Reading Science
Critical and functional perspectives on discourses of science

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2 Emerging perspectives on the many dimensions of scientific discourse

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Over the past centuries, several forces have tended to suppress our consciousness of the rhetorical, communicative and symbolic character of scientific knowledge—thereby suppressing awareness of the role of language in the production of knowledge: the desire to get closer to the material object and the empirical experience of it; the warranting of representation through material practice; and the desire to remove misleading forms of representation. Perhaps the very success of scientific representations has suppressed awareness of language in the production of scientific knowledge, for scientific knowledge seems to be cast in naturally authoritative forms, unthinkable in any alternative representation.

But for whatever reasons, we are caught much in the dilemma of the inhabitants of the two-dimensional world described in the novel Flatland. These plane geometric creatures literally cannot rise above themselves to see their own world in the richer perspective of a third dimension, a perspective that would reveal to them their own shapes and the peculiarities of their own interactions.

Nonetheless, by the force of our own reflexive gyrations we have been gaining glimpses of a few dimensions in which the language of knowledge operates. These glimpses are starting to show us how much language is part of complex webs of human activity and meaning making.

The language of science has in recent decades interested researchers from different disciplines, including sociology, rhetoric, psychology, history, philosophy and linguistics. The reasons for the interest are varied, from social critique to epistemological concerns, from educational goals to specific disciplinary puzzles in linguistics, rhetoric or sociology, from practical advice and policy choice to theory building. The researchers have thus used a variety of disciplinary tools for making visible and analysing phenomena, and have been driven by different ranges of questions concerns, and intellectual and practical programmes.

A responsible synthesis would attempt a comprehensive search of literatures in a variety of fields, an archeology of each to identify the shape of each of the disciplinary projects and a principled account of the
variety of sciences and technologies whose languages have been studied. Research is currently making incontrovertibly visible that scientific language is no unitary or stable thing, although certain tendencies or characteristics may be widespread. Scientific discourse is evolving and multiple, emerging in relation to the specialties, projects, methods, problems, social configurations, individual positionings and other dynamics that drive scientific activities. Further, as science studies have indicated, even all the sciences together form no essentially marked and bounded domain, although various enclosures (such as societies or journal readership or university departments) may partially direct the circulation of communication. These problems of identifying crisply bounded discourse domains become even more difficult if we extend our survey to technology, which itself is not clearly bounded from the sciences. I will consider none of these things here.

What I will consider are the accomplishments of a few of the more illuminating approaches to the discourse of science to see what kinds of things they have made visible and how their objects may be of interest to each other. Namely, I will be considering Latour’s actant network theory as a semiotic and rhetorical account, Greg Myers’ construction of scientific communication as a field of social negotiation, Halliday and Martin’s semiotic representation of scientific language, and my own attempt to place scientific communication within a systematizing account of scientific activity.

All of these projects are social constructivist in a broad sense, in that they attempt to understand our accounts and knowledge labeled as science as the product of human social activity, although there are many varieties of social constructivism, varying both in their claims about how social activity is accomplished and in the relations between social accounting and material experience. The four projects I discuss have different positions on these issues, which I will not attend to either. However, for all four language is important. Language is part of human relations to material experience, to other humans, and to knowledge.

**LATOUR’S POWER SEMANTICS**

We will begin with the ostensibly most social of the accounts of scientific communication, actant network theory, most clearly articulated in Bruno Latour’s *Science in Action*, a work which draws upon much of the work in social studies of science in the last two decades. Latour presents scientists and engineers— or purveyors of technoscience— as powerful rhetorical actors enlisting others in networks, to serve as resources in trials of strength with the critiques, claims, and projects of competing technoscientists. The end of this competitive enlistment is to create webs of relationships so strong that certain ideas, objects, facts become blackboxed, and are thereafter no longer seen as competitive sites of struggle.

Rather they are taken for granted as unproblematic, primarily because the cost of opening up the black box is too great—one can’t find a place to insert the crowbar, or if even one could find some break in the seamless web of interacting support, one could not marshal the strength and resources to force open the now-unexamined to serious questioning. Consequently, while science-in-the-making is deeply competitive and contentious, science-once-made appears co-operative and harmonious, as traces of division are excised within a narrative of progress towards current belief, taken as true. Moreover, it is in the interest of the entrepreneurs of new technoscience to downplay the questionings and opposition of others, thereby increasing the appearance of strength of their projects to attract further allies and to encourage further use of their would-be black box, thereby making it increasingly indispensable in widening alliances of practice.

This is a deeply political and rhetorical view of science, where all is a matter of building alliances and then enacting the roles that maintain the political position, although the alliances may be as much with machines and microbes as with humans. Latour’s account begins with the visible texts and the resources of citations, ideas, and experiments that are displayed there, but then moves backwards into the resources that stand behind the represented appearances in the text. In this light the citations become networks of social alliances and the labs become locales for producing inscriptions—turning mice into data and graphs that serve as resources and warrants for texts. As the alliances and rhetorical alignments become embodied in machines and funded laboratories, interests of various actors become committed in material and financial practice, establishing strongholds in the world that are not easily disassembled. Ultimately if the entrepreneur of knowledge is successful, labs become tribunals of reason and centers of calculation, thereby becoming compulsory passage points for subsidiary and related networks of knowledge production and maintenance, and they become the site of production of immutable mobiles that spread throughout society. So all activity becomes part of the extension of the rhetorical struggle, transformed into centres of communication and rhetorical power. The rhetoric enters both into the representations that contend and pass for knowledge, and in the ways that actants position themselves with respect to potential allies in the network.

In this entrepreneurial game, communications are central to enlisting allies, largely by the ways specific allies are built into or represented in the texts, through such semantic elements as citation and reference to the literature; the inscription of phenomena; metrics that imply certain procedural, material, and intellectual commitments; and technicality of description that displays methodological and instrumental resources. The semantics of the article thereby locate the claim in networks of
strengths that provide support and obduracy to the knowledge represented. This can be called a semantics of power.

Such an approach to semantics moves beyond semantics as a set of taxonomic relations of possible referents carved up into different conceptual objects. This approach to semantics examines the social and power implications of each term and concept – who has a stake in which term and how that stake brings power to bear in the deployment of a particular word or meaning. In a sense this can also be seen as a socially activated semantics, where each act of reference is also an act of affiliation, enlistment, or a display of allies to threaten those outside the web of alliances. Thus semantics becomes the visible mobilisation of resources that are drawn on and deployed in a text. A further extension of this research programme that would enter more fully into a discourse analysis, as suggested by the metaphor of deployment of resources, would be to examine the manner in which various resources are elaborated and linked within a cohesive text. What we would be looking at then are not only the forces gathered within a centre of strength, but the architectural, billeting and co-ordinated action plans.

**MYERS’ COOPERATIVE PRAGMATICS OF INTELLECTUAL AGONISM**

Where Latour has seemed most interested in the aggregation and display of intellectual power, Myers has been most concerned with how people continue to talk to each other despite the arguments, differences, criticisms, and harsh evaluations that are part of scientific contention.

Myers has not pretended to a comprehensive account of the language of science nor of the social relations of science, but has rather investigated a variety of phenomena, largely defined in rhetorical and linguistic terms. He has been particularly concerned with the linguistic and rhetorical means by which disagreements are negotiated. His work on biology, gathered together in *Writing Biology*, examines the discursive back and forth by which researchers stake claims, attempt to advance them, and are restrained by gatekeepers and opponents, who attempt to restrict claims. Arguments move through various spheres, from the funding cycle, to publication, to the popular realm, each with characteristic methods of presentation and resistance, tropes and dynamics of knowledge negotiation. In short, Myers identifies interactive rhetorical processes that shape the communal production of knowledge among people largely in antagonistic positions.

More recently he has examined the management of conflictual discourse through techniques of irony and politeness, which allow one to oppose by indirect, avoiding the social ruptures of direct opposition (see, for examples, Myers 1989 and 1990a). He has also studied the deployment of various forms, such as narrative or dialogue, to advance arguments. As well he has looked at the verbs used to characterise the speech acts of claim-making in scientific articles to show how these may be adjusted to indicate the appropriate level of assertiveness given the nature of the disciplinary project, social relations, and individual claim and warrant (see Myers 1992b).

Another line of Myers’ scientific discourse work is more semantically based, looking at how the recognition of coherence relations in texts is related to domain-specific, specialised knowledge (see Myers 1991). While this work might have implications for pragmatics through identifying insider–outsider boundaries and the modes of communicating that respect the audience’s conditions of being either insiders or outsiders, it has much more in common with Hallidayan work of the sort described below.

If Latour may be said to concern himself with a rhetorical semantics, showing how resources can be effectively aligned and displayed, Myers may be said to be concerned primarily with a rhetorical pragmatics of sciences, demonstrating how personal relations and self-presentation of arguments and argumentative positions may be adjusted both to advance arguments and avoid rupture of co-operative principles. Interestingly, in his critical reviews and discussions of other works in rhetoric of science, he winds up evaluating the effectiveness, ethics and social interaction of those texts he criticizes, as in discussing an article by Howe and Lyne, where he concludes by commenting, ‘There is no future in fighting dirty and trying to stay clean’ (Myers 1992a: 201).

**HALLIDAY’S GRAMMATICAL SEMANTICS**

Halliday and Martin in *Writing and Science* pursue a kind of grammatical semantics. Embedded in the larger Hallidayan programme that connects linguistic observations with social, political, and psychological implications, this book most concretely provides an analysis of particular lexical items and semantic relations found in a variety of educational and research texts ranging over a number of fields and periods. By far the largest amount of analysis is devoted to nouns, both in relation to taxonomy and the nominalisation process, driven by grammatical metaphor – long an especial concern of Halliday. The most salient finding is that nominalisation has increased historically within science and other domains and that a similar process of nominal compaction occurs in individual texts. Historically this nominalisation has served to create higher and higher order abstractions which provide conceptual objects that populate the intellectual landscape of scientific specialities. These nominal abstractions are increasingly removed from concrete experience, and at each stage of the abstracting nominalisation process, concrete referential information is lost, so that the material meaning of higher order nominals becomes increasingly hard to follow and agree
on. Within each individual text there is a similar process as earlier
concrete reference is compacted and abstracted in the unfolding of
the article's argument, where events turn into phenomena into conceptua-
ised processes. Thus each article also projects a conceptual landscape
populated by nominal objects constructed in the course of the text.
Moreover, both historically and in individual texts, these objects become
arrayed in taxonomies dividing up the conceptual landscape into discrete
technical objects, whose definitions are linked through their abstract
relations. The processes by which terms are made technical and are
arrayed in taxonomies are also examined in some detail.

(Here we may also remember the comment from Latour and others in
social studies of science that when arguments heat up, they become
technical. This comment suggests that competitive struggle or agon
makes distinctions useful and differences visible, if not indeed the sites
of discussion. This further suggests that in the vocabulary of any tech-
nical field we have the fossils of earlier points of contention, with the
surviving representation and its internal articulations drawn not only in
contrast to suppressed losers, as deconstruction might point out, but also
in relation to the resources by which the conquest was made – all the
time remembering that the standing representation is likely to be a
negotiated collaboration over a period of struggle, showing respect to
all the powerful resources any of the contending sides may have brought
to bear, rather than a simple choice of a primitive dichotomy. We might
also remember that the agon is not only with intellectual opponents, but
also possibly with practical problems that demand effective action and
evasive phenomena that tease the imagination. But this set of specula-
tions needs to be examined against historical evidence.)

In Halliday and Martin's analysis, the system of verbs in scientific
writing relates those nouns to each other, either as descriptions of
external events or internal logical operations. As actions are increas-
ingly embedded in abstracted nouns, verbs also increasingly express abstracted
relations. Typically the verbs are relational intensive, (such as to be and its
equivalents – ranging from signal and embody to confirm and prove), or
circumstantial (such as cause and its equivalents). Halliday gives particu-
lar attention to causal verb phrases and the syntactic relations they
establish among nouns. Martin also begins to map causal implication
sequences, where one state is described as being transformed into
another. Thus again we have discrete objects that are acted upon to
become new objects. This transformation is represented through typical
syntactic relations among nominal objects. So the basic semantics is of
conceptual objects deployed in nominalised grammatical forms, put in
syntactic relations of coexistence, revelation or causation. One thing is
another, or reveals another or causes another.

Similarly Halliday and Martin discuss conjunctions and prepositions
that put nouns in elaborating, extending or enhancing relations.

SOME PERSPECTIVES ON THE HALLIDAYAN VIEW

The overall picture we obtain of scientific discourse from Halliday and
Martin is of a process which is constantly creating new conceptual
objects that populate its domain and can be arrayed in various syntactic
relations, primarily of coexistence and causality with other states. (There
may be processes other than discussed by Halliday and Martin by which
the semantic/conceptual/ontological field of objects grows.) Difficulties
students and others have with scientific language are in the recognition
and appropriate manipulation of the verbal objects which correspond to
conceptual objects. Myers would add to this that students have difficulty in
recognising the semantic relations among different synonymous,
antonymous, hyponymous or sequentially linked terms. We can see in
this view of the creation of scientific lexical/conceptual objects some-
thing like Latour's black-boxing – once the object is given a stable name,
its details, problems and material particularities and relations to other
objects in its network vanish in a higher level abstraction which becomes
difficult to unpack once made. Moreover, certain of these objects get
displayed as resources to be relied upon in articles. They form a ground
of ontological certainty upon which one can construct new objects.

From a Vygotskian perspective we can also see these terms as tools for
organising and manipulating perceptions of the world, so that these
objects and their appropriate manipulations become the very means of
thinking that are difficult to escape once engaged with, but difficult to
engage with when approached from any other form of intellectual life.
While this observation reverberates with both Wittgenstein's 'forms of
life' and Kuhn's 'untranslatability', it points the way toward a more
moderate and precise account of the mechanisms by which perceptual
and accounting frames are formed, and of the difficulties in attempting
to engage the perspective of those immersed in a different discoursal
universe.

We may also see in this synthesis of Halliday and Martin with Myers,
Latour and Vygotsky the beginning of a conjunction of the grammatical
code with the intellectual code and the code of representation of nature.
Thus the semantics become a kind of cognitive semantics, having from
the Hallidayan perspective their origin in narrative descriptive processes
and grammatical metaphor (see Halliday and Matthiessen in press) or
from the Latourian perspective having their origin in agon and alliance
building, but ultimately having their consequences in the cognitive
structure and contents of scientific thought. The implications of this
for educational projects are significant, both in identifying the difficulties
of entering into scientific discourse and in identifying the kind of
symbolic-cognitive practice one is trying to foster in science education.

When just looking at lexical and grammatical processes, we see a
unified view of the sciences as uniformly engaged in precisely the same
discursive practices of object creation, abstraction, and relation-building. It also presents the sciences much on the terms that science itself would like to consider itself, with attention to the cognitive objects it creates in representation of natural objects and processes. The fissure-laden and contentious social and material processes by which phenomena are construed into widely accepted symbolic form are hidden from Halliday and Martin’s view. They represent the field as a series of textual objects – the field already filtered through the mode of textuality, and therefore seeming to have textualised homogeneity – that is the field is reduced to a semantic field which names the conceptual objects of study and analysis, to be syntactically manipulated according to a limited range of accepted symbolic procedures to make arguments in the symbolic domain. For this reason, Hallidayan grammatical and syntactic studies frequently move freely between analyses of classroom and research science, without noting differences in the language that may appear only at other levels. The typical move of research articles to pretend the truth and acceptance of their claims, even while wrestling uncertain phenomena into some stable-appearing symbolic form and arguing with competing views, results in the rhetorical and epistemic activity of the writing not being highly marked at the grammatical and syntactic level. The form of the argument is to black-box itself as much as possible and make itself look as much like accepted textbook knowledge as it can manage within the context of disciplinary discussion at the research front.

In a broader activity construal of field, the textual mode would be part of the social and material activity but would not encompass it. There are things that happen beyond the edge of the paper, some of which get represented in the text as textualised objects (as in Halliday’s tenor, or interactional component of discourse), but others that never appear directly although they may have great influence on the things that do appear. It is in these realms that sciences may look most different from each other – as a physics laboratory and a physics seminar may look very different from an anthropological expedition and an anthropology seminar, although the textbooks and journals of both may have certain resemblances as they set on the shelf. The texts only serve operationally as important parts of this larger range of activity of knowledge production, education, dissemination and application, although they may refer to various parts of the processes. Even more complexly, texts may be sensitive to or influenced by these larger social activities. Further, the texts’ relations to these encompassing activities may be translated into textually displayed objects, as well as translated out into other forms of practice, in a variety of different ways.

We can see Halliday and Martin’s focus on the textual representation from a different path. Although Halliday and Martin mention other dimensions of language as represented within the Hallidayan system, particularly tenor (which is the interpersonal element), the primary emphasis of their analysis is on the field and mode, or ideational and textual elements. Moreover field is given a particularly lexical, textual interpretation – the field being represented by the names of objects that populate the conceptual field. Thus chemistry is indicated by the names of chemical objects displayed within the texts from the names of chemicals such as acids, to methods and tools, such as titrums and test tubes, to chemical processes such as calcification. Chemistry is not considered to be the social and institutional and material configurations that stand behind the text but are not mentioned such as disciplines, journals, collegial relations, reward systems, networks, and the test tube racks and sinks that do not get mentioned in the text – the kinds of things sociologists of science might associate with the field and its practices. To Latour these may include some of the black boxes so taken for granted that they are no longer seen, but they also might contain the many contingent relations and interests that one is attempting to draw under control by proposing the right objects that will tie those alliances, interests and contingencies together around a new black box.

That is, in Halliday and Martin science is much as it presents itself in its texts, only we have to find out how to read those difficult texts, and perhaps recover some of the concrete narrative that has been pressed out of the abstraction. So the dimension we recover here from the textual appearance is the process of textualisation which makes the text more compact and abstract – and therefore difficult. Myers would also point out that the compactness and abstraction are in part achieved through the web of semantic relations taught as part of specialised training, as in textbooks, but that are left implicit and invisible in texts that circulate only among the fully trained. As both Halliday and Martin repeatedly suggest, it is the difficulty and abstraction of the text that define the applied social problems that drive their analysis – how to make the textualised knowledge more accessible to students and adults and how to bring that knowledge more in line with the concrete transitive activity of the real world that is being covered by the nominalised abstraction.

**BAZERMAN’S RHETORICAL FORMS FOR SYMBOLIC ACTION**

My sets of problems and sites of observation cut across these other three lines of work. As a writing teacher, I have been most concerned with what one must attend to in order to write successful documents in scientific and other domains, and then how those forms of attention can be appropriately translated into successful textual choices. It is the textual relations with those encompassing activities and how one engages with the material and social through textual action that have held my attention most. Genre provided a grasp on this complex and inchoate
activity, because it is through the typified utterances of genre that one interacts with others and encapsulates what one has to report on the material phenomena one has grasped through material experiences and inscriptive practices. By genre I do not just mean the formal characteristics that one must observe so as to be recognised as correctly following the visible rules and expectations. Genre more fundamentally is a kind of activity to be carried out in a recognisable textual space. That activity embodies relations with the readers and kinds of messages to be developed in order to carry out generically appropriate intentions and interactions – to complete the rhetorical and social possibilities of the genre. Thus genre presents an opportunity space for realising certain kinds of activities, meanings, and relations. Genre exists only in the recognition and deployment of typicity by writers and readers – it is the recognisable shape by which participation is enacted and understood (see, for example, Bazerman 1994b and 1997).

This conception of genre differs from the Hallidayan conception of genre, which places genre on an equal footing with register. Genre in Hallidayan and other functional linguistic formulations refers primarily to broad patterns of semantic organisation that may come to dominate passages of text longer than a sentence – such as narration, description, report, etc. Genre may be seen in these traditions either as a series of linguistic features that co-vary or as a locus of utterer’s decisions that will influence the emergence of staged textual features.

My attention was drawn to the specific expected forms of discrete texts through which one’s literate action is framed and recognised in relevant communities. That is, texts of recognised types, appearing in certain perceived circumstances, are perceived to have particular force. If a particular message does not fulfill all the expectations that usually attach to its type, or if it confuses its appearances among various possible actions, it may evoke various kinds of confusion and ineffectiveness or may be engaged in an intentional deception. Thus I have tried to understand textual appearances within the entire set of relations and transactions in which appearances are embedded, and I have attended largely to the framing devices and the shaping of actions – in this spirit I examined the emergence of the modern experimental report in sciences, its many transformations, its diffusion to the social sciences, the social structure that arose in conjunction with the textual structure, and the kinds of activities that are influenced by the regularised forms of literacy (Bazerman 1988). I also have examined how communicative forms and actions have been proposed in relation to specific social and epistemological projects that are to be realised through communicative relations (see Bazerman 1994a and Bazerman and Paradis 1991).

In my recent work on Thomas Edison, some of those activities I have been exploring have been the gaining of value and meaning within structured discursive spaces. In order to create the technology of central power and light in the everyday life world, Edison must get various other people linked in various discursive networks to see the meaning of his project and to see the value in that meaning. Thus incandescent lighting must gain specific presence in the patent system through the approval of claims of novelty embedded in patent application and the assignment of patent numbers that give legal standing to the claims. The specific value and meaning created through the patent application/review process then gives particular standing in legal proceedings where the patent rights are defended and enforced. Each of these structured forums are constituted out of sequences of allowable and appropriate generic utterances distributed differentially to people with different institutional roles. Typified utterances embedded with these forums then create specific meanings and values in interaction with the particularities of each instance as represented within that forum. Late nineteenth-century newspapers, the financial markets, technical journals, the inner circles of industrial financiers and so on each identify specific discursive realms on which Edison had to represent himself and his project appropriately and successfully for all the parts of this large techno-socio-legal-financial-industrial-commercial undertaking to come together in the construction and use of the material system of electric power delivery – the wires, transformers, generators and light bulbs along with the buildings that house them and the workers that operate them (Bazerman forthcoming).

The power semantics here are a bit different than in Latour’s account. Rather than tying alliances together in a centre of calculation, which becomes in a sense a semantic gathering place of the interests and representations of all members of the network, here we look at the movement of representations outward across complexes of discursive networks, each having its own standing. Each, therefore, remoulds the project as part of its enlistment. We have a project that is representationally distributed in a kind of pragmatics of negotiation of the kind suggested by Myers. That is, we have adjustments among many centres of discourse, accommodated through the semantic flexibility and pragmatic distances negotiated by skilled language users who know how to maintain social networks despite differences among themselves and who know how to take meanings from one domain and transform them appropriately for another domain.

**LOCATED ACTS OF MEANING**

I am also beginning to explore another dimension of scientific discourse, a dimension suggested by Halliday and Martin’s analysis: the operation of meaning within each discursive system. Once a representation gains place within a discursive system, it is accepted as properly represented in it, and therefore becomes a valued discursive object, how is that meaning operative within that discursive system? How is it linked with and
transformed into other meanings? What kinds of intellectual operations can be performed on it, and what kind of operations can it perform on other meanings? What kind of tools do these meanings or concepts or representations become for thinking? How are those tools used? And how do other tools get used on them? These might be said to be the formal operations or knowledge and intellectual procedures of the field. In some empirical fields there may be material, empirical procedures for identifying appropriate objects such as new chemical processes or species of plants and admitting them into the pantheon, and these procedures and instances of their application can be argued and contested in symbolic ways as in experimental reports and methodological arguments, but once in the pantheon they can be operated on in certain purely symbolic ways. These symbolic operations we might call chemical meaning and thinking, or botanic meaning and thinking. The kinds of grammatical semantics of nominalisation and causal relations that Halliday and Martin point to and the underweb of semantic cohesive relations within a knowledge representational field pointed to by Myers are clearly parts of that story.

From my first works in the rhetoric of science, I have given readings of the intellectual operations of texts, in large part to examine how those operations point outwards to contextual operations or draw on contextual resources, and in both instances actively engage with those contexts. However, this is always carried out in the local textual environment where there is a kind of local textual thinking which carries out the disciplinary project through the creation of an allowable and forceful textual object. For example, I have looked at how the introduction of quantum theory helped reconfigure the organisation and intellectual operations of articles in spectroscopy. I have also examined how Newton attempted to construct compusive relations within a discursive space that eliminates external distractions — in part by using argumentative resources of mathematics, which was furthest along as a self-contained discursive system. Similarly, I also considered how Adam Smith in order to create a space for calculation and exchange through quantification — countable money — began to identify certain calculative operations that formed the grounds of economics, which now appears as an enclosed discourse even though Smith’s own text constantly draws on much wider concerns to try to focus them on this space. McCloskey points out that modern quantitative-appearing economic argument has been able to suppress and make covert these wider discursive concerns, but has not been able to eliminate value and policy concerns that keep the discourse open, much as Newton’s setting the terms of argument restricted allowable meanings in optics for a hundred years and in mechanics for two hundred.

Also most recently I have begun to give some thought to the nature and role of concepts as active operators in disciplinary discourses of different sorts. But these all represent pieces that I have barely begun to fit together — to try to understand meaning actions, in a sense which goes beyond Austin’s reference acts and Searle’s propositional acts. Austin and Searle’s concern for states of affairs represented within speech acts considers isolated representations as contained acts of assertion, but what I have in mind is the working out of complex meanings in related representations — meaningful representations that can only become meaningful and persuasively forceful within a complex of related assertions and that are worked through in the course of building an allowable set of cohesive representations. It is one thing to consider the conditions under which we can appropriately assert ‘the cat is on the mat’, and quite another to consider the conditions appropriate to asserting an account of the influence of the increase of the price of crude oil on the gross world product in the previous quarter. Understanding the way concepts work within specialised discourses provide a way into understanding how meanings are organized and realized within those discourses.

The manipulation of symbols within generic disciplinary space to unfold meaning is also a cognitive activity, drawing together the understandings and interests of the writer and readers in joint projects, so that the readers must be engaged, influenced, and persuaded by the unfolding text, so that they give continuing meaning-constructing attention to the temporally and spatially unfolding text, without the alienation of alternative commitments and understandings that distance the reader from the representations of the text. The joint construction of meaning is more than simply a calculus of symbols, it is a rhetorical sharing of thought within a generically identifiable space using the accepted resources appropriate to be deployed in that space in ways that keep enlisting the meanings and understandings and procedures the readers will bring to that space.

All the projects I have described here remain sketchy glimpses of different spots on different kinds of maps, but they all form pieces of a complex n-dimensional puzzle. They start to reveal specialised and consequential linguistic practices in complicated systems. Years ago, I commented that some sample articles I examined from literary studies, sociology and biochemistry played different moves in different games, on different game boards. We still don’t know what all the games are or what the full range of moves or game boards is, but are getting some better snapshots of moments of play. The richer the picture we develop, the better a mirror we will create for the reflective practice of language use, which I see as the end of rhetorical knowledge: to help a skilled behaviour become even more self-monitoring, self-knowing, precise and skilled.
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