

## FOREWORD

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I tried to distinguish for myself what went into the writing of a “historically-informed” play by Carl Djerassi and myself, “Oxygen” (1), and the history of the discovery of that element, as investigated by many, and retold recently by Jean-Pierre Poirier (2). So obvious—a fiction vs. truth. But... trouble was lurking at every step in my thinking. Fiction could be seen transforming into hypothesis, and the vaunted truth—an ideal good for mottos, but not standing up well to analysis.

So I retreat, and write down a piece of my interior monologue in probing the distinction between a play and a history. Why not start with a definition of good history of science, which, in the context of Antoine Lavoisier, Larry Holmes (3) and Poirier (2) gave us? What I say subsequently is obvious to the professional authors in this issue. But perhaps it doesn't hurt to repeat it. Here's my try:

Good history of science is an authentic account of scientific events, and their causes and consequences for the people involved, and the community.

The first clause tries to escape a definition of truth (see substantive article in the *Stanford Encyclopedia of Philosophy* (4)). Even if it were as simple as “the truth is the facts” (what Joseph Priestley told the Lavoisiers at an October 1774 Paris dinner about his way of making oxygen from mercuric oxide), one is immediately faced with what Antoine or Marie-Anne Paulze Lavoisier made of that statement—how they understood it. For good reasons, this has been called the Rashomon effect,

recently put to good use by Jeffrey I. Seeman (5). Making you cognizant of the multiplicity of perceptions of any action, it automatically creates an interconnected network of interpretation from seemingly simple facts/datapoints, and the human beings involved. Most certainly including the historian.

The facts are mute (I have used this phrase before). It is a human being that weaves a story around the facts, a story of connection and causation. One story crafted by the scientists as they did the work. Another by the historian.

A story is constructed, based on the facts. And slowly the difference between fiction and truth is undermined. Narrative is human, narrative is natural. Elsewhere I have written of the essential nature of storytelling in science (“Narrative” (6) and “The Tensions of Scientific Storytelling” (7), both *American Scientist* columns). And how narrative, along with other modes of reasoning that are not mathematizable, such as metaphor, is undervalued in science.

It is inevitable that the historian's story is more “rational” than that of the scientist. (Shall I call him/her “the actor”, inviting a resonance with theatre? And on another level, probing what is real in theatrical performance.) The historian, after all, sees more. And after time has passed. Dangerous, and seductive—that hindsight. Yet, somehow the historian's perspective of a fixed-motive actor is unrealistic. The outlook of the actor/scientist is continually adjusted, and in no way as “rationally” as the historian

may wish to see him or her. The actor moves to a state of understanding or misunderstanding, struggling all the way. With facts that are waiting to be fit in, explanations that enrich and complicate the story. If the historian can change his or her analysis, why not the actor?

I find the formulation of “causes” that often occurs in historical studies, of science or otherwise, to be troubling. Even accepting the multiplicity of causative events, there is a peculiarly mechanical aspect that invoking causation attaches to human-driven events. It is somehow as if the actors, be they Lavoisier or the school-teacher who hid five of us for fifteen months in 1943-4 Ukraine (8), were automata, devoid of free will. I would prefer to see a platter laid out, with multiple small causative events displayed on it.

Also, I don't want the actor/scientist's way to be seen as quiet, rational progress—it's a scramble, a seizing of every foot- or hand-hold on understanding. I've called it scrabbling, and I do not have the board game in mind. I've found the process useful in characterizing my actions, or the actions of another scientist, prior to the sanitizing process of getting their work past the gatekeepers of scientific publication.

Am I confirming Paul Feyerabend's outlook (9) that anything goes? There may be moments of it, but somehow I feel that for most people the scrabbling is in the service of a good, that of the enhancement of reliable knowledge. We generally have no problem telling apart the intent charlatan/faker and the struggling scientist.

So let me try for another formulation:

Good history of science is writing a detailed story of scientific work, one that makes sense.

This is going to get me into as much trouble as the first definition, if not more. “Story” is pretty vague, and there is zero incentive, it would seem to some, that the words spoken, or measurements made, are reliably reported and, where that matters, are reproducible within a margin of error.

I would counter that falsified facts and unreproducible work do not “make sense.” But the Trump years and legacy would make anyone question that position.

I still believe that getting the word “story” in the description is a plus. It hints at a multiplicity of potentially credible stories, and the natural variability in their reception. It makes you think of both the actor/scientist and the historian of science engaged in the creation of a story. Making sense is a strong constraint on what both do.

Another interesting outcome of this definition is that it provides an opening to imaginative work, be it fiction or theatre. The construction of alternative realities (making good sense, of course) could then be seen as not just the province of science fiction or fantasy, or authors of fiction in general. But it could also be seen as productive activity for historians of science. Or their students!

## References and Notes

1. C. Djerassi and R. Hoffmann, *Oxygen*, Wiley-VCH, Weinheim, Germany, 2001.
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3. F. L. Holmes, *Lavoisier and the Chemistry of Life*, University of Wisconsin Press, Madison, 1987.
4. M. Glanzberg (2018) *Truth*. in E. N. Zalta, Ed., *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), <https://plato.stanford.edu/archives/fall2018/entries/truth/> (accessed 30 Nov. 2021).
5. J. I. Seeman, “The Corey-Woodward Conflict: Possible Explanations and in-Depth Analyses. The Rashomon Effect,” *Chem. Rec.*, **2023**, 23, to be published.
6. R. Hoffmann, “Narrative,” *Am. Sci.*, **2000**, 88 (July-August), 310-313.
7. R. Hoffmann, “The Tensions of Scientific Storytelling,” *Am. Sci.*, **2014**, 102 (July-August), 250-253.
8. Mykola and Maria Dyuk, <https://www.yadvashem.org/righteous/stories/dyuk.html> (accessed 1 Dec. 2021).
9. P. Feyerabend, *Against Method: Outline of an Anarchistic Theory of Knowledge*, Redwood Burn Ltd/Trowbridge & Esher, London, 1975.

## About the Author

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