

Preface

The purpose of this study is to provide some interpretations of scientific texts in their social context that will help us understand how texts produce scientific knowledge and reproduce the cultural authority of that knowledge. I shall give to drafts and published versions of biologists' writing—grant proposals, articles, and popularizations—the kind of detailed attention usually reserved for literature. But the goal of this effort is not, as it is for many literary studies, to promote an appreciation of the unique qualities of the authors or to argue for a reevaluation of their writing. Instead, the close attention is meant to bring out the social aspects of scientific work, aspects that may be missed in the usual course of reading textbooks, newspaper reports, or journal articles.

For instance, among the texts I will consider are an article in *The Proceedings of the National Academy of Sciences (PNAS)*, " 'Sexual' Behavior in Parthenogenetic Lizards (*Cnemidophorus*)," and an article in *Time* reporting the same study, "Leapin' Lizards: Lesbian Reptiles Act Like Males." One way of looking at these texts would be to evaluate them as carriers of information about a discovery: the *PNAS* article carries the information from the discoverers to the scientific community, and the *Time* article carries it from the scientific community to the larger public. But in this study I shall treat such texts, not as reporting, but as constructing scientific facts. In this view, the *PNAS* article is part of the social processes of getting other researchers to see a phenomenon of animal behavior, making a claim about this phenomenon, negotiating the place and value of this claim in the structure of scientific knowledge, and determining the place of the authors in the scientific community. The *Time* article also constructs a fact (though not, I shall argue, the same fact), places this fact in structures of knowledge ("The Sexes" section of the magazine, between "Sports" and "Cinema"), and places the zoologist in the community, as a white-coated, humorless, keen-eyed discoverer of lizard sex—an expert. It offers us the choice between accepting this new fact as "scientific," above the realm of social processes, and rejecting all such facts as trivial, divorced from common sense and common life. Either way, the *Time* article cuts us off from the social processes behind the *PNAS* article, the processes through which the fact was made.

If texts were just channels for communication of information that already existed independent of them, we could restrict ourselves to the philosophical questions about proper method and the pedagogical questions of how to teach and use the conventional forms more efficiently. But if texts are structures both for thinking and for social interaction, we can ask what they tell us about scientific knowledge. Following some sociologists of scientific knowledge, whom I introduce in the first chapter, I trace the power of this knowledge to social processes. The striking feature of scientific disciplines is the ability of their members to agree, much more than, say, literary critics, discourse analysts, or sociologists of science, on just what constitutes knowledge at any point, and what does not, and to build cumulatively on the accepted knowledge. Scientific discourse creates the consensus of the scientific community; it turns tensions, challenges, and even bitter controversies into sources of strength and continuity. Scientific texts help create the selectivity, communality, and cumulativeness that both scientists and nonscientists attribute to scientific thought.

I shall relate scientific texts to social organization and to the production of scientific knowledge by giving readings of various texts by biologists. In the first chapter I shall relate the literary approach to texts in which I was trained to some of the approaches to scientific texts I have learned from sociologists, and shall position myself in relation to some of the issues raised by these sociologists. The rest of the chapters, though they deal with several different lines of research, follow a movement through a stylized cycle of a research project, from proposals for new research, to articles reporting research to the community of specialist researchers, to controversies in the reception of these articles, to popularizations presenting specialized knowledge to a wider audience, and finally to a scientific controversy in the public forum. Each chapter shows biologists writing for a different audience: the panel of the funding committees, the editors and referees who make decisions at a journal, the members of a core set involved in a controversy, and the general public.

I start with grant proposals, the most obviously rhetorical form of scientific writing, and the genre on which all the other writing depends, because all this research depends on funding of one sort or another. The second chapter describes how two proposals are revised in the course of writing and resubmission. I shall argue that we can see in these processes how research programs that the researchers themselves believed radically challenged established ideas were incorporated into the mainstream of the discipline.

In a parallel study, the third chapter examines the refereeing and

revision of two journal articles (by the same biologists whose proposals we saw in chapter 2) that had unusually bumpy rides to final journal publication. I shall argue that these processes can be seen as the negotiation of the status of the knowledge claim made in the texts.

Then, in the fourth chapter, I shall consider a controversy involving one of these researchers and other specialists in his research area, and show how the texts produced in the course of exchanges that were sometimes heated are related, as narratives that are interpreted and reinterpreted by various participants.

In the fifth chapter I consider the narratives of three popular science articles in *Scientific American* and *New Scientist*, comparing them to the authors' articles for specialized professional audiences, and looking at the sorts of changes made by the journal editors to bring the scientists' manuscripts into line with the conventions of their journal.

Finally, in the sixth chapter, I look at the construction of scientific expertise in a larger context, in the debate over the uses of scientific knowledge in society. I reconsider the debates over E. O. Wilson's book *Sociobiology* in terms of Wilson's construction of a narrative and his critics' ironic interpretation and retelling of that narrative. Where the arguments described in the fourth chapter took place at research seminars and in a few specialized journals, the sociobiology controversy takes place in the public forum, in popular magazines and newspapers, and it involves participants outside any one research group.

Like all research in the growing and rather vaguely defined academic area of science studies, this book falls between several disciplines. When I give account in the first chapter of my position between sociology and discourse analysis, I use what Nigel Gilbert and Michael Mulkay have called the "empiricist repertoire," showing how the research in scientific texts seems to lead unavoidably to just the synthesis of approaches I have presented. I could also give an account in the "contingent repertoire," of how I moved from a position as a graduate student of Victorian literature, to a job teaching scientific writing, to a job teaching literature, to a job teaching linguistics and translation, and how I moved from New York to Texas to England, and how this study developed from a simple request for abstracts to use as teaching materials for a writing course, through my own rewritten abstracts of conference papers, rejected proposals for funding, and carefully worded job application letters. All these changes in the course of writing the book leave me with the practical problem of defining (or finding) whom I'm talking to, and leave librarians with the practical problem of figuring out where this book goes in their cataloguing system.

I make an attempt to locate my approach in my subtitle, which is full of coded references to positions taken and assumptions taken for granted, aimed at potential readers in each of the disciplines to which I am appealing. *Texts* is a code word for a kind of literary study that looks beyond works of literature, for linguistic study that looks beyond the sentence, and for sociological study that sees discourse as the basis for social analysis. *Social construction* allies the book with those sociologists who see science as the product of social processes (note, for instance, Latour and Woolgar's subtitle to *Laboratory Life: The Social Construction of a Scientific Fact*, and see also their Postscript to the second edition, explaining why they changed this subtitle). Even the apparently innocent pair of words, *scientific knowledge*, signals that I will not restrict my analysis to the institutions and roles of the scientific community, as some sociologists have done, but will consider the content of science as well.

Although the jargon of my subtitle might scare some readers off, the main title is intended, not only to give some key words for the guidance of librarians, but also to suggest two broad groups of readers I hope to reach: those interested in *writing* and those interested in *biology*. I began this study when I was working as a teacher of writing and, with colleagues, was developing a writing course for natural scientists that would teach critical reading, rather than just teaching the formats and style of technical documents as given. I have tried to make it a contribution to the lively discussions about the teaching of writing, particularly of academic and professional writing, that have developed in composition programs and rhetorical studies in the United States. But I hope it retains some interest for a broader audience of those trained as scholars of literature who have applied the methods of literary criticism to nonliterary texts, and for those researchers in text linguistics, in language teaching, and in translation who have begun to look at the linguistic feature of genres.

By including the word *biology* in the title, I hope to get this book placed on the rapidly lengthening shelf of studies of science, and particularly with studies that do not necessarily take physics as the typical science. I hope it will become clear, after the first chapter, that the title is not *Writing ABOUT Biology* because that would imply that biology is there before the writing and that the writing merely dresses it up. I argue instead that writing *produces* biology. The title intentionally echoes a number of similar present-participle-plus-object constructions in titles of contemporary literary criticism and social science books (*Writing Culture*, *Reading Woman*, *Constructing Quarks*). I do not mind a cliché, and I see these titles as reflecting a focus on processes rather than on a subject.

I also hope that the title will attract biologists, though I must be cautious about what it has to offer them. It is not a how-to book, and in fact the studies in it suggest that it is very hard to give simple and unequivocal tips to those who want a book on how to write their next article. But I believe it can be useful to biologists and other scientists by pointing out which features of their texts might have rhetorical significance. As I say in the introduction, it is an important methodological question whether such a study can tell biologists anything they do not already know. I hoped at the outset that it would, that it would reveal the real science below the apparent science, like many studies of ideology in other cultural realms. But I have found that the biologists who read my chapters (all chapters were read by the writers studied and by other scientists as well) were not surprised by what I had to say, and were only surprised by the lengths to which I went to say it. Other researchers in the sociology of scientific knowledge have encountered strong resistance to their emphasis on texts from the writers they studied. But none of the scientists whose writings I examined denied that social processes were going on, and that these processes involved texts. So now I see myself, not as revealing what is hidden under biology, but as making explicit what its practitioners know, and perhaps take for granted. This is a more humble project, but one that can be useful to biologists trying to see why an article or proposal is causing them unusual difficulty, as well as to nonbiologists trying to trace the production of a scientific fact when they see only the last, public stage. That is, the project can be useful to biologists trying to get out of their assumptions, and to nonbiologists trying to get into them.

David Crews, one of the biologists whose writing I analyze, once noted, in the margin of a version of one of these chapters, "You're an ethologist." Writing researchers might take some methodological lessons from him. Like ethologists, we should not only observe and categorize the behavior of individuals, we should also consider the evolution of this behavior in its ecological context, and compare it to behavior of other species in other environments. And I agree with Dr. Crews that atypical subjects may provide the best means of reexamining received ideas about behavior. But I do not think we are ready yet for a "Natural History of Biologists' Writing." This is not just because scientists are more complicated than lizards or garter snakes, or because they won't stay in glass cages until we can perform an assay, but because our language, institutions, and authority as experts are intertwined with theirs. When Dr. Crews saw how I interpreted my data he decided I was more of a "seat of the pants ethologist." That, I think, is all one can be in the study of scientific writing today.