Rhetoric Used by Proponents and Opponents of the Research Study, "Weather Whiplash in agricultural regions drives deterioration of water quality."

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Abstract: The scientific community has begun to come to a consensus about many climate issues, but little action is being taken to begin to counteract the effects of climate change. It is up to rhetoricians to analyze the discourse surrounding climate change data, in order to improve the rhetorical strategies used by scientists and the media to promote social awareness and positive changes in climate change management strategies. To this end, the rhetoric surrounding the results of Terrance Loecke and Amy Burgin's research paper, "Weather Whiplash in Agricultural Regions Drives Deterioration of Water Quality," has been analyzed. Empathy appeals were most commonly used in third party promoters who had no vested interest in the success of the study, while the blog contradicting the results used misleading logic and a negative credibility appeal, undermining the legitimacy of the research authors and institute. Recommendations for strengthening rhetorical strategies to communicate with non-scientists better include the increased promotion of articles that minimize sensationalism and the stressing of personal and professional credibility of individual scientists. Further analysis of rhetoric around individual studies should be encouraged for comparison.

Keywords: Climate Change Rhetoric, Climate Community Awareness

Rhetoric and Climate Change

While climate scientists begin to come to a consensus about the urgency of acknowledging our changing environment, surprisingly little social change has been put into motion (Norgaard, 2011). As sociologists are being urged into action by researchers like John Urry, rhetoricians also have an obligation to begin focusing on the inclusion of non-scientists into discussions of strategies to reduce the impact of climate change (2015). According to Hoffman in his book *How Culture Shapes the Climate Change Debate*, current rhetoric surrounding the issue has generated more confusion than clarity with the general public (Soron, 2015). KM Wilson gives us an example of this confusion from the outset of the rise of climate change awareness in the public eye. Wilson explains, the "focus on possible consequences set the stage for continuing media debates about the uncertainty of future predictions, while relegating what is known and agreed upon about climate change to scientific journals" (2000, p. 2). The purpose of this research paper is to add to the existing research and analysis of climate change rhetoric, supporting future attempts to use rhetoric to influence the reduction of climate change impact and include non-scientists in the conversations about political policies regarding the environment.

An analysis of promoters and opponents of the study "Weather Whiplash in Agricultural Regions Drives Deterioration of Water Quality" by Terrance D Loecke and Amy Burgin shows that while all sides used appeals to their reader's logic, however valid, only opponent Anthony Watts of the climate denial site *Watts Up With That?* used ethical (ethos) appeals to attack the credibility of the authors and institution behind the findings. Additionally, appeals to empathy and emotion (pathos appeal) are more prominent in third party promoters without a vested interest in the success of the researchers and their institution.

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Journal Title
Volume #, Issue #, 20##, http://<websitelink>.com

ISSN: ####-#### (Print), ISSN: ####-#### (Online)
http://doi.org/########################## (Article)

COMMON GROUND

The Appeals

This paper is organized by the classic rhetorical categories logos, ethos, and pathos (Bizzell, 2001). I will use Logos to describe all appeals to logic, including appeals that are not factual but attempt to convince the reader that logic supports the case being argued. Ethos will be used to describe all appeals to the credibility of the study, including the credibility granted to the study via association with its supporters. Finally, Pathos will be used to describe all emotional appeals.

As recommended by Jimmie Killingsworth in "Rhetorical Appeals: A Revision," within these broader categories, the appeals will be discussed using generally understood terms for ease of use (2005). For example, when speaking about logical appeals, the language used may be more specific and reference financial appeals when a subject is trying to convince their reader by explaining the cost-benefits of their proposed changes.

Logical (Logos)

Killingsworth defines logos in modern terms as "the control tower of an airport, toward which the author moves and directs the flight of the audience" (2005, p. 252). Logos is in essence the topic being discussed, or as a layman may describe it, the unadorned facts of the situation. Logical appeals are prominent in all of the rhetoric surrounding the article by Loecke and Burgin, though the strength of the logical argument presented is dependent on the language used within each piece (2017). Rhetoricians have gone back and forth throughout history, between the use of sophisticated language for the clearest explanation by the author, and the use of simpler language for the clearest understanding by the reader (Bizzell, 2001). The following publications, with the exception of Loecke and Burgin's research paper, err on the side of simpler terminology, making the information accessible to a wider audience but with less precision. In the case of the *Watts Up With That?* blog, the actual validity of the logic is disregarded entirely (2017).

The peer-reviewed article by Loecke and Burgin focuses on the logical appeal almost exclusively (2017). The authors discuss weather whiplash, in this case defined as "drought-to-flood transitions," attributed to climate change, and the environmental, health, and financial impacts of the phenomenon (Loecke, 2017, p. 7). Their assessments are based on data collected from third party facilities and prior research done in the field by peer-reviewed sources. The research paper includes detailed numerical data as well as graphs and models. Use of technical jargon and detailed explanations ensures that the author's study is fully understood and helps create the sense that the logical appeal is the major focus of the paper.

Though more approachable, a press release from the University of Kansas remains relatively focused on logical appeals (Lynch, 2017). The release is an echo of the logic from Loecke and Burgin's weather whiplash research paper, but inserts more quotes from Loecke and Burgin, which makes the data easier to comprehend. This allows the logical appeals to be accessible to a larger audience. Burgin uses a good simile to describe what is physically happening, "The soil is like a sponge, and when it's dry the nitrogen stays put, […] But as soon as you wet it, like when you wring a sponge, the nitrogen can flood into the rivers." The press release also focuses heavily on logical financial appeals, listing out figures like the $4.1 million nitrate removal plant in Des Moines, that costs $7,000 a day to operate, and is now running 25 to 150-plus days a year. Loecke is quoted explaining in simple terms what this means for individuals, "The average person will pay more to have clean drinking water, like in the city of Des Moines." Loecke also goes on to explain why logically this is a complicated problem due to difficulty in prediction.

The article "The Midwest's Weather Whiplash Threatens Groundwater" posted on *Scientific American's* website also had a large focus on logical financial topoi, citing the same numbers as the University of Kansas press release (Balaraman, 2017). The article introduces the problem, and then walks the reader sequentially through the process of nitrate being introduced into the soil all the way through to the final costs, environmental problems, and health issues related to the rising nitrate contamination in groundwater. Specific ecological problems that can result from nitrate are listed, providing more information to weight the importance logically, "ranging from

producing more algae and starving water bodies of oxygen to harming fish populations." Blue-baby syndrome is mentioned logically appealing to the health-conscious. All of these are explained with minimal field-specific jargon.

On Anthony Watts' Blog, *Watts Up With That?* Watts uses logical appeals to counter the data presented by Loecke and Burgin in their study (2017). Watts posts the study by Loecke and Burgin, and then selects a specific section to argue.

> We looked at observations of the 2012 drought that ended in a flood and asked how frequently that has occurred across upper Midwest across in the last 10-15 years," Locke said. "We found that the connection between draught-to-flood conditions and high nitrate was pretty common (Watts, 2017).

Watts then begins to dissect the excerpt, walking his readers through his process, "You could learn this was pretty common just by looking at climate history" (Watts, 2017). He goes on to describe how weather patterns move across the United States and explains the drought and flood cycle, including graphics of historical data on these cycles. This appears to be a logical appeal, but fails to take the argument through to completion as it ignores the fact that the excerpted statement from Loecke and Burgin wasn't arguing that the drought-flood cycle was new, only that there was a connection between the cycle and high nitrate levels, and that it will be exacerbated with future climate change (Loecke, 2017). Watts does not acknowledge the data regarding nitrate contamination in the water at all. He also originally addresses Kansas's climate data, only to make a correction that notes Iowa is the same anyway, with a new weather history chart (Watts, 2017).

Credible (Ethos)

Credibility uses the position of the author, both real and invented, to represent "a particular communal outlook that points toward agreed-upon values and invites the audience to join (or return to) the community" (Killingsworth, 2005, p. 252). Credibility is a key issue in scientists' attempts to establish the existence of climate change, with "the research community's collective reputation at stake" (Nordhagen, 2014, p. 150). Although researcher credibility is hard to universally define, it is common knowledge that accredited universities within the United States inspire a certain level of confidence due to the regulation of research expectations and methods across national academia. For researchers, this is often the most important aspect to verify in publication as, "In cases of conflict, professional credibility conventionally trumps personal or public-facing concerns" (Nordhagen, 2014, p. 159).

In "Weather Whiplash in Agricultural Regions Drives Deterioration of Water Quality," credibility is established positively using formatting standard for a research paper, though most require the reader to be an academic to carry much weight (Loecke, 2017). The presence of the researcher's departmental associations shows their personal areas of expertise. The extensive references list citing peer-reviewed journals and other sources serves as a valuable rhetorical tool within the scientific community, though admittedly may lose effect within in non-scientist circles. In the acknowledgements, the additional information that the authors have no competing financial interests is stated, letting the reader know that the study, and an individual researcher, was funded by the National Science Foundation. This may not mean much to non-scientist readers who are not familiar with the National Science Foundation, but it is reasonably easy to research. Additional, the acknowledgement includes that the study was indirectly supported by the Lucielle A. Carver Mississippi Riverside Environmental Research Station and the U.S.G.S., two entities credited with collecting the hydrologic and nitrate monitoring data. In addition to these specific methods, I would argue that the researchers' description of their step-by-step process lends to credibility through transparency, though it would require at least a modest understanding of the science involved for this to be persuasive to a reader.

The University of Kansas works actively to boost the credibility of Loecke and Burgin with their press release, "'Weather whiplash' triggered by changing climate will degrade Midwest's drinking water, researcher says," building their professional credentials. The release notes how they both, "serve as scientists with the Kansas Biological Survey," and makes sure to highlight additional researchers and resources that were used to come to the study's conclusions (Lynch, 2017). Of particular note is the article closing on the sentence, "The National Science Foundation supported this work." Although it is noted that the National Science Foundation funded the research in the research paper (Loecke, 2017, p. 14), here the slightly vaguer wording of "supported" implies approval beyond funding (Lynch, 2017). The issuing of this press release is a sign of support in itself from the University of Kansas, and does lend credibility as the University is clearly proud of the results.

Popular media has a different type of credibility, and though it has been accused of misrepresenting science, large publications like *Scientific American* have been attributed with controlling the public opinion that helps direct funding (Lunsford, 2009). *Scientific American*, which picked up an article about Loecke and Burgin's findings from Climatewire, made the article accessible to a larger audience (Balaraman, 2017). In addition to the backing of their own credibility, Climatewire author Kavya Balaraman adds the additional information that researchers in Wisconsin are coming to the same conclusions. This provides a previously lacking sense of scientific consensus for non-scientists readers who may not have found the References section of Loecke and Burgin's research paper easily comprehensible.

Credibility for *Watt's Up With That?* is not limited by the constraints of the larger media outlets and research institutions. The noted climate change denial website run by Anthony Watt's, a former television Meteorologist and retired member of the American Meteorogical Society (Watts, 2017). Watt not only addresses his professional credibility in the "about" section of his website, but also his personal credibility, posting pictures of his solar panels and energy efficient car to emphasize his green lifestyle. In addition to establishing his own credibility, Watt also attacks the credibility of the University of Kansas and Loecke and Burgin. He begins by prefacing the actual research article title with "Oh, please:" and then goes on to describe the University of Kansas as the "department of creative doom labels" and the article as a "fine example of Tabloid Climatology." Watt's statement prefacing his inclusion of direct passages of the weather whiplash study is a smart strategy, as studies have shown that readers remember the first statement clearer than the following information, specifically when it's at odds with the following information (Peter, 2016).

Emotional (Pathos)

Killingsworth defines Pathos appeals as representative of the audience, more specifically the authors need to realign themselves with the audience as a "we" to remove a divide in opinion (2005, p. 252). Emotional appeals create sympathy or empathy within the reader, and can often lead to readers attaching sentiments to an argument that isn't directly related (Merry, 2010). Melissa Merry asserts, "Much of the distrust of emotional appeals stems from the view—both inside and outside academia—that emotions undermine rational decision-making processes." That being said, many rhetoricians like Richard Whatley believe, "It is legitimate and necessary…to stimulate emotions such as hope, fear and altruism because they lead to worthy aims" (Bizzell, 2001, p. 1002).

Within Loecke and Burgin's formal paper, the only evidence of emotional appeal comes in the form of wording in the conclusion (Loecke, 2017). The term "unfortunately" expresses the authors' feelings, and the phrase, "Our observations illustrate a harbinger of a future in which increased climatic variation amplifies negative trends in water quality in a region already grappling with impairments," is worded strongly in a way that elicits negative feelings of fear and sadness for the reader (2017, p. 14). These emotional appeals are left for the end of the paper, separated from the data analysis.

The University of Kansas Press release is similarly reserved in appealing to emotion, though it does quote Burgin who points out that, although the problem is in Iowa, “it’s a matter of time before [we Kansans are] in the same boat” (Lynch, 2017). The statement pushes for empathy from the reader, following a clear verbalization of the similarity between the two heavily agricultural states.

Scientific American’s article about Loecke and Burgin’s weather whiplash study uses many strong words and phrases to appeal to the reader’s fears, including “Scientists fear,” “threatens,” and “skyrocketing nitrate” (2017). The opening sentence alone plays heavily on creating an emotional reaction in the reader: “Scientists fear the Midwest’s new fluctuating weather patterns will exacerbate an old problem: nitrate contamination” (2017). Although the statement is true, the potential for even more fluctuation is a small part of the paper. The core issue already exists and Burgin and Loecke are documenting the nitrate contamination to prove its effects, and suggest how better prediction could limit them. The article also mentions blue-baby syndrome, appealing to the readers sense of family and their fears, early on and then in more detail towards the end of the article. The article quotes Burgin, “Blue baby syndrome got a lot of attention in the late ’70s and early ’80s — it’s when infants consume high-nitrate water, which then interacts with the blood and causes them to suffocate and turn blue” (2017). The visual of babies turning blue goes beyond what is necessary for a logical appeal, which is supported by the necessity of the follow up assuring the reader that blue baby syndrome is no longer common, but an example of possible illnesses that could become an issue.

Anthony Watts uses an emotional appeal centered in disgust to transition from his reprinting of Loecke and Burgin’s study to his own argument (Watts, 2017). Watts claims the study is, “nothing more than one of the worst examples Tabloid Climatology.” Tabloids are known for having a “negative connotation, because it has become associated with poor quality content and techniques of unethical reporting" (Popović, 2014, p. 13). He also inserts an image that is attention grabbing, ridiculing any attempts to reference a changing climate with the term, “Tabloid Climatology,” followed by the tagline, “Only you can prevent bad weather” (Watts, 2017).

Conclusion

The study, "Weather Whiplash in Agricultural Regions Drives Deterioration of Water Quality," was posted March 10, 2017 on Springer Link freely available to the public. The Amazon site Alexa was used to get consistent estimates about website statistics, as no other unbiased data source was readily available. On Alexa, Springer.com is ranked 482 globally, a stat that combines daily views with views over the past three months to rank websites. Added to the knowledge that 68,252 sites link to Springer.com, it’s clear that Springer.com is popular. Despite this, googling Weather Whiplash shows that Loecke and Burgin’s article is the 6th link down on the first page. It relies heavily on logical appeal, with a less obvious credibility appeal, and a very small emotional appeal at the end. There currently is not a huge push for rhetorical tactics within scientific writing, and to preserve the integrity and clarity of study results, this seems ideal. This integrity seems to come at the cost of lower exposure to people navigating the subject of weather whiplash outside of an academic database.

The press release by the University of Kansas announcing the findings of Loecke and Burgin is located within the school’s website and was published on March 19, 2017. The University of Kansas website is ranked 5,304 globally on the Alexa website with 13,231 sites linking to its page and the link to the press release appears on the 5th page of google results, at almost the bottom of the page. The release focuses heavily on logic with subtle appeals to emotion and credibility. The press release is most notable for its accessibility for an average reader, using similes and careful step-by-step explanations of the weather whiplash phenomenon. The quotations by Loecke and Burgin use less scientific terminology when interviewed than they did

when publishing their results. Again, a good representation of Loecke and Burgin's data, but it does not rank as high as other sources that use more emotional appeals.

Anthony Watts' blog *Watts Up With That?* posted its rebuttal to Loecke and Burgin's article March 30, 2017, the day after the University of Kansas posted its press release. Ranked 42,596 globally on the Alexa website, with 4,192 sites linking to it, the *Watts Up With That?* blog post still comes up third on the google search. The biggest rhetorical component of the blog post is its attempt to discredit the University of Kansas and its researchers. Watts also attempts to use a logical sounding collection of statements and visuals to appeal to his reader's logic. The emotional appeals include appealing to the reader's disgust at the research community's lack of integrity and fear of the influence of researchers on politics and financial situations.

Scientific American picked up the article about Loecke and Burgin from E&E News' Climatewire on April 10, 2017. The site ranks 3,760 globally according to the Alexa website, and has about 40,321 other sites linking to it. The article on *Scientific American*'s website is the 4th link that appears when googling "Weather Whiplash." Although Jeanne Fahnestock argues that publications like *Scientific American* tend to contribute to misunderstandings in the communication of data, not everyone sees them as a negative (Lunsford, 2009). As Richard Whatley believed, "It is legitimate and necessary…to stimulate emotions such as hope, fear and altruism because they lead to worthy aims" (Bizzell, 2001, p. 1002). Here *Scientific American* appeals to fear, but ends on a note of hope by conveying Burgin and Loecke's manageable solutions to the problem of nitrate contamination due to weather whiplash.

Recommendations

In light of the research presented above, I contend that there are several ways rhetoric could be better used to support reader reception of Loecke and Burgin's data and recommended solutions to help combat nitrate contamination due to weather whiplash. The first would be better promotion of the University of Kansas' press release (Lynch, 2017). The press release had the best use of accessible terminology and the clearest explanation for a non-scientist, but was on the least trafficked site among the three proponents of the research according to the Alexa website. The second recommendation would be to use fewer sensational emotional terms in publications like *Scientific American* (Balaraman, 2017). The dramatic emphasis on climate change for this article detracted from its importance of the study's findings, when a more subtle reference to potential future effects could have been sufficient. Additionally, dramatic word usage reinforces the sensationalism accusations of sites like the *Watts Up With That?* blog. Finally, I would recommend rhetoricians find a way to make scientists research results more accessible to non-scientists, and strengthen their credibility in ways that appeal to non-scientists. When Loecke and Burgin were quoted directly, they became individuals with personal credentials versus "scientists" who are names listed on a study. Further analysis of rhetoric around individual studies should be encouraged for comparison.

Acknowledgement

I want to thank Clay Arango for the introductions leading to my topic. I would also like to thank Kacie Little, Rene Santana, Andrew Scot, Lindsay Seeley, and Professor Joshua Welsh for their feedback.

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