ACADEMIC ARGUMENT: INDUCTION OR INTERACTION?

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ABSTRACT

Academic discourse is often seen as a unique form of argument which depends on the demonstration of absolute truth, empirical evidence or flawless logic. In contrast, the Sociology of science regards academic persuasion as social practice, based on the social circumstances of the text. This paper explores this view to reveal some of the ways that academic argument is rooted in the interactions between members of disciplinary communities. Based on a corpus of research articles in eight disciplines, I will focus on some of the ways writers engage and address their readers, claim significance and establish credibility for their research. My argument will be that the persuasiveness of a research article cannot be explained by universal rules of induction or evidential logic, but by the use of rhetorical features which differ between disciplines.

KEY WORDS: Academic argument, interaction, disciplinary communities, research articles, rhetoric.

RESUMEN

El discurso académico suele considerarse como un tipo de argumento peculiar que se basa en la demostración de la verdad absoluta, la evidencia empírica o la lógica impecable. Por el contrario, la sociología de las ciencias considera la persuasión académica como una práctica social, basada en las circunstancias sociales del texto. Este artículo explora este enfoque con el propósito de poner de manifiesto algunas de las formas en las que el argumento académico está arraigado en las interacciones entre los miembros de las comunidades disciplinarias. Basándome en un corpus de artículos científicos pertenecientes a ocho disciplinas, me centraré en algunas de las formas en las que los escritores interactúan con la audiencia, reivindican la importancia de la investigación y establecen su credibilidad. Mi argumento es que la capacidad de persuación de un artículo científico no se puede explicar en términos de reglas universales de inducción o lógica probatoria, sino sobre la base del uso de elementos retóricos que difieren entre disciplinas.

PALABRAS CLAVE: Argumentación académica, interacción, comunidades disciplinarias, corpus, artículos de investigación, retórica.

1. INTRODUCTION

We typically regard academic discourse as a unique form of argument which depends on the demonstration of absolute truth, empirical evidence or flawless logic. Its persuasive potency is seen as grounded in rationality and based on exacting methodologies, dispassionate observation, and informed reflection. Academic writing, in other words, represents the discourses of 'Truth' (Lemke, 1995: 178). It provides an objective description of what the natural and human world is actually like and this, in turn, serves to distinguish it from the socially contingent. We see this form of persuasion as a guarantee of reliable knowledge, and we invest it with cultural authority, free of the cynicism with which we view the partisan rhetoric of politics and commerce.

It has always been a basic conviction of the sociology of science however, that there is an intimate connection between knowledge and the social practices of the academic community. Writing is a social act and every successful text displays the writer's awareness of both its readers and the consequences of the writing. In this paper I want to explore some of the ways that persuasion is interactionally accomplished by examining its foundations in disciplinary communities, focusing on how writers engage and address their readers, claim significance and establish credibility for their research. My argument will be that academic argument does not depend on universal laws of proof or logic but that the rhetorical features of research articles reflect the institutionally sanctioned social practices of those who write and read them.

2. SCIENTIFIC DEMONSTRATION VS. SOCIAL CONSTRUCTION

I want to begin by looking at a familiar view of argument in the hard sciences. Science is held in high esteem in the modern world precisely because it provides the model of rationality and detached reasoning. The label 'scientific' confers reliability on a method and prestige on its users, it implies all that is most objective and empirically verifiable about academic knowledge. As a result it has been imitated by other areas of human inquiry which are often considered softer and more rhetorical in their forms of argument.

Scientific accounts have been, until fairly recently, widely seen as reflecting a previously existing reality, independent of the observing scientist and knowable through the application of appropriate procedures. For the inductivist, impartial observation and rigorous experimental methods provide sure foundations for knowledge by educing inferences about natural phenomena. This realist model regards writing as a means of simply dressing the thoughts one sends into the world and sees persuasion as a function of logical necessity. Scientific papers are therefore persuasive because they are observations which communicate independently existing truths. These truths originate in our direct access to phenomena in the external world. Argument is neutral description and the legitimacy of knowledge is built on non-contingent pillars of experimental demonstration, replication, and falsifiabil-

ity. Texts are simply the channel which allow the scientist to relay the truth from nature.

But induction offers probabilities rather than proof. Logically it is not the case that if the premises of an inductive inference are true then the conclusion must be true, for by moving from statements about the particular to those about the unobserved, we must acknowledge uncertainty and inaccuracy. The failures of predictions and models to withstand experimental tests are therefore critical in science, for theories can never be established as even probably true by inductive logic. Unfortunately, conclusive falsifications are also ruled out by the absence of any secure observational base upon which they could be tested (Chalmers, 1978). The problem, for both inductivism and falsification, is that observation depends on what the mind allows the eye to see, and this is determined, to a large extent, by the theories and assumptions the scientist brings to the problem (eg Kuhn, 1970). Observations are as fallible as the theories they presuppose, and therefore fail to provide a solid foundation for the acceptance of scientific claims.

All reporting occurs within a pragmatic context and in relation to a theory which fits observation and data in meaningful patterns. Thus the eminent theoretical physicist Stephen Hawking (1993:44) notes that while a theory may describe a wide class of observations, "beyond that it makes no sense to ask if it corresponds to reality, because we do not know what reality is independent of a theory". In other words it is naïve to regard texts as accurate representations of what the world is like because this representation is always filtered through acts of selection, foregrounding, and symbolisation. Because we have no access to absolute proof, to discuss results and theories is not to provide an accurate account of 'what the world is really like'; it is to engage in another form of argument altogether.

Basically, academic texts do more than report research that plausibly represents an external world, they work to transform findings or reflections into academic knowledge. This knowledge is not a privileged representation of reality, but a conversation between individuals. To accept this view we do not have to fall into a realm of idealism divorced from the physical world. Sociologists as much as scientists need their sensory experience of the world, but this experienced reality *underdetermines* what they can know and say about it, and they must therefore draw on principles and orientations from their cultural resources to organize it. We cannot step outside the beliefs or discourses of our social groups to find a justification for our ideas that is somehow 'objective.' This leads us to see writing as an engagement in a social process, where arguments reflect appropriate disciplinary practices.

To examine texts themselves, and the contexts in which they are written, is to encounter a more complex picture, where 'reality' is constructed through essentially social processes involving authority, credibility and disciplinary appeals. Texts are produced as actions of situated writers, and are persuasive only when they employ social and linguistic conventions that colleagues find convincing. We find, in other words, a more pragmatically oriented realism that grounds academic argument in disciplinary practices for producing agreement.

While 'empirical adequacy' may be the cornerstone of gaining ratification of one's work, the fact that "truth" does not lie exclusively in the external world

means that knowledge can only emerge from a disciplinary matrix. There will always be more than one plausible interpretation of any piece of data and more than one way of looking at any problem. So while all claims require ratification to become knowledge, readers always have the option of refuting them. Because of this, the writer's attempts to anticipate possible negative reactions to his or her claims lie at the heart of all academic argument. All claims have to display a plausible relationship with 'reality' (the discipline's epistemological framework), and writers must demonstrate this by encoding ideas, employing warrants, and framing arguments in ways that their potential audience will find most convincing. More than this, writers also have to create a professionally acceptable persona and an appropriate attitude, both to their readers and their arguments. Most importantly, academic argument means relating independent research to shared experience, collectively creating knowledge through interaction with one's peers.

3. SOCIAL PRACTICES AND DISCIPLINARY CONVENTIONS

Persuasion in academic articles comprises a series of rhetorical choices designed to galvanise support, express collegiality, resolve difficulties, and avoid disagreement in ways which most closely correspond to the community's assumptions, methods, and bodies of knowledge. Importantly then, persuasion is not simply accomplished with language, but with language that demonstrates legitimacy. Writers must recognize and replicate the field's organizational structures, beliefs, and authorized institutional practices in order to appeal to readers from within the boundaries of their discipline.

Discoursal conventions are persuasive because they are significant carriers of the epistemological and social beliefs of community members. I want to suggest that regularities in these conventions are influenced by knowledge constructing practices that broadly reflect the types of intellectual inquiry and cognitive understandings of the hard and soft knowledge domains. The concept of hard and soft fields carries connotations of clear-cut divisions, risking reductionism by packing a multitude of complex abstractions into a few simple opposites. But this scheme is directly related to established disciplinary groupings (Becher, 1989), and gains support from studies which suggest that it may actually represent participant actors' own perceptions of their practices (Biglan, 1973; Kolb, 1981; Hyland, 2000). If the hard-soft distinction is conceived as continuums, then I believe it offers a useful way of examining general similarities and differences between fields.

The hard knowledge disciplines can be seen as predominantly analytical and structuralist, concerned with quantitative model building and the analysis of observable experience to establish empirical uniformities. Explanations thus derive from precise measurement and systematic scrutiny of relationships between a limited number of controlled variables. Knowledge is characterised by relatively steady cumulative growth, problems emerge from prior problems and there are fairly clear-cut criteria of what constitutes a new contribution and how it builds on what has come before (Becher, 1989; Hyland, 1998). Soft knowledge disciplines, in contrast,

TABLE1: READER FEATURES (PER 10,000 WORDS) (FROM HYLAND 2001)			
CATEGORY	TOTAL NO. OF SIGNALS	ITEMS PER 10, 000 WORDS	% OF TOTAL FEATURES
Inclusive pronouns	2.843	21.5	36.5
Imperative	1.661	12.6	21.3
Obligation modal	730	5.5	9.4
Indefinite pronoun	720	5.4	9.2
Knowledge reference	642	4.9	8.2
Rhetorical questions	511	3.9	6.6
Second person pronouns	261	2.0	3.4
Asides	148	1.1	1.9
Real questions	145	1.1	1.9
It is (adj.) to do	124	0.9	1.6
Totals	7.785	58.9	100

often concern the influence of human actions on events. Variables are therefore more varied and causal connections more tenuous. These fields tend to employ synthetic rather than analytic inquiry strategies and exhibit a more reiterative pattern of development with less scope for reproducibility (Becher, 1989: 12-17; Kolb, 1981).

These representations have rhetorical effects which are reflected in preferred patterns of persuasion. In the following two sections I will examine some of these patterns and outline how they are used by academics to demonstrate their professional credibility and the value of their work to their disciplines.

4. INTERACTION AND ENGAGEMENT: READER-ORIENTED FEATURES

One significant dimension of academic argument is the writer's projection of the perceptions, interests, and needs of a potential audience. Any text anticipates a reader's response and itself responds to a larger discourse already in progress, so argument incorporates the active role of an addressee and is understood against a background of other opinions on the same theme in prior texts (Bakhtin, 1986). This is most obviously achieved when writers address readers directly using inclusive or second person pronouns and interjections, and when they position them with questions, directives and reference to shared knowledge.

Table 1 shows the main devices initiating such interactions, with inclusive first person pronouns and imperatives amounting to over half of all features.

The results show some interesting cross-discipline similarities, but most obvious are the disciplinary variations, where philosophers employed *ten times* more

TABLE 2: FREQUENCY OF READER FEATURES PER DISCIPLINE (PER 10,000 WORDS) (FROM HYLAND 2001)

Discipline	Questions		Asides	Pronouns			Shared knowledge	Directives	Totals
	Real	Rhetorical		Incl	2nd pers.	Indef.			
Philosophy	4.3	10.1	2.2	81.7	12.1	16.3	9.9	26.1	162.7
Sociology	0.9	5.8	1.8	19.9	0.1	2.5	4.2	15.8	51.0
App Ling	0.7	4.2	1.4	13.3	0.0	5.8	5.5	19.5	50.3
Physics	0.2	0.8	0.3	12.9	0.0	8.0	5.2	21.1	48.5
Elect Eng	0.0	0.0	0.0	6.8	0.0	2.7	3.9	29.0	42.3
Marketing	0.7	2.6	1.4	8.0	0.1	3.2	3.8	12.6	32.4
Mech Eng	0.1	0.8	0.1	2.4	0.3	1.8	3.0	19.9	28.4
Biology	0.2	0.8	0.0	0.8	0.0	0.3	1.3	13.0	16.4
Overall	1.1	3.9	1.1	21.5	2.0	5.4	4.9	19.0	58.9

devices than biologists, for example. In general, Table 2 shows that, the more discursive soft fields of the humanities and social sciences employed more reader-oriented markers than the sciences and engineering. This symmetry was upset by the physicists who joined philosophers, sociologists and applied linguists in a relatively high use of inclusive *we* pronouns and explicit references to shared assumptions. Directives of various kinds tended to comprise the highest proportion of features in the hard sciences. Questions were largely a feature of the soft disciplines.

There appear to be two main rhetorical purposes to writers' use of these appeals to the reader.

1. The first is primarily interpersonal and acknowledges the need to meet readers' expectations of inclusion. Here we find readers addressed as participants in an argument with inclusive or second person pronouns and interjections to effect interpersonal solidarity and membership of a disciplinary in-group.
2. The second purpose seems more to do with rhetorically positioning the audience, recognising the reader's role as a critic and potential negater of claims by predicting and responding to possible objections and alternative interpretations. Here the writer pulls the audience into the discourse at critical points to guide them to particular interpretations with questions, directives and references to shared knowledge.

These broad functions are not always clearly distinct, but these two overarching purposes allow us to more clearly see some of the ways writers project readers into their texts and to compare the rhetorical patterns of such engagement in different discourse communities.

Personal Pronouns

Readers are most explicitly brought into the text as discourse participants by the use of personal pronouns, most commonly inclusive *we*. The clearest acknowledgement of the reader's presence, second person *you* and *your*, occur only rarely, suggesting that writers generally seek to reduce distance from their audience, minimizing any implication that the writer and reader are not closely linked as members of the same disciplinary community. More often, the writer adopts the position of an imaginary reader to suggest what any reasonable, thinking member of the community might conclude or do, sending a clear signal of membership, textually constructing both the writer and the reader as participants with similar understanding and goals. It also sets up a dialogue between equals in which the potential point of view of the reader is woven into the fabric of the argument, articulating the thoughts and counter-claims of fellow professionals. The persuasive nature of this strategy often extends into explicitly spelling out the conclusions the writer wants the reader to draw:

> (1) The reader will note the use of the passive voice when referring to what the learner does, constant in the literature which makes reference to learner autonomy. (AL)
>
> To this end, we remind the reader that in the case of the nonrelativistic hydrogenic atom a similar situation occurs. (Phy)
>
> Furthermore, one has to consider that splice variants may alter the transactivation... (Bio)

Laying stress on their membership, their joint affiliation to a community-situated pursuit of knowledge is an important way that writers give persuasive weight to their texts. In particular inclusive *we* is heavily used to bind writer and reader together and as members of a disciplinary in-group:

> (2) Classical electromagnetic theory [9] tells us that a couple of potentials, A, V may be replaced by A - Vtp and V + tp without affecting the fields. (EE)
>
> ...on what basis do we (who call ourselves applied linguists) decide to include or exclude them? (AL)
>
> We know, however, it is only in the last few years that Weber and Simmel have really been brought back to a place of honour in Francophone sociology. (Soc)

Here we can see that the inclusive pronoun presupposes a certain communality, but *we* can also be employed to guide readers towards a preferred interpretation, shading into explicit positioning of the reader. So while drawing on a strategy which stresses the involvement of the writer and reader in a shared journey of exploration, it is always clear who is leading the expedition:

(10) Now that we have a plausible theory of depiction, we should be able to answer the question of what static images depict. But this turns out to be not at all a straightforward matter. We seem, in fact, to be faced with a dilemma. Suppose we say that static images can depict movement. This brings us into conflict with Currie's account... (Phil)

Personal Asides

In addition to bringing readers into the text through pronouns, writers also address them directly through asides and interruptions to the ongoing discussion, briefly breaking off the argument to offer a comment on an aspect of what has been said. Once again, this is far more of a feature of argument in the soft fields. All writing needs to solicit reader collusion, but the social sciences and humanities typically rely far more on an explicitly interpretative framework. Because they deal with greater contextual vagaries, less predictable variables, and more diverse research outcomes, readers must be drawn in as participants to a greater extent than in the sciences. Writers must appeal more to the reader's willingness to follow their reasoning and rely more on focusing readers on the negotiation of their claims rather than how they have processed natural phenomena.

By turning to the reader in mid-argumentative flow, the writer again acknowledges and responds to an active audience, often to initiate a brief dialogue which adds more to the writer-reader relationship than to propositional development:

(3) And —as I believe many TESOL professionals will readily acknowledge— critical thinking has now begun to make its mark, particularly in the area of L2 composition. (AL)

What sort of rigidity a designator is endowed with seems to be determined by convention (this, by the way, is exactly the target of Wittgensteinian critiques of Kripke's essentialism). (Phil)

...who above all provoked the mistrust of academics, both because of his trenchant opinions (often, it is true, insufficiently thought out) and his political opinions. (Soc)

These are interventions simply to connect, to show that they are all, writer and readers alike, engaged in the same game and are in a position to draw on shared understandings, if not of actual content, then at least of what might be considered a relevant aside.

While pronouns and asides work to explicitly engage readers in the discourse and to establish solidarity, writers often use inclusion for explicitly persuasive ends, encouraging readers to see what they see and to draw the same conclusions. More overtly rhetorical strategies take a dialogic position which draw on directives, interrogatives, and appeals to shared knowledge.

Directives

These are the most frequent devices used to initiate reader participation in academic texts. These utterances instruct the reader to perform an action or to see things in a way determined by the writer (Hyland, forthcoming). Directive force is typically realised in three main ways: by the presence of an imperative (4); by a modal of obligation addressed to the reader (5); and by a predicative adjective expressing the writer's judgement of necessity/importance controlling a complement *to-* clause (6):

> (4) Consider now the simple conventional reflection effect in a magnetic interface. (Phy)
>
> With this in our mind, let us underline what has turned out problematic in the speech act theories. (AL)
>
> (5) What we now need to examine is whether there is more to constancy than this. (Phil)
>
> ...we must identify the principal screws Sx and Sp. (ME)
>
> (6) As marketers, however, it is important to understand how the information consumers associate with a company affects their responses to the products... (Mkt)
>
> Hence it is necessary to understand the capacitive coupling of the devices to the metal gates. (Phy)

There is a clear reader-oriented focus to these statements, signalling a recognition of the dialogic dimension of research writing and directing the reader to some action or understanding. Many of these directives are used to metadiscoursally guide readers through the discussion, steering them to tables, examples, arguments or other sources to support the writer's argument. Equally however, directives functioned to position readers, requiring them to *note, concede* or *consider* something in the text, thereby leading them to a particular interpretation. Typically these conducted readers towards the writer's conclusions by setting up premises (7) or emphasising what they should attend to in the argument (8):

> (7) Now suppose a speculative philosophical naturalist turns into a real scientist. (Phil)
>
> Then, let us consider a reference field which has rigid rotation W,*(p) and a rigid displacement w(p) at source point. (EE)
>
> Imagine that you are about to buy a product in that category. (Mkt)
>
> (8) ...mark that it is possible to interpret the larger symmetry in terms of supersymmetric quantum mechanics. (Phy)

> ...this must not be seen as obviating the need for a caring critical sociology, which is a more fundamental project (Soc)

This strategy therefore seeks explicitly to move readers in a particular direction: focusing attention and emphasising important points.

It is also worth noting that about half of all directives occurred in the science and engineering papers where, in fact, they comprised 61% of all the features examined in the hard fields, compared with only 25% in the soft papers. This imbalance may be partly as a result of the fact that directives can carry strong connotations of unequal power, claiming greater authority for the writer by requiring readers to act or see things in a way determined by the writer. Engagement can here violate the conventional fiction of democratic peer relationships in published research writing and so writers are often cautious in how they use directives. Most directives thus tend to be citational in the soft fields, a less threatening role than those which explicitly tell readers how to interpret an argument. In the hard knowledge papers, on the other hand, there is far greater use of non-citational directives, and an apparently more direct style of engagement. Directives allow an economy of expression highly valued by information saturated scientists who often read rapidly, searching for the value in a paper.

Appeals to shared knowledge

A less imposing involvement strategy is to position readers within the apparently naturalised boundaries of disciplinary understandings by appeals to shared knowledge. The notion of what can be reliably considered 'shared' is clearly open to exploitation for rhetorical ends. Obviously readers can only be brought to agreement with the writer by building on some kind of implicit contract concerning what is relatively incontrovertible. In asking them to identify with particular beliefs or knowledge however, writers are actually constructing readers by presupposing that they hold such beliefs. While there are various ways of accomplishing this, these constructions of solidarity often involve direct and explicit calls for the reader to recognise some disciplinary acknowledged cognitive or procedural perception:

> (9) This measurement is distinctly different from the more familiar NMR pulsed field gradient measurement of solvent self-diffusion. (Phy)

> For the numerical integration, the semiellipse is parameterized in the usual way and a standard Gaussian quadrature is applied. (EE)

> It should be obvious that very cognitively disabled people do not, and cannot, constitute a social-historical force in the sense I intend... (Soc)

Over three quarters of all such explicit appeals to collective understandings occurred in the soft papers. While the hard papers drew extensively on considerable domain knowledge of specialised methods, instruments, materials, and theoretical

models, these understandings were, with the exception of methods sections, generally signalled less explicitly (eg. MacDonald, 1994). Scientists expect their readers to have considerable conceptual knowledge and to be able to decode lexical and mathematical relations to unpack their arguments. The soft fields, in contrast, tend towards greater elaboration and readers are given rather more help in identifying entities, making connections and drawing inferences.

One key way in which writers seek to engage readers as cooperative participants is to project them into the text by anticipating a possible objection or inference that they are likely to make. By conceding what any reasonable and knowledgeable colleague might interject, the writer assigns readers a role in the argument, acknowledging their contribution and implying a clear dialogue with them:

> (10) Of course, someone might suggest that Euler did not see that "the details could be filled in in the right sort of way". In that case, however... (Phil)

> It is, of course, important to encourage practitioners to become more reflective about their day-to-day activities' (as Standing Accused has done) but there are other ways of changing professional practices. (Soc)

This strategy clearly positions readers. Typically the writer will concede a point, only to bring the reader to agreement with a responding argument introduced by *but* or *however*. It is this concession which seeks to engage and turn the reader, setting up an explicit dialogue with a virtual debater.

Direct questions

The final strategy of positioning readers discussed here is the use of questions. Direct questions are considerably under-used in academic writing, perhaps because they are the strategy of involvement par excellence. However, they invite engagement and bring the interlocutor into a discourse arena where they can be led to the writer's viewpoint. As Webber points out:

> Questions create anticipation, arouse interest, challenge the reader into thinking about the topic of the text, and have a direct appeal in bringing the second person into a kind of dialogue with the writer, which other rhetorical devices do not have to the same extent. (Webber, 1994: 266)

Writers sometimes open with a question to 'establish a niche,' creating interest and clearly setting out the topic the paper will respond to. In this way, not only is a problem invested with significance, but the reader is immediately invited to explore an issue with the writer as an equal partner:

> (11) Which point in a moving body is a characteristic point? What special geometrical properties does its trajectory have? Where are they? And next, which line in a moving body is a characteristic line? And where is it located? How can we

identify the characteristic lines into the axis of C-pair, H-pair, R-pair and P-pair respectively? and so on. None of these problems are completely solved so far. (ME)

While real questions do occur, however, these are usually employed to close papers, holding the reader's interest beyond the discourse to the results of further research. 80% of all questions in the corpus were rhetorical, presenting an opinion as an interrogative so the reader appears to be the judge, but actually expecting no response. This kind of rhetorical positioning of readers is most obvious when the writer poses a question and replies immediately, simultaneously initiating and closing the dialogue:

(12) Are there objects that, by themselves, demand a certain sort of rigid designation rather than some other? The question has to be answered in the positive. (Phil)

Why does the capacitance behave this way? To understand we first notice that at large B there are regular and nearly equal-spaced peaks in both C3, (B) and C31 (-B). (Phy)

Is it, in fact, necessary to choose between nurture and nature? My contention is that it is not. (Soc)

In sum, these are important features of academic argument. Through their use of directives, personal pronouns, interjections, questions, and so on, we can recover something of how writers construct their readers by drawing them into both a dialogue and a relationship. These features represent important aspects of academic argument and reveal how writers and readers make connections, through texts, to their disciplinary cultures.

4. CLAIMING SIGNIFICANCE AND CREDIBILITY

We have seen that persuasion in academic research articles largely involves constructing a text using devices that best position the writer and his or her research within a particular discourse community. In this section I will briefly review a number of other discursive strategies that writers use for both promoting their work and for demonstrating disciplinary competence.

One way academics claim significance is to open their papers with a promotional statement. In the science and engineering papers writers did not introduce their work with the purpose of naïvely establishing a territory, but frequently by offering the research as a valuable contribution to pressing real-world issues:

(13) Physical maps are an important resource for most molecular research facilitating positional cloning of trait genes, sequencing of genomic DNAs and analysis of chromosome and genome structure in detail. (Bio)

The self-diffusion coefficient of a material is an important physical parameter. It is a very sensitive probe to the structure of a medium. (Phy)

> Therefore, it is of paramount importance for the shop engineer to be capable of preventing the front end bending from occurring in his mill. A first step toward this goal is to understand how the metal flow characteristics are affected by each of various factors that may lead to the unbalanced rolling. (EE)

Thus while we might expect practitioners to be aware of these points, their inclusion in the introduction serves to reinforce the significance of the topic in the minds of readers.

Introductions in the humanities/social science texts more often filled-in potential gaps in readers' topic awareness, but they also frequently claimed topic centrality (Swales, 1990: 141). The principal means of establishing importance was to establish a disciplinary relevant, rather than real-world problem:

> (14) My main concern in this paper will be to examine an essentialist solution, proposed by Maudlin (1990), for a concrete problem in Philosophy of Spacetime: the dilemma between spacetime substantivalism and determinism raised by the New Leibnizian Argument (NLA). (Phil)

> The problem of separating the effects of household heterogeneity from state dependence in brand choice models is important from a theoretical as well as a managerial perspective. (Mkt)

The issue of selecting a particular topic, method, or approach is not only important in securing colleagues' interest, but also in displaying one's disciplinary credentials. Bruner (1994) observes that topics are resources of joint attention which coordinate activities and mark co-participation in communities of practice. This is especially the case in the soft knowledge disciplines where theories often fail to provide a coherent programme to guide research. Constructing a credible problem is therefore often a major way that writers in the soft fields display a familiarity with the discipline's literature and awareness of the topics which it currently considers urgent or interesting.

Representing the topic as important to the community is often achieved, particularly in the soft fields, by indicating that it had formed the subject of earlier work. However greater significance, and community credibility, can be claimed by indicating a gap in this literature (Swales, 1990). Here writers represent a problem as something which is unresolved by the community. The following cases, for example, do not directly address the focus under study, but the state of argument and knowledge current in the field:

> (15) Noticeably absent from the ecological literature on crime and control, however, is any systematic attempt to specify how and why patterns of policing vary across communities. (Soc)

> But in mainstream composition studies little consideration has been given to writing in languages other than English... (AL)

> Unfortunately, research on both information-sharing norms and integrated goals has been largely conceptual with limited empirical support. (Mkt)

The ability to identify such omissions is a critical step in claiming insider status in all disciplines, but is particularly crucial in the soft fields where the greater diffusion of research areas and approaches often requires validation of the topic itself.

A related demonstration of insider credibility is a writer's use of explicit appeals to the community's situated cultural understandings. Instead of demonstrating the relevance of their research by invoking the literature, writers frequently draw on, or exploit, the implicit domain knowledge of the discipline. This connection is occasionally marked explicitly, as in these examples:

> (16) *Clahsen's well-known conclusion is, of course, that* Universal Grammar is not available to the adult L2 learner (AL)
>
> Although reciprocal exchange of limiting resources is *the most obvious (and traditional) choice* for cost: benefit analysis... (Bio)
>
> It has become *something of a commonplace* in moral philosophy to regard this simplicity as more of a vice than a virtue. (Phil)
>
> *Traditional models of CS/D formation typically* model satisfaction to be a function of antecedent constructs that are defined relative to the choice already made. (Mkt)

This persuasive strategy is found in all disciplines, but a variation common in the soft fields is to appeal directly to the community, rather than its domain knowledge. Here writers deliberately promoted their group membership by invoking it specifically, aligning themselves with their readers:

> (17) One of the things applied linguists have to decide is whether they like the name that this particular professional affiliation bestows upon them. (AL)
>
> Traditionally, philosophers have explored two possibilities. (Phil)
>
> Sociologists in general, and political sociologists in particular, seemingly share a strong commitment to their own societies and sociopolitical problems. (Soc)

If we look more closely and preferred lexical patterns of persuasion, we find a variety of devices used to emphasize the value of papers. The principal rhetorical justifications can, in order of occurrence, be glossed as 'benefit', 'novelty', 'importance' and 'interest.' Hard knowledge writers tend to employ appeals to novelty and benefit, while writers in marketing, applied linguistics and sociology largely draw on the notion of importance as persuasive strategies.

Mechanical and electronic engineering accentuate their practical, applied orientation by emphasizing the utility of the reported research, mainly to the industrial world which relies on it. This also seems to be the major strategy employed in the marketing abstracts, another field closely associated with non-academic interests:

(18) Our results help explain why consumers value price guarantees (e.g., offering to refund the difference if a customer finds the brand at a lower price within 30 days) and performance guarantees (e.g., offering free upgrades on software for 12 months). (Mkt)

ABC is a tool that can help companies become more profitable and understand the true functions and drivers of their costs. (ME)

The structure function, however, may help us very efficiently to identify the different subregions of the heat-flow path from their contribution to the overall response. (EE)

In this paper, a heuristic method that provides a good solution for the cell formation and machine selection design stage in an acceptable resolution time is proposed. (EE)

The science fields, where constant innovation and progress is a central part of their disciplinary cultures, tend to stress the novelty of their research. Practitioners expect scientific advancement and readers tend to look mainly for new results to further develop their own research (Bazerman, 1988, ch 8). Consequently, the need to stress novelty was paramount, although sometimes combined with a statement of value:

(19) In addition to D. palmicola, the two further species are, therefore, described as new in this paper and a key to Delortia species is provided. (Bio)

The essays presented herein illustrate two novel approaches to monitor the intracellular dynamics of nuclear proteins. (Bio)

A new design for a minimum inductance, distributed current, longitudinal (z) gradient coil, fabricated on the surface of an elliptic cylinder is proposed. (Phy)

We will show to result from combining sputter and spin-coating techniques in novel four-layer Cerenkov configurations. (Phy)

In sum, readers make judgements about claims based on their knowledge of the topic and how it is being handled, and part of this involves making an evaluation of the writer as an informed colleague who is able to speak with authority. Persuasion here then involves using signals which convey insider credibility that helps to secure agreement for claims.

6. CONCLUSION

The nature of academic argument has been the subject of considerable philosophical debate (eg. Pera & Shea, 1991). Part of this debate has involved the extent to which epistemic and rhetorical factors can be distinguished; whether it is pos-

sible to separate truth-construction from the consensus achieved by techniques of persuasion. In this paper I have argued that knowledge has to be seen as a rhetorical construct, socially created in particular disciplinary communities, and that what is regarded as persuasive concerns the ways writers accommodate the needs of their readers as community members.

To argue successfully a writer must overcome numerous rhetorical problems. She must identify a credible disciplinary issue, demonstrate its significance, locate it within a wider disciplinary context, enact appropriate relationships with readers, and display credibility as a disciplinary member. Persuasion then is at least partly attained through a discursive display of credibility, 'membership', and appropriate argument using the patterns of interaction valued by the community to shape a valued disciplinary position. Embedded within the characteristic generic practices of the research article are writers' perceptions of appropriate norms of engagement, their epistemological beliefs of how knowledge is understood, and the best ways to package this knowledge and persuasively represent it to their colleagues. I hope to have shown here some of the ways that particular discursive practices are used to accomplish this.

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