Issue Paper

Introduction:

Clear writing can seem impractical or untraditional, especially in science. Scientists often don't consider clarity, focusing instead on writing as they see their superiors and colleagues write. Some scientists are pushing towards making conference posters simpler, easier to quickly read and understand.[1] However, many older researchers are critical of this. Scientific fields are experiencing push and pull between clarity and traditional communication. Scientific writing needs a push towards clarity.

Clearer scientific writing can be helpful and sometimes even an ethical imperative. The newest scientific research impacts the lives of common people, not just scientists. Common people may have a loved one with a disease that scientists are discovering new things about. Scientists should then make their work accessible and clear to common people. Furthermore, scientists are (likely inadvertently) creating an elite space when they write in the complex, scientific lingo. It is unethical for the scientific community to inadvertently or intentionally require a certain education to understand research and new information.

In his book *Style*[2], Williams wrote about how writing clearly is the author's responsibility. He claims that the first rule of ethical writing is to put yourself in your readers shoes. This rule states that your writing is ethical if you would choose to read what you wrote from your readers' perspective. Williams explains that your writing is unethical if you would not choose to live with the consequences of reading your writing. Hodge and Kress give further perspective that

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[1] *Inside Higher Ed*, "There's a Movement for Better Scientific Posters. But Are They Really Better?" www.insidehighered.com/news/2019/06/24/theres-movement-better-scientific-posters-are-they-really-better.
[2] Williams, J. M. (2009). Style: Toward Clarity and Grace. Chicago, IL: Univ. of Chicago Press.

language defines the way we perceive the world. These authors all agree that language is very influential and we must be conscious how we use it. However, Williams cautions that most unethical writing is unintentionally unethical.

I will be addressing this unintentionally unethical writing in science. Scientists write about complicated topics, concepts, and processes. Therefore, researchers understandably expect that their writing will also be complicated. Williams acknowledges that some writing will necessarily be complex and can't be simplified. For example, scientists can only write so simply while creating problems in advanced college astrophysics textbooks. However when disseminating newfound research, scientists should use accessible language.

Example Analysis and Revisions:

As an example, I will now look at a scientific article, *Endocannabinoid-mediated rescue of striatal LTD and motor deficits in Parkinson's disease models*.[3] I will explain how this article is unclear and so unethical since the common audience struggles to understand the information. The article talks about exciting new research that would be especially pertinent to families affected by Parkinson's disease, but they can't understand it currently. Below I describe the language choices that would create a more clear and ethical article.

The most important parts of the paper are the abstract, the figures, and the conclusion. Scientists often skim articles, as even experts often find them dense and difficult to read.[4] When they do this, scientists look at 3 main places, the abstract, the figures, and the conclusion. As such, writers would spend a lot of time focused on these sections, so I will look at examples from

[3] Kreitzer AC, Malenka RC. Endocannabinoid-mediated rescue of striatal LTD and motor deficits in Parkinson's disease models. Nature. 2007;445(7128):643–647. doi:10.1038/nature05506

[4] Pain, Elisabeth. "How to (Seriously) Read a Scientific Paper." *Science*, 2016, doi:10.1126/science.caredit.a1600047.

the article in these 3 areas. For each, I will show the original in a), discuss how it could be altered to make it more clear, and then show it's revision in b).

Example 1: Characters and Complicated Terms

The following excerpt has a number of issues, including *emphasis* and *characters*. Notably, this excerpt is at the end of the abstract, after the indirect pathway, striatum, and endocannabinoids have been introduced. These sentences then are using known, but still complicated terms. Each sentence should have their complicated terms at the end. This sentence structure is related to *emphasis*, which is fixed at the end of the sentence. Sentences with proper emphasis have new or complicated information or words that need special stress at the end. Below, I highlighted what should be in the emphasis position to make the sentences more understandable to the standard audience. The sentences in this excerpt also have subjects that are not *characters*, agents that can perform actions including doing, thinking, or perceiving. This sentence choice is standard in scientific writing, but increases obscurity. It increases obscurity because readers have a harder time figuring out what is actually going on. Williams would explain that this choice is unethical because it obscures the real actors and so makes a sentence more difficult to read. I **bolded** the current subject below.

> 1a) **Administration of these drugs together in vivo** reduces parkinsonian motor deficits, suggesting that **endocannabinoid-mediated depression of indirect-pathway synapses** has a critical role in the control of movement. **These findings** have implications for understanding the normal functions of the basal ganglia, and also suggest approaches

for the development of therapeutic drugs for the treatment of striatal-based brain disorders.

I have noted that the subjects are not characters and that the first sentence does not have emphasis on the proper word. I have fixed these issues in sentence 1b. As you will see, I made changes to all of each sentence to accomodate for changing subjects to characters and the position of "endocannabinoid" in the sentence. In doing so, I have made this example clearer and more ethical.

1b) When **we** administer these drugs in vivo, **we** see a reduction of parkinsonian motor deficits, suggesting that **people** can only move when the **brain** depresses indirect-pathway synapses using endocannabinoids. **We** found new information about the normal functions of the basal ganglia, from which **we** can now develop new therapeutic drugs to better treat striatal-based brain disorders.

Example 2: Active versus Passive

The next example is from the caption for Figure 3. It has issues with its subjects not being characters, but also it is written in passive voice. When subjects are not characters, sentences often become *passive*. A passive sentence is one where the subject receives the action of the verb instead of performing the action. According to Hodge and Kress, passive sentences weaken the causation of a sentence which mystifies the contents of the sentence. As Williams points out, this mystification is unethical, even when it's unintentional.

We can make this example more ethical if we made the sentences all active, adding in the appropriate characters. I have **bolded** the subject and highlighted in blue the passive verb.

2a) In this and subsequent panels, **normalized EPSCs recorded from direct-pathway and indirect-pathway MSNs** are plotted over time.

We can see that this sentence has a non-character subject and that the sentence is passive. Williams would explain that this sentence is unethical because these issues make it more difficult to understand. We fix these to look like this:

2b) In this and subsequent panels, **we** plotted normalized EPSCs over time that **we** had recorded from direct-pathway and indirect-pathway MSNs.

Example 3: Nominalizations

Hodge and Kress also discussed that sentences can be obscured by converting action verbs to nouns, called *nominalizations*. They discussed that people often argue less with nouns, despite often arguing over verbs instead. They explain how language can define reality and using nominalizations is a way to do this.

Williams also discussed nominalizations. He sees that they have a place, like when they refer to a previous sentence or when they name a familiar concept such as "Amendment." However, he cautions that often readers will better understand a sentence when the nominalizations are changed to verbs. He points out that nominalizations can be dense and difficult for a reader to get through, and so they decrease clarity.

We can revise the nominalizations. In the example below, I have **bolded** the subjects, highlighted the emphasis, and highlighted in green the nominalizations.

3a) Together with previous results, **our findings** specifically suggest that **manipulation of activity in the indirect basal ganglia pathway by means of modulation of endocannabinoid production**

> may be particularly beneficial for brain disorders that involve dysfunctions of striatal circuitry, such as Parkinson's disease.

This example has issues with characters, nominalizations, and emphasis. The emphasis is on an important concept right now, but is needed on the complicated and more important concept of "modulation of endocannabinoid production." Characters are not yet subjects and there's an incredibly long subject starting with "manipulation" and ending with "production." These are both nominalization and along with "modulation," each of these need to be changed to verbs. Fixed, this example looks like this:

> 3b) Together with previous results, **we** found that **we** could partially improve brain disorders involving dysfunction of striatal circuitry, such as Parkinson's disease, when **we** manipulated activity in the indirect basal ganglia pathway by modulating the endocannabinoids the brain produces.

Other Opinions

Many writers would also think that this article is unintentionally unethical. Williams would agree with me that this article was an example of unintentional obscurity. The authors were likely focusing on passing as much information as possible instead of clarity. Hodge and Kress would include that language sets the limits on how we perceive reality. The scientific writers help perpetuate a reality in which the common reader expects that they will never be able to understand scientific articles. Hodge and Kress would point out that the article is full of sentences without clear actors. Williams would come back in to point out that this and other issues in the document contribute to its unethicality due to its opacity to the common reader.

Other writers however would think that this article is perfectly ethical. For example, Lanham has a different view of clarity. He considers that clarity depends on familiarity and involves getting the job done. With this article, Lanham would see it as solely a communication between scientists. Especially in the same field, other scientists would understand the article as is and Lanham considers that to be sufficient clarity. For the examples above, he would say that scientists are not supposed to use first-person language. Furthermore, he would say that the complicated concepts do not need to go at the end of the sentence, where they are easier to process. He would claim this was unnecessary as most scientific articles are read by fellow researchers who are familiar with those concepts.

Lanham is correct that this article is sufficient to communicate between scientists. However, he is wrong to think that this is enough. He considers it ethical to perpetuate the scientific field's elitism. He doesn't see it this way necessarily, but sees clarity as forced and unnecessary. Lanham rightfully expects most of the audience are scientists and so can understand the technical language. However, in considering only the scientists, he is excluding non-scientists that read the article or would like to read it. Lanham considers it sufficient that a small portion of the population can easily access information. Throughout history, many have proved him wrong. Knowledge should never be only available to a select few.

Furthermore, Lanham is placing a larger burden upon the scientists readers. Many have adjusted to slogging through articles written by their colleagues. Likely they have learned to like this arduous task. This may be due to the psychological process in which people justify their doing an unenjoyable task by learning to like it, related to cognitive dissonance. Whatever the case, many researchers still read scientific articles differently than leisure reading, and learning

to read them well takes years of practice.[5] While many may cling to tradition, they would likely also appreciate articles that were clearer and took less mental effort to understand.

Conclusion

Making this transition to clearer scientific articles will not be easy. Scientists may encounter difficulties when making these changes. As with the changes to conference posters, older scientists may be critical. Older scientists often hold much influence over younger scientists' futures. Their judgement holds enormous sway over the younger scientists who may want to push the bounds and fix the issues they see in the scientific community. However, there are still many older scientists that do see the potential benefit of this new poster format-- granted it's proven to work. There are those that could be convinced.

Progressive scientists may have to push for clarity for a while and may lose out on some opportunities due to their choice of language or poster-layout. Because of this, many progressive scientists may lose sight of their goal, the goal to make scientific information more accessible to both scientists and common people. Their future is held by those who may have disdain and disapproval for this new style of writing. Furthermore, scientific journals never seem to publish clear articles, and getting published is essential to doing research.

This transition to clarity could come at great personal cost for many researchers, and almost seems impossible. That being said, scientists do need to create clearer writing. For it to be ethical, research should be accessible to the everyday person. Knowledge should never be limited to those with enough money or opportunity for a higher education.

[5] Ibid.