REVIEW/COMPTE RENDU

Writing Science: Literacy and Discursive Power

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Writing Science: Literacy and Discursive Power, *M.A.K. Halliday and J.R. Martin, University of Pittsburgh Press, 1993, 283 pages.*

IN ITS ARRANGEMENT, topics, and polemics, *Writing Science: Literacy and Discursive Power* bears the imprint of its intellectual habitat—a community of scholars and educators committed to the explanatory power of systemic-functional linguistics. The book is not co-authored in the usual sense, but partitioned: after two introductory chapters, five chapters go to Halliday ("Part 1: Professional Literacy: Construing Nature") and four to Martin ("Part 2: School Literacy"). One of these four is shared with two other co-authors (P. Wignell and S. Eggins), and all chapters are laced with mention of other researchers and educators whose work is cooperative with Halliday's and Martin's. The solidarity of this network of voices leads to some assumptions of familiarity which may startle outsiders—the idea of certain wordings being more "natural" or more "congruent" than others, for example. But that network is also representative of the theoretical confidence behind this body of thinking—confidence inspired by the system of functional grammar, intricate, interlocking, and exhaustive. Every niche of the systemic account is packed with the outcomes of meticulous reasoning, and the whole is governed by a set of coordinated principles.[1]

While the book's arrangement embodies internal relations amongst a community of scholars, it also shows traces of external relations. Most of its chapters are retrieved from other publications, many of which are devoted to the systemic idea and its application to education. The systemic view has

[1] This review cannot recover the contents and relations of all the niches relevant to *Writing Science;* the fullest account appears in Halliday's *Introduction to Functional Grammar* 1985.

been widely disseminated in Australia, and has enjoyed—for such an intricate theory—an unusual publicity in its direct effects on teaching in public schools there (see *The Power of Literacy: A Genre Approach to Teaching Writing,* ed. Bill Cope and Mary Kalantzis 1993). At the same time, however, readers will hear, in many of these chapters, residue of a zealous tone that *witnesses* what the authors may have experienced as resistance to their insights and recommendations.

As a result of this volume's partitioning and its origins in other publications, there is a lot of repetition. Both Halliday and Martin explain science's taxonomic thinking and its consequences, and they both do so several times—each time as if it is all New. Illustrative samples appear several times over—as if we had never seen them before. Some readers may weary of this repetition, or expect some acknowledgement of their plight, but on the whole it seems to me a minor oddity, and even a useful one, for *Writing Science* advances complicated ideas which, in their repeated versions, become successively clearer.

At the centre of these ideas is Halliday and Martin's systemic-functional analysis of the language of science. While observers have long noted science's preference for nominalization, systemic analysis advances such observations beyond their usual standing. As science routinely turns *processes* into *things,* the grammar that Halliday and Martin describe accomplishes a range of conversions: not only actions but also attributes and even modals are nominalized (*be able* → *potential,* for example); the noun phrase (or nominal group, in SFL terminology) expands to take in Agents as Possessors or Classifiers; in some cases, the medium of the process is "absorbed" (but not "omitted") (159). Nominal elements assume the sentence's semantic burden, while verbs are left to describe "the relationship between...nominalized processes" (63), or to be replaced themselves by "dummies" (159).

Halliday and Martin's analysis is exceptionally respectful of refinements and variations in scientific nominalization, and informative along these lines. To some readers, however, it may not seem to be breaking new ground. After all, even computerized style checkers have heard about nominalization, and many people recognize it as a feature of scientific writing. But, in fact, their studies are an important contribution to our understanding of this phenomenon, for Halliday and Martin—systematically—link it to co-occurring features of text and conditions of context. First, they observe that nominalization realizes, in the grammar, taxonomic reasoning: ordered, hierarchically arranged sets of technical terms which comprise the materials

of scientific knowledge. (This realization can have delicate grammatical effects: for example, the modifier in a technical nominal phrase like *energetic instability* is Classifier rather than Epithet, as it is in *energetic person, "energetic instability* [contrasting] with *kinetic instability* in a taxonomic relation—two kinds of *instability"* (128).) Taxonomic reasoning produces technicality—and new interpretations of the world, alternative to "commonsense" ones.

Second, Halliday and Martin argue (repeatedly) that the nominalization which realizes taxonomy—holding the world steady for investigation, differentiation and ordering—at the same time provides for the "flow" of scientific text, its momentum and coherence. Nominal groups package "complex sequences of text" (15) to be deployed in subsequent clauses. Applying categories developed to account for the distribution of information in clauses, Halliday and Martin find that sentence Themes (leftmost constitutents, what is being talked about) pick up previous Rhemes (what is being said about what is being talked about). In science writing, then, the typical Theme is an expanded nominal group which condenses information distributed over a clause in an earlier sentence. (To concoct a nontechnical example: *The object moves rapidly* → *The object's rapid movement....*) Nominalization plays the crucial role in the textual cohesion characteristic of scientific genres—types of writing in which the relation between parts of a text must be explicit and unmistakable.

Finally, Halliday and Martin relate these textual conditions to sociohistorical context—to the requirements and intentions of science, and the production of scientific knowledge.

> The birth of science...(if we may indulge in a well-worn lexical metaphor), from the union of technology with mathematics, is realized semiotically by the birth of grammatical metaphor [the reconstrual of a process, prototypically realized by a verb, in a noun, the prototypical realization of a thing] from the union of nominalization with recursive modification of the nominal group. (15)

A "scientific grammar" evolved (if we may alter the lexical metaphor) to sustain the cognitive ambitions of new ways of construing the world. Halliday documents the evolution in analyses of passages from Chaucer, Newton, Priestly, and, in our day, Stephen Jay Gould. Still maintaining an historical, evolutionary perspective, he also conducts a contrastive analysis of scientific writing in Chinese and English.

Halliday and Martin maintain throughout that the features of science

writing are deeply motivated by context ("...the device of nominalization, far from being an arbitrary or ritualistic feature, is an essential resource for constructing scientific discourse" (61)) and that scientific context, in turn, is "reconstrued" by its grammar, for scientific grammar, like any grammar, is "a theory of human experience" (8). But the motivations of scientific grammar are not the end of the story: there are problematic and controversial implications, too.

For one thing, the scientific nominal group is inherently ambiguous, because information is lost in its formation. So, for example, a phrase from Gould, "Darwin's gradual rise to mounting complexity," means that "Darwin thought that species gradually became more complex," not that Darwin rose up gradually, or that he became more complex (31). The grammar of this phrase (and others, like "orbital motion"—an orbit moves? something moves in an orbit? a move is caused by an orbit? (129)) presupposes background knowledge in its correct interpretation, for its structure does not in itself code the transitivity relations among its parts. And this is one of the problems with scientific writing: "density"—"strings of lexical words without any grammatical words in between" (77). (The downranking of meaning from clause to NP also has rhetorical implications: "[meaning] is less negotiable, since you can argue with a clause, but you can't argue with a nominal group" (39).)

Aware of the social and cognitive practicalities evoked by the discourse of science—its difficulty and resistance to newcomers—Australian educators (presumably like educators elsewhere) have instituted curricular and pedagogical changes that aim to reduce the technicality of science writing. Halliday and Martin are against these changes. Having argued that technicality (and its attendant grammar) is the constitutive feature of scientific knowledge, Martin deplores the disappearance of science textbooks from Australian schools, and their replacement by the materials of everyday language: "it is utter nonsense to suggest that students learn science better when they are encouraged to use their own words" (230). And just when textbooks, with their valuable models of scientific discourse, retire from classrooms, students are assigned forms of expression, such as personalized narrative, which are inappropriate or unaccommodating to scientific knowledge.

Martin argues for an interventionist pedagogy, one in which generic and grammatical models guide students in the production of scientific text and, thus, the acquisition of scientific knowledge. Although his analyses concentrate on the discourse of geography, they have clear connections to

other scientific disciplines. Moreover, his comparison of geography with history is illuminating and promising, for it proposes a subtle yet compelling distinction between the "technicality" of the sciences and the "abstraction" of the humanities, both realized, at one level, through a nominalizing grammar. (He also suggests that "[f]or many students abstraction probably forms more of a problem than technicality, since science teachers do teach to the concepts and terms that make up scientific discourse whereas English and history teachers do not focus specifically on nominalization as their main interpretive tool" (213).)

Besides quarrelling with current pedagogies, Halliday and Martin's studies also ambush the folk notion of "jargon," the notion, that is, that technical terms

> are unnecessary and that the same meaning could have been conveyed without them, in the everyday language of ordinary commonsense....some people think that [scientific language] is an unnecessary, more or less ritualistic way of writing, and that science—scientific concepts and scientific reasoning—could just as well be expressed in everyday, non-technical [sic] terms. They refer to this other kind of language as "plain English," "simple words" and the like. (70)

Writing Science demonstrates that, on the contrary, the language of science is constitutive of science itself, and cannot be separated from it. Halliday and Martin firmly dismiss commonplaces about "plain" language, and Martin goes so far as to associate educational versions with "Americans," "anti-systemic positions," and "anti-rationality" (265), and with "liberal-humanist rhetoric used by middle-class educators to oppress generations of migrant, aboriginal and working-class students in Australia" (255).

Halliday and Martin are uncompromising in their antagonism to the folk idea that scientific speech is only "jargon." Yet they readily—even eagerly—accommodate a contiguous idea: namely, that, when the grammar of scientific nominal groups appears in other fields, principally bureaucratic ones, it is bad. A grammar that began by "freeing and enabling" has come to dominate, and has ended by "constraining and distorting" (10): in discourses other than scientific ones, nominalization

> is largely a ritual feature, engendering only prestige and bureaucratic power. It becomes a language of hierarchy, privileging the expert and limiting access to specialized domains of cultural experience. (15)

The authors appear to share this view with equal intensity. While Halliday observes that "scientific English" inappropriately and excessively transferred to other contexts "[makes] no sense *except* as ritual (for example bureaucratic discourse)" (68), and only "[serves] to create distance between writer and reader, to depersonalize the discourse and give it a spurious air of being rational and objective" (84), Martin observes that "[t]echnical discourse can be used to exclude" (205) and he is similarly suspicious when the grammar of science appears in the documents of bureaucracy: "Writing in administrative contexts, with an eye to social control, is the source of much of the most heavily nominalized discourse in western culture" (216).

How do Halliday and Martin know that the characteristic nominals of science are inappropriate and despicable, and merely ritualistic, in other contexts? By looking for *function* (and, perhaps, checking the taxonomies of systemic-functional linguistics to see if they would predict, or explain, the appearance of dense NPs in bureaucratic or administrative documents). In science writing, these forms are germane, constitutive, indispensable: they make scientific knowledge possible; they are functional. Elsewhere, they are only a matter of prestige or "status" (217). While Martin concedes that the whole matter needs some looking into (217), neither he nor Halliday seems willing to entertain prestige as an authentic motivation of a linguistic feature, or to entertain the possibility that nominalizations in bureaucratic texts may be cognitively functional along lines adjacent to those which track the evolution of the distinctive grammar of science.

Although Halliday and Martin maintain that systemic-functional linguistics is political, having "been evolved as a tool for participating in the political process" (22), the politics of this volume are a bit abrupt—and much coarser than its fine-grain, sensitive analyses of wordings of science. When "ideology" is invoked, it is attached to a category (genre) at a very high rank of their analysis: "at the level of social context, ideology is realized by genre, which in turn is realized by register" (37). But *genre,* for Halliday and Martin, orders terms like *narration, report, exposition*—terms which easily cast their lines and drift free of the material circumstances of their instantiation. (So Halliday, convincingly enough, analyses Gould's instantiation of narrative as privileging the interests and experience of white, educated, middle-class male adults (37), while Martin seems to suggest (200) a quite different gender affiliation for narrative.) Readers accustomed to current North American conceptualizations of genre—genre, that is, as fusing *discourse regularities* (which translates approximately but not exactly into Halliday and Martin's "register")

with typified *social situations*—may be disappointed to find themselves returned to handbook terms like "narration" and "exposition." Although these terms are here somewhat "technicalized" by their position in a hierarchized taxonomy, they are still for the most part the unanalyzed notions that produced generations of schoolroom essays in North America. Moreover, the taxonomy specifically separates "field (the knowledge that is being constructed) and genre (the global patterns of text organization that package this knowledge)" (201) ("field" also being defined as referring "to what is happening, to the nature of the social action that is taking place: what is it that the participants are engaged in, in which the language figures as some essential component...(including the notion of activity sequences oriented to some global institutional purpose)" (32)). This separation depletes *genre* of social content—at least as realized in *narration, report, exposition*—and of substantial materials for constructing political insights into "ideology."

Despite this misalignment of Australian *genre* and North American genre, Canadian researchers and teachers of technical communication will nevertheless find *Writing Science* in general a rich resource, a commanding account of the wordings of technicality, and an inspiring guide to further inquiry. In particular, specialists in technical communication—a field still haunted by aspects of humanist, English-department sensibility—will benefit from this book's steadfast explanation of the grammar of scientific statements as inseparable from scientific knowledge.