Bazerman, Charles (1988). How Language Realizes the Work of Science: Science as a Naturally Situated Social Semiotic System. In *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science* (291-317). Madison: U of Wisconsin P.

Connection to Key Concepts: Winsor recommends reviewing this chapter for "a discussion of the way nature and the statements we make about it limit one another" (342). This text is the basis for her complex statement regarding knowledge and nature which she uses to frame her discussion of engineering discourse: "Knowledge is not found ready-made in nature. Instead, knowledge is constructed in the interplay between nature and the symbol systems we use to structure and interpret it" (342).

Outline

- The question: how can we understand the ways in which "language accomplishes the work of science?" (291)
- Symbols (words and numbers) represent the concepts of science; the problem is making the symbols have a "one-to-one" relationship with what they are describing (292).
- Scientific discourse is privileged above other discourse due to the complex symbology that it employs.
- Bazerman asserts that there is good cause to distrust the ability of scientific language to accurately describe what we observe:
    - 1. Languages are semiotic systems, and thus carry assumptions that affect not only representations of what we observe, but also our observations;
    - 2. Science incorporates outside sociological components into observations, effectively legitimizing programs that "may simply be the result of class interests" (294);
    - 3. "Scientific language serves to establish and maintain the authority of science, largely through exclusion and intimidation" (294);
    - 4. Scientific language can be used to serve competitive interests in the scientific community;
    - 5. "Scientific language is often fuzzy, incomplete, undefinitive" (294);
    - 6. "scientific formulations are a human construction and thus are heir to all the limitations of humanity" (294).
- These reasons for distrusting scientific discourse are conceptually rooted in a divide between linguistics and semiology.
- Invokes Saussure and his conception of semiotics: words and symbols not only represent meaning, they arise from it (296). Sassure's definitions of linguistic study pose problems for the study of scientific discourse:
    - Excludes diachronic study: systematic linguists limit study of language to synchronic
    - Signs are arbitrary and have no special relationship to the signified: this concept is used to "divorce […] code from meaning" (296-7)
    - Semiotics introduced as the study of sign systems (diachronic)
- Social relativist critics of scientific discourse are interested in deconstructing the

syntactic and grammatical codes of scientific communications to reveal the text as "a linguistic structure, a contrivance, having no inherent meaning, but creating sociopsychological realities out of its semiotic code" (298).

- A question is raised through the examination of the attempts to wed social situations to linguistic studies (as in sociolinguistics): how are abstract conceptions in scientific language related to material production? (298-301).
- Vygotskian Model of Practical Social Semiosis: only so much of a process can be explained through words, and many social activities are bound unwritten rules that govern interactions (303). This principle influences scientific communication.
    - In Winsor, the oral presentations where some material is verbal, some written, etc.
- Communication is based on shared knowledge, so we must understand who shares in the scientific community and why:
    - **Socialization of the Neophyte**: a negotiation takes place until the neophyte conforms to the social meanings embodied by the accomplished speaker. This allows the neophyte to associate symbols with concrete actions to be taken on concrete things (experiments; explications of material, etc.);
    - Neophytes become acculturated to a social system through what Vygotsky calls the "zone of proximal development"; the neophyte repeats what she is told, incorporates it into written or verbal practice, and eventually the scaffolding is made tacit; that marks the point at which the neophyte is ready to participate independent of scaffolding (307).
    - "The semiotic-cognitive-behavioral system ties language to specific manipulations of materials, and if those ties do not hold, our language use in concrete situations breaks down" (307).
    - **Change, growth, or instability in the systems of understandings already shared by socialized members of the community:** scientific communities must have new information to be legitimate.
    - New findings take time to be incorporated because the act of persuasion is not immediate, but negotiated.
    - Scientists, when presenting findings, may selectively (as a rhetorical move) include only those times when they were able to achieve their desired ends and only what is necessary to achieve those ends. Their conversation is rooted in a "cognitive/symbolic framework that already incorporates the possibility (if not the reality) of the existence of such an object of the precise kind represented" (310). "Their own description may not be useful in helping others (or even themselves at a later time) in reconstituting that object" (310).
        Winsor: "The knowledge of the engine and the knowledge of the documents about the engine were identical" (345-6).
    - Replication in terms of disagreement becomes irrelevant, since the semiotic system shapes understandings of the findings: "Replicators will understand the words differently, do the experiment differently, and see the results differently" (310).

    - Replication can be built into machines, so that every time a machine works as intended, the principles that underlie its use are reaffirmed.
        See Winsor on scientific tools (343)
- Empirical experience is the major foundation for scientific discourse, such that scientific validity is closely linked to the natural world (312).
- Expressions within scientific discourse are not static and eternal: they change frequently over time (315).
- "Regularities occurred because individuals perceive situations as similar and make similar choices. Institutionalization and codification occurred because repeated choices appear to the collective wisdom (or wisdom of a few powerful actors) to be generally and explicitly advisable" (316).
    - In Winsor, the way in which scientific documents are written after the fact becomes standardized, even if counterintuitive to the outsider.
- "in those communal endeavors whose goal is symbolic knowledge, the more we understand the way symbols are used in the activity, the better we can carry out that activity" (317).