
Fred D'Agostino's new book has a notable leitmotif: Thomas Kuhn's 'essential tension'. By taking up the title of a 1959 paper by Kuhn, which returned as the title of the 1977 collection of Kuhn's essays, D'Agostino places himself squarely in a certain tradition. The main title of his book, naturalizing epistemology, indicates where he wants to move from there, namely towards a naturalization of that topic central to Kuhn's philosophy of science. D'Agostino's framework is social epistemology, which means that scientific knowledge is essentially seen as the product of scientific communities and therefore possesses a social dimension. Of course, Kuhn reappears here again as he is "the godfather of social epistemology" (p. 6). The risk-spreading argument is a foundational argument for a social epistemology. It shows why it is essential not to model a scientific community as an individual but as a collection of different individuals bound together by shared values. Shared values influence the behavior of group members but do not fully determine it; so individual choices of different group members in the same situation may differ (due to the differences of the individuals). This property of shared values becomes important in times of extraordinary science (in Kuhn's sense), when different choices can be made. The conservative strategy tries to fit recalcitrant anomalies into the existing framework, whereas the more revolutionary strategy tries to develop alternatives to it. For the long-term success of science, it is of vital importance that both strategies are simultaneously pursued by the relevant community, because only due to their continuous interaction will the winning strategy emerge as such. Both strategies are risky—no one knows which one will finally prevail—but both have to be pursued for the sake of the enterprise. The group solves the problem by spreading the risk. Although only one strategy will eventually win, which implies that the other strategy will fail, the group as a whole will win in any case (if there is anything to win). It is the individual differences of different group members that do the trick.

The risk-spreading argument provides the leitmotif for D'Agostino's book. He wants to investigate empirically how the cooperation of different group members constitutes the specific epistemic efficiency of scientific groups. Therefore, he examines certain social and institutional mechanisms and cultural aspects which play a key role in maintaining an essential tension between conservative and progressive (or innovative) tendencies in research communities.
D'Agostino outlines his project as follows: First he wants to draw lessons from (social) psychology, management science, political science and organizational theory in order (a) to analyze general conditions of collective knowledge production and (b) to understand the social dynamics of collective enquiry. Subsequently, he intends to explain how groups might produce knowledge more effectively by unlocking so-called assembly bonuses. In short, the idea of an assembly bonus is that certain kinds of group interactions may produce higher quality outcomes (in our case: knowledge) than outcomes that could have been achieved by the combination of the efforts of individual group members working alone. In order to reap these bonuses, D'Agostino claims, it is necessary to maintain a balance between social and psychological factors which inhibit innovative problem solving and factors which facilitate these kinds of processes. Let us now review the chapters of D'Agostino's book.

In chapter 2 D'Agostino first discusses the “risk-spreading argument”, which we have already mentioned as an answer to the essential tension between tradition and innovation in scientific research (cf. Kuhn, 1970, p. 186; 1977 [1973], p. 332). He then introduces a second essential tension, “an empirical analogue of Kuhn's tension” (p. 15), which is the topic of his book. It is the tension between a variety of inhibiting (conservative) factors and a variety of facilitating (progressive) factors operative in collective research. In what follows D'Agostino tries to continue the “Kuhnian legacy” (p. 19) by investigating whether it is possible to identify institutional, cultural and motivational factors which counterbalance social mechanisms inhibiting divergent thinking and innovation in communities of enquiry.

Chapter 3 is dedicated to the question of why it is beneficial to supplement individual efforts by collective organization of labor and research in the first place. D'Agostino's answer to this question lies in the concept of bounded rationality, i.e., in-principle constraints on rational decision-making processes for finite beings like us. He characterizes seven dimensions of our bounded rationality, including the inexhaustibility of descriptions and the complexity of situations surpassing our computational abilities, in order “to identify both the necessity for and the limitations on the collectivization of enquiry” (p. 21). Subsequently, D'Agostino discusses the potential of collective enquiry to compensate the effects of bounded rationality by several means, such as error correction through peers, division of labor, and the promotion of divergent thought by expectancy disconfirmation.

Chapter 4 addresses the consistent pattern which can inhibit the rational interaction of individuals, whereas chapters 5–8 identify various factors counteracting these inhibitions. More to the point, in his discussion of the social mechanisms limiting the potential of collective enquiry in chapter 4, D'Agostino draws extensively on social psychology and management science. He identifies no less than eleven mechanisms that may interfere with the collective pursuit of knowledge, thereby possibly leading to suboptimal outcomes. Let us take as examples two which appear to be central: social comparison and path dependency. The mechanism of social comparison occurs because group members tend to adjust their position to the mainstream position of the group: they want to conform to the community. As a consequence, the potential diversity of approaches and information in research communities tends to be restricted because of (anticipated) social pressure and the desire for group acceptance. Path dependency occurs because of the simple fact that even in teamwork someone has to make the first move; more specifically, someone (also depending on her social capital) is the first speaker whose contribution is of significance to the group and thereby sets the agenda for later contributions. This leads to a confinement to the potential diversity of further contributions because of a tendency to orientate oneself towards the “emerging line of discussion” (p. 53). Hence, these and similar mechanisms result in convergent (conservative) thinking and a decrease in innovative strength.

Luckily enough, there are not only inhibitory mechanisms but also disinhibitors discussed in chapters 5 through 8. Chapter 5 considers some of the motivations in a scientific community that might provide some counter pressure to the mechanisms discussed in the previous chapter. Chapter 6 approaches the same problem from a cultural anthropological point of view by discussing cultural elements, i.e., “the values in which a functioning community of enquiry will be grounded” (p. 81). Chapters 7 and 8 discuss the role an effective division of labor can have in communities of enquiry, particularly with respect to countering restrictions to epistemic productivity.

In chapter 5 D'Agostino discusses a variety of motivational factors that might provide counterweights to innovation-inhibiting factors and thereby facilitate collective enquiries. For example, he talks about competitive structures, anonymous peer reviews and scientific incentives, particularly symbolic and cultural capital (reputation). These mechanisms result in the facilitation of information sharing and divergent thinking and thereby tend to counterbalance the above-mentioned conservative factors.

In chapter 6 D'Agostino considers what he calls cultural aspects of research communities, which play a key role in promoting diversity. His main argument in this part of the book seems to be this: Research-guiding paradigms and epistemic values for evaluating research are not fixed, but need to be interpreted and, in the case of the latter, also need to be balanced against each other. This is, however, no drawback as it allows for diversity within a common framework. It thereby enables the pursuit of the same global goals (to the extent values and paradigms are shared) while doing this in different ways. This kind of diversity serves a critical function for progress, since it leads to the development of different research strategies and innovative solutions.

Chapter 7 deals with problems of the division of labor in communities of enquiry. Again, Kuhn's risk-spreading argument provides an exemplar for it: there is an advantageous division of labor in the community regarding conservative and progressive strategies of research. A division of labor is generally called for in situations of high complexity given our bounded rationality. However, the ensuing problem is neither a psychological nor a social one (as are the problems discussed in previous chapters). It rather concerns the decomposition of the complex problem into smaller sub-problems that are indeed tractable independently from one another. At this point the principal “essential tension” strategy comes into play: different groups within the community compete for the most fruitful decomposition of the main problem into sub-problems. This increases the probability that the optimal strategy will be found and prevail in the community.

In chapter 8 D'Agostino reviews a variety of the topics discussed above. Above all, he considers alternative incentives for information sharing and some additional aspects relating to division of labor as well as successful scientific communication and research strategies. Due to the limited scope of this review, we will not be able to deal with all the topics of this chapter. Hence, let us focus on one main aspect discussed under the name environmental looping: D'Agostino once again stresses the importance of paradigms as frameworks for addressing “real-world complexity” (p. 157). Paradigms make partial solutions to very complex problems possible, thereby enabling partial progress. This, as D'Agostino emphasizes, is particularly important because it allows for positive feedback loops and motivating rewards for the research communities instead of global frustration due to unmanageable problems. The researchers believe themselves to be on the right track; and this increases self-esteem and confidence in the paradigm—a psychological precondition for fruitful knowledge production.
Let us now turn to the final chapter, where D'Agostino summarizes his results and explains in what way his model can accommodate research communities of quite different sizes. Subsequently, he addresses questions concerning the assessment of collective research. In this context D'Agostino advocates what could be called a procedural standards model for the evaluation of research results instead of an outcome-oriented model. These procedural standards, then, are best fulfilled by successfully balancing the considered social, cultural and psychological mechanisms to keep up the essential tension in the community; for example, by pursuing diverse strategies to solve a problem while sharing a common conceptual framework, or by balancing risk-takers and risk-avoiders in the research community. D'Agostino concludes his book with some meta-philosophical remarks in regard to his own philosophical approach, which he describes metaphorically as a geographical map of the relevant issues in collective research and social epistemology rather than a concrete guideline for problem solving in this area.

The epistemological consequences D'Agostino draws from his model of enquiry deserve some more detailed attention. In chapter 9 he comes back to his account of pathway dependency of research and asks us: "Could we have arrived at a wholly different scientific or humanistic worldview if we'd followed a different path than the one we did follow—the path initiated by, take your pick, Plato, or Galileo, or Moses?" (p. 166). He answers in the affirmative and supports his arguments with reference to cultures which actually did arrive at different worldviews from that of the "western tradition" (ibid.). It would appear that D'Agostino here links a form of cultural relativism with an idea Kyle Stanford has called "the problem of unconceptual alternatives" (Stanford, 2006). In short, Stanford's idea is that underdetermination of theories by data is a challenge to scientific realism, given the possibility of unconceived and empirically equivalent alternatives to our current, well-confirmed, theories. These alternatives might conceptualize the world in very different ways, thereby subverting our realist beliefs. Indeed, D'Agostino makes the instrumentalist point that our chosen path might not be the one leading "to some utopian optimum of knowledge and efficacy" and that a notion of an ultimate truth "probably makes no sense, given the plurality of competing standards and approaches" (p. 166). So D'Agostino is certainly a contingentist (as contrasted with the position of the inevitabilist).

However, this consequence is alleviated by D'Agostino's own concept of theory proliferation and competition, as it would seem. According to D'Agostino, interactions among research teams traveling different paths (methods and theories within a common framework) may basically decrease the degree of contingency in consequence of path dependency (p. 133). This is the case since researchers forming different teams may compare their methods and their results in view of the addressed problem. It may be possible, and indeed it is feasible, to upgrade this kind of triangulation method to a more systematic approach to theory comparison over a longer period of time. Thereby, theories which would be superior in the long run would not be at risk of being prematurely dismissed (p. 135).

In addition, D'Agostino recognizes that the "phenomena our enquiries are about—what they are like [...] influences what our findings about them are like, especially in forcing us to reject accounts of their natures that do not enable us to manipulate them or to bring them under a satisfying form of intellectual control" (p. 166). In other words, the object-sided aspects of our experiences constrain the possibility space of research paths (cf. Hoyningen-Huene, 1993, chapter 3). D'Agostino does not discuss the degree of dependence on the object-sided aspects of the phenomena, though. All things considered, these constraints might guide research to such an extent that the contingentist position would be weakened substantially. Furthermore, strong realists would certainly add that the best explanation for the success of the scientific methods and theories actually used in the long run is the reliability of these methods and theories in the acquisition of truth (cf. Sankey, 2008). We do not want to argue for a realist position at this point, but stress that an extended discussion of arguments like these would be desirable. Probably because D'Agostino himself realizes that his arguments are not particularly strong in this respect, he carefully hedges his position.

Beyond these remarks, we have three main points of criticism. First, due to its style, the book is not an easy read. There are many long sentences which are difficult to follow. In addition, some topics are taken up several times in the book, and it is not always easy to get the accumulated message. Second, in accordance with its program, the book addresses much empirical literature regarding the mechanisms operative in groups as they were developed by psychologists, economists, management scientists and other investigators. However, it is not always clear whether the empirical results can also be meaningfully applied to scientific groups (see Footnote 1). Kuhn has already emphasized that the members of scientific groups have undergone rather rigid socialization processes that make them rather special. It is therefore sometimes doubtful whether results gained from other sorts of groups can be transferred to scientific groups. This also relates to the epistemological consequences drawn from his model of enquiry, since D'Agostino makes no distinction between the assumed contingency of political and religious worldviews and scientific theories (see above). Considering the debates on this topic, particularly in the philosophy of science of the 20th century and beyond, this seems to be a highly controversial claim based on shaky evidence.

Third, the title of the book is quite misleading. On the one hand, its main title naturalizing epistemology is far too general. The book is not about knowledge in general and possible ways of its naturalization. On the other hand, its subtitle Thomas Kuhn and the essential tension is badly misleading because this is not a book about Kuhn and one of the elements of his theory. It is rather a book that uses one of Kuhn's suggestions as a leitmotif in order to further develop a naturalized, i.e. empirically based, social epistemology.

Furthermore, it should be noted that in one respect the book seems to miss Kuhn's spirit, and it would have been helpful if this discrepancy were made more explicit, and if D'Agostino would have stated why he disagrees with Kuhn on this point (if he really does). For Kuhn, the more conservative and the more progressive strategies stand on the same footing in the sense that they are both essential for the progress of science. One might even say that in Kuhn, the more conservative strategy comes into play more often, because it plays an essential role both in normal and in extraordinary science, whereas the more innovative strategy has a legitimate place only in extraordinary science. By contrast, D'Agostino seems to have a tendency to evaluate the more conservative elements in knowledge gathering groups negatively (see, e.g., p. 18). These conservative elements are seen more as hindrances than as a necessary prerequisite of a sustainably successful normal science. For Kuhn, however, the conservative elements are responsible for the unprecedented thoroughness, depth and accuracy that successful normal science can reach. Furthermore, when in phases of extraordinary science the overall commitment to the conservative elements relents, the achieved thoroughness, depth and accuracy of the previous normal science tradition is the real challenge for the competitors: new paradigms must come with the promise to at least reach, if not exceed, this standard.

Notwithstanding these criticisms, D'Agostino's book is a welcome addition to the growing literature contributing to an empirically based social epistemology; particularly the comprehensive collection and interrelation of socio-psychological effects on re-
search communities gives opportunity for new insights in research
dynamics and knowledge production.

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