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Style and Electronic Communication: The Accommodation of Scientific Risks in the Sierra Magazine

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STYLE AND ELECTRONIC COMMUNICATION:
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ABSTRACT

This thesis focuses on how style accommodates scientific risks for public audiences in *Sierra* Magazine articles. Language has previously been unexplored in risk communication; in accommodation research, style has not been investigated. Responding to these gaps in research, this study combines two unexplored dimensions—risk communication and accommodation—to show how syntax, diction, and metaphor resituate technical language and ideas in scientific risk studies for *Sierra* readers. First, interviews with *Sierra* editors and writers will provide a rich understanding of how their editing and composition practices influence accommodation processes. From there, an electronic communication analysis will illustrate how this medium can accommodate beyond text to give *Sierra* readers active roles and responsibilities to learn about and engage with scientific risks. Finally, Gibson's Style Machine will determine the style *Sierra* writers and editors use to address their implied readers, while diction and metaphor analyses will demonstrate how style shapes technical knowledge around these readers' values, needs, and interests.

DEDICATION

This thesis is dedicated the family and friends in my life, who helped me to reach this point in my academic endeavors, encouraged me to believe in myself, and reminded me to take time for the sunshine. To my dad, who taught me to always try my best, constantly reminded me to eat my fruits and vegetables, and unwaveringly encouraged me to embrace the richness of learning. To my mother, whose unconditional patience and support helped me to stay motivated, and whose care packages and coloring books reminded me always of her support. To my two sisters, whose exemplary examples have demonstrated what dedication and persistence can accomplish; your shining examples have been an inspiration for my own accomplishments. To Aunt Elizabeth, whose emails and postcards reminding me to appreciate the beautiful things in life allowed me to maintain a balanced perspective. And finally, I would like to thank the Brookwood Drive constituents; for all the life coaching at Super Taco, and for helping me discover comedy in the unlikeliest of places.

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Chapter One

INTRODUCTION

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Communication plays an integral social role in establishing and developing

research, which allows scientists to build ideas within their scholarship and enables the

sharing of these discoveries with public audiences. A social network between experts

and public audiences helps not only cultivate interdisciplinary approaches to risks studied

in closed scientific disciplines, but also helps public audiences learn of risk implications

that directly affect them. Because researchers possessing knowledge of risks threatening

to human health and well-being have an ethical obligation to inform public audiences of

their findings (Penrose and Katz 2009), scientific accommodation for appropriate

audiences is crucial. Communication exchanges between scientists and public audiences

must therefore be open.

As mediators of technical knowledge, scientific communicators shape and control

information by constructing a select reality of a risk for public audiences. In this process,

scientific information becomes transformed as it is adapted to the level of knowledge an

audience has on the subject. As the technical information disseminates to public

audiences through accommodation, several textual and medium changes take place.

To reach a larger range of audiences, technical communicators accommodate

scientific facts by changing not only syntax, but also the style of text (Katz, "Language

and Persuasion in Biotechnology"); on a larger scale, scientific accommodation has

begun to broadcast risks using electronic media to increase the speed with which findings

are communicated and to expand the audiences that can be reached. This approach also

allows more focused accommodation by allowing technical communicators to "include links for more detailed or secondary background information to avoid slowing readers not interested in that level of information" (Oliu, Brusaw, Alred 563). Penrose and Katz identify two major benefits the electronic communication medium contributes to scientific accommodation. It increases public accessibility to technical risks by (1) providing links to interactive resources—such a blogs and journal articles—connecting them and scientists to the risks. By providing these valuable resources, it also makes the public more accountable for these risks by (2) providing them with opportunities to directly engage with the risk.

1.1 Present Research

This thesis aims to examine the role of the technical communicator in communicating risks for public audiences, and how based on interactive communication models, style, is used in the accommodation of science to the public, and informs the creation of the implied reader. This suggests something about the discussion concerning communication models (static vs. interactive), by which my argument delineates itself from traditional or general notions of risk communication, and upon which my argument concerning the importance of style rests. Previous research discussions concerning style in scientific accommodation have examined other dimensions of rhetorical accommodation briefly reviewed above. Responding to Fahnestock's address of rhetorical fact changes and Boyd's discussion of "accommodation of language" (1: 364), my research will closely examine how diction and metaphor transform both style and

content of accommodated risks—and how metaphors that change modality are themselves forms of accommodation that cross different stases, providing a bridge between scientists and the public, with one leg of the metaphor in each (Penrose and Katz). Also essential to the process of accommodation is the use of syntax to create the target audience; for this I will use Gibson's style analysis of grammar to examine how syntax creates the readers of the *Sierra* Magazine articles. Finally, my thesis will examine the role that the Internet may play not only in promulgating content, but also in enhancing the influential effects of rhetorical style used in the articles.

The analyses in this thesis will focus on articles from the web-based *Sierra* Magazine. This bimonthly publication, which reaches "more than a million people across North America" and is linked to the "country's oldest, largest, and most influential grassroots environmental group," features "tightly focused, provocative, well-researched investigation" articles concentrating on "environmental issues of national or international concern" (*Sierra* website). This thesis will explore how, as an accommodation resource of environmental science, technical communicators of this publication bring expert conversations among researchers to readers who "have some interest in environmental issues, [and are] into traveling and outdoors activities" (Scott). The stylistic constructions of text in these articles will prove extremely helpful in discerning the audience for whom technical communicators adapt technical information, as well as how they do it by creating that audience. Interviews conducted with writers and editors of this magazine may inform my analysis by revealing their intentions as they communicate to me their interpretations of what they have done in the construction of accommodated

knowledge and of audiences in their text. This thesis also will explore how the electronic

dimension of online technology sets up an interaction between experts and public

audiences and allows public audiences not only learn about, but also use, the knowledge

accommodated for them.

Chapter Two

LITERATURE REVIEW

This literature review discusses how models of communication shape writing style accommodating scientific risks for public audiences. These models reveal two important things: (1) the framework used to disseminate complex research findings from specialized scientific communities to more open public audience communities comprised of non-experts, and (2) the communication flexibility governing the relationship between these groups. In effect, writing style reveals these communication models through textual clues.

The following discussion will be broken into three sections:

- The first section (2.1) will introduce an evolution of communication models, beginning with the traditional, information model, and working towards several dynamic rhetorical models intended to foster healthy communication between separate spheres[1] of experts and public audiences;
- The second section (2.2) will discuss the important role of technical communicators in shaping scientific risks;
- The third section (2.3) will tie together the first two sections, and touch on how text and style allow technical accommodators reinforce a rhetorical model of communication.

2.1   COMMUNICATION MODELS

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[1] This references Craig Waddell's depiction of experts and public audiences as existing in separate spheres. More detailed description of this separation will be discussed in the next section.

This next section will explore the importance of strong communication models in scientific communication and risk accommodation with discussions of one-way (ahetorical) and two-way (rhetorical) models.

2.1.1   Necessity for Reader Involvement

Scientific risks are complex and evolving social issues that demand a comfortable "rhetorical climate" (Booth; *Modern Dogma*; 99) where experts and public audiences can collaborate. As such, a dynamic communication model that mediates conversation between interest groups shaping solutions to risks is required. Scientists and rhetoricians alike have recognized the need for a rhetorical climate where experts and public audiences can communicate openly and acknowledge "how expert and lay understanding of risk differs" (McComas 81). Without a communication model that allows for a comfortable and open communication flow to bridge the gap between experts and public audiences, passage between these separated groups is nearly impossible.

Katherine McComas' historical exploration of risk communication suggests that many unsuccessful expert attempts to communicate with public audiences have been foiled for two reasons: disregard to "social contexts that surround public responses to risk communication" (75), and a "pervasive lack of trust in many risk management institutions" (76). For much of the last decade, communication of scientific risks between experts and public audiences has operated on a one-way, information model (McComas 2006; Leiss 1996, Fischoff 1995; Plough and Krimsky 1987). In the field of risk communication, traditional, scientific models of communication have focused on risk

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factors and physical processes, which increase public audience knowledge but do not influence their affective responses to risks (Cvetovich and Lofstedt 1999; McComas 2006). Some studies have identified public audience behavior as an important "variable" for calculating and managing risk, but have shown through demonstrated examples how this important consideration is often left out of the communication model (Slovic 2000; Lipkus et al. 2003; Burger and Gochfeld 2006). From the rhetorical point of view of style, traditional models of risk communication may be seen as being based on a "transmission view" of knowledge, in which scientific factors and processes are reported to public audiences who are seen as passive listeners and readers (Katz and Miller 1996; Grabill and Simmons 1998; Waddell 1998; Katz 2001; Katz 2008).

The next section will discuss in more detail the components, and downfalls, of the one-way communication model. An active communication network that accommodates discussion and collaboration between experts and public audiences requires a communication model that supports the flexibility of these interactions.

2.1.2 Defects of One-Way (Arhetorical) Communication Models

Steven Katz and Carolyn Miller depict risk communication as operating "between parties who have different (usually much different) knowledge about the risk and different degrees of access to powers; the parties are often characterized as 'experts' on the one hand and citizens, "laypeople,[2]" or the general public on the other" (Katz and

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[2] This term communicates a hierarchy between communication groups, which could reinforce the information model of communication. For the purpose of this thesis, we will use "non-expert audiences" in the place of "laypeople" throughout to maintain consistency with the favored rhetorical

Miller 116). Craig Waddell figures these parties within two separated spheres, where experts "have reached or will reach consensus" and "no appropriate role is defined for public participation" (141). Discussions between experts and public audiences, as observed by Waddell (142), result in a one-way transfer of information—or "technocractic" model—where expert assessments of risks are based on "facts, knowledge, probabilities, and calculations," and public perceptions of risks are generally "subjective, mistaken, emotional and even irrational" (Katz and Miller 116). Public voices in this restricted communication model represent a "force to be neutralized, not incorporated into the decision-making process" (Killingsworth and Palmer, *Ecospeak* 165-66; see also Grabill and Simmons; Katz and Miller).

Recent attention to "social contexts that surround public responses to risk information" (McComas 75) have begun to shape scientific risks for public audiences—yet this accommodation has not historically been practiced in risk communication operating on the one-way model. In their discussion of the Shannon[3] and Weaver communication model, Gunther Kress and Theo van Leeuwen explain the parts of this mechanical process.

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model of communication—which will be discussed in more detail within this chapter. Although this also creates a hierarchy between "experts" and "non-experts," the preference of two these terms demonstrates the relationship scientists and public audiences have with expert knowledge.

[3] In her discussion on the information model, N. Katherine Hayles points to Claude Elwood Shannon's stipulation that it only be applied to the "efficient transmission of messages through communication channels" rather than "what those messages mean." Although other researchers were "quick to impute larger linguistic and social implications to the theory, [Shannon] resisted these attempts" (54).
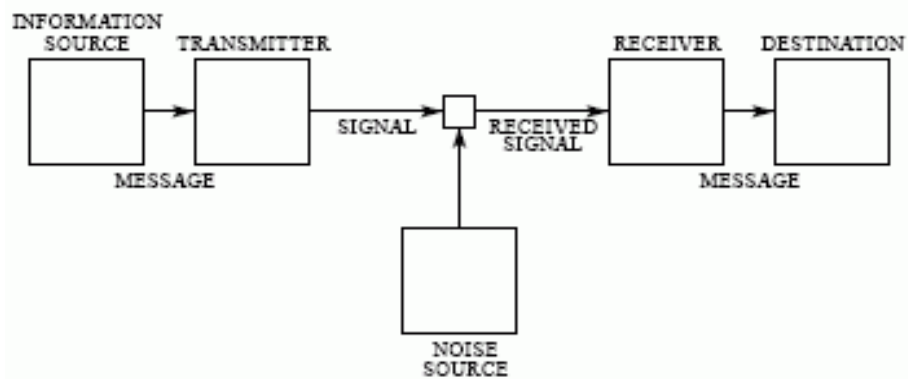
**Figure 2.1: Shannon and Weaver's Communication Model
[adapted by Kress & van Leeuwen (46)].**

Developed at Bell Labs in 1948, this model of information transfer shows the parts of the

communication situation and establishes definitive roles for participating groups. After

its success in mass communication, it was applied to many risk communication ventures

with experts as creators of the "message" (Katz and Miller; Conn and Fiemer; Covello et

al.; Keeney and von Winterfeldt; Renn).

In this model, the "information source" is the scientific fields from which research

originates; the technical experts communicating the "message" are scientists; the

"receivers" are public audiences not acquainted with specialized knowledge of the

scientific risk (Kress and van Leeuwen 46). Any subsequent response from the

"receiver" after the message has been shaped and sent by the "transmitter" is considered

"noise" (Kress and van Leeuwen; Penrose and Katz) because it distracts from the

information flow. In many cases, when public audiences inevitably experience difficulty

deciphering the complexity of scientific risks—either because of the technical complexity

of the information or inapplicability of the science to their lives—their responses are

viewed as negative. They are essentially defying the structure of the communication

situation and rebelling against their assigned responsibility. According to the flow of the

model, public audiences are not fulfilling their designated role as "receiver" of

information if they respond to the experts. In essence, these responses are contributing to

the knowledge, which is what experts are expected to control. When public audiences

attempt to gain some of this power, it is seen as threatening to the experts, who are seen

as having full control of the knowledge. Killingsworth equates knowledge with power in

these exchanges when he writes, "Every technical document involves an exchange of

knowledge and/or power between an author and an audience" (84). In an effort to

respond, public audiences also attempt to take some of the power from the experts on the

subject.

        As Katz and Miller observe, this restricted communication model fails to explain

how different versions of apparently identical information have different effects on

audience (129). McComas' research attributes this oversight to disregard to the social

configuration of risks. When conceiving public audiences' roles as "receivers," it fails to

explain effects on attitudes, emotions, and values. All of these are ultimately seen as

"noise" in the system, which distracts from the main message "transmitted" from experts

to public audiences along a one-way channel (Kress and van Leeuwen 46). As experts

control knowledge, public audiences become estranged from the "information source"

experts who are unable to shape how they conceptualize or access scientific risks.

        In his article, "The Roles of Rhetoric in the Public Understanding of Science,"

Alan Gross depicts how this transmission-oriented process—which he calls the deficit

model—restricts the natural flow of communication. Reinforcing Waddell's separation of expert and public audience spheres, this model omits the importance of the relationship between expert and audience and places a strain on communication flexibility. Gross' deficit model critique demonstrates how transfers of "relevant knowledge in situations where public health and safety are clearly at stake" result in isolation of science from "contexts that give it public significance" (Gross 7, 9). This arhetorical communication structure, which "decontextualiz[es] risks and fail[s] to consider social factors that influence public perception of risk" (Grabill and Simmons 416), reinforces—what Stephen Pepper coins as—scientific sufficiency and public deficiency (Pepper; World Hypotheses: A Study in Evidence; quoted in Gross). It essentially widens the gap between scientists and public audiences that "rhetoric of accommodation works strenuously to mask" (Gross 16).

The next section will outline several communication models aimed at fostering healthy rhetorical environments in which experts and public audiences benefit from collaborating on risk solutions.

2.1.3 Two-Way (Rhetorical) Communication in Scientific Accommodation

Necessary for successful risk communication is a model that recognizes public audience feedback in the communication of scientific information. Rhetorical models of communication reify the idea of construction—rather than transmission—of knowledge between the expert and public audience spheres. In his continuing discussion of dominant communication models, Gross refers to the integration of rhetoric into the

linear communication model as the "contextual model." Unlike the information transfer

model, this recognizes the relationship between expert and public audiences as necessary

for healthy communication. The contextual model serves a much more rhetorical

purpose in its quest to unify scientific and local (public) interests. What results from

scientific accommodation using the contextual model is the creation of public

understanding as a "joint product of the scientific and local knowledge" (Gross 11).

   To illustrate the opposite construction of the linear communication model, Kress

and van Leeuwen adopt and dissect the communication model originated by Watson and

Hill.
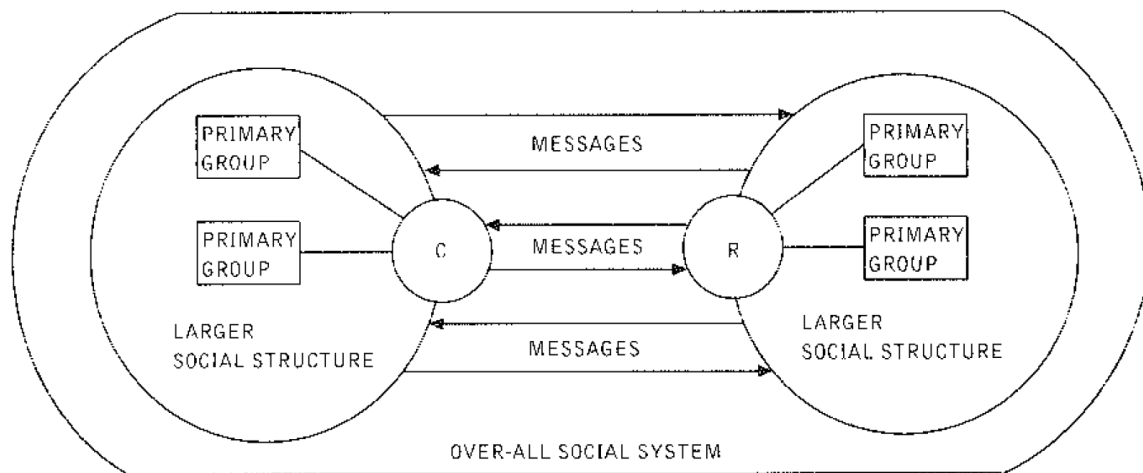
Figure 2.2: Watson and Hill Communication Model.

   Embracing more natural communication practices, this model moves away from

the mechanical rigidity of defined roles assigned within the transmission model (49).

This two-way model focuses on the social relationships between primary groups. Rather

than splitting expert and public audience groups apart, this model looks to common goals

between groups. This encourages separate spheres to work together to contribute to risk

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solutions rather than creating fissures based on expert and public audience differences. Even though the separation between C for "Communicator" and R for "Recipient" emphasizes the distance between the two groups, this model works to find connections between "larger social structures" (49).To avoid power structures, this analytical approach embraces communication between, rather than across, groups. While the rhetorical model of communication developed by Watson and Hill, and analyzed by Kress and van Leeuwen, inches closer to fostering a comfortable communication network between experts and public audiences, it neglects a major element: the eclectic and diverse interpretations of audience members interpreting scientific information.

In his discussion of applied communication models in biotechnology, Katz takes the rhetorical model a step further to incorporate multiple audience interpretations.
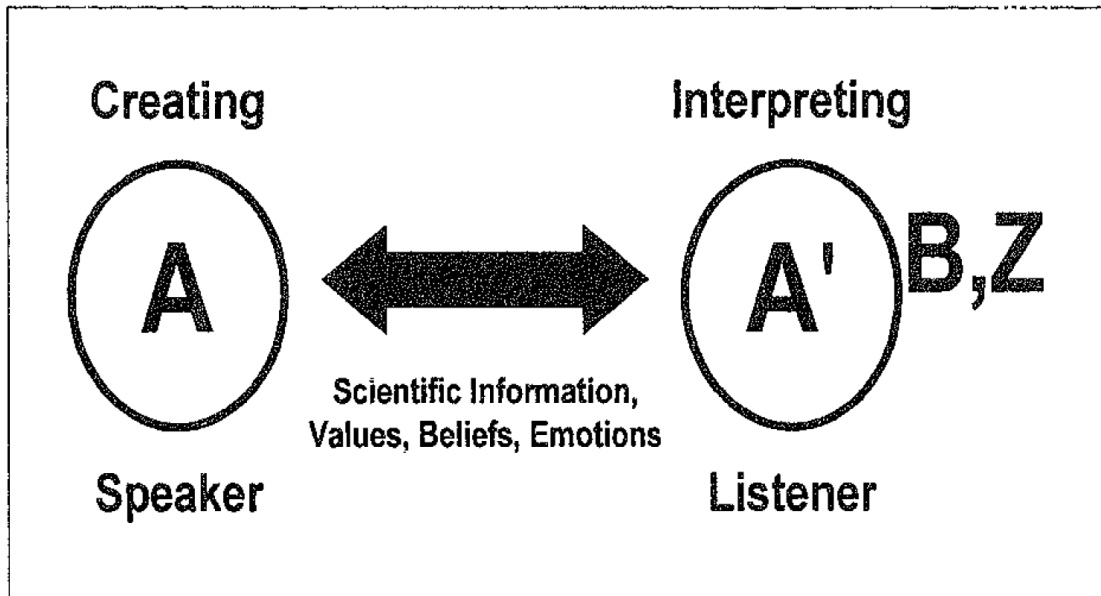
Figure 2.3: Rhetorical model of communication (adapted from Katz "Biotechnology").

He points out that "results of not acknowledging or taking the role of creativity and interpretation in human communication into account are perhaps most evident in the history of failed attempts to communicate with the public" about risks (169). While the information model of communication considers these distractions "noise," the rhetorical model of communication sees these "uncontrolled variables" as significant factors that describe the way "values, goals, concerns, and emotions of audiences may affect what is regarded as the creation and interpretation of communication" (Katz, 2008, 168). This customized model focuses on the value of public audience responses in relation to the entire idea being communicated. When scientific risks studied by experts are shared with public audiences, it is not sufficient to categorize "experts" and "public audiences" into groups. Just as not all "scientists" see the same solution to a problem in their research, not all "public audiences" understand technical research the same way.

Borrowing Paul Stern and Harvey Fineberg's definition of "risk" as "things, forces or circumstances that pose danger to people or to what they value" (215), McComas suggests shaping risks to public audiences' social contexts. When situating risks in relation to their "social, cultural, and psychological influences" (Slovic 1999), it allows audiences to understand technical research in a way they can identify and understand. Lawrence Prelli reinforces this idea when he explains: "Audiences of scientists' judge scientific claims, not with reference to the canons of formal logic, but against received community problems, values, expectations, and interests. The judgmental standards are located within situated audiences' frames of reference, not in logical rules that transcend specific situations for scientific claiming" (Prelli 7).

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Successful accommodation of scientific risks largely depends upon how technical

knowledge is situated in relation to public audiences' needs, attitudes, and knowledge.

2.2   THE ROLE OF ACCOMODATORS

This section will discuss how technical communicators are afforded with both a

balanced view and reading and writing skills to communicate complex risks.

2.2.1   Bridging the Gap

Jeffrey Grabill and W. Michele Simmons find that when the fissure between

scientists and public audiences occurs, "epistemology linked to science" gets placed in

the technical sphere, while the "rhetoric of 'arrangement' and 'style'" get placed within

the public audience sphere. When risk communicators attempt to "disseminate

information" to various public audiences, the "resulting rhetoric...is stripped of its

epistemological possibilities." These public audiences, who lack the sophisticated expert

knowledge necessary to understand technical risks, cannot understand the language

within the expert sphere. Technical communicators can linguistically reformulate

scientific risks for public audiences through appropriate description and metaphors, but

these audiences are unable to develop or contribute to the technical theory.

In attempts to accommodate technical scientific research for eclectic ranges of

public audiences, processes and findings from scientific research tend to be

oversimplified in order to appeal to general public audiences. When this happens, these

audiences naturally resist "their separation from the processes of risk" as they step into a

passive role in these processes (Grabill and Simmons 426). For this reason, scientific

accommodation requires a communicator who might need to adjust knowledge for

"listeners or readers [who] possess varying types and degrees of scientific knowledge"

(Penrose and Katz 203).

Despite communication breakdowns due to insufficient models, scientists have,

can, and should continue to communicate directly with the public. Unfortunately, in the

past the high priority risk usually results in the greatest conflict (Renn 1992; Katz and

Miller 1996; Slovic 1999; Katz 2000; Mebust and Katz 2008; McComas 2006; Katz

2008). Successful accommodation of these high priority risks requires a communicator

afforded with both expert and public audience perspectives to ensure that scientific

findings are objectively adapted to their audiences' needs and priorities.

Grabill and Simmons' depiction of risks as socially constructed assign

responsibility of scientific accommodation to technical communicators, who possess the

"research and writing skills necessary for the complex processes of constructing and

communicating risk" (Grabill and Simmons 1998). To borrow Stephen Doheny-Farina's

terms (1992), scientific accommodation requires technical communicators to become

"scout writers" and "field anthropologists" [4] as they venture into "unknown technical

territory" to allow public audiences not only to "tap into" the technical knowledge, but

also shape it through electronic communication mediums (Doheny-Farina 184). In such

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[4] These roles of technical communicators were originally applied to usability design teams in Doheny-Farina's research, but work well in describing the responsibilities of scientific accommodators as they mediate the divide between technical details concerning a risk and public interests in health and well-being.

roles, technical communicators forge the gap between epistemology linked to science produced by "tribes of scientists" (Latour and Woolgar 1986) and public audiences. Technical communicators must initially understand the different "interests, values, emotions, and rationalities" of their audiences before shaping the scientific knowledge of risks to fit those social factors (Grabill and Simmons 1998). With their training and perspective, technical communicators can mediate between expert and general public priorities and concerns. By understanding the technical research and audience needs, attitudes, and concerns, a technical communicator can skillfully disambiguate complex scientific knowledge for readers. Their ability to understand complicated, scientific processes and explain them in a way that public audiences can understand helps establish their credibility—and by extension, the credibility of their organization. When readers' can understand and respond to scientific risks placed within their context of understanding, technical communicators penetrate the barrier dividing expert and public audience spheres. This helps facilitate communication of complex issues between both groups.

2.2.2   Establishing a Safe Rhetorical Climate

In some of the earliest audience accommodation literature, Aristotle highlights the importance of ethos, stating, "Because the public must trust those who are trying to persuade them, central to all situated utterances is a speaker who evokes appropriate emotions and endorses appropriate values, a speaker in whose virtue, good will, and good sense the public has confidence" (Aristotle, *On Rhetoric*; cited in Gross). When

accommodating scientific knowledge for nonexperts, technical communicators are essentially inviting their audiences to accept the arguments they present. Their success depends on how well they "convince their audience of their own competence to evaluate within the context of shared values" (Killingsworth; Signs & Genres; 98). Gross discusses the cultivation of trust as a distinguishing factor in rhetorical models of communication—which he calls "contextual" models for their recognition of audience context. Rather than assuming that the public is already persuaded by the value of science—as is indicative of the deficit (one-way) model—the contextual model works to establish a relationship between accommodator and audience by grounding knowledge within local concerns. When readers think an organization respects—and maybe even shares—their priorities and interests, the level of value and trust in the source increases.

This crucial dimension of trust in communication of scientific risks is especially significant due to the dynamic nature of this research. Whether it is the latest health recall or research update from scientific labs, the public needs a reliable technical communicator they can trust who can give them the most comprehensible and informed updates.

Writing style is an important tool affording technical communicators the ability to gain readers' trust. The next section will discuss how style of text operating under rhetorical models of communication may accommodate public audiences' needs, values, and priorities to scientific risks. The previously discussed rhetorical models recognize the dynamic relationship between experts and public audiences. Style that communicates these rhetorical values prompts opportunities for these interest groups to collaborate.

2.3   LANGUAGE AS ACCOMODATION

Tying together the first two sections, this third section will discuss how text and style allow technical accommodators to reinforce a rhetorical model of communication. Building from previous research, this discussion will also touch on the significance of communication models in modifying knowledge claims from scientific disciplines to public audiences.

2.3.1   Accommodation of Scientific Facts: Changes across Contexts

To understand how technical risks become accommodated across rhetorical situations, the more general discussion concerning communication in science requires preliminary attention. Bruno Latour's research showing how knowledge is unpacked through scientific accommodation processes offers a helpful departure point. His findings assert that the degree of certainty—or modality—of scientific facts fluctuate based on their context.[5] With the development of a scale containing five statement types to measure changes in facts across disciplines, Latour points to an important negotiation

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[5] Fahnestock applies this notion of certainty to accommodation, stressing that the "degree of certainty conveyed by a statement may depend more on context as it does on wording" (290). In relation to the accommodation of scientific knowledge, specifically, she contends that as a scientific observation changes in certainty, it is an "inevitable consequence of changing the audience for a piece of information and thus the purpose of relating it and thus the genre of discourse that conveys it" ("Accommodating Science" 291).

process of scientific knowledge from technical to public fields (1987), as well as within science itself. Because these adjustments depend critically on the "knowledge of the context in each particular case" (Latour and Woolgar 80), the social milieu of audience priorities and interests in each context also has a powerful influence on fact changes. In scientific accommodation, technical facts change contextually based on the perspectives and societal values of the targeted audience; concurrently, the knowledge tailored for public audiences is built through a network of words and phrases—or linguistic references—familiar to the readers. This permits the understanding of unfamiliar content.

2.3.2   Appealing to Public Audiences through Style

In her seminal research, Jeanne Fahnestock examines three facets of how science is accommodated to public audiences (1986). First, her analyses concerning stasis change shows how four questions of purpose shape scientific claims. As claims from technical disciplines become adjusted to a public audience's already held beliefs and assumptions, they move along an ordered stasis system. This system accounts for changes in purpose and content of scientific information between professional and public disciplines as claims move from fact and cause to value and action (291). Second, her analyses of appeals highlight two persuasive tactics used to situate scientific claims for public audiences. The "wonder appeal" emphasizes the uniqueness of a subject, while the "application appeal" focuses on effects and results of scientific findings to confer greater certainty (275). This analysis reveals the control appeals have in shaping a readers' constructed reality of scientific information selected by the scientific

accommodator. Finally, her analysis of "statement types," prompted by Latour and Woolgar's delineation of them, analyzes the level of modality, or certainty, created by such logical and stylistic elements as citations and qualifiers to show what happens to information as it shifts from limited to larger audiences (290), depending on the level of concrete evidence the audience needs in order to respond appropriately to the risk. Using the concept "rhetorical life" to reference the journey facts travel when changing certainty level from technical to public audiences, she demonstrates how stases, appeal and modality adjust scientific facts when they move across rhetorical contexts. Each of these tactics allows the focal point of scientific information to reflect the priorities and interests of the audience being addressed, which in turn influences the action taken in response to the information.

In addition to the logic of arguments and levels of certainty, style plays a crucial role in the construction of persuasion. Fahnestock offers valuable insight on how argumentative structure and arrangement influences—and even creates—the readers' opinion (286). However, scientific accommodation depends as much on syntax as it does on the arrangement of scientific observations. The central role that style plays in accommodating science for the public cannot be overlooked, and in fact requires further investigation.

While accommodated style of technical information allows accommodators to write about risks in language comfortable to their audience, attention to the content is certainly integral to accommodating risks, as it provides the basis for which words and ideas the writer chooses to emphasize. After all, a driving force behind the necessity for

scientific accommodation is attributed to lack of comprehension between scientists and public audiences. Penrose and Katz explain it well when they state: "While experts are interested in theory and technical details, in methods and results, public audiences are generally interested in what things 'do' and their effect on public safety, health and welfare" (205). Because public audiences understand scientific risks more often by their concrete implications and effects rather than their the theory and methods of studying them—which hazards ambiguity—scientific accommodation is essential for framing the risk appropriately for the audience. Theories and scientific details may be of interest to public audiences who do not have full access to this technical information. The question of " access" is not only linked to the fact that scientific details are not published in places or in a style the general public is likely to read or comprehend. If that were the case, technical communicators could easily "bridge the gap." However, the lack of access is more fundamental, as I suspect Boyd's notion of "epistemic access[6]" suggests. No linguistic reformulation can adequately convey the scientific details of risk, although: 1) this is not necessary, since the public audience is not interested in doing the science, but rather in other concerns, such as health and safety; 2) in this regard, it should be possible to hint at the gist of the scientific details, appropriate for that audience and relevant to their needs, through grammar, diction, and metaphor.

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[6] In the first edition of his essay, Boyd classifies "epistemic access" in two ways: "passive" is where public audiences may be able to understand technical knowledge, but are unable create or construct it; "active" epistemic access is where experts can understand and construct technical knowledge. These concepts will be further discussed in Chapter Three.

Technical communicators use style to shape scientific details for public audiences, but because the audiences are not experts, they will not fully understand the complexity of how a risk operates in its original scientific context. Consequently, this inaccessibility makes them unable to entirely understand the scientific knowledge concerning the risk. To understand how style shapes scientific accommodation, this thesis will investigate the role "language plays in the perception, reception, and understanding of science and risk assessment" (Katz, 2001, 93) through *Sierra* Magazine articles.

Chapter Three

METHODS

3.1   UNEXPLORED TERRITORY IN RISK COMMUNICATION

While communication models and the mission of technical communicators both influence how scientific knowledge becomes transformed across disciplines, it could be argued that rhetorical style is central to scientific accommodation. Just as written text depends upon "an analysis of various bits of the whole into discrete symbolic units—words," various bits of technical details that structure a scientific risk also fit within—and are given meaning by—the scientific conversation in which they are situated (Killingsworth and Gilbertson 56). Thus, style and content can be understood to work together to situate scientific knowledge within a linguistic structure familiar to public audiences.

One dimension of style that may be important to examine and that has not been fully explored is the role metaphor plays in scientific accommodation (Leatherdale 1974; Hallyn 2000). This thesis will use Richard Boyd's definition of "epistemic access" to talk about how metaphor accommodates science for public audiences. Metaphors help structure complex knowledge to allow non-experts passive access to scientific risks. Even though public audiences cannot develop or contribute to expert knowledge, metaphors provide experts with a way to communicate about risks with audiences outside their scientific field. Boyd's theory of accommodation can be *applied* to examining the way experts may use "heuristic" metaphors to construct models about a risk for the general public. When technical accommodators successfully create passive epistemic access through metaphor, public audiences are "invited to explore the similarities and analogies between features of [technical knowledge] and [general knowledge] including features not yet discovered, or not yet fully understood." Passive epistemic access through metaphor prompts public audiences to "apply their current [general] understanding" to some of the "associated implications" of the technical knowledge (Boyd, 1: 363; 2: 489). In combination with electronic communication, accommodated understanding of this specialized knowledge allows public audiences to understand risk knowledge.

In Boyd's discussion of metaphor *in science itself*, wherein "theory-constitutive" metaphors in scientific theory provide experts "non-passive epistemic access" to causal structures of physical reality, different metaphors may "accommodate" scientific facts for general audiences with passive epistemic access. Boyd gives more attention to metaphor

in relation to public audiences in the first edition of his essay. In the second edition of his essay, Boyd cuts out the discussion of passive epistemic access, and adds discussion that focuses even more on theory-constitutive metaphors in scientific theories itself; all that is left in the second edition is a reference to "non-passive epistemic access," which focuses on expert to expert communication (c.f. 1979, 1993).

Although epistemic access in scientific accommodation would be what Boyd calls "passive" rather than active insofar as the public themselves could not use the metaphors to build scientific theory and knowledge the way scientists do (Boyd, 1: 388), the gateway provided by metaphor may allow public audiences to begin understanding closed, scientific knowledge. The success of this accommodation will depend upon a technical communicator's grasp of their audiences' needs and interests.

Another important dimension of the rhetoric of style that has not been examined much in scientific accommodation is the role that syntax may play not only in communicating difficult scientific knowledge (Katz 2001, 2008; Penrose and Katz 2009), but actually enabling the creation of an "ideal audience" (Ong 1975) and thus an "implied reader," for whom the technical information is catered (Gibson 1966; Thralls, Blyer and Ewald 1988). In his explanation of how the implied reader is created, Gibson writes: "When a writer selects a style, he chooses certain words and not others, and he prefers certain organizations of words to other possible organizations. Every choice he makes is significant in dramatizing a personality or voice, with a particular center of concern and a particular relation to the person he is addressing "(x). As such, careful attention to the needs and interests of the audience, as well as to the role style plays in creating that

audience, may allow technical communicators to better shape scientific risks to their readers' priorities and values. Style in accommodation creates and makes possible a role for the general public in which readers become more invested in the science, and more knowledgeable about the risk, thus allowing the public to play more active roles as mediators of change.

3.2   A BRIEF DISCUSSION OF METHODS

The analysis of this thesis will consist of five sections, which will structure the body of my thesis.

1. First-hand interviews with writers and editors within the magazine will set up the textual analyses later in the thesis; these interviews will not only reveal the writer/editor's thoughts and intentions as they accommodate science for the readers of the *Sierra* Magazine, but will also demonstrate the effect of the publication's internal editing process on scientific accommodation. Editorial controls will reveal how organizational goals constitute values that facilitate the stylistic choices in the articles.

2. With the goal of expanding the range of readers—and conjunctively, funding—the *Sierra* Magazine uses electronic avenues of communication to foster public audience engagement with risks. Readers are now able to go beyond the text—and even the *Sierra* Magazine itself—by clicking on individual words or phrases within the article, linking them to an entire network of knowledge that allows them to enrich their understanding of the risk. As a source of accommodation, this publication uses electronic communication not only to expand knowledge, but to enrich their readers' understanding by allowing them to step beyond the limitations of the text.

3. Grammatical analyses will explain how the implied reader roles are created by the "Welcome to the Sierra Club" greeting on the website, as well as by overarching editorial regulations and the technical communicators themselves.

4. A diction analysis of the *Sierra* Magazine articles will both uncover emphasized ideas established through repetition and decipher how scientific terms are unpacked within accommodated texts by looking at etymological origins of words, and how they are being used in the context of the accommodation.

5. Finally, metaphor analysis of *Sierra* Magazine articles will be used to discover and explore new stylistic dimensions in accommodating risks in environmental science.

The results from these research approaches will help writers and editors in other organizations, as well as other popular science publications, become more aware of their role as accommodators. It will also make writers, editors and readers more informed— and perhaps more critical—of how style affects the creation and perception of scientific risk.

The variety of style analyses used in this study is especially fitting because they reveal two factors central to accommodation. Grammar analyses show the types of implied readers created through the text, while diction and metaphor analyses demonstrate how words and ideas resituates risks for those readers.

3.3   OPERATIONAL DEFINTIONS

There are several defining terms and ideas relating to accommodation that will govern the analyses in this thesis. To keep track of each, these next sections will serve as a roadmap to explain how these ideas operate. We will first begin by introducing the difference between real and implied readers—two terms used throughout to break down the broader categories of "readers" and "audiences."

3.3.1 Real and Implied Readers

The adjustment of scientific risks for public audiences requires technical accommodators to have a strong sense of their audience. Walker Gibson's differentiation between **real** and **implied readers** is especially useful when considering *Sierra* Magazine audiences. While real readers assume sets of "attitudes and qualities" (265) through *Sierra* language, the implied reader is the role real readers step into "in order to experience the language" ("Authors, Speakers, Readers" 266). *Sierra* Magazine writers and editors must consider both audience roles when designing articles because the invention of implied readers is inextricably linked with appeal to real readers. While the articles are written for an implied audience, who "care about our parks, a safe and healthy community in which to live, smart energy solutions to combat global warming, and an enduring legacy for America's wild places" (*Sierra* website), the real readers are responsible for financially supporting the publication.

Since subscribed readership to the publication is tied closely with the financial development of the magazine, *Sierra* Magazine writers and editors face a unique challenge when accommodating scientific risks articles for their readers. A main purpose of accommodation is to alert public audiences of risks affecting them so they can appropriately respond. The design of accommodated information in this publication demonstrates a prime example of a public audiences' direct response to scientific risks. Not only can they react to risks communicated to them; they also control the future existence of the organization that accommodates their understanding of risks.

With the advent of popular science publications—such as the *Sierra* Magazine—and technical communicators, rhetorical mediation of technical risks has reached a whole new dimension. Through editorial and textual controls, an electronic medium and writing style—all of which will be discussed in detail below—the *Sierra* Magazine is able to craft articles that unite rhetorical and epistemological possibilities. The model below (Figure 3.1) shows how expanded author and reader roles within text allow a relationship to develop between expert and public audience spheres.
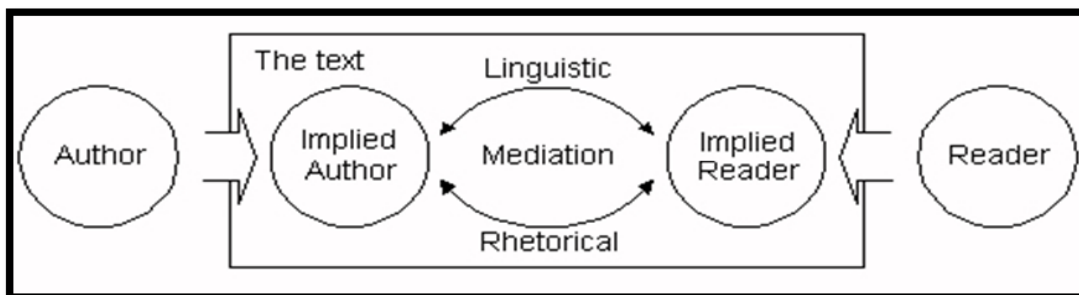
**Figure 3.1: Model of Textual Mediation Based on
Rhetorical Model of Communication.**

As the above figure suggests, rhetorical text reinforces the author role as creator and the reader role as interpreter. These roles are often more specific within a text, where authors figure themselves within a particular role in order to appeal to a particular type of audience. This is central to persuasion, where ultimately, the author is using rhetorical mediation to either persuade his or her audience to accept an idea they are putting force or foster trust as a technique to build their ethos. In scientific accommodation, linguistic mediation between author and reader is a complex issue that can be analyzed using a variety of approaches. This thesis will use style, a dimension unexplored in accommodation literature, to evaluate the relationship between author and reader.

3.3.2   Measuring Diction and Metaphor Style

Diction and metaphor are two stylistic techniques technical communicators use to accommodate scientific risks for public audiences. Both approaches allow writers to restructure technical words and ideas experts use to explain scientific risks into language accessible for public audiences.

When writers accommodate technical knowledge for readers, they are "perfectly conscious of the act of writing, conscious of selecting a certain kind of imagery to reinforce a certain kind of mood, etc., [but they] cannot possibly be conscious of the interrelationships among all these equations" (Burke 20). The purpose of metaphor and diction style analyses is to see the "significance and/or implicit meaning in a text" to see how it corresponds to the content, or "explicit meaning" of a text (Beardsley 5). By foregrounding style, the analyses in this study will make language "opaque" (as opposed

to "transparent" language that we have seen in the communication models discussed in Chapter Two) by revealing interrelationships between words and ideas.

Metaphor analyses will be used to decipher the ways in which this publication assigns values to particular ideas, and to explore how technical ideas are reconstructed within a new discourse when divorced from both their terminology ("proper names") and definite descriptions. Metaphors serve as a powerful tool for audience adaptation—as well as audience influence—not only because they link certain identifications to the thing being compared, but also structures the way we think about the thing being compared. Perhaps a reader has seen the accommodated term "mad cow disease" or recognizes the term, "climate change," a term used also used by scientists. However, the level of epistemic access determines how well a scientist versus the general public will understand the same term. Chances are, the way on which they are reported in those publications as compared with the *Sierra* Magazine will be integrally different based on the goals of the organization and the implied reader the publication aims to create. Building on this idea, Foss writes: "Metaphors contain implicit assumptions, points of view, and evaluations. They organize attitudes towards whatever they describe and provide motives for acting in certain ways (Foss). As such, accommodators must be aware of the metaphors they use to adapt information to their readers as well as the implications necessarily attached.

This thesis will apply style analyses to *Sierra* Magazine texts in order to "contribute to an understanding of how [diction and metaphor] structures are constructed and maintained through rhetoric" (Foss 160). Results from these analyses will be

especially advantageous for technical communicators, who "must be in command of several styles, so that he or she can accommodate his or her manner to various subject matters, occasions, purposes, and audiences" (Corbett 361). These diction and metaphor breakdowns will demonstrate how individual terms and ideas work together to construct interpretations or understandings of which the writer may not have been aware.

3.3.3 Editorial Controls

Editorial controls in popular science magazines shape knowledge for audiences in two primary ways. First, with a firm understanding of their audience, editors can organizationally structure the magazine around their readers' interpretive habits. M. Jimmie Killingsworth points out: "In addition to the types of charts, graphs, pictures, and language, [editors] have to consider carefully the 'voice,' 'persona,' or 'self' that they put forward. A very different authorial image will emerge in each of the presentations because of the audience's interpretive habits and the authors' effort to accommodate what is generally understood about those habits (Killingsworth, 1992, 74). The presentation of scientific risks in a large way shapes public audience perceptions of risk because it allows readers a presentation through which can interpret scientific knowledge. Penrose and Katz support this when they write: "Topical headings help readers see at a glance what major topics or issues will be raised in each section of an article" (221). This allows readers to select articles most interesting—or alarming, in the case of risks—to them; it also allows editors to shape the way their audience perceives these risks. By presenting

articles in a particular format, editors and writers craft articles with the most important ideas in order to economize words and space. This allows them to simplify information for readers who do not necessarily have time to internalize technical details, but who need a deep enough level of detail to carry on intelligent conversations about the topics.

In addition to layout, editors also apply knowledge of their readers' interpretive habits to each article as it travels through the editorial review board. Gibson ties together editorial roles with the creation of implied readers when he states: "The job of an editor is largely the definition of his magazine's [implied] reader and an editorial 'policy' is a decision or prediction as to the role or roles in which one's [readers] would like to imagine themselves" (267). At the *Sierra* Magazine, this editorial process works towards the guarantee that each article reflects their implied readers' values. Each level of editing also ensures that technical documents explaining scientific research are accommodated not only for content, but also language.

3.3.4 Electronic Communication

In addition to stylistic choices and editorial controls, electronic communication plays a significant role in accommodating scientific risks in the *Sierra* Magazine. This medium of communication provides a wider availability of technical information and allows writers to create roles and responsibilities for readers through writing style. While electronic articles are beneficial for public audiences and accommodators, scientists also value this medium. As Penrose and Katz point out: "Digital technologies offer new ways for scientists to interact with their broader disciplinary communities as well" (27). Each

link, website and resource suggestion within the article provides public audiences access to the network of knowledge linking them and experts. Although readers may not necessarily understand the intricacies of the scientific risks, the *Sierra* Magazine uses style designed for their readers to accommodate risks within social frames relative to their understanding. Electronic communication reinforces Watson and Hill's rhetorical communication model (Figure 2.2) and the Implied Author—Implied Reader model from earlier in this chapter (Figure 3.1) because it allows electronically mediated "messages" created by authors and interpreted by readers to fluctuate freely between experts and public audience groups across the Internet.

While many of the articles—restricted to limits between 100 and 700 words—are designed to pique readers' interests, the electronic element allows readers to actively track information depending on how involved they wish to become with the risk. In this capacity, readers are no longer simply "receivers" of information from an "information source" operating along a one-way model of communication. Their role in grappling with risks is now significant.

3.3.5   Introduction to "Grapple"

This section shows an example of the general layout and order of the articles found in the *Sierra* Magazine "Grapple" section. Spanning across a five-page spread, "Grapple" is broken into seven sub-headings highlighting current environmental stories; each are shown and briefly described in Figure 3.2. While this spread shows articles from the March/April 2010 *Sierra* Magazine issue, it is important to note that these are

not the only articles analyzed in this study. A detailed explanation of the article selection process will follow in the next section of this chapter.

The Future of Garbage
Your trash can is the latest front in the fight against global warming

Instead of producing methane in landfills, these former table scraps and yard trimmings will nurture California farms and vineyards.

Three days a week, M. Lee Meinicke, cofounder of Philly Compost, takes her truck on a circuit of Philadelphia restaurants, caterers, and markets, filling 20-gallon bins with plate scrapings, aging produce, chicken bones, food-stained napkins, and other discarded organic matter. The waste will be served up as dinner to Meinicke's stable of red wigglers and night crawlers, emerging on the other end as compost that she will sell for $15 per four-gallon bin. She turns straw into gold, and participating businesses help fight climate change: "What hooks them is the global-warming issue," she says.

In the oxygen-deprived environment of a landfill, rotting food produces methane, a gas with 72 times the global- warming potential of carbon dioxide. Landfills are the largest human-made source of methane emissions in the United States, with a greenhouse-gas impact equal to one-fifth of that produced by the nation's coal-fired power plants.

"While we're working on getting cars off the road and shutting down coal plants, composting is the fastest, easiest, cheapest way to deal with greenhouse-gas emissions right now," says Linda Christopher, executive director of the Grassroots Recycling Network.

Compost programs don't lack for raw material: A fourth of the nation's trash is made up of "putrescibles"--food scraps, yard waste, and other biodegradable rubbish. Leaves and yard waste have been banned from landfills in 22 states, but only a handful of communities nationwide compost food scraps. Last year San Francisco supplied residences with compost bins and made it illegal to put food and yard waste in the garbage.

Recycling advocates would like to see the 3,800 U.S. facilities that compost leaves and yard debris begin to take food waste as well, but it will require costly measures to cope with odors and screen out plastic detritus like sandwich bags, latex gloves, and sporks. Once that's done, however, the worms and microorganisms can do their work, resulting in a black, nutrient-rich compost prized by farmers and gardeners. Given the demand, Christopher argues, we should start thinking of food scraps as a resource, not refuse. "When they're tossed into the landfill," she says, "they're lost to us forever."

Headlining article highlights current issue that is popular in the media or "hot on TV" (*Sierra* interview)

Figure 3.2: General Model of "Grapple" Layout
from the March/April 2010 Issue.

SIERRA
Up to Speed: Two Months, One Page

Biologists observe octopuses off the coast of Indonesia carrying coconut shells to use as emergency shelters.

Thousands of dead octopuses wash up on Portuguese beaches.

World Watch estimates that methane from livestock, clearing of rainforests for pasture, and other emanations from animal agriculture amount to more than half of the world's total greenhouse-gas emissions.

Lakes of liquid methane dot the surface of Saturn's moon Titan-a camera on the Cassini spacecraft catches sunlight reflecting off one.

Water is found on the moon.

Brown pelicans are removed from the endangered species list. In the 1960s they were almost wiped out by DDT.

"Technologically advanced societies must be prepared to encourage more sober lifestyles, while reducing their energy consumption and improving its efficiency," declares Pope Benedict. He warns, however, against a "supposedly egalitarian vision of the 'dignity' of all living creatures," saying it verges on Paganism.

No new coal plant broke ground in the United States in 2009.

No new solar plants or wind farms are likely to be built on a million protected acres of California's Mojave Desert, because of opposition from Senator Dianne Feinstein (D). She does propose a large tax credit for building solar projects on degraded lands.

Solar panel theft is on the rise.

The CIA puts its spycraft to work monitoring environmental trends like desertification, melting ice caps, and rising sea levels. The program existed in the 1990s, but was killed by the Bush administration.

A Japanese whaling ship strikes a boat belonging to the conservationist Sea Shepherd Society off Antarctica, shearing away its bow.

The EPA proposes strict new limits on ground-level ozone, the main ingredient in smog, reversing a 2008 Bush-era decision.

At the U.N. Climate Change Conference in Copenhagen, many countries announce substantial commitments to reduce carbon emissions, but despite strong personal intervention by President Barack Obama, there is no final, binding climate accord.

Federal and state governments will use $1.79 billion in funds obtained through the bankruptcy of copper-mining giant ASARCO to clean up and restore the company's 19 Superfund Sites. ASARCO had attempted to sell off its most valuable assets to a shell company before seeking Chapter 11 protection. (See "Going for Broke," May/June 2006.)

The EPA signs off on a permit for Patriot Coal's Hobet 45 mountaintop-removal mine, in Lincoln County, West Virginia. The mine will bury more than three miles of streams under millions of cubic yards of rubble.

A major study in the journal *Science* demonstrates the damages from mountaintop-removal operations like Hobet 45. Its conclusion: "Mining permits are being issued despite the preponderance of scientific evidence that impacts are pervasive and irreversible and that mitigation cannot compensate for losses."

Paddy Power, Ireland's largest bookmaker, is taking bets on how many polar bears will be left at the end of next year. Odds are 13 to 8 on fewer than now.

Shows an abbreviated view of a variety of current stories

**Figure 3.2: General Model of "Grapple" Layout
from the March/April 2010 Issue (cont.)**

Not a Lot of Axolotls

The axolotl's resemblance to an alien goes beyond appearance and orthography. It can regenerate lost limbs; it spends its life in water but can breathe air when it wants to; and it has survived (thus far) in a dismally polluted habitat-- Mexico City's Lake Xochimilco.

The nine-inch salamander's evolutionary quirk is that it spends its entire life in an external-gilled larval state. That suited it well in the past, but today's axolotl has to contend with wastewater from one of the world's largest cities, nonnative species that eat its offspring and food, and a persisting tradition of axolotl tamales.

Only 700 to 1,200 survive in the wild. Mexican conservationists are trying to establish refuges to protect the axolotl and to make it a symbol for nature tourism and environmental education. For the moment, however, it's easier to find an axolotl in a pet store or on a T-shirt than in the waters of Xochimilco.

Spotlights threatened flora/fauna

Global Conspiracy

Global-warming deniers from Sarah Palin to the Saudi Arabian government had a field day in December with the release of catty and occasionally scandalous e-mails between climate researchers at the Hadley Climate Research Unit (HadCRU) at England's University of East Anglia. Phil Jones, director of the unit and author of some of the e-mails, stepped down pending an investigation. Meanwhile, deniers triumphantly cite the purloined messages as proof that global warming is a fraud.

But the Hadley lab is just one of four major organizations tracking global temperatures; the others are NASA, the National Oceanic and Atmospheric Administration (NOAA), and the Japan Meteorological Agency (JMA). A global conspiracy--or just a warmer globe?
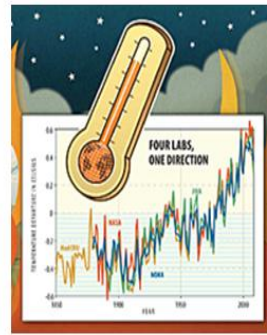
Typically more technical, this article uses graphs/charts to visually depict complicated scientific findings

Woe Is Us: Ready, set, panic.

Hand Me a Tissue

The last time the earth was menaced by ooze (The Blob, 1958), we had Steve McQueen to save us. But McQueen died in 1980, and now the blobs are not confined to celluloid. In a particularly revolting manifestation of a warming planet, the world's waterways are increasingly clogged with snotlike masses of microorganisms, living and dead.

In summertime in the Mediterranean, concentrations of "marine mucilage" stretch for hundreds of miles off the Italian coast, fouling nets, smothering fish, and nauseating swimmers. Similar conditions have been reported in the North Sea and off the coast of Australia. A 2009 study found that the outbreaks have "increased almost exponentially" in the past 20 years and linked them to the warmer, stiller waters consistent with climate change. Beyond the "ick" factor, the blobs harbor viruses and bacteria, including the deadly E. coli, in concentrations large enough to sicken bathers and force beach closures.

Mucus blobs also plague freshwater streams. The diatom Didymosphenia geminata, a.k.a. "didymo" or "rock snot," is native to North American rivers but has recently expanded its range greatly throughout the Rocky Mountain West and into Canada.

Huge colonies of these single-cell creatures attach themselves to rocks or plants on stream bottoms, covering up to 90 percent of the surface area with strands that resemble streaming toilet paper and crowding out fish, plants, and insects, not to mention would-be swimmers.

Focuses on results of threats; common "wonder appeal" use

**Figure 3.2: General Model of "Grapple" Layout
from the March/April 2010 Issue (cont.)**

AS THE WORLD WARMS
Quick thinking before we slowly fry

BLOW ME DOWN A blustery November weekend allowed wind farms to generate 53 percent of Spain's electricity for five hours, setting a new record for a country that gets a quarter of its power from alternative energy. Thanks to government subsidies and breezy weather, wind power has blown past other renewables in Spain, jumping from 9 percent of Spanish electricity production in the first nine months of 2009 to 14 percent in October.

MUSCLES PER GALLON As the Ford Mustang and the Chevy Camaro duke it out for the title of manliest muscle car, the Mustang has a surprising new throwdown: best fuel efficiency. The 2011 Mustang V-6 will not only boast a 305-horsepower engine—that's 95 more than the 2010 model—but also get 30 mpg on the highway. Ford claims to be the only car manufacturer offering 300 horsepower and 30 mpg in the same package, but the 304-horsepower, 29-mpg V-6 Camaro is right on its tail.

DOGHOUSE GAS EMISSIONS Not content with shedding and shoe chewing, our canine companions are out to wreck the climate as well. British architects Robert and Brenda Vale calculate that the annual ecological pawprint of a medium-size dog is twice what's required to construct a Toyota Land Cruiser and drive it 6,200 miles. Fido's carnivorous diet is to blame, which leads the Vales to suggest that we trade him in for vegetarian—and ultimately edible—pets like rabbits or chickens, or else feed him lower-impact leftovers from the table. —*D.S.*

> Selects two issues to pit against one another to help readers consider both sides

ON THE ONE HAND . . .
The Montreal Protocol, which banned ozone-depleting chlorofluorocarbons (CFCs) from products like refrigerators, air conditioners, and insulating foam, is widely hailed as the most successful international environmental agreement in history. Introduced in September 1987, the protocol was eventually signed by every member of the United Nations and has succeeded in phasing out 96 percent of the ozone-zapping chemicals. While there is still a hole in the ozone layer over the South Pole, scientists expect it will close by 2050.

ON THE OTHER . . .
The ozone-safe hydrofluorocarbons (HFCs) that replaced CFCs have a downside: They contribute to global warming with a vigor 4,470 times more potent than carbon dioxide's. The Montreal Protocol called for phasing them out by 2030, but climate activists say that's too long to wait. While HFCs make up 2 percent of U.S. greenhouse-gas emissions now, they could account for 9 to 19 percent of warming gases by 2050. Ozone- and greenhouse-safe substitutes are on the way: Coca-Cola has already committed to ridding its vending machines of HFCs by 2015.

Figure 3.2: General Model of "Grapple" Layout
from the March/April 2010 Issue (cont.)

Et Tu, Exxon?
Oil-industry giant hedges its bets on climate change

Has ExxonMobil turned away from the dark side? Last December, the oil behemoth--notorious for funneling millions of dollars to climate-change skeptics--announced a $31 billion deal to buy XTO Energy, one of the largest U.S. natural gas producers. Analysts dubbed the move a hedge against climate change: Since natural gas has a smaller carbon footprint than coal or oil, it would be a major profit center if Congress enacted laws penalizing CO2 emissions.

"It doesn't prove they believe in global warming," says Joseph Romm, a climate expert who blogs for the Center for American Progress (climateprogress.org). "But given that this has been the most backward oil company in the world on the issue, one has to look at it as a climate-change play."

Or it could be a routine business decision by a company struggling to grow. Finding large new oilfields to exploit has become increasingly difficult, says energy analyst Geoffrey Styles. But the natural gas sector, with huge reserves unlocked by new technologies like hydraulic fracturing and horizontal drilling, is booming. "Exxon probably sees this as a global opportunity it doesn't want to miss," Styles says. "If it happens to have other benefits, that's just gravy."

To realize those benefits, however, Exxon may find itself in the unfamiliar position of supporting government action to halt climate change. Although a supply glut has severely depressed natural gas prices, coal is still cheaper. "If you want to see substantial growth in natural gas," Romm says, "you have to use it to replace coal." And the only way that would happen would be if Congress put a price on CO2.

The irony is as thick as an oil slick. Exxon has fought for years to prevent action on climate change. Now its business plan may require it.

Another endangered flora/fauna closes out the section

Figure 3.2: General Model of "Grapple" Layout
from the March/April 2010 Issue (cont.)

Following trends of other established popular science magazines that have "changed their editorial policies within the last few years to include more coverage of scientific subjects" (Interview, Oliver Payne), the *Sierra* Magazine introduced their "Grapple" section in September 2008. This section was designed to simplify technical details of scientific articles in order to make them more accessible to audiences with interests in environmental issues, but with limited familiarity with scientific knowledge.

3.3.6 Article Selection Process

The articles selected for style analyses in this study were drawn from the *Sierra* Magazine "Grapple" section. This specialized section is unique because it accommodates technical, scientific risks for two types of readers. The implied readers have an active involvement in environmental issues, but do not have the capacity to fully understand the technical knowledge. The real readers are the 97.6% of Sierra Club members who financially supporting the publication's existence (please see footnote 7 for more details). Analyses of these articles illustrate how technical knowledge is accommodated for two, distinct types of readers through style.

The selection of articles extends across a long enough period of time to cover a variety of timely topics; however, because "Grapple" was only introduced in September/October 2008, the article selection pool remained limited. With a wider range of articles from which to choose, this analysis could be more varied and informed in future studies (please see Chapter 5 for more of an expansion on this). Articles for this study were selected from issues between September/October 2008 and July/August 2010, which was the last possible issue date allowing enough time to analyze results within this study. Since each issue contains seven possible "Grapple" articles, and there were twelve issues to choose from, this gave me a possible eighty-four articles from which to choose. These eighty-four articles were subset by topics concerning environmental risks, which were further subset by criteria (i.e. grammar, diction, metaphor) suitability.

Chapter Four

RESULTS

The following results will be divided into five sections:

1. First-hand interviews with *Sierra* Magazine editors and writers will set up the textual analyses in this study. These involved perspectives will account for how their views of accommodation influence their practices and processes.
2. An electronic communication analysis will reveal how Sierra Magazine articles expand the network between experts and public audiences and create an extended responsibility for implied readers beyond the text.
3. Grammatical analyses of the welcome page using Gibson's Style Machine and analyses of several articles openings will reveal the implied reader role the *Sierra* Magazine has created to appeal to their readers through their text.
4. Diction analyses of *Sierra* Magazine articles will show how the creation of the implied reader is reinforced through style.
5. Metaphor analyses will demonstrate how technical risks are accommodated for implied readers through the restructuring of language.

4.1   EDITOR AND WRITER INTERVIEW RESULTS

Before presenting the analysis results, we will first look at the *Sierra* Magazine editorial structure to show the network each article must pass through to ensure it appeals to the implied reader and aligns with the values of the organization.

4.1.1   Practice Influences Process

As evidenced by the complex editorial configuration of Figure 4.1, there are several levels of editing that occur in this structure. An editor from the *Sierra* Magazine explained in an interview that each article must be approved by multiple editors several

times before final printing. In addition to clarity, each editor checks to make sure every article appeals to their readers' interests and builds on their previous knowledge. While writers accommodate content of articles through diction and metaphor, editors contribute to the accommodation process by concentrating on creating and developing a particular interpretation for readers.
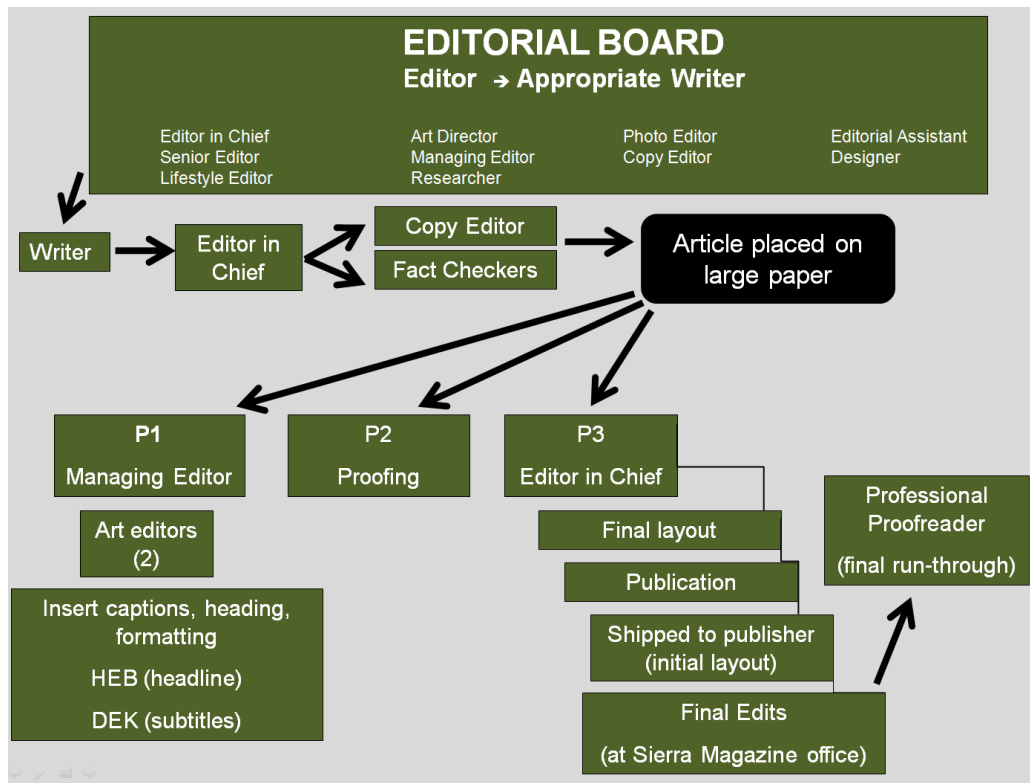
Figure 4.1: Editorial Structure of the *Sierra* Magazine.

This first section of results is particularly revealing because it offers a perspective into how the practice of accommodation influences composition and editing processes. Through interviews with *Sierra* Magazine writers and editors, these technical accommodators will provide insight that will help both "identify some of the basic concepts involved in a rhetorical process" and explain how they work (Foss 8).

Each section will be divided by bolded question headings based on key topic discussed. For a list of leading interview questions approved by the Internal Review Board (IRB) as appropriate for facilitating conversations with *Sierra* writers and editors, please refer to Appendix B. In the interest of keeping the writer and editor identities anonymous, they will be generically described as the *Sierra* writer or editor throughout.

4.1.2   Current "Grapple" Layout

When asked how the "Grapple" section originated, the *Sierra* editor attributed the editorial reconstruction to a "shake up at the top" of the magazine; specifically, the introduction of a "new editor in chief," who decided to "redesign the magazine to conform to his new notions. 'Grapple' was an outgrowth of [a previous section called the] 'Lay of the Land,'" explained the *Sierra* editor. "Some of the elements carried over, although there is not as much [material concerning] electoral politics as there used to be. 'Grapple' is now more of an environmental news section."

4.1.3   Article Selection Process

The *Sierra* editor explained that locating interesting topics for Sierra articles required him to "read widely" to discover the most updated scientific research. Common places include "scientific publications, the news, blogs, newspapers, and environmental blogs." With an interest in graphic representation, the *Sierra* editor seeks "interesting graphic representation of environmental situations" when perusing through the news, blogs, and scientific publications.

The "original food miles article," the *Sierra* editor explained, was based on a scientific study conducted by the Leopold Center for Sustainable Agriculture at Iowa State University. This research on food miles was especially appealing to the editor because of its potential for graphic representation. "It included exactly how much fuel was required to get a potato from Iowa to an ending location on the other side of the country," explained the *Sierra* editor. Using the study as inspiration for their article, the *Sierra* Magazine "used Photoshop to do the same." Soon after, however, "readers wrote, casting doubt" in the validity of the article. "How did it take that much fuel?" it led the *Sierra* Magazine to wonder. Upon further investigation by the *Sierra* Magazine, it turned out that the original paper on which the article was based, "The Road Less Traveled," (Leopold Center for Sustainable Agriculture, 2002) was "written mostly by grad[uate] students working under their professor" at Iowa State University. Subsequent to the publication of their article, *Sierra* learned that the original study contained calculation errors; as a result, *Sierra*'s "calculations significantly overstate[d] the amount of fuel needed to move the items to market" (please see Appendix C for the full editorial note).

After publically apologizing and explaining the discrepancy to their *Sierra* readers, they released an amended article on the same topic in 2009; this time, they used a peer reviewed article based on a study by Christopher L. Weber and H. Scott Matthews from Carnegie Mellon University. (This peer reviewed article, "Food Miles and the Relative Climate Impacts of Food Choices in the United States," and the 2009 revised *Sierra* article, The Locavore's Dilemma," have been applied to a diction analysis later in this chapter). Reflecting upon this experience, the *Sierra* editor stated: "We learned a

very important lesson from this: if basing an article on a scientific study, it should be peer reviewed."

4.1.4   Accommodating Scientific Knowledge for *Sierra* Readers

The *Sierra* writer responded that his process involved reading scientific journal articles and shortening the "take home message" into a roughly 800-1000 word summary. He explained that, especially in longer articles, it was essential that he describe technical and scientific terms (i.e. carbon emissions) just in case their audience had no prior knowledge of the term definitions.

When a *Sierra* Magazine editor was asked the same questions, he explained that "selection of appropriate language for our readers [involves] putting the scientific study in layperson's terms; terms you might use as your explain the study to someone you're having a beer with, or to someone like your grandma. Or maybe even while you're having a beer with grandma," the editor joked. The process involves "finding a point of interest and using an interesting and striking example or memorable quote to put it all together."

4.1.5   Who are the Real *Sierra* Readers?

The *Sierra* writer described the general readership audience of the magazine as people who "have some interest in environmental issues, [and who are] into traveling and outdoors activities." While most Sierra Club members have traditionally been older, the *Sierra* writer explained that membership has, more recently, expanded to a younger

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audience. "Many of our articles, such as the annual college guide, are designed to appeal to a larger range of younger audiences," he explained. While many of the articles are based on subjects that will interest the readers of the magazine, the editorial board also looks for ideas that are "currently being tested [or are] hot on TV."

When the *Sierra* editor was asked to describe the readers articles were written for, his initial response was: "*Sierra* is a really hard magazine to pitch for." He explained that most articles were aimed to focus around an "interesting fact" and "what readers can do with them." The *Sierra* editor referenced the article, "Backyard Dioxin Factories: Household 'Burn Barrels' are Major Toxic Polluters," as a text encompassing both of these points. "Burn barrels are a source of major dioxins, but most people think [these dioxins] only come from industrial sources," he explained. This article alerted readers to the "interesting fact" that dioxins come from household burning trash in burn barrels and, because it is a local concern, it gave readers the opportunity to do something about it.

The audience, according to the *Sierra* editor, is composed of "more than 90% of Sierra Club members. For a long time, the members were somewhat older, [around the age of] fifty. Many are active in various ways; either politically or physically." For the "Grapple" section, specifically, the *Sierra* editor stated that many articles are catered towards readers who would identify themselves as "environmentalists." While the interests of the readers in many ways determine the content selected for *Sierra* articles, this does not exclusively control topics published within the magazine. "When choosing articles, they are not always the most interesting," admitted the *Sierra* editor. Oftentimes,

the articles are required to "tie into what the Sierra Club[7] is working on." The editor

explained that, most recently, there have been "lots of articles about coal because the

Sierra Club's larger initiative has been to get the [United States] off coal. Stories that

coincide with Sierra Club campaigns is something we often do."

4.1.6   Electronic Accommodation

When asked about electronic linking within articles, the *Sierra* editor that there

was "not a lot of resources for fancy presentations on the web." With regards to linking

Sierra article content to other sources, the "primary source material or scientific study

where the material originated" is, with available space, listed at the bottom of the page.

The *Sierra* editor pointed to the "Up To Speed" article in the "Grapple" section as a good

demonstration of source listing. "When the copy editor links articles to other sources"

within the text, explained the *Sierra* editor, "they are not necessarily linked where they

got the story from." Following up from his description of their readers, the *Sierra* editor

explained that "most members are not interested in reading long scientific studies. [Most

members] are environmentalists and are not only interested in the [technical] science."

Because of this, electronic linking within the text and source listings at the bottom of

articles for "further reader" are especially effective in "piquing [readers'] interest and

stimulating learning" about the topics within the articles. The Sierra editor also stated

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[7] In a follow-up interview, the *Sierra* editor verified the current magazine circulation number as 550,000. When both the number of paid subscriptions (4,000) and the number of Sierra Club members opting out of receiving the magazine (8,500) are subtracted from the total number of circulations the total amount of Sierra Club members receiving current circulations amounts to 537,500. These figures indicate that 97.6% of *Sierra* Magazine readers are Sierra Club members.

that, with "unemployment in recent years, space is at a premium. The Internet is especially useful for economizing words and space."

As indicated by interviews with *Sierra* Magazine editors and writers, electronic links provide implied readers access to original scientific sources and, through textual linking, mediates between accommodated *Sierra* texts and outside sources. The next section will begin by showing how organizational structure shapes accommodation to set up electronic hyperlinks as a form of accommodation. A close examination of an "Up to Speed" *Sierra* article will demonstrate how electronic communication shapes accommodation in the magazine by providing an active role for public audiences to engage with risks in the text.

4.2   ELECTRONIC COMMUNICATION AS ACCOMMODATION

Organizational structure, which was discussed in Chapter 3, is an example of editorial accommodation that "influence[s], even create[s], the reader's opinion" (Fahnestock 286). In addition to controlling headings and overall organization of the "Grapple" section, editors also reshape technical graphs with complex details into colorful, visually appropriate diagrams to match the argument the article is making and the scientific knowledge the *Sierra* Magazine is accommodating. Through a fabric of images, accommodated charts, and graphs, they present the scientific risks within a controlled editorial layout. This structure helps real readers become accustomed to the accessible layout, while also creating a strong ethos for the *Sierra* Magazine.
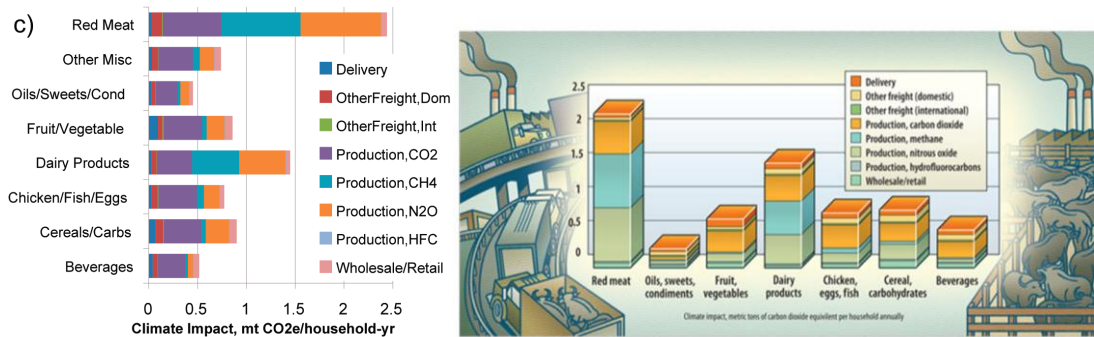
Figure 4.2: Graphs from Technical Source (left) and
***Sierra* Magazine Article (right).**

In Figure 4.2, the *Sierra* Magazine article, "Food Miles," uses visual design features to

represent the same data displayed in the text of the original scientific research from which

the article was adapted (left side).[8] The raw data from the Environmental Science and

Technology Journal study, "Food Miles and the Relative Climate Impacts of Food

Choices in the United States," by Christopher L. Weber and H. Scott Matthews, is

surrounded by cow and truck images to complement the accommodated content in the

Sierra Magazine article. This demonstrates a clear example of writers and editors

working together to accommodate content and interpretation for their implied readers.

In the same way that accommodated graphs—like the one shown in Figure 4.2—

make the complexity of technical risks easier for non-experts to understand and use,

electronic hyper-linking serves a similar function. In their research on communicating

risks with the public, Burger and Gochfeld claim that "it is a mistake to assume that

detailed [knowledge] on the nature of risks and benefits, the multiplicity of effects (both

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[8] Interesting to note is that reproducing part of Figure 2 from Weber and Matthews' study, rather than
Figure 1, would have been more applicable to the point *Sierra* made in their "Locavore's Dilemma"
article.

positive and negative) and the target (who is at risk) is too complicated" to communicate to public audiences ("Knowledge about Fish Consumption Advisories," 352). Accommodation through electronic communication is crucial for giving the public opportunities to connect with detailed knowledge about risks.

Through a network of words that "act as gateways to other content areas," readers are able to learn about and engage with risks solutions by clicking on hyperlinks within *Sierra* text (Oliu, Brusaw, Alred 568). If readers wish to have more involved roles, electronic mediation gives them opportunities to engage further with scientific research. The electronic dimension of *Sierra* Magazine articles accommodates technical knowledge for readers interested in environmental issues.

Gross points out that in order to scientific accommodation to be rhetorical, it must "focus on the *inter*action between science and its publics" (Gross 6). Writing style effectively grounds knowledge within the local concerns of *Sierra* readers through text; electronic mediation is crucial for engaging readers and inviting them to learn more about technical risks outside of the accommodated text. Penrose and Katz contend: "To a large extent, the communication of science to the public is shaped by the technologies the public uses" (35). Style accommodates technical risks around public audiences' general understanding; textual links prompt the public to take one step closer in engaging with experts.

SIERRA
Up to Speed: Two Months, One Page

The summer of 2009 is the second hottest on record worldwide, only a tenth of a degree cooler than the all-time high, set in 1998.

Two German freighters inaugurate commercial use of the Northeast Passage, sailing from Siberia to Rotterdam through ice-free Arctic waters.

The Arctic is warmer than it's been in 2,000 years.

Only 57 percent of Americans believe there is solid evidence that the earth is warming, down from 77 percent in 2006.

The United States seeks to end international trade in polar bear parts. Until 2008, when polar bears were declared an endangered species, it was the world's largest importer of polar bear skins and trophies.

The U.S. Fish and Wildlife Service proposes the designation of 128 million acres of Alaska coastline as critical habitat for polar bears.

The president of the low-lying Maldives islands holds a cabinet meeting underwater.

In Sweden, labels in grocery stores and restaurants now inform consumers of the carbon footprint of their lingonberry jam and pannkakor.

A German geothermal plant apparently sets off an earthquake.

The U.S. company First Solar will build the world's largest solar-power plant—in China.

Public outcry scotched a plan to power a 36,000-acre wind farm in West Texas with 240 Chinese-built turbines.

The project's backers will now build the turbines in the United States. The World Bank's Clean Technology Fund is financing a new coal-fired power plant in Gujarat, India, that will likely be the largest new contributor of greenhouse gases in the world.

The World Bank says that developing nations will need $100 billion a year for the next 40 years to deal with the effects of global warming.

Saudi Arabia asks for financial assistance should global demand for oil decrease.

Russia is preparing to host the 2014 Winter Olympic Games by logging large areas of Sochi National Park.

U.S. carbon emissions peaked in 2007 and have fallen 9 percent since then.

Australians John and Helen Taylor set a new hypermiling record, getting an average of 67.9 mpg while driving their Volkswagen Jetta TDI 9,505 miles to visit the 48 contiguous states.

The EPA proposes requiring U.S. coal plants and other large facilities to slash their greenhouse-gas emissions and reduce their toxic air pollution.

The Obama administration releases the first $21 million of $1.4 billion in stimulus money for capturing and storing CO2 from industrial facilities.

Bill Gates pledges $120 million to promote sustainable farming in Africa.

George Soros says he'll invest $1 billion in clean-energy technology.

Environmental fugitive Larkin Baggett is captured in Florida after confronting federal officers with an assault rifle.

The EPA moves to deny a permit to the Spruce No. 1 Mine in West Virginia, which would have been the country's largest mountaintop-removal operation.

Under the nation's first mandatory composting program, San Franciscans must now separate what will rot from what will not, or pay a fine. The city aims to produce zero waste by 2020.

Lost hikers really do walk in circles.

Callout boxes:
- Concise heading indicate topics covered
- Hyperlinks to outside Web sites economize text
- Numerous embedded links do not distract—but instead, enhance—readers' understanding due to their relevance

Figure 4.3: "Up to Speed" Electronic Article Featuring Hyperlinks

Figure 4.3 shows an especially useful example of electronic accommodation in the article "Up to Speed: Two Months, One Page." Within the twenty-five links connecting readers to sources across the Internet, readers are prompted to learn more about the text through direct expert news and information. These source links, which include newspapers and federal government agencies, are listed alphabetically in Table

4.1 with the number of times the original text links to them. This list demonstrates the wide variety of knowledge sources *Sierra* Magazine defers to through electronic communication capabilities.

Table 4.1: Organizations Electronically Linked in "Up to Speed" Article

Organization	Links within Figure 4.3 *Sierra* article
ABC News	1
BBC News	1
Bill and Melinda Gates Foundation	1
Bloomberg	1
Charleston Gazette	1
CNN.com	1
Guardian News	1
Johnson's Russia List	1
National Aeronautics and Space Administration (Goddard Institute for Space Studies)	1
New York Times	9
Pew Research Center for the People and the Press	1
Reuters	2
San Francisco Chronicle	1
U.S. Department of Energy	1
U.S. Fish and Wildlife Service	1
Yahoo! Green	1

Electronic hyper-linking allows the *Sierra* Magazine to connect their accommodated articles with levels of expert knowledge; from specialized organizations such as the U.S. Department of Energy and the National Aeronautics and Space Administration, to mainstream news sources across the country such the *New York Times* and the *San Francisco Chronicle*.

The next three style analyses will inform both the *Sierra* interviews and the preceding electronic communication findings by specifically looking at how accommodation functions through language. Grammatical analyses will show the style

Sierra Magazine uses to address implied and real readers. From there, diction analyses will look at specific words used to resituate complex ideas, while metaphor analyses will show how technical ideas are restructured so readers can understand risks discussed in *Sierra* articles.

4.3   ACCOMODATION THROUGH GRAMMAR

Evaluating grammatical style is especially important in this study because it reveals the tone used by the *Sierra* Magazine to shape risks for their implied readers. This is extremely useful in determining whether the communication model used to mediate between author and reader is information or rhetorically based. Results from the following three analyses—which measure the welcome page, the beginning lines of several *Sierra* articles, and a full text article—will help identify the readers for whom risks are accommodated by "accounting for distinctions" in tone and style (Gibson 115). These findings, which will afford us with a firm understanding of common *Sierra* Magazine styles addressing implied readers, prepare us to see how diction and metaphor shape risks for this audience. The next section will explain three types of style measurable by Walker Gibson's "Style Machine."

4.3.1   Gibson's Method for Measuring Style

The tone and style of a text serves as a revealing indicator of the relationship between an author (writer) and a reader. If a writer uses jargon and technical words to describe a scientific risk to a reader unfamiliar with the content, the style will be dry and inaccessible. On the other hand, if a writer understands their readers' levels of

understanding on the subject and shapes the content around their knowledge and values, the style—and thus the relationship between writer and reader—will be friendly and approachable. Gibson points out: "Communication is more than a matter of words" (7). The style a writer uses to communicate their content creates a tone through the text. In his discussion of textual meditation, Gibson writes: "As readers, we are made over every time we take up a piece of writing: we recognize that there are assumptions and expectations implied there and that as sympathetic listeners to the voice speaking to us, we must share these assumptions" (13). In scientific accommodation, style allows technical accommodators to connect with their readers and shape complex information into a linguistic form comfortable for them. For this study, we will analyze the style of *Sierra* Magazine texts to determine how writers communicate with their readers beyond words. In his research, Gibson creates three categories for common language style; each is described below by their defining attributes:

Table 4.2: Sweet, Tough, and Stuffy Styles as Depicted by Gibson.

STYLE	DESCRIPTION
Sweet	▪ Writer addresses reader directly ("you") and is astutely focused on the reader's needs and desires ▪ Most common in advertisements, writers using this style talk as if they know the audience exceedingly well as often characterize readers in specific ways (76) ▪ Common use of rhetorical devices of informal speech (contractions, eccentric punctuation, fragments) in order to secure intimacy with the reader; simple sentence structures (85)
Tough	▪ Writer generally presents themselves as believable human character, without omniscience

	▪ Writer knows only what they know and is aware of his/her limitations
	▪ Style evidenced by colloquial patterns and tense intimacy with the assumed reader (41)
Stuffy	▪ Known as scarecrow or organization prose
	▪ Evidenced by refusal to assume personal responsibility (with continuous use of the passive voice) and strong preference for abstract nouns as subjects of active verbs
	▪ "Doer of the action" is typically magnitude or data rather than humans; common use of narrating voice (Gibson, 1966, 91)

These three styles were perfected and shaped by Gibson using his "Style Machine."

Through a systematic measurement of "sixteen different grammatical-rhetorical

qualities," ("Tough, Sweet, and Stuffy" 113) this approach isolates styles as a way of

evaluating the tone present in a piece of writing.   This study will apply this same

quantitative method to determine the styles *Sierra* Magazine writers use to accommodate

scientific risks for their readers.

Like style, diction and metaphor are also important dimensions of scientific

accommodation not immediately recognized within text. Their descriptions and

approaches will each be described in more detail in the next section.

4.3.2   GRAMMAR ANALYSIS ONE: Locating the Implied Reader in the Welcome Page

The welcome page is a significant text for style analysis because it is one of the

first introductions *Sierra* readers have to the magazine. When applied to Gibson's "Style

Machine," which analyzes style through grammar, the results yielded 12 sweet elements,

5 tough, and 2 stuffy. The implications of these styles do not stop at the sweet, tough,

and stuffy categories, but extend into the operation of risk accommodation. While this

welcome page grammatical style analysis will closely examine the results in relation to

Gibson's commentary on each category, an integrated discussion of accommodation will

be used to set up our understanding for diction and metaphor analyses following this

section. This analysis discussion, which corresponds to Table 4.2, is broken up by the

grammatical-rhetoric qualities measured; each explanation will set apart the term

discussed in bold and offset with guillemet (**«bolded word here»**) punctuation.

Table 4.3: *Sierra* **Magazine Welcome Page Results**
Applied to Gibson's Style Machine.

Grammatical-Rhetoric Qualities	Number of Words for Category	% of Total Word Count	Style
Monosyllables	145	62%	Sweet
Words of 2 syllables or more	89	38%	Stuffy
First and second person pronouns	$1^{st} = 2$ $2^{nd} = 5$		Sweet
Subjects: neuter vs. people	Neuter = 2 People = 5		Sweet
Finite verbs	25	10.8%	Tough / Sweet
To be **forms as finite verbs**	1	Total finite verbs: .04%	Sweet / Stuffy
Passive verbs	1		Tough
True adjectives	14	.06%	Tough
Adjectives modified	1		Sweet

Noun adjuncts	8	.03%	Sweet
Average length of clauses	4.3 words per clause		Tough / Sweet
Clauses, proportion of total words	9	.06%	Tough
"Embedded words" – words separating subject and verb	1		Sweet
The	14	.06%	Sweet
Contractions and fragments	Contractions: 2 Fragments: 16		Sweet
(Irregular) punctuation	Parentheses: 0 Italics: 0 Dashes: 1 Question Marks: 1 Exclamation Points: 1		Sweet

Sweet: **12**	Tough: **5**	Stuffy: **2**

The more frequent use of «monosyllable» (62%) as compared with

«polysyllabic» words (38%) may indicate, according to Gibson, the "difficulty" of a

prose passage: Very Difficult, Easy and so on" (117). Beyond this simple calculation,

Gibson suggests that a balance between monosyllabic and polysyllabic words forges an

"intimacy of tone" marked by a sweet style. He warns against the use of "ruthlessly

Spartan diction" of Tough and Stuffy styles, and suggests a "more flexible vocabulary

permits a wide range" (119) of word usages. This balance is crucial not only in

establishing a sweet tone, but also for accommodating complex scientific terms to the

general public's understanding of a risk.

"Sweet Talk is far more generous with **«pronouns»** than is Stuffy Talk" (119),

which tends to repeat nouns in a legalistic way, rather than relying on pronouns, as if [the

writer does not] trust his reader to make the proper reference" (119). As previously

discussed in Chapter Two, the establishment of trust between author and reader is a

crucial foundation of accommodation. In order to feel like their involvement is valued,

public audiences need indication that their contribution is important. The Sweet Talker

does this flawlessly by making "explicit gestures to the reader, calling him by name

(*you*)." While information models of communication—as evidenced by Stuffy Talk—use

the pronoun *I* to exclude the reader, the Sweet Talker reinforces the rhetorical

communication model by using the pronoun *you* to include the reader (120).

The category of **«finite verbs»** is "part of the general distinction between formal-

written language and informal-conversational language. The Tough Talker's

"unwillingness to subordinate makes for simple sentence structures and a high proportion

of finite verbs" (121). The Sweet Talk's fondness for the second person is often

accompanied by uninflected verb forms used without any auxiliary." (122). The welcome

page shows a classic example of this with, "Stay **connected**: **subscribe** to our email

newsletter and **check out** our online communities." Three base verbs in a 13-word

sentence. This style embodies the importance for public audience participation and

involvement with the text—an initiative further reinforced by electronic communication.

The appearance of **«to be»**, according to Gibson, "is part of the urge for naming"

(122). In the welcome page, the use of *to be* helps the *Sierra* Magazine establish their

credibility. The line reads: "We **are** the oldest, largest, and most influential grassroots environmental organization in the United States." An organization's strong ethos grounds the claims technical communicators make about scientific risks. While the rest of this welcome page focuses on inviting and persuading the implied reader to step into a particular role, this one line establishes why the reader should trust *Sierra* as a credible accommodating source.

The one line in the text using a **«passive verb»** states: "Since 1892, the Sierra Club **has been** working to protect communities, wild places, and the planet itself." This line, which also differs from the predominantly sweet tone pervading the welcome page, helps the *Sierra* Magazine ground their credibility by giving strong historical priorities, which also align with the implied reader values dictated by the Sweet Talker in the text.

«True adjectives» explore how the "frequency of adverbs contribute[s] to tone" (123). While most Sweet Talkers tend to "plaster their nouns liberally with this kind of modification," the Tough Talkers are "sparing with adjectives" as they tastefully apply adjectives to words. Perhaps most curious is the distribution of adjectives within the selection. Within the first 100 words, there are eleven adjectives, including: safe, healthy, smart, energy, enduring, wild, oldest, largest, influential, grassroots, and environmental. In fact, the last five adjectives are all clumped together within one phrase in order to modify "organization." The last 135 words contain only three adjectives: local, award-winning, and current. Both the quantity and descriptive quality of the adjectives diminish throughout the text.

The Sweet Talker's use of **«noun adjuncts»** exemplifies the need to be "daring and resourceful in inventing new forms of expression" (126) and the "desire to give things names, perhaps, also to add that crisp authority conveyed by mannerisms" (127). Most significant to this insight is the welcome page's use of **email newsletter** and **online communities**; both examples use electronic mediums to embody interactive methods for involving readers with scientific risks.

The implication carried by Tough and Sweet Talkers with their **«length of clauses»** is that they "use the included clause generously" (129) and "use shorter clauses, and at least in most cases they place a smaller fraction of their discourse within clauses than the Stuffy Talkers do" (129). In addition to the short clauses throughout the welcome page, the editorial placement of bullets directs readers' attention towards central ideas. Within the text, a total of eleven bullets off-set important information within the text; combined within the short clauses, it directs readers' attention towards important sections.

Gibson uses the term "self-embedding" describe the separation of subject and verb. In the welcoming page, the only line indicative of this category—labeled **«embedded words»** in Table 4.3—states: "You're here because, like **1.3 million of your friends and neighbors**, you want…" Gibson points out that, while subordinate structures can be revealing the tone created in a text, "much depends not only on the *number* and *length of* subordinate structures, but also on their *placing* in the sentence" (129). The self-embedding phrase in the welcome page helps unite *you* to include a

larger group. In fact, this usage actually sets a tone in the sentence by clearly defining

the implied readers by their common needs and wants.

Gibson argues that the frequent use of the determiner **«the»** functions as "an

implied expression of intimacy" (130).   Like the adjectives, the distribution of *the*

throughout the text is particularly significant. The appearance of *the* appears fourteen

times within the last 180 words of the text, while there are none within the first 54 words.

In place of the determiner *the*, the first section substitutes *a* in its place. Once the *Sierra*

Magazine establishes the implied reader within the first 54 words, through phrases like,

"you want a safe and healthy community in which to live [and] a smart and healthy

community in which to live," they introduce a Sweet Talker to imply that the author and

readers' have "some relationship already in operation" (131).

The use of **«contractions»** and **«fragments»** frequently appear in the welcome

page, mostly within the bulleted lists. With an emphasis on action and involvement, the

bottom section outlines seven main points under "Your first steps." These include

sentence fragments that begin with action verbs, including "subscribe, enjoy and explore,

read, meet, learn, visit, and join." These sentence fragments, which lack an explicit

subject, use the implied reader as the fulfiller of each verb role, thus creating an implied

involvement for the reader.

The use of **«irregular punctuation»** helps Sweet Talkers "stimulate as

convincingly as [they] can the voice of intimate conversation." A **«dash»**, the first type

of punctuation found on the welcome page, appears in the phrase, "Join us – become a

member," at the end of the bulleted points outlining "Your first steps." By linking two action verbs together, the dash seems to "echo the sound of intimate discourse" as if to capture the "sound of an intense human voice in action" (133). That is, the *Sierra* Magazine captures the excitement of having their implied reader become involved by combining two modes of involvement: joining and becoming a member. The **«question mark»**, according to Gibson, "engages the assumed reader more than any other mark of end punctuation" (134). After showing "Your first steps" in an organized, bulleted list, the end of the welcome page asks: "Not sure what to do first?" as if to anticipate the reader's thought process. At this point, their involvement is emphasized—and, perhaps most important, is the fact that this appears at the end, thereby reinforcing the reader's role. Almost as if to say, "Reader, are you still there?" in attempt to keep the conversation going. An **«exclamation point»** is used within the first line as a friendly, general greeting. "Welcome to the Sierra Club!" the text reads. Used to "appeal to the reader by laying stress on the speaker's own excitement," this is especially useful in at the beginning of the page because it establishes a positive and friendly tone between writer and reader.

The next section transitions from the welcome page into actual *Sierra* Magazine text. Inspired by several above style categories that showed curious style distribution patterns across the text, this next grammatical analysis will isolate the beginning lines of several *Sierra* Magazine article to locate the tone established between writer and reader through style.

4.3.3 GRAMMAR ANALYSIS TWO:
Style in *Sierra* Article Openings

When accommodating knowledge for varied audiences, Oliu, Brusaw, and Alred instruct writers to "picture a typical representative of that group and write directly to that person" (69). This aligns nicely with Gibson's description of sweet style, where writes "talk as if they [know their reader] exceedingly well, and categorize [them] in specific ways" (76). Throughout many "Grapple" articles, the *Sierra* Magazine effectively applies a conversational, sweet tone to directly engage their intended readers. Table 4.4 shows a comprehensive view of article openings used to directly address, and create a role for, these readers. These articles were selected from the first lines of Grapple articles to illustrate how *Sierra* writers begin article conversations with their readers through style. The categories in Table 4.4 demonstrate how the relationship between writer and reader is developed through style. These results reveals two common techniques *Sierra* writers have used to directly address implied readers: (1) Writer poses reader with informal, conversational questions and (2) writers shares assumptions with their reader.

Table 4.4: Article Openings Addressing Intended Audience in *Sierra* Magazine articles.

Technique Addressing Reader	Issue Date	Opening Line of Article
Writer poses reader with informal, conversational question	July/Aug. 2010	OK, *Sierra* reader: How do you measure up?
	May/June 2010	Driven a stick shift lately?
	July/Aug. 2010	So you think you can manage without Delta smelt or Furbish's lousewort. But do you want to live in a world without apple pie and a cup of joe?

	Sept./Oct. 2009	You know how in gangster movies the hitmen dispose of the bodies by dissolving them in acid? That's what we're doing to all sea life.
	July/Aug. 2009	Pop quiz: Which ingredient in Coca-Cola uses the most water?
	Sept./Oct. 2008	Want to reduce your carbon footprint?
Writer shares assumptions with their reader	March/April 2009	We usually think of major appliances as being found in the kitchen, but there's a big bruiser in your living room (and, on average, 1.4 other places).
	May/June 2009	No one expects it to last forever, but as this goes to press, the U.S. environmental movement is in a state of connubial bliss with the man it labored so hard to put in office, President Barack Obama.
	May/June 2009	Everyone agrees that the nation's energy-transmission system needs a makeover.

Gibson regards questions, more than any other mark of end punctuation, as a technique that engages the assumed reader directly. "When you ask a question, you expect an answer," he contends. "Or at least you pretend you do" ("Tough, Sweet, and Stuffy" 133-4). Informal, sentence fragments such as, "Driven a stick shift lately?" and "Want to reduce your carbon footprint?" gives reader a chance to involve themselves in the text. These questions allow readers to silently respond and establish their own opinion before they begin to read the article. As they read the article, they are not simply reading the text for information; instead, they have already become involved with the

material through the rhetorical question opening the text, thus allowing them to much more easily step into the implied reader role.

The second approach uses deductive reasoning to establish a common belief uniting the *Sierra* Magazine and the implied reader. This technique seems to reassure the reader that the writer—and organization—are operating off the same assumptions with key phrases like, "We usually think," "No one expects," and "Everyone agrees." When a reader knows that a writer accommodating technical risks for them shares similar views, they are much more likely to accept the argument the article is making. This forged sense of shared knowledge established by the *Sierra* Magazine allows the implied reader to identify with the writer, gain trust in the credibility of the organization, and become persuaded by the knowledge. And, through these questions and common assumptions, readers will be more likely to become inspired to engage with the risks.

4.3.4 GRAMMAR ANALYSIS THREE:
A Close Textual Reading

Implied readers, as we discussed in Chapter Three, are created in the text by writers (Gibson). In a way, they are the idealized audience with whom the writer is having a conversation. The use of a sweet style is especially effective when accommodating scientific risks because it allows writers to set a conversational tone with their readers through the text. Now, rather than addressing a mass crowd of faceless public audiences across the country, the writer is able to, based on the general types of readers subscribing to the magazine, create a friendly reader with which they communicate. This first analysis will demonstrate how the categorically sweet style is

extended from the welcome page and used to address the implied reader within the article. Entitled, "Backyard Dioxin Factories: Household 'Burn Barrels' are Major Toxic Polluters," this text selection was premiered in the November/December 2009 *Sierra* Magazine issue.

The first paragraph, which opens with a "sweet" style, begins as if part of an ongoing conversation with the reader (Gibson). "Is that the smell of dioxin on the morning breeze?" asks the curious writer to the scientifically interested reader. "Don't be too quick to blame the neighborhood chemical factory, coal-fired power plant, or garbage incinerator, because it may well be coming from your own backyard," continues the writer, as if he lives in the same small American town as the reader. The writer communicates as if he knows the readers' thoughts and values, and further, writes as if he can identify with them. This helps to establish the writer's—and by extension, the *Sierra* Magazine's—ethos for the reader, who now knows that the person delivering the scientific information in the article *also* lives in a neighborhood with chemical factories, power plants and garbage incinerators, and also has a backyard. This writer is not somebody who is "reporting" information to their audience, but is conversationally sharing some scientific knowledge about environmental threats; one friendly neighbor to another.

The second paragraph opens with a statistic from the EPA to scientifically back the article's credibility, and to provide access to the scientific information. Yet, the friendly, level-headed neighbor enters again when the writer explains the concerns of "folks" not wanting to "drive long distances and pay for disposal" and their desire to

maintain their values of "self-sufficiency and pragmatism." The article is not simply reporting facts and information, but is explaining the values, concerns, and emotions linked to the facts and data. In Foss' terms, the article is essentially producing a different description of the "same [EPA fact-based] reality" (122). Only with a more audience-conscious approach.

While the third paragraph begins to get more in-depth with the scientific data and facts, even this is not overly technical or information-driven because each of the ideas are explained in ways with which readers can identify in order to understand how dioxins might personally affect them. In other words, dioxin risk is explained by their causes and their effects. This makes the science more applicable to the readers, and also makes the risk easier to imagine.

As evidenced through the examples examined so far, language in risk accommodation is central in creating an intended reader. Once established through sections such as the welcome page and openings lines of articles, writers have a good sense of how they can reconstruct technical terminology so that their readers can better understand scientific risks. The next analysis section will look at how diction shapes accommodation through both etymology and repetition of ideas.

4.4 ACCOMMODATION THROUGH DICTION

In this section, there will be two diction analyses demonstrating how diction changes between scientific articles and accommodated Sierra articles.

4.4.1 DICTION ANALYSIS ONE:
How Etymological Definitions of Words Influence Scientific Accommodation

Diction choices play an integral role in shaping scientific information and facts as they pass from the technical into the popular discourse. Not only do the words themselves change, but so do the meanings and associations constructed by these networks of words. This first diction analysis will investigate the article, "Woe Is Us: Ready, set, panic," featured in the July/August 2009 *Sierra* Magazine issue in relation to R.J. Schnell et al.'s study entitled, "Development of a Marker Assisted Selection Program for Cacao." This scientific study, sponsored by the U.S. Department of Agriculture (USDA) Subtropical Horticulture Research Station, was presented at the American Phytopathological Society's Symposium on "Cacao Diseases: Important Threats to Chocolate Production Worldwide."

While an etymological approach was the aim of this analysis, it came to fruition only after a preliminary categorical analysis targeting the terms, and related ideas, emphasized in the article. The words were grouped into four categories—which included numerical classifications, eating, disease, and scientific/technical terms adapted from the original study—the last of which was selected for a closer etymological analysis.

Table 4.5: Initial Categorical Diction Analysis for the Cocoa Disease Article.

47	Challenged	frosty	more	survey
59	change	fungi (2)	nasty	suseptible
70	Chocolate (2)	genetic	net	takes
1980s	climate	geneticist	Not (2)	them
adults	cocoa (3)	genome	numbers	Things
Africa (2)*	coexist	global	only	third
Agriculture	company	Happily	orbit	though
all	contain	Harris	out	tolerance
also	country	humans	percent (3)	Too (2)
Amazon	crop	Hundreds	planting	trees (6)
Amazonian	cut	importer	pod	turned
Americans	deadly	increasing	race	U.S. (2)
antibiotic	Department	Interactive	ravaging	USDA
appetite	destroyed	issues	Raymond	very
areas	dinosaurs	joining	reach	victim
asked	disease (2)	knew	recent	virus (2)
assessing	Doomed	large	research	We
attempt	earth	late (2)	resistant	weaker
basin	education	leading	Say	West
before	engineering	like (2)	says	what
blame	epidemic	literacy	scenario	when
bleak	exporter	little	Schnell	where (2)
Brazil	falling	long	scientific (2)	witches' (2)
broom (2)	Farmers	major	sequence	world's (2)
but	favor	marginal	So	worst
cacoa (4)	five	Mars	source	would
candy	found	may	stumped	year's
case	four	millions	sun	

*Number in parenthesis refers to number of times word is found within the text.

Key for Categories

Blue = Numerical (quantitative) classifications
Yellow = Eating; food; consumption
Green = Disease; negative connotation
Purple = Environmental; scientific [later broken into physical/abstract]

The first three categories were relatively predictable based on the context of the

study; the last category, on the other hand, was particularly curious in that the levels of

scientific meaning, which range from physical to abstract, demonstrated changes in abstraction and modality when compared with their counter-parts in Schnell et al.'s article. By looking at this last category of grouped words, this developed analysis does two things: it looks past the simple number of times words appear in the article as a means of targeting emphasized ideas, and in doing so, it moves beyond explicit conceptions of words into how implicit, etymological, patterns create changes in abstraction and modality. Important to note is that Table 4.6 does not intend to show synonymous terms between Schnell et al.'s scientific article and the *Sierra* article; instead, their juxtaposition aims to show how the technical and accommodated terms are loosely related.

Table 4.6: Second Categorical Diction Analysis for the Cocoa Disease Article.

Scientific term	Popular term
Fungal pathogens; fungal diseases	Nasty fungi
Confectionary industry	Candy company
Susceptible (to disease)	Very little tolerance; falling victim to
Disease resistant cultivars	Antibiotic-resistant diseases
Commercial cultivars	Farmers
Production of cacao has been severely affected	Deadly virus is ravaging cacao trees
Disseminate new, productive, disease resistant cultivators of cacao	Race to sequence cacao's genome
Vegetative broom resistance	Witches' broom

4.4.2   DICTION ANALYSIS ONE:
Anglo-Saxon vs. Latin Word Choices

The first example of this diction change is the *Sierra* Magazine's rewording of

Schnell et al.'s, "**susceptible** to" [disease], into "**falling victim** to" [disease]. As editors

strive to simplify diction and eliminate jargon, polysyllabic words are often substituted

with a series of words containing fewer syllables so as to explain technical ideas with

more familiar terms, and to make technical details less daunting than would alternatively

be used in scientific studies. When this happens, not only are there reductions in

syllables, but invariably, changes in meaning also occur. As with the definition of

"susceptible," this abstract verb signifies to being "capable of taking, receiving, being

affected by, or undergoing something" or "sensitive to; liable or open to (attack or

injury)." In contrast, the accommodated phrase "falling victim" is much more concrete.

"Falling," in its most general usage, has a negative connotation. In specific etymological

contexts, the tone is the same in defining words as "decreased, diminished, or reduced. "

The word "victim" communicates this same idea, with the definition, "one who suffers

severely in body or property through cruel or oppressive treatment." (Please refer to

Appendix A for the full etymological history of these words). Fahnestock points out this

change as a common scientific accommodation tendency to "leap to results[9]" by

replacing "the signs or data of an original research report with the effects of results"

(284). While this example demonstrates a mild diction change, the accommodated

version is, in effect, "increasing the significance and certainty of their subject matter" by

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[9] This accommodation technique, known as "the wonder appeal" in Fahnestock's research, will
discussed in more detail in the following diction analysis.

changing the non-definitive "capability" of being exposed to a disease to the concrete physical reality of "severely suffering" from a disease.

The second example of diction change refers to the words linked to the term "fungal" and "fungi" in Schnell et al.'s study and the *Sierra* Magazine article, respectively. The former of which uses words like "disease" and "pathogens" to modify fungal matter, while the latter uses the term "nasty" to refer to this same substance. Disease, like candy, has come to stand on its own as a definition because of its increased use as a definer, with examples like "disease-maker," "disease-causing," "disease-resisting," and "disease-spreading." Its escalation from "a slight disturbance, uneasiness and discomfort" in the early fourteenth century, to associations linked to "illness and sickness" in the later fourteenth century, demonstrate a conscious health focus (please refer to Appendix for full details on this etymological shift). The word "nasty" has similar originating roots as that of "disease," in that it has come to mean "disagreeable, objectionable, unpleasant, and annoying," yet it has not matured past this association into a health threat. Due to this change in diction, Schnell et al. maintain that the fungal "disease" is much more deadly to the cocoa trees than the *Sierra* Magazine's rather passive description of the fungus as unpleasant to the growth of the cocoa trees—but certainly not deadly!

Grammatically speaking, the transformation from the noun "pathogen" and adjective "nasty" demonstrates a clear example showing how accommodation ties values to certain ideas to "serve an epideictic purpose." This point can be further proven by the

initial categorical analysis in the study showing a pervasively negative tone throughout the article. (Please refer to Figure 4.4).

With its initial usage originating in 1880, pathogen refers to a "microorganism that causes disease." When this scientific, and comparatively objective, term is compared with the accommodated word "nasty," to describe the common linking word fungal/fungi, it attaches a negative connotation onto a word that was perhaps intended to be factual by the experts originating the research. In one of its earliest usages, "nasty" is synonymous with things that are "unpleasant, disagreeable; objectionable, offensive, and repellent." In using particular grammar choices to restructure scientific risks within a context more audience-appropriate, the accommodator inadvertently attaches a value to the scientific knowledge.

Similar to significant change in severity between "nasty" and "disease," the diction change between Schnell et al.'s description of the "production of cacao" as "severely affected" as compared with the *Sierra* Magazine's description of "deadly virus ravaging cocoa trees" shows a noticeable difference in modality between the two sources' descriptions concerning the effect of disease on cocoa trees. Not only has the wording changed, but the severity level of the fungus' impact on cocoa trees has been altered, as well.

4.4.3   DICTION ANALYSIS ONE:
Etymological Changes

Another example of this diction change is between the USDA term "confectionary" and the *Sierra* Magazine equated term, "candy," which appears as a fair equivalent in meaning. In defense of the *Sierra* Magazine's diction choice, the change from "confectionary industry" to "candy company" not only reduces their letter count by nine, but also reduces confusion about the type of "confectionary" to which the article refers.[10] Etymologically speaking, however, the word "confectionary" has historically referred to the art, or process, of making the product rather than to the product itself (for all intents and purposes of this paper, the final product can appropriately be called "candy"). The "confectionary" reference to all things sweet leaves room for ambiguity as compared with "candy," which has commonly been used to describe a measured product formed when refined sugar is mixed with boiling water.

"Confectionary" originated as an adjective in its early fifteenth century application as an art form and transitioned into noun usage as it came to be associated with final products as a result of the confectionary process (please refer to Appendix B for a more detailed etymological history). Despite this shift from art form to finalized product, the term "confectionary" remained linked with the art rather than a measured

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[10] "Confectionary" refers not only to commercialized forms of "candy," but more widely encompasses anything sweet that has been created by a less manufactured process (i.e. Danish pastry, Krispy Kreme doughnut, sweet meat). "Candy," on the other hand, moves further down the ladder of abstraction and refers to a more narrow range of sweets than produced by a "confectionary" process (i.e. Snickers, Reeses Pieces, Starburst). It would seem strange to refer to a gourmet Danish pastry as a piece of "candy" because its production is more of an art form rather than a process involving boiled water and sugar.

process, which has come to be more commonly associated with the term "candy." Through its increased usage within the nineteenth century, candy has retained a consistently adjectival use, and has been used to describe and define words like "candy-shop," "candy-cane," "candy-man," and "candy-striped." As "candy" has become linked to other words, it has in many ways becomes more concrete, thus moving down the ladder of abstraction, while "confectionary" has remained more ambiguous as it has maintained its link to an "art."

While "candy" certainly refers to the sweets manufactured at the Mars Candy Company—to which the USDA study directly refers—Schnell et al. are sure to refer to the "confectionary industry" as affected by the cocoa bean blight because not only would candy companies be affected, but also any industry that uses cocoa in any part of their production process.[11] In using the term "candy," the *Sierra* Magazine eliminates the possibility of any industry outside of a candy production company as being affected by the cocoa bean blight.

With pressure on editors to both adhere to specified word limits, while still pique their readers' interests with the most up-to-date scientific findings, the integrity of the original scientific meanings run the risk of being compromised. As the above examples have shown, the word and etymological changes from Schnell et al.'s USDA technical

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[11] This would include not only categorical "candy" companies, but any "confectionary industry" that uses cocoa beans as part of their process (i.e. pastry shops, Swiss Miss Hot Chocolate, cocoa bean lotion, coffee companies).

study and the *Sierra* Magazine's popular science article have a powerful influence on scientific accommodation. A comparative look at the diction across these two discourses shows how malleable levels of modality and layers abstraction become through style and word choices. The analysis on this short article demonstrates on a small scale how word choice reveals the layers of scientific accommodation across both explicit and implicit levels.

Examining the accommodation element of the wonder appeal—which was touched on briefly in this previous analysis—diction analysis two will explore how the certainty of rhetorical facts change through diction.

4.4.4   DICTION ANALYSIS TWO:
Adjusting Modality through Diction

This second diction analysis looks at how the very concise, 146-word *Sierra* Magazine article, "The Locavore's Dilemma" has been adapted from a dense seven-page scientific paper entitled "Food-Miles and the Relative Climate Impacts of Food Choices in the United States."

Through this diction analyses, this article demonstrates key ways that scientific accommodators move up and down the ladder of abstraction using diction to restructure technical ideas for their implied readers. Diction choice is crucial in audience adaptation because "when composing an article, a writer must initially define their purpose and audience so that they can "select term[s] that [are] neither too general nor too specific for the context" (Oliu, Brusaw, and Alred 119).   As we have found in the welcome page and analyses of several articles with depicted sweet styles, a diction analysis with this

article will show how readers step into a role to learn about and engage with a scientific risk. Due to the amount of technical words carried over from the original scientific study, this *Sierra* article was selected for analysis to see how diction strikes the balance between readers' general understanding of the risk with specific expert terms.

The first example, like the grammatical analysis of *Sierra* article openings, uses the introduction to place the risk discussed within implied reader concern. The change from "recent public concern" to "recently many concerned eaters" personalizes the risk for the reader. This helps ground the severity of the risk within local, reader interests.

Table 4.7: Diction Analysis for "The Locavore's Dilemma."

Scientific term/phrase	Popular term/phrase
Recent public concern	Recently many concerned eaters
Food Miles = "roughly a measure of how far food travels between its production and the final consumer"	Food Miles = "the number of…miles their meals have to travel between farm and fork"
"Nitrous oxide (N_2O) emissions, mainly due to nitrogen fertilizer application, other soil management techniques, and manure management"	"Nitrous oxide [is] released in the growing of cattle feed"
Methane (CH_4) emissions are mainly due to enteric fermentation in ruminant animals (cattle, sheep, goats) and manure management"	"Non-CO_2 gases include methane, which cows burp"

The degree of certainty changes between the Food Miles scientific study definition and *Sierra* Magazine article. The indefinite scientific statement, "**roughly the measure** of how far food travels," is transformed into the much more definitive *Sierra* Magazine statement: "**the number** of miles meals have to travel." The scientific study statement contains "modalities which draw attention to the generality of available

evidence" to resist making any definitive claims based on the research (Latour and Woolgar, "Statement Types" 78); the Sierra Magazine, in an attempt to show the research findings as concrete, uses the "wonder appeal" to "add significance to a subject by claiming its uniqueness, its one-of-a-kind status" (Fahnestock 280). Fahnestock describes the wonder appeal as a tactic exercised by scientific accommodators "to make their readers marvel at a detail within the research, science accommodators "leaves out any mention" of opposing details to "make his subject seem more wonderful." In doing so, the accommodator is "not telling an untruth; he simply selects only the information that serves his epideictic purpose" (Fahnestock 281). In the *Sierra* article, the writer states: "While there are many fine reasons for doing so" to deflect the attention from the two other factors contributing to food miles (production and distribution). Instead, the *Sierra* article draws attention to the findings as hand when it reads: "Transportation **turns out** to account for…" Coupled with the use of relative qualifiers, greater and only, the article constructs an overarching hierarchy of ideas throughout the article, which dictates that the effect of greenhouse gas usage on food transportation is subordinate to food consumption, which is subordinate to red meat consumption. In order to see the relationship between all these ideas, the line reads: "The transportation of food turns out to account for **only** 11 percent of its greenhouse-gas emissions…food production is a much **greater** factor—especially that of red meat."

The scientific compounds Nitrous oxide (N_2O) and Methane (CH_4) are also described in concrete terms when compared with the scientific study. As Table 4.7 indicates, the accommodated article uses specific animals (cows) to explain the cause of

the two emissions gases, while the scientific article uses abstract terms such as "fertilizer application, soil management techniques, and manure management" to describes the cause of the emissions. Even the description of Methane in the scientific study uses "**ruminant animals**" to describe "**cows**" and "**enteric fermentation**" to describe what "**cows burp**."

Another intriguing diction change between the original scientific research and the *Sierra* article is the omitted definition for "carbon footprint." The scientific study describes "carbon footprint" specifically as "a measure of the total consumer responsibility for greenhouse gas emissions," while the *Sierra* Magazine attaches no definition to the term. Allowing reader to infer their own meaning from the context, the article states: "Switching from beef to veggies one day a week, the researchers figure, would reduce your carbon footprint more than if you bought all of your food locally." Heavy with a sweet style, the writer addresses the implied reader (*you*) three times in order to personalize the technical term "carbon footprint." With the scientific definition removed, "carbon footprint" in the *Sierra* article becomes accepted as a "factual and established" idea that requires no support (Latour and Woolgar, "Statement Types" 76). The structure of the sentence defines "carbon footprint" by a cause and effect relationship. That is, if the reader switches from beef to veggies, then their carbon footprint will be reduced. Through these simple diction changes, the positioning of words within the sentence structure actually defines—and accommodates—this technical term. Perhaps the reader may not understand the complicated definition of "carbon footprint;" instead, they will know that on their next trip to the grocery store to purchase

veggies for dinner over beef, they are consciously reducing their carbon footprint.[12] In

the interest of accommodating technical definitions for public audiences, this diction

change is especially useful because it gives the reader a specific responsibility in

responding to the risk. Similar to the welcome page, where a bulleted list gives readers'

specific ways to become involved with the organization, this diction accommodation

provides readers specific ways to, not only learn about the risk, but also engage with it by

making conscious lifestyle decisions.

While these two diction analyses have demonstrated how technical words are

shaped for audience and purpose, these next three analyses will demonstrate how

metaphor acts as a "device available to the scientific community to accomplish the task of

accommodation of language to the causal structure of the world." Boyd credits this

stylistic technique as a valuable "procedure aimed at accommodation of linguistic usage."

Metaphors, he explains, play a "role in the development and articulation of theories in

relatively mature sciences" by introducing "theoretical terminology where none

previously existed" (2: 492).

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[12] An interesting question to consider: Why did *Sierra* focus exclusively on the switch from red meat
to vegetables versus other possible comparisons? According to Weber and Matthews' scientific study,
switching from red meat to a chicken/egg/fish diet would have nearly the same impact on food miles
as a switch to a fruit/vegetable diet. Speculatively, this focus could be attributed to Sierra's 100-700
word editorial article guidelines, which would not allow sufficient room to discuss all possible
consumer choices. Or, perhaps this accommodation is linked to the root of this study: the priorities
held by implied *Sierra* readers. Indeed, this beef versus vegetable dichotomy may reflect values held
(or assumed to be held) by *Sierra* readers, many of whom might be vegetarians, or else, sympathetic
to this dietary choice. If this same *Sierra* article indicated that a consumer switch from red meat to
chicken reduces one's carbon footprint, it might not resonate as strongly with implied *Sierra* readers.
In the Future Studies section of this thesis (Chapter 5.3), a suggested expansion discusses the
examination of how focuses of scientific articles are selected for accommodation in popular science
articles.

4.5   ACCOMODATION THROUGH METAPHOR

A common objective across these metaphor analyses will be to see how ideas and terms are situated within the article in order to explain technical ideas for public audiences. While word hyphenation and definition abbreviations may be justified by stringent *Sierra* Magazine editorial guidelines, my interest in these analyses is looking beyond these issues; my focus will be on how networks of scientific ideas are constructed. Through the analyses that follow, I intend to address the question: As technical information in scientific reports from organizations like the Environmental Protection Agency (EPA) become adapted to *Sierra* Magazine articles, how do the ideas become reshaped through metaphor?

Especially instrumental in answering this is Foss' discussion of metaphors as forms of argumentation. "When seen as a way of knowing the world," writes Foss, "metaphor does not simply provide support for an argument; instead, the structure of the metaphor itself argues. The metaphor explicates the appropriateness of the associated characteristics of one term to those of another term and thus invites an audience to adopt the resulting perspective. If the audience finds the associated characteristics acceptable and sees the appropriateness of linking the two systems of characteristics, the audience accepts the argument the metaphor offers" (301-2). Using this discussion of metaphorical arguments as a framework for analyzing the following *Sierra* Magazine articles, I will examine how these articles structure an accommodated understanding of technical knowledge for public audiences.

Boyd's discussion of language as epistemic access provides a backdrop to the larger question of how metaphors function within the *Sierra* Magazine. George Lakoff and Mark Johnson's discussion of orientational metaphors will enhance my understanding of how systems of concepts are organized in relation to one another, while Penrose and Katz's discussion of how metaphors can be used to adapt information for audience understanding—specifically through the ladder of abstraction—will further enrich my analysis.

4.5.1 METAPHOR ANALYSIS ONE:
Increase and Decrease through Orientational Metaphors

The first *Sierra* Magazine artifact used to show metaphor as accommodation comes from the July/August 2009 issue. Focusing on the economic recession's influence on the environment, the article, entitled, "Green Lining to the Recession: Is there an Upside to the Downslide?" also uses orientational metaphors to "organize a whole system of concepts with respect to one another" (Lakoff and Johnson 14). Using opposite terms relating to increases and decreases, as well as positives and negatives, the style of the article emulates what it says, which helps reinforce the main idea shaped by the author. Linking words associated with increases and positives, such as "consume, contraceptives, vegetable seeds, canning and freezing supplies, and recessions" creates an associated relationship between these words, while words affiliated with decreases and negatives, such as "IRA, bank balance, oil consumption, drilling for oil and gas, bottled water consumption, demand for beef, and deforestation" forge a connection between these ideas.

Table 4.8: Orientational Metaphors from, "Green Lining to the Recession"

Positive / Increasing Associations	Negative / Decreasing Associations
Silver lining to economic downturn	*Shrinking* IRA
Recessions are *great*	*Dwindling* bank balance
Consume *more*	Economic *downturn*
Contraceptives *up*	Greenhouse-gas *heavy*
Vegetable seeds have *risen*	Consume *less*
Sales of canning & freezing supplies have *increased*	Oil consumption…projected to *decline*
Adjustments can *continue*	*Fewer* tons of carbon dioxide
Economy has *recovered*	Drilling for oil & gas is *down*
	Smaller families
	Reduce waste
	Bottled-water consumption has *fallen*
	Demand for beef is *down*
	Drop in deforestation
	Economic *disaster*
	Renewable energy & green technology is *down*

As a result, recession-related adaptations are framed as positive, while all other practices that are being left behind due to the recession are depicted as negative. This binary split is clearly depicted in Table 4.8.

In Foss' discussion of how metaphors "organize attitudes towards whatever they describe," she states that they "contain implicit assumptions, points of view, and evaluations" (301). While this article uses orientational metaphors to pit two groups of ideas against one another to show the relationship between them, the quotes selected also grant "passive epistemic access to the referent of that term by deferring to the relevant experts," (Boyd 1: 389) who also use orientational language to orient particular ideas. For example, Christopher Knittel, an economics professor at the University of California at Davis uses the spatial adjective "great" to describe recessions, and the adjective "more," which indicates increase, to refer to consumption. Using the same strategy, John Whitehead, the professor of environmental economics who is also quoted in the article, describes the economy in a positive light as eventually being "recovered" as well as a "great" opportunity. By constructing these referential systems, these experts are assigning values to the ideas which they talk about, which helps to reveal their "attitudes towards whatever they describe" (Foss). Through language, the *Sierra* Magazine establishes a structure of concepts as a means of orienting ideas that the article discusses in relation to one another.

The next analysis, which also uses orientational metaphors to structure opposite ideas within the article, opposes physical and abstract concepts to explain biofuel in more tangible terms for public audiences.

4.5.2 METAPHOR ANALYSIS TWO:
Attacking the Biofuel Issue

In the September/October 2008 article, "Biofuel Takes a Beating," the issue of biofuel, which has ignited passionate disagreements between several developing countries and the United Nations (UN), is defined in relation to two primary metaphor categories: Attacking and Orientational. Both of these metaphors work in concert with one another to engage readers with issues concerning biofuel and to show relationships between the concepts contributing to the science.

While this article is not overly technical in its explanations, it does communicate a great deal of knowledge about how factors relating to biofuel influence one another. While scientific accommodation remains a challenge for popular science writers, there are two main goals off of which accommodators must work: to help readers develop knowledge based their understanding and to generate knowledge. In this way, Orientational and Attacking metaphors, as demonstrated by this analyzed article, have a strong influence on the transformation of scientific information and perception of accommodated knowledge.

4.5.3 METAPHOR ANALYSIS TWO:
Attacking Metaphors

The attacking metaphors are the most obvious as well as the most controlling throughout the article. Rather than rigidly listing the viewpoints and opinions of the two leading groups (the UN and developing countries), the *Sierra* Magazine structures the presentation of biofuel viewpoints through this metaphor, thus giving the article a more interactive approach. This predominant metaphor uses war-like language to create

interplay between the opposing groups entering the attack on biofuel. This helps to not only accommodate the science behind the biofuel issue, but also engages the reader with the text. The *Sierra* Magazine describes how the opposing groups advance towards one, united problem, using their arguments on the issue as weaponry to "**gang up** on" and "**beat**" the issue of biofuel. Rather than pitting opposing groups against one another, the article uses biofuel as the piñata of attack in order objectively convey the arguments for or against it.

The article begins with the developing countries initiating the battle, as they "le[a]d **the charge**" against their opponents. This first shot fired, so to speak, introduces the conflicting arguments on the issue of biofuel and briefly outlines the premises held by each group. After the initial attack, the UN defense responds by "**muster**[ing] a vague promise to study the impact of biofuel production." And so begins the interplay between the opposing groups. The triumphs and defeats of each group are described in battle terms, which further put into perspective the wins and the losses of each viewpoint. The UN is described as having "**won the skirmish**," but "**losing the battle**" to put into perspective how far-reaching this issue spans. The ragging on biofuel gains intensity as the "**heavy hitters**" Kellogg's, Tyson Foods and Kroger "**join to fray**" in order to take a hit at the issue of biofuel. The interaction of the opposing viewpoints on the central issue of biofuel shows the neutrality that McManus strives for in reporting, as he both engages his readers with objective reasons concerning biofuel and does so with a captivating style.

4.5.4 METAPHOR ANALYSIS TWO:
Orientational Metaphors

The second category, Orientational Metaphors, occurs frequently, yet more invisibly throughout the article. As another form of personal engagement with the text, the *Sierra* Magazine links physical actions with abstract concepts to emphasize relationships between elements contributing to biofuel. The "fuel **outcompet[es]** food for precious agricultural land"… "corn ethanol" has "**caused food prices to increase**"… the "biofuel push has **raised** world food prices." How can corn ethanol physically cause food prices to increase? Are there no other factors at play? Rather than muddling the article with these other details, the *Sierra* Magazine creates direct causalities through metaphor. These orientations show the relationship of power between two factors to demonstrate exactly how biofuel and corn ethanol contribute to food prices and, in the case of fuel, how biofuel contributes to the competition for land.

Like the biofuel article, this next analysis uses metaphor to accommodate specific, technical knowledge about dioxins from burn barrels into specific ideas relatable to *Sierra* Magazine implied readers. Metaphor allows these readers to access epistemic access circulated between experts and, through accommodation, invites them to actively learn about and engage with the risk.

4.5.5 METAPHOR ANALYSIS THREE:
Accommodating Epistemic Access through Metaphor

Written for the November/December 2009 *Sierra* Magazine issue, the article, "Backyard Dioxin Factories: Household 'Burn Barrels' are Major Toxic Polluters," addresses the risk of dioxins emitted from the burning of household trash. Adapted from

the U.S. Environmental Protection Agency (EPA) major scientific report entitled,

*"*Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin

(TCDD) and Related Compounds," which has become commonly referred to as the EPA

dioxin reassessment. From this report, the scientific data in the article entitled,

"Backyard Dioxin Factories: Household 'Burn Barrels' are Major Toxic Polluters,"

becomes repositioned to appeal to the human concerns of the magazine's public

audience. One strategy used by the *Sierra* Magazine to achieve this effect is through

metaphor.

The term "dioxin" becomes the referent throughout the article, giving this word a

high level of "presence" (Perelman 1982) within the text in order to reinforce the idea in

readers' minds. In conjunction with this repetition, metaphor works throughout the

article to define the attributes of dioxins as they affect the health of the readers' of the

article. Foss' discussion on how language constructs meaning through metaphor explains

this idea well when she writes:

> We do not perceive reality and then interpret or give it meaning. Rather, we
>
> experience reality through the language by which we describe it; it is whatever we
>
> describe it *as*. Metaphor is a basic way by which the process of using symbols to
>
> construct reality occurs. It serves as a structuring principle; focusing on particular
>
> aspects of a phenomenon and hiding others; thus, each metaphor produces a
>
> different description of the 'same' reality. (300)

The EPA describes dioxins in their scientific report using language "unobstructed by

emotions [and] values" (Katz, 2008, 169), while the *Sierra* Magazine must consider their

readers' "goals, concerns, and emotions" when reporting the risks associated with dioxins. These considerations help situate the readers' general understanding of the risk in relation to technical knowledge.

By relating dioxins to everyday concepts that "extend the senses" (Boyd 1: 382), such as morning breeze, the use of metaphor is especially effective because it disseminates expectations for fresh, brisk, and clean air, and instead replaces it with a breeze wafting with dioxins. This metaphor uses something which "most speakers of English can report the presence of" to allow readers to visualize a risk affecting the very air they breathe (Boyd 1: 383). The use of metaphor to describe dioxin ashes as "toxic soup" also helps readers to visualize the viscosity of the dioxin as it "contaminat[es] soil and leach[es] into drinking-water sources." Moving these descriptions down the ladder of abstraction assigns more tangible comparisons to how dioxins manifest themselves (i.e. through air and liquid form) and allows readers to imagine how they will be affected on an everyday basis. Or, as Penrose and Katz write, metaphor of this type helps to serve as an indication of how "a phenomenon is similar to…other phenomena the audience is more familiar with" (216).

The U.S. Food and Drug Administration's (FDA), "Questions and Answers about Dioxins," based on the EPA scientific report, states that, "Dioxins decompose very slowly in the environment and can be deposited on plants and taken up by animals and aquatic organisms. [They] may be concentrated in the food chain so that animals have higher concentrations than plants, water, soil, or sediments" (FDA). Using this scientific information on which to base their article, the *Sierra* Magazine explains that "when

dioxin lands on plants that are later consumed by livestock, it bioaccumulates and is passed on to those who eat meat, eggs, and dairy products." This accommodated sentence explains the same idea as does the technical source, but in a far more specific way in order to demonstrate the tangibility of dioxins through the food chain. This description makes it easier for readers to visualize the specific types of meat, eggs, and dairy products they purchase and put on their refrigerator shelves. Because this article instigates the associated link between dioxins and meat, eggs, and dairy products, it is likely that, the next time a reader of this article is perusing their local grocery store for their preferred "Born Free Organic Free Range" brand of eggs, they will consciously make the connection between those items and the dioxins they read about in the article, which will prompt them to make a more conscious decision about their food purchases.[13]

By moving down the ladder of abstraction, the *Sierra* Magazine article accommodates the generality of "food" described on the FDA's "Questions and Answers about Dioxins," and further prompts the reader to make a more personal connection to their own "meat, eggs, and dairy product" purchases. If the word "food" had been left in place of these three specific products, the connection would have perhaps been not as

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[13] This *Sierra* article makes clear the importance of consumer food choices in food items with the highest risk for dioxin bioaccumulation, such as "meat, eggs, and dairy products." One important question unexplored in the article is: What is the better food purchase decision—eggs from organic, free range or industrial battery-caged chickens? When burn barrel dioxins waft through the air and settle on food chickens eat, it seems likely that chickens in both environments would be equally susceptible to contamination. It could be further argued that, because free range chickens are often raised in rural areas with abundant burn barrels, the eggs from these free range chickens might have higher dioxin levels than chickens raised in industrial battery-caged environments. Although the article recognizes risks associated with consuming meat, egg, and dairy products exposed to dioxin bioaccumulation, there is no firm basis for deciding which consumer choice would be safer.

strong, or personally meaningful, to the reader. By providing a reference in which

dioxins affect readers on a personal, consumer-choice level, the threat of dioxins goes

from being an abstract, eminent threat to which "almost every living creature has been

exposed" (FDA) to an issue that affects the food choices that readers make on an

everyday basis. In creating a personalized association between the readers and the

science, the *Sierra* Magazine forges, what Richard Boyd calls, "socially coordinated

epistemic access" (2: 382). While Boyd is talking about expert scientific theory, we also

can adapt the notion of social epistemic access to apply to accommodated versions of

science as well. The reference to the technical science becomes placed in a more

personably oriented position to the reader so that they can understand how the science of

the risk in dioxins affects their own health.

Another example of accommodation in this *Sierra* Magazine comes from, perhaps

the most scientific line, in the article: "Most of the dioxin from burning trash comes from

petroleum-based plastic and polystyrene, which also releases benzene, lead, arsenic, and

PCBs into the air," reads this technical and complex sentence. Because this line is

embedded in the article between the discussion of values—with which readers can

identify—and the effects of science, it does not come off as being explicitly technical or

overwhelming. In fact, due to its placement, this line actually builds on readers'

understanding because, even if they do not know what benzene, lead, arsenic, or PCBs

do, or what their individual effects are—as most readers probably won't, unless they have

had some toxicology background—they will be able to infer meanings based on the

effects of the dioxins. This way, the article is not only informing the reader of scientific data, but actually teaches information, thus making it a more interactive learning process.

The abbreviation of PCBs also helps readers forge a familiarity with the science. Rather than using the term, Polychlorinated biphenyl, the article creates an abbreviated association that a reader can more easily recognize if they see or hear it anywhere in the future. This list not only creates a recognizable relationship *between* the four emissions in the air, but also establishes a reader's recognition *with* these four items.

The *Sierra* Magazine uses metaphor as a common form of scientific accommodation in order to make the scientific and technical information more relatable to their readers, and to also orient ideas in relation to one another. By organizing the articles by their metaphorical structures, it is possible to make opaque not only the model of communication used within the article, but also the relationship between ideas in the text. Classification of major tenors and vehicles is especially revealing, for it serves, according to Foss, as an "index to how the rhetor sees the world" (Foss 160). Metaphor not only establishes relationships *between* ideas in text, but also establishes relationships *with* readers of the text.

Chapter Five

DISCUSSION

5.1   Research Benefits

With the addition of style and metaphor onto Fahnestock's scientific accommodation research, the findings from this study are helpful for rhetoric as a discipline because it demonstrates practical examples of style changes and the relationship between levels of readers. These findings are also beneficial for writers and editors in practical industries who are faced with the challenge of accommodating technical risks of public audiences. By understanding who their real readers are, writers will be able to select word choices and vocabulary their audiences are able to understand (diction), and ideas with which they can identify (metaphor). Additionally, because language has not been explored much in risk communication studies, this study is valuable for risk scientists to see how their studies are transformed as they become accommodated.

5.2   Study Limitations

Once data leaves the scientific field, no two interpretations—or adaptations—are the same. The accommodated text mediates between scientists and public audiences; the construction of which is guided by editorial stylistic controls on an organizational level and each writer's stylistic choices within each article on a local level. Both are ultimately linked by the same goals. The writer reinforces the implied reader role mandated by the organization to appropriately inform and appeal to public audiences who can financially support the organization. And so the cycle continues. The *Sierra* Magazine organization creates a reader; the text reinforces these roles; if the text is successful, the readers

financially sustain the organization. Grammar, diction, and metaphor analyses help reveal the controlling influences of style in the *Sierra* Magazine, which demonstrates how quantitative guidelines (word limits) and qualitative (composition and editorial) processes shape scientific accommodation. While the interviews with *Sierra* editors in this study provided enlightening descriptions of implied readers, these insights did not speak to the real readers. When accommodating text to real readers, writers "analyze the readers' needs and defer to them;" implied readers, on the other hand, are "invented and determined audiences within the text" (Thralls, Blyer, and Ewald 47). A study more focused on audience of popular science publications, specifically, might be helpful in differentiating between real and implied reader needs, values, and knowledge.

In addition to audience, the conclusions drawn from this study could also be expanded from the limited insight on the context influencing the accommodation process. The analyses used to measure grammar, diction, and metaphor in this study were based on objective research methods showing how style changes from scientific to popular texts; as such, these analyses are somewhat isolated from the processes shaping them. These style analyses were informed by interviews with *Sierra* writers and editors, who provided rich insight into many dimensions of the accommodation process; interactions, however, were limited to email correspondences and telephone conversations. With funding—which this study did not support—visits to the *Sierra* Magazine headquarters in San Francisco, California, could allow for a study following in-house *Sierra* documents through the editorial structure to see the first-hand process of risk accommodation within the magazine.

A more expansive study—with sufficient funding and resources—might explore style changes from the original, technical document to the final, accommodated popular science magazine article. Questions listed in Appendix B set up these conversations with experts; if a study expanded to this, it would be a profitable perspective to the larger process of accommodation.

Finally, while this study certainly improves our understanding of risk accommodation across a large span of articles, a future follow-up study might allow for a larger sample. After the articles selected for style analyses in this study were subset by technical risk topics and criteria suitability, the sample size ended up being rather small. If this study had pulled from a larger collection of articles directly applicable to risk, the initial sample size would encompass a more expansive range of scientific risk topics.

This next section will discuss how several dimensions of this study can be expanded to encompass a richer understanding of accommodation and its intersection with risk communication.

5.3   Expanding this Study

This study was privileged enough to have been influenced by expert perspectives within both rhetorical and scientific fields of study. As such, the inspiration for extensions for this study reflects the multidisciplinary interests of these thesis reviewers.

An interesting consideration that surfaced throughout the evolution of this thesis was the important question: Are *Sierra* writers introducing inaccuracies as they accommodate scientific risks for their readers? This study focused on the function of style in

accommodation; a future study might explore more closely how scientific knowledge itself changes from technical documents to popular science articles. While this study briefly investigated the tension affiliated with accommodating technical accuracy versus general public comprehension of risks, a study with more focused attention towards this crucial balance would make a valuable contribution to the fields of accommodation and risk communication. Extending from this inquiry, it might also be beneficial to study which selections of technical documents are chosen for emphasis within *Sierra* articles. (Footnote 12 in Chapter 4 prompts an important question about this issue and sets up a good starting point for this exploration).

In defining the general term "audience," this study made an important distinction between real and implied readers to show how both influence the creation of accommodated *Sierra* articles. While descriptions of real readers were depicted within *Sierra* writer/editor interviews, a future empirical study interviewing and surveying real readers could offer a stronger, first-hand understanding of how they understand accommodated risks in *Sierra* articles. A more focused audience study could administer surveys to, and conduct interviews with, collegiate *Sierra* readers to understand how risks are both accommodated for these real readers through style and to decipher how the electronic dimension of the magazine provides them with more a involved role with the technical risks accommodated in *Sierra* articles.

While this study closely examined the way style accommodates technical risks descriptions for real and implied readers of the *Sierra* Magazine, the same methodology employed in this study could also be applied to the original, scientific documents to fully

understand the observed accommodation process. Attention to the type of technical document (i.e. bulletin, peer-reviewed scientific journal paper, etc.) and the implied or real reader for each type of text would shed light on how style influences technical documents within a different context.

Another advantageous approach to this study might be the application of additional stylistic methods. While this study applied three stylistic tools to show how language operates in the scientific accommodation process, the potential for other stylistic approaches remains promising. Figures of speech analyses could show how rhetorical principles, such as parallelism, repetition, addition, variation, and omission (Quinn), shape scientific terms and ideas for public audiences, while the application of Aristotle's 28 special lines of arguments may serve as a good tool to explore accommodation strategies (Walsh). Discussions of modality, nominalizations of actions and processes, as well as speech acts, might also shed interesting light on the way accommodation works in risk communication.

To further explore the electronic dimension of accommodation touched on in this thesis, a future information design study could investigate how social media tools might help audiences further engage with scientific risks. Blogs, for example, would enhance public audience response and would allow *Sierra* readers to have a more involved role in the two-way communication approach between them and scientific experts. Examination of how these open-ended social network systems enhance accommodation, and give public audiences access, could help further demonstrate how electronic mediation fosters an interactive, rhetorical model of communication.

5.4   Looking Forward: Placing the Implications of this Study into a Larger Scope

Risks concerning burn barrels, food miles and cocoa bean blights aimed at readers with an "environmental interest" in scientific topics may seem minor in risk-intensity, but if larger issues escalate these low-intensity risks, the implications become increasingly drastic in scope. When high dioxin levels affect the health and wellbeing of residents in neighborhoods with heavy concentrations of burn barrels, or when escalated cocoa bean blights collapse economic markets relying on this crop, the environmental and science risks found on the pages of the *Sierra* Magazine become social and health issues that affect experts and public audiences alike.

For these cases, a rhetorical model of communication between experts and public audiences is crucial. Accommodation of scientific risks through grammar, diction, and metaphor afford both spheres the ability to share and engage about risks through an open network of communication.

APPENDICES

Appendix A

Etymological Analysis from "Woe Is Us:
Ready, set, panic," article, featured
in the July/August 2009
Sierra Magazine

Word	Etymology*
Confectionary	- Of the nature of a confection, comfit, or sweetmeat; of or pertaining to confections or confectioners' work. [1669] - A maker of confections; a confectioner. [1641] - Confectioner's art.[1774]
Candy	- Crystallized sugar, made by repeated boiling and slow evaporation [1420] **1769** <u>MRS. RAFFALD</u> *Eng. Housekpr.* (1778) 241 To a pound of double refined sugar put two spoonfuls of water, skim it well, and boil it almost to a candy, when it is cold, drain your plums out of the first syrup, and put them in the thick syrup. *Comb.*, as **candy-girl**, **-merchant**, **pink**, **-shop**, **-stall**, **-store**, **-woman**; **candy-coloured**, **-pale** adjs.; **candy-braid** (*U.S.*), a twist of candy or toffee; **candy-broad sugar** (*Sc.*), 'loaf or lump sugar' (Jam.); **candy butcher** **1880** <u>PATTERSON</u> *Antrim & Down Gloss.* (E.D.S.) *Candy-man*, a rag-man. These men generally give a kind of toffee, called 'candy', in exchange for rags, etc.
Company	- Companionship, fellowship, society; *to keep company* (*with*): to associate *with*, frequent the society of; *esp.* (*vulgar* and *dial.*) to associate as lovers or as a lover, to 'court'. [1598] - Sexual connexion.　　Eg:　*c*1386 <u>CHAUCER</u> *Knt.'s T.* 1453 Noght wol I knowe the compaignye of man. - Persons casually or temporarily brought into local association, travelling companionship, etc. More loosely, with the notion of companionship obscured, 'People such as prevent solitude or privacy'; and so applicable to a single person. - A body of persons combined or incorporated for some common object, or for the joint execution or performance of anything; *esp.* a mediæval trade guild, and hence, a corporation historically representing such, as in the London 'City Companies'. [1389]
Industry	- Intelligent; skill, ingenuity, dexterity, or cleverness. *House of industry*, a workhouse. *school (✝college) of industry*, a school in which various industrial occupations are taught; an industrial school. [1696] - A particular form or branch of productive labour; a trade or manufacture.

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Disease	▪ A cause of discomfort or distress; a trouble, an annoyance, a grievance.[1386] ▪ Absence of ease; uneasiness, discomfort; inconvenience, annoyance; disquiet, disturbance; trouble. [1450] ▪ The condition of being (more or less seriously) out of health; illness, sickness. [1788] ▪ *Comb.*, as **disease-germ**, **-maker**; **disease-causing**, **-producing**, **-resisting**, **-spreading**, etc., adjs. [1890]
Nasty	▪ Filthy, dirty [1390] ▪ Of a thing: unpleasant, disagreeable; objectionable, annoying. In recent use freq. in heightened sense: offensive; repellent. [1548] ▪ Of weather: bad, unpleasant, wet. [1634] ▪ *Brit. regional*. Of a person (also occas., a piece of writing): ill-tempered, spiteful, unkind (to someone). [1825] ▪ nasty [Online Etymology Dictionary] c.1400, "foul, filthy, dirty, unclean," perhaps from O.Fr. nastre "bad, strange," shortened form of villenastre "infamous, bad," from vilein "villain" + -astre, pejorative suffix, from L. -aster. Alternative etymology is from Du. nestig "dirty," lit. "like a bird's nest." Likely reinforced by a Scand. source (cf. Swed. dial. naskug "dirty, nasty"). Of weather, from 1634; of things generally, "unpleasant, offensive," from 1705. Of people, "ill-tempered," from 1825.
Pathogen	▪ A microorganism that causes disease. [1880]
Susceptible	▪ Const. *of* or *to*: Capable of taking, receiving, being affected by, or undergoing something. [1605] ▪ Capable of, or in fit condition for (doing something). [1829]
Falling	▪ To be taken ill *of* (a disease). [1538] ▪ To decrease, diminish, or become reduced. [1580] ▪ To come to ruin, perish. [1780]
Victim	▪ One who suffers severely in body or property through cruel or oppressive treatment. [1660] ▪ One who is reduced or destined to suffer under some oppressive or destructive agency. [1718]

*All definitions found in the *Oxford English Dictionary*, unless otherwise specified.

Appendix B

Internal Review Board Approval Email and Approved Research Application

Dear Dr. Katz,

The chair of the Clemson University Institutional Review Board (IRB) validated the protocol identified above using exempt review procedures and a determination was made on October 5, 2010, that the proposed activities involving human participants qualify as Exempt from continuing review under Category B2, based on the Federal Regulations (45 CFR 46). This exemption is valid for all organizations with a research site letter on file with the IRB. You may begin this study.

Please remember that the IRB will have to review all changes to this research protocol before initiation. You are obligated to report any unanticipated problems involving risks to subjects, complications, and/or any adverse events to the ORC immediately.

We also ask that you notify the ORC when your study is complete or if terminated.

Please review the Responsibilities of Principal Investigators (available at http://www.clemson.edu/research/compliance/irb/regulations.html) and the Responsibilities of Research Team Members (available at http://www.clemson.edu/research/compliance/irb/regulations.html) and be sure these documents are distributed to all appropriate parties.

Please let us know if you have any questions and use the IRB number and title in all communications regarding this study. Good luck with your study.

All the best,
Nalinee

Nalinee D. Patin
IRB Coordinator
Clemson University
Office of Research Compliance
Institutional Review Board (IRB)
Voice: (864) 656-0636
Fax: (864) 656-4475
E-mail: npatin@clemson.edu
Web site: http://www.clemson.edu/research/compliance/irb/
IRB E-mail: irb@clemson.edu

Exempt Review Application

Clemson University Institutional Review Board (IRB) **(Version 3.1.2010)**

Clemson University IRB Website

Office use only	Protocol Number: ▓▓
☐ Approved Exemption Category _____	
_____ Signature of IRB Chair/Designee	_____ Date

1.	**Developmental Approval:** If you already have developmental approval for this research study, please give the IRB protocol number assigned to the study. More information available here. ▓▓

2.	**Research Title:**	Style and Electronic Communication: The Accommodation of Scientific Risks in the Sierra Magazine
	If different, title used on consent document(s)	▓
	If class project, include course number and title	▓

3.	**Principal Investigator (PI):** The PI must be a member of the Clemson faculty or staff. You cannot be the PI if this is your thesis or dissertation. The PI must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here. CITI training site available here.	
	Name: Dr. Steven B. Katz	☒ Faculty ☐ Staff
	Department: English	E-mail: skatz@clemson.edu
	Campus address: 602 Strode Tower	Phone: 864.656.5394
		Fax: ▓

4.	**Co-Investigator(s):** Co-Investigators must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here. CITI training site available here.		
	Name: Erin Dalton		E-mail: dalton3@clemson.edu
	Department: English		Phone: 203.980.2719
	☐ Faculty ☐ Staff	☒ Graduate student ☐ Undergraduate student	☐ Other. Please specify. ▓
	Name: ▓		E-mail: ▓
	Department: ▓		Phone: ▓
	☐ Faculty ☐ Staff	☐ Graduate student ☐ Undergraduate student	☐ Other. Please specify. ▓

5.	**Additional Research Team Members:** All research team members must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here. CITI training site available here.
	☐ List of additional research team members included. Form available here.

6. **Research Team Roles:** Describe the role of each member of the research team (everyone included in Items 3, 4 and 5), indicating which research activities will be carried out by each particular member. Team members may be grouped into categories.

   Description: Co-Investigator will be responsible for interviewing editors and writers at the Sierra Magazine, as well as authored scientists of selected studies, through phone and email communication. Principal Investigator (PI) will oversee all interviewing operations to ensure that the Co-Investigator stays in line with the objectives of their thesis study.

7. **Email Communications:** If you would like one or two of your team members (in addition to the PI) to be copied on all email communications, please list these individuals in the box below.

Name: Erin Dalton	E-mail: dalton3@clemson.edu
Name:	E-mail:

8. **Study Purpose:** In non-technical terms, provide a brief description of the purpose of the study. Upon conclusion of the study, how will you share your results (e.g., academic publication, evaluation report to funder, conference presentation)?

   Description:
   The general purpose of this study is to explore how scientific risks are accommodated for public audiences through popular science publications. Drawing from the Sierra Magazine, we will use a series of style analyses to gauge how technical editors within this organization adjust scientific research for readers who have little technical knowledge of the subjects being discussed. Through interviews with Sierra Magazine writers and editors, these involved perspectives will account for how their views of accommodation influence their practices and processes. Based on a comparison of our style analysis results, these interviews will help explain how writing style influences the accommodation process based on these first-hand accounts.

   Our interviews with scientists, from whose research Sierra Magazine articles are based, will afford us with perspectives from technical experts.

   The study results presented will be in support of the Co-Investigator's Masters degree thesis research to be developed with the intent of publication.

9. **Anticipated Dates of Research:**

   Anticipated start date (may not be prior to IRB approval; may be "upon IRB approval"):
   Upon IRB approval

   Anticipated completion date (Please include time needed for analysis of individually identifiable data):
   May 2011

10. **Funding Source:** Please check all that apply.

☐ Submitted for internal funding
☐ Internally funded
☐ Submitted for external funding
     Funding source, if applicable (Do not use initials): ▭
     Proposal number (PPN) for the Office of Sponsored Programs: ▭
     Name of PI on Funding Proposal: ▭
☐ **Externally funded**
     Funding source, if applicable (Do not use initials): ▭
     Proposal number (PPN) for the Office of Sponsored Programs: ▭
     Name of PI on Funding Proposal: ▭
☐ Intend to seek funding   From whom? ▭
☒ Not funded

11. **Support provided by Creative Inquiry Initiative:** ☐ Yes ☒ No

12. **Other IRB Approvals:**

    Has this research study been presented to any other IRB? ☐ Yes ☒ No

    Where? ▭   When? ▭

    If yes, what was their decision? ☐ Approved ☐ Disapproved ☐ Pending

    Please attach a copy of any submissions, approvals, or disapprovals from other IRBs.

13. **Exempt Review Checklist:** To determine whether this study meets the federal requirements for exemption [45 CFR 46.101], please complete the following checklist. This will indicate if your study can be exempted from IRB continuing review.

    The Federal Code [45 CFR 46.101] permits research activities in the following six categories to be exempted. Please check the relevant exemption category / categories.

Categories of Research Activities Exempt from Continuing Review	

☐	**B1.** Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:
	  a. research on regular and special education instructional strategies, OR
	  b. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
	
	NOTE: Survey and interview procedures with minors are exemptible if the activities fall within this category.

☒	**B2.** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, UNLESS:
	  a. the information obtained is recorded in such a manner that human participants can be identified, directly or through identifiers linked to the participants; AND
	  b. any disclosure of the human participants' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation.

	NOTE: Survey and interview techniques which include minors are not exempt. Observation of the public behavior of minors, if the researcher is not a participant, is exempt.
☐	**B3.** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Category B2, if: a. the human participants are elected or appointed public officials or candidates for public office, or b. federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
☐	**B4.** Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that participants cannot be identified directly or through identifiers linked to the participants.
☐	**B5.** NOTE: Please contact the IRB office before selecting this category since use of this exemption must be initiated by the agency head of the federal funder. Research and demonstration projects which are conducted by or subject to the approval of appropriate Federal Department or Agency heads, and which are designed to study, evaluate, or otherwise examine: a. public benefit or service programs; or b. procedures for obtaining benefits or services under those programs; or c. possible changes in or alternatives to those programs or procedures; or d. possible changes in methods or levels of payment for benefits or services under those programs.
☐	**B6.** Taste and food quality evaluation and consumer acceptance studies, a. if wholesome foods without additives are consumed, OR b. if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

14. **Based on the Exemption Category you checked above, please answer the corresponding questions below:**

Exemption Category B1: Complete questions a and b.

a. Is the research conducted exclusively in established or commonly accepted educational settings?
   Yes ☐   No ☐

b. Does the research exclusively involve normal educational practices?
   Yes ☐   No ☐

Exemption Category B2 or B3: Complete questions c through g.

c. Does the research involving human subjects exclusively involve the use of educational tests, survey procedures, interview procedures or observation of public behavior?
   Yes ☒   No ☐

d. Is the information obtained recorded in such a manner that you could identify the human participants, directly or through codes or demographic information linked to the participants?
Yes ☐   No ☒

e. Could any disclosure of the human participants' responses outside the research reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation?
Yes ☐   No ☒

f. If survey or interview techniques are employed, will all participants be 18 years of age or older?
Yes ☒   No ☐   Does not apply ☐

g. If observations of the public behavior of minors are employed, will a researcher participate in the activities being observed?
Yes ☐   No ☐   Does not apply ☒

Exemption Category B4: Complete questions h through n.

h. What are the types of data or specimens? ▭

i. What is the source of the data or specimens? ▭

j. Are the data or specimens publicly available? (That is, can the general public obtain the data or specimens? Data are not considered publicly available if access is limited to researchers.)
Yes ☐   No ☐
If yes, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).

k. If the data or specimens are not publicly available, are you required to obtain permission to access these? If the answer is "Yes," attach a copy of the correspondence granting you permission.
Yes ☐   No ☐

l. If the data or specimens are not publicly available, how are these identified when they are made available to you?
1) ☐ Direct Identifier (e.g., subject name, address, or social security number).
2) ☐ Indirect Identifier (e.g., an assigned code that could be used by the investigator or the source providing the data or specimens to identify a subject, such as a pathology tracking number or a tracking code used by the source).
If you will receive data with indirect identifiers only, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
3) ☐ No Identifier (i.e., neither the researcher nor the source providing the data or specimens can identify a subject based upon information provided with the data or specimens).
If it will be impossible for anyone to identify subjects based upon information provided with the data or specimens, you will not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46). Please contact the IRB staff for confirmation.

m. If (1) is checked above, will you record any direct identifiers that are available to you?
Yes* ☐   No ☐

n. Will any data or specimens be collected from participants after the submission of this application? (Data or specimens are considered to "exist" if ALL the data or specimens to be used for the research have been collected prior to the submission of this application.)

Yes* ☒   No ☐

*Your research does not qualify for exemption from IRB review under Exemption Category B4.

PLEASE NOTE: If you are applying for exemption only under Exemption Category B4, you have now completed this application. Please submit your application following the instructions at the end of the form.

Exemption Category B5: Please contact the IRB office if use of this exemption for your protocol has been initiated by the agency head of the federal funder.

Exemption Category B6: Complete questions o through q.

o. Are only wholesome foods without additives consumed?
    Yes ☐   No ☐

p. Does the food consumed contain only food ingredients at or below the level and for a use found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
    Yes ☐   No ☐

q. Does the food consumed contain agricultural chemicals or environmental contaminants at or below the level found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
    Yes ☐   No ☐

15. **Study Sample:** (Groups specifically targeted for study)

Describe the participants you plan to recruit and the criteria used in the selection process. Indicate if there are any special inclusion or exclusion criteria.

NOTE: If individuals who are incarcerated will be participants, your research is not exemptible. Please complete the Expedited / Full Review Application.

Description:
After applying randomly selected Sierra Magazine articles to several methods of style analysis, the Co-Investigator will interview the writers of these articles to discuss how their composition processes shape technical information for their readers. Based on the selected Sierra Magazine articles analyzed, the Co-Investigator will contact the authors of scientific studies to discuss scientific accomodation from their technical perspective (please see attached Word document for full list of questions).

In order to see how the editorial process within the magazine influences accommodation, the Co-Investigator will send an email to the general inquiry address on the Sierra Magazine website to request an editor to interview. Based on the randomized availability of the editors, the Co-Investigator will interview willing editors about the structure and layout of the "Grapple" section of the magazine.

Age range of participants: 25 - 60 years old   Projected number of participants: 6

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☒ Employees   ☐ Students   ☐ Minors (under 18) *

☐ Pregnant women *   ☐ Fetuses / neonates *   ☐ Educationally / economically disadvantaged *

☐ Minors who are wards of the state, or any   ☐ Individuals who are incarcerated *
other agency, institution, or entity *

☐ Persons incompetent to give valid consent *

☐ Other–specify: ▭   ☐ Military personnel

*State necessity for using this type of participant: ▭

16. **Study Locations:**

☐ Clemson University   ☐ Other University / College ▭

☐ School System / Individual Schools ▭   ☒ Other – specify Sierra Magazine

You may need to obtain permission if participants will be recruited or data will be obtained through schools, employers, or community organizations. Are you required to obtain permission to gain access to people or to access data that are not publicly available? If yes, provide a research site letter from a person authorized to give you access to the participants or to the data. Guidance regarding Research Site Letters is available here.

☐ Research Site Letter(s) not required.
☐ Research Site Letter(s) attached.
☒ Research Site Letter(s) pending and will be provided when obtained.

17. **Recruitment Method:**

Describe how research participants will be recruited in the study. How will you identify potential participants? How will you contact them? **Attach a copy of any material you will use to recruit participants (e.g., advertisements, flyers, telephone scripts, verbal recruitment, cover letters, or follow-up reminders).**

Description:
The Co-Investigator's preliminary search for randomly selected Sierra Magazine editors will come from a general inquiry to the Sierra Magazine email (sierra.magazine@sierraclub.org) requesting volunteers for this research study. From the elicited response, the Co-Investigator will interview cooperative editors using pointed questions about the editorial layout of the "Grapple" section and the editorial structure through which each article travels before final publication.

Writers to be interviewed will be based on randomly selected articles applied to selected methods of style analyses (which will be the primary research method of this study). Interviews with the writers of these texts will enlighten how the composition process of these final articles influences accomodation of technical information.

Scientists interviewed will be selected based on the corresponding Sierra Magazine article used for analysis. Initial contact with them will be through email; follow-up questioning will be through phone interviewing.

18. **Participant Incentives:**

a. Will you pay participants? ☐ Yes   ☒ No

Amount: $▭   When will money be paid?: ▭

b. Will you give participants incentives / gifts / reimbursements? ☐ Yes ☒ No

Describe incentives / gifts / reimbursements: �____

Value of incentives / gifts / reimbursements: $�____

When will incentives / gifts / reimbursements be given?: �____

c. Will participants receive course credit or extra credit? ☐ Yes ☒ No

If course credit or extra credit is offered to participants, is an equivalent alternative to research participation provided? ☐ Yes ☐ No

19. Informed Consent:

a. Attach a copy of the informational letter or consent script you plan to provide to your participants (and their parents or guardians, if applicable). Consent Document Templates

b. Will you use concealment (incomplete disclosure) or deception in this study? ☐ Yes ☒ No
   If yes, please see guidance regarding Research Involving Deception or Concealment here, submit a copy of the debriefing statement / plan you will use, and provide a justification in the following space for this use of concealment or deception. �____

20. Procedures:

a. What data will you collect?
   The data to be collected from editors will include how the "Grapple" section came into existance, why it's editorially formatted as it is, what the editorial structure of the organization looks like. In relation to specific articles, the Co-Investigator will ask general questions about writers' personal composition processes. This will help gauge how these technical communicators accommodate scientific information for specific readers of the Sierra Magazine. Interview data from scientists will help clarify how scientific accomodation operates from a technical expert perspective (please see attached Word documents for specific questions).

b. How will you obtain the data (e.g., surveys, interviews, focus groups)? Please describe the process each participant will experience.
   Writers and editors from the Sierra Magazine, as well as scientific authors, will be identified by the Co-Investigator. After explaining the goals of the research study over email, each interviewee will be asked for their permission to participate in phone correspondence with the Co-Investigator. Through this correspondance, the Co-Investigator will ask questions concerning scientific accomodation from their perspective.

   The informational letter sent via email to Sierra Magazine writers and editors will serve as the explanation of the study (please see the attached document for further details).

c. If data collection tools will be used, how much time will it take to complete these tools? n/a

d. How many data collection sessions will be required for each participant? Will this include follow-up sessions?
   Initial survey questions will be distributed through email. Follow-up interviews through phone conversation sessions will be included if questions warrant more detail or clarification.

e. How will you collect data?
   ☐ in-person contact   ☒ telephone

☐ snail mail   ☒ email
☒ website   ☐ other, describe _____

Please include copies of surveys, interview questions, data collection tools and debriefing statements. If survey or interview questions have not been fully developed, provide information on the types of questions to be asked, or a description of the parameters of the survey / interview.

f. Will you audio record participants?   ☐ Yes ☒ No
g. Will you video record participants?   ☐ Yes ☒ No
h. Will you photograph participants?   ☐ Yes ☒ No

If you will audio or video record or take identifiable photographs of participants, please consult the IRB's Guidance on the Use of Audio / Video Recording and Photography here. Please include all the information addressed by this guidance document in the application and, where appropriate, in the consent document(s).

21. **Protection of Confidentiality:** Describe the security measures you will take to protect the confidentiality of the information obtained. Will participants be identifiable either by name or through demographic data? If yes, how will you protect the identity of the participants and their responses? Where will the data be stored and how will it be secured? Who will have access to the data? How will identifiers be maintained or destroyed after the study is completed?

Description:
We will do everything we can to protect the identity of our interviewees. When reporting our interview results, their names will not be revealed; they will instead be generically described as a participating "writer" or "editor" within the magazine and assigned a pseudonym by which they will be identified. The scientists interviewed will also be given a pseudonym. Because the Sierra Magazine publically lists their writers and editors within both their publication and electronic website, speculation as to their real identity may be possible.

Articles subject to style analyses will also be treated as anonymously written text when analyzed. However, as with the above circumstances beyond our confidentiality control, public access to these electronic texts may also reveal the true identity of the writers.

All information will be kept anonymous in the study; we cannot control what is electronically published online.

22. **PI Signature:**

I have reviewed this research protocol and the informed consent document(s), if applicable. I request approval of this research study by the IRB of Clemson University.

_____   _____
Signature of Principal Investigator   Date
(hard-copy signature only needed if application will not be submitted via PI's email account)

_____

Submission Instructions: Exempt applications are processed as received. There is no deadline for submitting exempt applications for review. Please allow seven to ten business days for processing.

Please submit this application and all associated documents from the Principal Investigator's (PI's) email address to the IRB staff. Receipt of the application electronically from the PI will qualify the application as a signed electronic submission. Alternatively, the signed, hard-copy application may be mailed or delivered to the Office of Research Compliance, 223 Brackett Hall, Clemson, SC 29634-5704.

LEADING INTERVIEW QUESTIONS FOR:

EDITORS (within the *Sierra* Magazine)
- How do you select articles from which you adapt your magazine articles?
- What journey does an article take as it goes through your editorial process at the magazine? How many, and what types of, editors review it?
- How did the current editorial layout of your magazine originate? Was there a call for it from your readers or did the initiative to reorganize your content come from your editorial staff?
- How would you define a "well accommodated" piece? What attributes would it have?
- How do you determine the focal points of your articles? On what do you focus in order to maintain the integrity of the scientific detail and still appeal to you intended audience? How do you strike the appropriate balance?
- Do you think the Internet helps to accommodate scientific research for public audiences by providing them tools to access resources to learn about the research beyond the scope of the *Sierra* Magazine article? How do you, as editors, select which key words are highlighted and linked to websites outside of the *Sierra* Magazine website? Do you editorially alter the way an article is written to include particular links to these resources?

WRITERS (within the *Sierra* Magazine)
- From what scientific source was [insert name of selected *Sierra* Magazine article here] adapted?
- What stylistic writing strategies do you use to adapt articles to your intended audience reading the *Sierra* Magazine? Who are your intended readers? Could you describe them?
- How would you define a "well accommodated" piece? What attributes would it have?
- What is your process for composing an article from scientific research? Could you describe your writing composition process for breaking down technical text into an article between 100 and 700 words (as dictated by the *Sierra* Magazine's editorial guidelines)?

SCIENTISTS
- Did the article, [insert title of selected *Sierra* Magazine article], do justice to your research?
- Did the article emphasize anything that should not have been?
- If you were to write an article for public audiences based on your research, is there another focus you would have chosen to emphasize?

- Were there any crucial details/findings in your research left out of [insert *Sierra* article title] that you thought were particularly notable?
- How would you define a "well accommodated" piece? What attributes would it have?
- Do you have any thoughts on effective methods for striking the appropriate balance between maintaining a complex level of details (within a scientific study) and general enough information to appeal to public audiences?
- Do you, personally, read popular science magazines? Which ones? Which attributes make them well written or accommodated for readers not involved, first-hand, with the research?

APPENDIX C

Sierra Editorial Note: Food Miles Articles

Decoder: Miles to Go Before You Eat
Why it pays to buy locally grown food

Posted May 31, 2006; amended May 2009
Editor's note: Subsequent to the publication of this feature, *Sierra* learned that there was a calculation error in the original paper on which the article was based, "The Load Less Traveled" (Leopold Center for Sustainable Agriculture, 2002). In addition, *Sierra*'s own calculations failed to account for the differing fuel-energy values of gasoline (light truck), diesel (commercial truck), bunker oil (ship), and jet fuel (air). We also neglected to cite the weight of our example produce; e.g., the potato was large, weighing one pound. Together, these errors led us to significantly overstate the amount of fuel needed to move the items to market.

On May 31, 2006, we posted the Leopold Center's recalculations of the fuel requirements to transport various produce to market. Unfortunately, we recently learned that those calculations were also in error. The figures below are the center's new calculations using a different (and, they think, more reliable) estimate of the energy requirement by mode of transportation. By chance the results are very similar to the miscalculated totals. Please note that for the purpose of this example, the "market" was designated to be Des Moines, Iowa (*Sierra* Magazine, "Decoder: Miles to Go Before You Eat").

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