemic position of the subject, independently of whether these error possibilities are available to or entertained by the subject. In my opinion, though these studies show that dispositions to attribute knowledge are sensitive to the possibilities made salient in a given conversational context, they fail to show that this sensitivity is specifically due to egocentric biases. For example, it is unclear why these studies should favour Nagel’s psychological explanation over alternative accounts including those provided by ascriber contextualism, pragmatic accounts (e.g. Rysiew 2001), and other psychological explanations (e.g. Gerken 2013; Turri 2015).

David Sackris and Beebe’s chapter, ‘Is Justification Necessary for Knowledge?’, provides empirical studies questioning the necessity of justification for knowledge. Quite surprisingly, their experiments report that people are willing to ascribe knowledge to subjects who have true beliefs but apparently lack proper basis for their beliefs.

Methodological advances. It is a common practice in X-Phi to take survey responses as a straightforward indicator of folk intuitions about philosophical concepts, assuming the reliability of the survey methodology and eventually attributing to the results a philosophical significance. Two contributions in the volume question such methodological presumptions.

Drawing upon research in psychology on false memory and semantic processing in the contribution, ‘Semantic Integration as a Method for Investigating Concepts’, Derek Powell, Zachary Horne, and Pinillos suggest an alternative methodology to test folk intuitions about philosophical questions, the method of semantic integration. This methodology uses memory tasks as implicit measures of the degree to which different situations instantiate certain concepts. This method can track relations among groups of concepts while avoiding some serious problems affecting the traditional survey method (e.g. biases due to pragmatic and psychological factors).

Lastly, in his contribution, ‘The Promise of Experimental Philosophy and the Inference’, Jonathan Weinberg considers the prospects of X-Phi in directly contributing to solving first-order philosophical questions. He assumes that ordinary capacities to make philosophical judgements have a defeasible reliability. The problem of X-Phi is to distinguish reliable philosophical judgements from non-reliable ones. This is a quite complicated task given that psychological or statistical results are not necessarily philosophically significant. Weinberg attempts to address this problem by offering a specific method to measure the philosophical significance of experimental results.

Advances in Experimental Epistemology is worth reading. This collection of both empirical and methodological studies in X-Phi is not only an important resource for experts in the field, but also a helpful guide for newcomers.

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Model-based Reasoning in Science and Technology: Theoretical and Cognitive Issues

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Models are simplified representations or descriptions of systems, which aim to capture characteristics that are considered fruitful for further study of those systems. Modelling entails the activity of demonstrating or revealing by capturing properties that are considered to be conducive to the understanding of those using the models in question. Given the crucial role that models play in the natural, social, and applied sciences, studying the relationship between modelling and knowledge is of great importance.