On the style and form of language that developed in the history of science

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(Reading for an undergraduate class, as a handout, to prepare for class discussion)

Introduction

 It is commonly assumed that science is neutral and that the modern style—the methods and conventions of writing and communication in science—came from nature not from people.

A careful study of historical documentary analysis shows that this is not the case, rather the way we talk about and write within science is the product of choices, cultural conditions in the past and intentional design of scientific writing as a genre or style, as a specific form of writing distinct from others intended to be read and seem different.

If this is a hard thing to accept, consider how you would design a product to go to market—you would make it specific for practical reasons, to be different from other options, and to make it seem like the best product out there. The way that products are made to seem best is a matter of style rather than inherent quality, and without discussing the inherent nature of science itself, consider how the communication and writing style of science came about. Consider how it has come to be seen to be the “best” way of knowing about the world, often in fact it is seen as the only way of knowing about the world—despite developing among a variety of distinct ways of knowing.

If this sounds radical to you, please ask yourself one question: If you were going to design a system and form of writing about the world to be convincing to as many people as possible, what would that system look like.

Pretend for a moment you lived prior to the 18th century and were an expert on some subject, a navigator or a student of natural philosophy, or a merchant looking to trade with other cultures. You’d be faced with challenges.

Many people believe different things so you might look for a way to avoid challenging belief systems or, at least, minimizing the ways that you sound like a challenge to those systems.

Many people hold many religions; you would avoid religious language, at least at the superficial level.

Many people can disagree about interpretation even if they accept the basic data, so you might look for ways to make the interpretive aspect less obvious.

Most people also recognize that certain types of speech and writing are authoritative and proper compared to others. Imagine you receive a message from someone you don’t know, all things being equal just think about getting a professional letter formatted properly as opposed to a text message written in abbreviations and using improper grammar, are you accustomed to trusting one more than the other? This is in part because when you read the two kinds of writing, the letter and the text message, you have ideas already about what sort of person is writing to you, one more professional, the other less. This is the central issue, the making invisible of the writer in science. The issue of how writing style influences our vision of the writer isn’t accidental, and in the history of science the creation of a voice for the scientist, even before there were things called scientists, was an intentional shift in writing style.

Truth as a style of writing

Science as we know it stems from roots in antiquity, but the main form it takes and particularly the way it is written and thought about starts in the early 16th to the 17th century—during this period the activities of observation and interpretation of natural phenomena we call science today were actually parts of different fields of endeavor. Some examples include: parts of contemporary geology, biology, and botany—particularly the gathering of samples and suggestion of taxonomy and speculation on natural history were done by naturalists. Often the naturalist would have been an amateur holding a different profession, and it was a common pastime for middle class and rich gentleman interested in the subject. This history continues in the tradition of collecting hobbies that continue today (e.g. butterfly collections, pressed leaves, bird watching, and rock collecting all stem from this era). Similarly the physical sciences of chemistry and physics didn’t exist; they were subjects linked to philosophy (speculation on what makes up the universe for example as a branch of natural-metaphysics) and in some cases natural theology relating issues of the universe and the nature of the world to religion. Much basic science was done as a side line by practitioners of applied trades (engineers, doctors, farmers, monks) and then communicated between them in books that would look little like science to a modern reader; they mixed the styles of writing and intellectual categories of science – religion, philosophy, and included discussions of ethics - each written in the style deemed appropriate by the writer. There were a number of popular styles of writing in the period, among them some were similar to what we would call a travelogue (in which the author leads the reader through a tour or trip they took), or a philosophical treatise that acknowledged the rational individuality of the author (which would sound a bit like a political or religious document to modern readers despite talking about nature recognized it as interpreted in these personal frames).

This multiplicity of ways of writing came up against a challenge when global trade was mercantilized, particularly expanded during the brief era of Dutch colonial and trade dominance.[[1]](#footnote-1) During this period the emphasis was placed on the practical application of science, and a careful effort was practiced in removing the often Christian explanations from the techniques and technologies developed. For example the works of Boyle in developing the air pump, Bacon’s writings about nature, and even Darwin’s works on evolution in a slightly later era actively discuss religion and religious implications. These longer works were separated from the products of the research in the form of the technologies developed, or brief monographs that distinguish themselves in applied focus. Isaac Newton, concerned that his work be seen as sacrilegious in its emphasis on natural and material cause, often capped writings with religious discussions.

The founding of “science” and the coining of the term scientist, occurred slightly later, and it is important to remember that at the time the scientist was named such in reference to an already extant use of the term artist for highly skilled practitioners of the arts and design. The use of the word “artist”, as a base for the term scientist, rather than the use of the word “artisan” as a base was at the time seen to be a reference to the importance of the individual, of the subject in the formation of the knowledge of science. Today we think of the scientist without the same sort of personal action and intention as an artist—the result of the way that scientists have written themselves out of the story of science itself. The scientist wasn’t an artisan or craftsman, performing a series of skills without being important themselves; the scientists used their insight and individual talent to make science. Importantly, in early science, the link between the practice of science and the people who made these insights depended on their ability to portray themselves as appropriately stationed in life and of trustworthy backgrounds. One way of doing this was to demonstrate their wealth and status, because it is important to remember that science was performed by gentlemen (mostly men, as the society allowed few women to participate) who had enough wealth to take time off from work to do their research. These wealthy gentlemen lived in a time when taking credit, accepting compliments and talking about themselves was seen as bad manners and in part this cultural emphasis was the starting point for much of the invisibility of the writer in scientific writing. At a time when one linguistically referred to the wealth and importance of peeople as belonging to their family so as not to embarrass them, and often replacing the people of the family with the name of their house (or the location of the house if they were aristocracy), it felt natural to place the activity written about as belonging to the tools and elements of the research rather than write about themselves. For example, a researcher in appropriate modesty would never refer to their important discovery, it was a breach of modesty to claim credit, rather they would say that the discovery made itself apparent through the simple experiment. This transfer of a social convention of modesty took time to become standardized and had challenges, particularly in early forms where the removal was seen to eliminate the presence of god as well as man. In response to this it was not uncommon to use religious language to imply god—thereby granting him presence. Shapin and Shaeffer, in *’Leviathan and the air pump’* present the active use and importance of the idea of the modest gentleman observer in scientific writing as well as philosophical writing of the time discussing the conversation between Boyle and the philosopher Hobbes.

In the same time period distinguishing science writing from travel writing was often difficult, the expansion of exploration and of literacy among the middle class and wealthy led to a demand for writings about the world, and the use of this style of writing about the world became a popular genre used by writers to distinguish their work from non-science writings. It is in fact noteworthy that the travels of Wallace and Darwin discussed in their writings on evolution, show different amounts of distance and invisibility, Darwin working from a lower class position and needing a broader audience used a much more personal voice in his writings, particularly when discussing the actual observations he made during travels on the Beagle. In contrast his more “scientific” writings, more similar to Wallace’s, have fewer references to his own experience and a more dramatic use of the passive voice, describing observation as arising out of the world and other elements of the invisibility of the author—what links their very different writings about natural history and evolution was the importance of omitting the personal to meet standards of modesty and appropriate portrayal of self as a British gentleman.

The old method of science in teratology and contrast: find the monster, the exception, the unusual, and in so doing it points out the general, then decry the monster and exclaim the original. And, we can see this in modern scientific writing still today: look for exceptions and outliers and state that they aren’t the valid portion. This isn’t a knowledge claim but a stylistic one based on conventions and an ethical determination of the value of the weird thing; that said, because we almost all understand that different is just that—different. It is a very convincing style of argument.

Another use of the invisibility of the author at the founding of modern science coincided and supported a key element of the scientific method that distinguished it as “science” from rationalist philosophy and metaphysics. The reliance on what Karl Popper called falsifiability. Popper is probably the best known philosopher of science in the modern age, and popularized among scientists, the idea that the core mechanism of science is the ability of other scientists to perform confirmation, the “check the work” performed by scientists. The concept of falsifiability is important in science because it is often possible to perform the same experiment multiple times, gaining the same result and still believe it to mean the wrong thing. Falsifiability responded to complaints that scientists simply “confirmed” each other. In the founding era of science, where fewer rules governed scientific research and significantly less was considered to be known about the world, a great deal of worry surrounded the question of how to decide when a new scientific observation qualified as knowledge/truth. In the same period we are thinking about, in which modest gentlemen were writing themselves out of the story, a pattern began to form of different scientists attempting to replicate each other’s work in order to check what they say. The modern form of publication including a methods section, a description of the work performed, arose at this time; as a way to demonstrate the honesty of the writer. In previous eras the work of the scholar/experimentalist was often kept private and considered proprietary, a theory and set of experiments belonged to the person who thought it up and did it. But in the 18th century the gentleman could be accused of lying if they weren’t agreeing with everyone else and even the accusation would stain their honor. Aside from fears of accusations, these were supposed to be rich gentlemen of means who had no need of selfishly keeping work to themselves, and if they did so, they could open themselves up to accusations of selfishness. The stage was set, and the convention of displaying methods to avoid insult began to be practiced by these early scientists. At the same time, the writers often felt embarrassed to write about the activities they did (a good gentleman shouldn’t talk about getting their hands dirty) and so the methods sections were often especially carefully written without a person in them.

Because of these rules for propriety the papers began to look somewhat like we today consider scientific writing. These practices of eliminating the self had another advantage, as discussed earlier, the need to design a ‘product’ for the widest audience can be applied, and scientific research began to circulate more easily between groups with different ideas about things. The Catholic researchers of continental Europe were more free to exchange papers with their Anglican associates in the United Kingdom, and colonial citizens were more easily taught about this new way of seeing the world. What had arisen largely in response to the local cultural pattern in Britain and Germany of protecting the honor of gentlemen, became an important tool in expanding colonial empires. This effectiveness of that early era of globalization is an important reason it is hard to think of science and of facts as anything but absolute today. The scientists working with and as part of the powerful commercial interests had no need to mention themselves, or the money they were earning for their work, and the more they eliminated themselves from the writings the harder it was for others to remember that these concepts and the set of practices associated with them are comparatively new in human history and that they can be understood as historically produced concepts. In other words, the more they said that science came from the world, rather than a group of rich white men, the more they seemed to control the world.

This style of writing with an invisible actor wasn’t only influential in science, it became widespread in history as **the** conception of trust, particularly in knowledge and the concept of “truth” (or abstract and universal knowledge), changes notably in the next 100 years, reshaping the way court testimony worked, the rules of war, and the responsibility of groups in power, as they began to describe the way the world worked as the product of the world as opposed to the result of efforts performed by people. In the end language is about many things, and the lack of persons in science writing has some benefits, but it also makes a lot of detail disappear about the world, the choice to use this style is as much about what not to talk about as it is a way to make data clearer. Power often comes down to responsibility, and trust is linked to the concept of blame, meaning rests in the language, and the style used to write about the world helps shape who takes responsibility, blame, and has power.

The Problem with the invisible in writing

As discussed in the previous section, the two goals of creating a form of knowledge that was universally marketable/applicable and the demand for a convention that provided for modesty of the writer has shaped the way we read authoritative texts. Whether the newspaper or a scientific journal article, the development of the “objective” tone as a way of writing has been practiced and shaped our expectations about the world today. This style that removes the author from scientific writing makes it seem as though what is written is natural truth as opposed to the product of the writer’s perspective. Over the last fifty years a number of critiques have been levied both in science and by those who study scientific writing, and these critiques share one thing in common: they worry that hiding information about the author makes it harder to tell whether you should trust what they wrote. Extreme examples in recent years, such as the controversy around journals owned and run by industries explicitly as a form of advertising, have brought public attention to the problem and led to a demand for transparency, but others have suggested a more serious revision is called for. For example, called “the god trick” by historian Donna Haraway, scientific writing styles have been criticized specifically for the removal of perspective even when a writer is honest and open about professional affiliations. The god-trick, she says, stems from historically replacing writing about people and religion/god with a new style in which the knowledge described is made to seem as if it is universal, the writing’s style is suggesting a universal perspective. This is Haraway’s god trick, that the writer is pretending to speak from a perspective outside of perspectives, and in so doing forms a kind of writing found earlier in religious texts as the perspective of god (with good and bad effects). In some cases of non-scientific writing this is linked through a different style but similar mechanism to what is called “omniscient narration” and implies that the writer knows everything. This omniscience is in fact correct when the writer is creating a fictional world but has different meanings and effects in scientific texts. But, take a moment and consider that the kind of writing that is most similar in style to scientific writing is only found in fiction writing. Should that make you consider the style more carefully? For Haraway, the importance of evaluating the writing style comes not from any aesthetic or personal concern about writing itself, but rather with the ability of style to shape the uses and quality of the knowledge that is written down. The linguistic removal of the self is the result of the history discussed above and was indisputably part of justifying colonial government and the harming of many people historically, but Haraway suggests that it continues to do harm. As scientists knowingly, or unaware, continue to write from the modesty of the 18th century, society has changed around them, and the inarguable utility of this writing in connecting people across difference at the time, now serves to make responding to differences harder today. The universality of perspective in the modern scientific fact makes it harder for science to allow other people to have different perspectives. Significant emphasis is placed on controls and standardization of the situation within experimentations, but because the perspectives of the author are never discussed, the assumptions they hold are never revealed, potentially damaging the validity of their controls. Key examples of this can be found in medical and pharmaceutical research, where to avoid legal issues, testing largely does not include pregnant women, similarly because drug companies want to minimize risks of side effects they select testing populations least likely to have those side effects – but these limitations of test population selection are not considered scientifically important because humans are seen as sharing physiological characteristics. The development of scientific knowledge, seen by many as an inherently good thing means that the selection of problems for research (i.e. why a scientist researches a given subject) is also not discussed in the publication about that research (for example a researcher on a disease is discouraged from discussing if they work on it out of a desire to help a friend who suffers from that disease – or perhaps to make money from a cure, but these intentions may effect how they do the research and what they consider a successful outcome. This conflict was particularly well documented around HIV/AIDS research, where rapid death rates in the 1980’s meant patients had different perspectives and expectations about experimental drugs than the more cautious researchers.

Conclusions

The way we are taught about science in high school maintains simplistic versions of this history. We divide the writing from the activities so that we have time to consider how to write it, you write up the lab after the fact. You include a detailed separate materials list to allow replicability but you never list yourself or the lab, or the teacher, the people are always erased to leave science free from people. From procedures detailed on paper we should be able to repeat all steps but throughout these various steps the way an activity is performed may be affected by variations and perspective. Does a very tall researcher do things the same as a very short one? Would a woman expect the same sort of processes to work as a man? Does someone located or raised in the difficulties of poverty consider the world in the same way that a person of privilege does? A wide range of scholarly work suggests these factors do have consequences (not always bad or good) on what the scientific knowledge ends up being, and for science to live up to its ideals these differing perspectives may need to be considered.

Pause for a moment, and think about how I wrote this paper, even here talking about history it is hard to tell the story without using a version of the invisibility of the author, without dropping myself out of the story. For the record I’m a graduate student studying the social dimensions of science and medicine, a white male, and a fan of science and technology. But, I naturally write without myself in the essay in the form of academic writing, partially out of habit, and in part to be read as knowledgeable by readers who have been educated in that habit of reading. Now that I’ve introduced myself you can ask yourself what you’d like to know about my perspective before you trust this essay, even a minimal effort at including the author opens up the discussion. Consider all this and ask yourself about the difference between science as writing and journalism, or science-fiction, or even a cookbook in which the materials, procedures, and outcomes are listed[[2]](#footnote-2).

1. Harold Cook’s discussion of the transferability of science and technology as key to the growth of trade because you could trade in knowledge and technology to other groups by universalizing the concepts being traded, thus demanding the invisibility of culture in science writing and communication for export even when they were culturally specific in longer forms within their home culture. Ways of knowing came to prominence in 16th-17th century because they had cross-cultural utility- as this utility expanded amid trade and out of primary functionality of the knowledge the system contained –the ways of expressing and transferring this knowledge was increasingly de-acculturated and de-contextualized –*Matters of exchange* by Cook [↑](#footnote-ref-1)
2. Consider the origin of the abstract at the beginning of the essay, originally used for filing and sorting. Some journals place it at the end because they consider it biasing to have at the start. The conventions for foot-notes and citations (only in some sciences are numbered citations used, these numbered citations remove even the names of other scholars) make wonder why the passive voice is used in science writing far more than in other forms of writing. [↑](#footnote-ref-2)