ISSA Proceedings 2006 – A Role For Dialectic In Science Studies

1. *Science studies and the rhetoric of science*

In the past few decades, our understanding of the workings of science have been immensely enriched and deepened by various theoretical approaches thriving in the conceptual space opened by the so-called Kuhnian revolution. The field of science studies has developed as a diverse inter- and cross-disciplinary enterprise where the attention shifted from the logical analysis of idealised proposition systems called 'theories' to the sensitive study of the actual practices of scientific activity. As the main thrust focused on the social dimensions of what scientists do, and how this is framed on different scales by the social environment, discursive pratices also became a major issue for several studies. While specific and contingent features of the linguistic medium of scientific communication used to be disregarded or ignored as either transparent or irrelevant by most traditional views, numerous recent approaches consider discursive reality to be constitutive of scientific knowledge production.

Typically, discourse-oriented analyses treat scientific communication in rhetorical terms (e.g. Bazerman 1988, Prelli 1989, Gross 1990, Pera and Shea 1991). The focus of attention is directed to scientific controversies where conflicting claims create spaces in which linguistic persuasive techniques become functional. In other words, discursive practices are seen as tools for persuasion, and language operates both as a transmitter of beliefs and a transmitter of cognitive attitudes to beliefs. While there are serious disagreements and divergences between certain approaches within rhetorical analyses of science – all the mentioned authors represent significantly different theoretical standpoints – I will refer to the family of these views with the umbrella term 'rhetoric of science'. For my purposes a dominant view in this 'rhetoric of science' is that belief acceptance is a process that cannot sufficiently be explained by idealised, discourse-insensitive cognitive factors.

Rhetoric of science fits in the main genre of science studies in several respects. First, by focusing on the influence of communicative performances on receptive

communities, it places scientific discourse in a social dimension. Second, by studying the linguistic medium of scientific communitcation, it contributes to broadening the complex of perspectives from which science is analysed, as opposed to the strictly 'cognitive' (i.e. logico-conceptual) interest of classical approaches. Third, since explanatory factors – rhetorical devices – are markedly different from the explicit evaluative criteria used by scientists, rhetoric of science relies on a clear distinction between actors' categories and analysts' categories, thus taking a meta-scientific attitude that does not fall back on its subject level. Fourth, it aims to provide empirical descriptions of the efficiency of persuasive techniques in specific situatuions, and refrains from formulating normative claims or 'universally' valid criteria.
The latter two points, distance from actors' categories and avoidance of normativity, are strongly interconnected notions, traceable back to the original commitments of science studies. According to a central commintment of the field, the way science studies reflects upon science is analogous to the way science reflects upon nature. In Bloor's highly inspirative Strong Programme, sociology of knowlede is a naturalistic enterprise where explanations of belief acceptance are formulated in terms of casuses, instead of reasons referred to by actors (e.g. Bloor 1992). The normative charge inherent in the concept of 'reason' is lacking from the entirely naturalistic concept of 'cause', and evaluative terms such as 'rationality', 'objectivity', or 'truth' are expelled from Bloor's programme where knowledge, instead of being 'justified true belief', is "whatever people take to be knowledge" in the purely descriptive sense (Bloor 1992, p. 5). Norms that govern or inform scientific research themselves become objects of explanation, and hence their normative force on the analyst of science cannot be accepted by her without facing the danger of blunt circularity.

However, such a strong rejection of normativity has been challenged even within science studies, where the influence of anthropology introduced participant observation methods at the expense of the 'stranger's perspective' favoured by sociologists (e.g. Latour and Woolgar 1979). The 'third wave of science studies' proposed by Collins and Evans (2002) attempts to bridge the gap between actors' and analysts' categories, by making use of a form of normativity that is simultanously binding for both scientists under study and those examining science. According to them, since the concept of 'expertise' informs both the analyst and the actor, a normative theory of expertise may facilitate a deeper insight to the workings of science without having to rely too much upon other

norms of scientific activity. In other words, while the analyst keeps some distance from the field she studies in order to benefit from the advantages of an external perspective, she remains close enough to understand some inherent properties hidden from the eyes of a complete stranger.
Nevertheless, 'expertise' seems too broad a concept to efficiently deal with the discourse of science. While it is apt to cover a number of aspects having to do with the 'craftmanship' profile of experimental science Collins and others investigate, discursive expertise needs further specification before building a normative theory of scientific communication while keeping an eye on fruitful insights of science studies. I propose that this form of expertise lies in the utilisation of argumentation-theory.

2. *The pragma-dialectical potential for science studies*
The pragma-dialectical approach to argumentation theory was developed in Amsterdam by van Eemeren, Grootendorst, Houtlosser, and others (e.g. Eemeren and Grootendorst 1992, Eemeren, Grootendorst, Jackson, and Jacobs 1993, Eemeren and Grootendorst 2004), combining several insights from different trends in contemporary discourse theories (see Eemeren *et al*. 1996). The approach relies on four "core commitments". Externalisation: instead of treating mental attitudes, the theory deals with externalised communicatory acts. Socialisation: argumentation is viewed as an interactional process between language users. Functionalisation: discursive elements are functional instruments within an environment of speech acts. Dialectification: argumentation is an attempt to convince a critical opponent by resolving the difference of opinion by rational means.

How does this programme agree with the main direction of science studies? *Externalisation* is perfectly in line with the empirical nature of the field: only by focusing on externalised elements of discourse can substantive, tangible reality be attributed to entities the theory deals with. Otherwise the analysis is restricted to either stipulated mental contents or idealised conceptual (re)constructions. In the first case, a sufficiently strong psychological theory of mental attitudes is required to support the analysis of the discourse, and even if such a theory were available – which does not seem to be the case – the study of argumentation would in all likelihood be reduced to that theory, rather than being developed in its own right. In the second case, self-sustained conceptual contents were to be abstracted from actual language use, and the result would be highly contingent

upon massive philosophical presuppositions concerning these 'World 3' entities. The most plausibe alternative is to subject concrete, externalised elements of discourse to empirical inquiry.

Socialisation is also promising, since the need for understanding scientific activity as an inherently social process is probably *the* central tenet of science studies. Moreover, while rhetoric also deals with social events, dialectic portrays a social dimension which is subtler than that of rhetoric in a number of respects. First, the communication model used by traditional rhetorical approaches is unidirectional: the basic element of discourse is a 'speech' (spoken or written) made by the active 'orator' and directed at the passive 'audience'. In dialectic, on the other hand, communication is viewed as fundamentally interactional in nature, and both parties play an active role in mutually shaping discursive space. Moreover, the parties of a dialectical dialogue are treated basically on equal terms, and they are endowed symmetrically with their positions in scientific communication – which more often than not seems a better model of actual scientific discourse within a core-group than the completely asymmetrical set-up suggested by the rhetorical perspective. Also, the fundamental element in rhetorical analysis is a unique persuasive act with no temporal dimension, while dialectic's essential interest in dynamic processes is more in line with the temporal sensitivity of many construction-oriented trends in science studies. While recent rhetoric of science has made serious and successful attempts to escape from the confines set by classical rhetorical inheritage, it seems that the potentials inherent in a dialectical perspective are often more promising to deal with several essential aspects of scientific discourse than those offered by the basic toolbox of rhetoric.

Functionalisation succeeds in taking discourse elements out of the formal context of logic and relocating them in the contingent environment of communicatory acts. Traditional argumentation theories worked in the framework of logical analysis, and evaluated arguments according to stipulatedly universal structural properties. In pragma-dialectic, purely structural reconstruction is replaced by functional analysis, and discursive elements are treated as speech acts serving specific purposes determined by the actual argumentative situation. This latter approach provides access to the discursive content, while leaving the rules of dialogue contingent and contestable. Access to contential issues is a key feature of dialectic approach since, in contrast with the structural reconstruction characteristic to philosophy of science, science studies aims to address the

emergence of specific knowledge contents, in addition to organising forms. However, in order to evaluate arguments understood in this framework, one needs to be able to internalise the 'form of life' in which the argumentative situation takes place, and it requires sharing some commitments between the analyst and the actor.

It is *dialectification* that might first seem partially at odds with some basic principles of science studies. Pragma-dialectic treats arguments as rational tools for resolving differences of opinion, and such an analysis relies on a normative theory of what it means to make rational moves in a controversy. Science studies with its relativistic taste, as I have argued, usually avoids such normative approaches. Similarly, rhetoric of science focuses on persuasion, which can be pursued in a purely descriptive manner. The pragma-dialectical school contrasts persuasion with convincing, in that while persuasion can be achieved by any tools, conviction is a result of rational discussion providing argumentative reasons for accepting or rejecting standpoints (Eemeren and Grootendorst 2004, pp 29-31). While rhetoric maintains a broad interest in all persuasive tools of *ethos, pathos*, and *logos*, dialectic puts a major, although not exclusive, stress on *logos* and offers an ideal model of rational discussion (pp. 21-22), as well as "commandments to reasonable discussants" (p. 190). If we appiled dialectic to scientific controversies, would it not amount to retreating to the mostly abandoned strongholds of normative philosophy of science?

Normativity as conceived by pragma-dialectic discourse analysis has several advantages over how traditional philosophers of science formulated normative claims. On the one hand, while philosophers proposed universal criteria of valid argumentation – i.e. forms of inductive or deductive inferences to ideal explanations – the pragma-dialectical model treats norms of rational discussion in a more flexible way. No rules of discussion are taken for granted once and for all, and the ideal model is fine-tuned with respect to the actual discursive practice. This is achieved by developing a careful interaction between descriptive and normative issues, and hence allowing for empirical feedback to the normative theory based on descriptive insights (pp. 27-31). Norms are neither *a priori* given nor absolute: they are abstracted from practice where, at the same time, they ought to hold.
On the other hand, rules of rational discussion are acknowledged both by actors and analysts. One does not need to become a scientist in order to be competent in

what it means to argue rationally, yet one needs to share some commitments with her scientist informants: a complete stranger has only limited access to understanding-based explanations. In his influential attack on the Strong Programme, Laudan criticised the symmetry principle – i.e. that the same types of causes must be attributed to 'rational' and 'irrational' beliefs – by emphasising that it is an 'empirical' question whether a belief is rational or not: a rational belief is one "that the agent can give reasons for antecedent to the adoption of the belief", and thus arguments are causally efficient in adopting rational beliefs (Laudan 1984, p. 58). (Similar but more detailed criticisms are Friedman 1998, Freedman 2005.) While it is a question whether recognition of arguments is an empirical matter or not, I see no point in doubting that argumentative reasons are seen in our broad culture as in some sense superior to other factors influencing belief acceptance. It especially applies to science: even if science does not manifest a pure ideal of rationality, as illustrated by many findings in science studies, here the norms of rational discourse seem to hold stronger than in other cultural enterprises. In order to understand discursive practices in science, it seems necessary to share some competence in these practices.

Collins and Evans (2002) distinguish between 'interactive expertise' and 'contributory expertise', claiming that analysts need a degree of expertise sufficiently strong to enable them to understand the problems of the field under study, while weaker than a level of expertise that would enable them to contribute to this field. In other words, their entry point to scientific activity is a competence that is similar to, but lesser than, what serves as knowledge base for scientific research. What I claim here is that it is not the degree but the range of expertise that provides access to discursive practice in science. Argumentation-theory may be the best candidate for capturing the kind of expertise that connects scientists to analysts of scientific discourse, thus offering a common forum for practice and interpreting that practice. Discourse theorists have *more* competence in analysing and evaluating arguments than the scientists who formulate these arguments: while scientists' discurisive competence stems from tacit practice and experience, scholars of argumetation derive their expertise from explicit, conscious, and systematic reflection.

What can we gain from the study of scientific arguments? First, with the application of a clear methodology, we can identify the realm of shared assumptions: the theoretical, conceptual, and methodological toolkit accepted and employed by actors situated in a given historical situation. Second, we can also

identify the space of disagreement, i.e. those assumptions that get addressed or challenged in a certain controversy. Third, we can map the conceptual order by analysing how other commitments are recruited in order to back or undermine these problematic assumptions. Fourth, we can follow the reasoned moves that result in changes in the conceptual order, thus learning not only how but also why certain episodes happen the way they do. Finally, we can evaluate discursive situations, and provide a feedback to scientists from which they might even benefit eventually.

3. *Terrains of applicability*

Still, further specification is required as to under what circumstances dialectic is an efficient tool to study scientific discourse. Markus (1987) argued that the primary discourse of science is so much formalised and ritualised that it is immune to hermeneutical analysis. According to this view, the most fundamental medium for communication in science is papers published in scientific journals, and the language used in these papers is regulated and impersonalised to such a degree that no informative research into the specific forms of language use is available in a hermeneutical framework. Markus' arguments seem to bear relevance to dialectic: since the pragma-dialectical model makes essential use of speech acts, the relative rarity of certain forms of speech acts in scientific publications may pose problems to the applicability of this approach. While papers argue for, and often against, certain standpoints, dialogic elements are submerged and traces of strategic moves are concealed (which in turn can be understood as a form of strategic maneuvering). In the least, scientific publications seem to pose a challenge to pragma-dialectical argumentation theory. (Note: these problems are not specific to dialectic, since, considering the 'dry' language of journal papers, they also seem to strike rhetorical aproaches.)

However, some less standardised forms of scientific communication are readily open to dialectical analysis. First, history of science provides countless examples of scientific argumentation where language use was less ritual and more flexible than today. Markus (1987) argues that the fundamental character of modern scientific prose was not fixed until the late nineteenth century – before that, a rich variety of discourse types had been available. For instance, dialogic treatises such as written by Galileo are clearly viable to style-sensitive discourse analyses. Also, scientific controversies written in letters, especially favoured in the 17th and 18th centuries, could provide a huge amount of fuel to pragma-dialectical studies (as

shown by Gabor Zemplen's analysis of the Newton-Lucas correspondence in this conference). Naturally, the question arises how far the validity of our norms of rational discussion can be projected on the historical past. This is a matter for both philosophical and empirical inquiry, but tentatively I assume that the range of these rules plausibly cover the modern, and most of the early modern, period. On the other hand, pragma-dialectic may contribute to the study of how specific norms were implicitly or explicity challenged, and how others were introduced to replace them, in actual scientific discourse.

Second, less formal types of scientific communication are also functional in knowledge production, as emphasised by different approaches in science studies. Sociologists and anthropologists often conduct 'field studies' by visiting research sites and recording informal discussions. While most of these studies are done form the relativist 'stranger's perspective', a normative theory of argumentation could prove fruitful for understanding the internal dynamics of these discursive interactions. For example, when the first wave of science studies introduced the concept of 'negotiation' in order to blur the stipulated distinction between pure intellectual discussions and interest-driven political-type disputes, it sacrificed not only undesirable philosophical presuppositions but also means of rational assessment. Perhaps it is time to re-introduce a similar, but still different, distinction between resolution-oriented rational discussion and persuasion-oriented opportunistic dispute – especially in the light of scientists' conviction that such a distinction does exist and plays an important role in shaping the order of various aspects of scientific activity.

Third, controversies belong to a type of discourse where, in contrast with the bulk of publications, disagreements and conflicting standpoints become functionally explicit. While in most papers authors are engaged in 'puzzle-solving' relying on a given and fixed theoretical, conceptual, and methodological toolbox, controversies often challenge certain elements of the set of shared assumptions. In other words, controversies in science tend to display meta-scientific, in addition to scientific, ambitions, and methodological, meta-theoretoical, or philosophical commitments are frequently at issue. The degree to which the space of disagreement gets functional in the controversy, as well as the size and shape of this disagreement space, can vary on broad scales. Pragma-dialectic analysis can be efficient in using speech act theory to identify which common assumptions get addressed and how the discussants make strategic moves to defend or reject contested commitments. Depending on the extent to which resolution is achieved or aimed at, distinctions can be made between different kinds of debates, as – following

Dascal's (2003) typology – e.g. between discussion (where the same norms are accepted on both sides, and the aim is to correct an error), dispute (where differences in commitments are too radical to make resolution possible), and controversy (in between the two other types, where some commitments become addressed but others remain available as bases on which resolution can be achieved)**[i]**.

4. *Conclusions*

The paper has tried to show that study of scientific activity could benefit from the application of the pragma-dialectic approach to discourse analysis. I argued that the basic commitments of pragma-dialectic are in fine agreement with several characterstics of recent trends in social studies of science. At the same time, a dialectical framework seems to have a number of advantages over a purely rhetorical one. I emphasised that dialectic endorses an interactive model of the social dimension, and it is sensitive to the temporal dynamics of communicatory practice. On the other hand, the model's normative elements create links between subject and interpretation while encouraging empirial flexibility. I also identified some forms of scientific communication in which pragma-dialectic approach seems especially promising.

However, all this theoretical talk is but a small and insufficient step. The usefulness of dialectic to science studies is to be demonstrated by providing detailed and informative case studies of argumentative dialogues in science. This paper, besides expressing my expectations, tried to contribute to the necessary conceptual preparations before the real work gets started.

NOTE

[i] With Gábor Zemplén, we are currently conducting a pragma-dialectical analysis of the (in)famous Bloor-Latour debate in science studies (Bloor 1999a,b, Latour 1999). The first rough results are published in Hungarian (Kutrovátz and Zemplén 2006), and we hope to prepare an English version after working further with the very intricate debate. Our findings indicate that this debate, while at places being presented by the opponents as promising the possibility of a fruitful controversy, belongs rather to the rank of quite hopeless disputes.

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