

IS THERE ROOM FOR THE PRESENT IN THE HISTORY OF SCIENCE?

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Abstract

With due appreciation for insights of historians, sociologists, and philosophers of science about the contingency of history in the making, the susceptibility of grand narratives to propagandistic purposes of the narrators, and of the tentativeness of scientific knowledge, I propose that an eye on the present, prudently and consciously applied, can sometimes be illuminating in history of science. For at least one class of readers and writers in history of chemistry, namely chemists, the question of “how did we get here?” is a natural intellectual one. The question need not—ought not—imply that “here” is an inevitable or a final destination. Why narratives that refer to the present appeal to chemists is discussed, as are some of the pitfalls to which such narratives are prone. Historians of chemistry are invited to reconsider some aspects of their professional strictures against keeping an eye on the present.

Introduction

The portrayal of figures from the past can lead to strong responses in the present, as was apparent when statues became foci of protests in reaction to the killing of George Floyd by Minneapolis police officers in 2020. In the United States, monuments to people who had owned slaves or fought for the Confederacy during the Civil War were particularly contested, as were statues of Christopher Columbus. Debates over the memorials were often heated: those who urged removal argued

that the monuments glorified white supremacy, while those who defended the statues asserted that removal was tantamount to erasing history.

What does this have to do with history of science? For one thing, scientific figures are not immune from this public reassessment, as Sebastian Kaupp-Roberts illustrates in a short piece about the nineteenth-century American surgeon J. Marion Sims (1). Sims invented useful gynecological procedures and instruments, some of them developed while operating without anesthesia on enslaved women—after anesthesia had been successfully demonstrated. City authorities in New York ordered the removal of a statue of Sims from Central Park in 2018.

For another thing—more relevant to the essay that follows—the monument controversies prompted widespread discussion in the popular press and social media about judging the past by standards of the present. Again, science was not exempt, as exemplified by an opinion piece in the *Financial Times* headlined “Scientific History Should Not be Set in Stone” (2) and a short responding letter “Don’t Judge Historical Figures by Modern Values” (3).

I wish to pursue the influence of present-day issues, knowledge, and values on the depiction and understanding of the past in science. Having begun in arenas visible to the wide world, I turn my attention to the scholarly world—without losing sight, I hope, of communication to a wider public (4). In short, I offer some opinions

about a recurrent topic in historiography, and particularly in historiography of science under the headings of presentism or whiggism. I propose that some aspects of whiggism can be present in scholarship of high quality, and I suggest why scientists have some affinity for whig history for good and for ill. I would be pleased if some professional historians of chemistry who read this article consider relaxing the rejection of presentism ingrained in the profession and if some fellow chemist-historians recognize some of the deleterious aspects that can accompany presentism.

What is Whig History and What is Wrong with It?

Whiggishness or whiggism is a term of opprobrium in the field of history, including (or perhaps especially) in history of science. The term whiggism appears first in Herbert Butterfield's influential book *The Whig Interpretation of History*, originally published in 1931 (5). Butterfield generalized the term from a reference to British political history written by members of the Whig party or scholars sympathetic to their aims. Such histories were simple morality tales of progress, culminating in the Whigs and their policies. By extension, whig history is any overly simplified historical narrative, presenting actors in the past either as promoters of the glorious present or obscurantist opponents of it.

Butterfield points to a preoccupation with present concerns as the root of this sort of bad history (pp 31-32):

The study of the past with one eye, so to speak, upon the present is the source of all sins and sophistries in history, starting with the simplest of them, the anachronism.

The problems begin even with the choice of historical question to investigate. A real historian seeks to understand the past in its own terms (p 17):

Instead of being moved to indignation by something in the past which at first seems alien and perhaps even wicked to our own day, instead of leaving it in the outer darkness, he makes the effort to bring this thing into the context where it is natural, and he elucidates the matter by showing its relation to other things which we do understand.

Butterfield goes on to contrast the true historian with two others, the first of whom, perhaps, is no historian at all, while the second is a whig historian (pp 17-18):

Whereas the man who keeps his eye on the present tends to ask some such question as, How did religious liberty arise? while the whig historian by a subtle

organization of his sympathies tends to read it as the question, To whom must we be grateful for our religious liberty?

For Butterfield, the remedy to whiggish approaches to history is thorough and detailed historical research that enters into the concerns and categories of the past, describing it in all its complexity and in its own terms. Abridgement is suspect, in his eyes, although he admits that it is necessary: it must be done, but in such a way that does not change the meaning of the narrative. The whig historian, by contrast, has an easy principle of selection that cuts through the complexity, namely to concentrate on the people and institutions whose ideas most closely resemble our own.

Objections to Butterfield's Strictures

Butterfield was certainly correct to criticize writing about history in a way that portrays figures of the past as having concerns and motivations that refer to the present, i.e., as promoters or opponents of what became the present. Such narratives distort how and why past events unfolded, and they lend themselves to simplistic teleological tales of heroes and villains. But is it really necessary, if one is to write good history, to leave the present out completely? As Nick Jardine puts it (6):

With Butterfield we surely should reject the hagiographical elevation of past "friends of progress," the structuring of historical narratives as fated convergences onto present beliefs and institutions, and the uncritical projection of present values onto the past. But there is no need to throw out the baby with the bath water.

There are two particular ways that I would suggest the present can be brought to bear in history of science in ways that would not diminish, and could enhance, its scholarly value.

1. In selecting historical questions based on interests in the present, including tracing a development from its discovery or proposal through to its present status.
2. In using present scientific knowledge judiciously to interpret past experiments and observations.

It seems to me that the present can be drawn into history of science in these two ways regardless of any philosophical commitment for or against the notion of scientific progress. I then discuss why a philosophical belief in scientific progress (to be defined below), common among scientists, makes whiggish history of science appear natural, for good and for ill.

Selecting Questions for Investigation

My first reaction to reading Butterfield's opinions about questions asked by those who have their eye on the present was that those are just the sort of questions scientists curious about the past of their field would ask.

That reaction was hardly original. Rupert Hall, writing about whiggism in 1983, observes, "The most obvious of all historical questions is: 'How did we arrive at the condition we are now in?'" Academic historians might be trained to avoid putting such questions, but, Hall notes, "The question is put, and the questioner will find an answer somewhere; if academic historians are silent he or she will seek an answer in other ways" (7). Hall laments the lost opportunity to communicate to those outside the field of history who pose such questions. After all, he suggests, who better to give reliable answers, including relevant contingencies and uncertainties, than historians?

Ernst Mayr describes a more refined version of the question of how the current situation came to be. Mayr (1904-2005) was a distinguished evolutionary biologist (elected to US National Academy of Sciences) who also wrote about the history and philosophy of his subject. He defines developmental history of science as "the study of those aspects of the past that help our understanding of the science of the present" (8), and he asserts that questions of this sort are what interest practicing scientists in the history of their fields. He distinguishes developmental history from descriptive history, the latter narrating how events unfolded in time. Good developmental histories, he asserts, do not ignore "failed" ideas, although they do not spend as much time on them as on theories whose traces are still visible in those of the present. Describing the development of a scientific discipline to the present need not—should not—assume that present theories are final.

Mayr argues that developmental history of science is not whiggish and that it is legitimate. If we take Butterfield's definition ("eye on the present"), developmental history of science *is* whiggish, but I agree with Mayr that it is legitimate. As scholarship, it ought to be judged in terms of what it sets out to accomplish, namely to trace ideas that shape current theories in a field. It seems to me that Mayr's developmental history is an extension of the "temporal depth" Edward Harrison mentions as "an integral part of scientific research" (9). Certainly scientists' networks of citations to earlier publications can function as source material for investigating the development of ideas in a field.

Naomi Oreskes touches several themes similar to Hall's 30 years later in an essay provocatively titled, "Why I Am a Presentist" (10). To be clear, Oreskes considers herself a motivational presentist only (that is, someone whose historical interests are influenced by the present), not a substantive or methodological presentist. Substantive presentism, she writes, is a belief that the past is substantially like the present; methodological presentism seeks to understand the past by studying similar events in the present or recent past. In her view, historians are right to avoid those two forms of presentism. But as for why historians write history (p 604):

We believe it is of value to us—living here, today, at this moment and in this place. If we deny this (really rather obvious) fact for fear of being labeled "presentist," we deprive ourselves of the most important argument we have for why we do what we do, why our universities and funding agencies should underwrite it, and why our students should be required to study it.

For Oreskes, topic selection rooted in the present need not be the question of how we got to the present; however, for her, as for Hall, relevance to the present would give historians opportunities to communicate with the wider public or with policymakers or specialists in other fields—opportunities too often forgone.

Using Present Scientific Knowledge to Interpret the Past

Butterfield's exhortation to his fellow historians to "make the past our present" (5, p 16) was made explicit for historians of science by Thomas Kuhn (11):

Insofar as possible (it is never entirely so, nor could history be written if it were), the historian should set aside the science that he knows. His science should be learned from the textbooks and journals of the period he studies.

Understanding science from within the time it was carried out is certainly important for describing how the activities in question unfolded. I can see how "translating" an operation (a chemical reaction, for example) into modern terms could entail distorting the operation (for example, unconsciously picturing the reaction being carried out with materials as pure or well-characterized as those available from a present-day chemical stockroom). Still, an historian who has immersed herself in the world of a past chymist has the task of interpreting that world to readers in the present. Part of the readers' job is to attempt to enter that unfamiliar past world, but surely the historian is to act as a guide, using readers' knowledge to help them understand that unfamiliar past world.

Arguably, the further removed from our own time, the more danger there is for a reader in the present to misapply current categories to the past. A well-known example is the word *scientist*, not coined until the 1830s. Using the term to describe an eighteenth-century savant practically invites the reader to clothe the savant in the nineteenth- and twentieth-century professional identity that the term brings to mind (12).

The word *chymistry* serves to distinguish the early modern activity described under that name from the later practice of chemistry. Lawrence Principe does not shy away from meeting his readers in the present, though, when introducing them to *chymistry* (13):

Early modern *chymistry* embraces many topics that are usually regarded today as separate disciplines—chemistry, medicine, theology, philosophy, literature, and the arts.

He goes on to explain why it would be a mistake to think of *chymistry* as a “protochemistry,” but he notes that twenty-first-century chemistry can be brought to bear in understanding it (13, p 138):

First, a knowledge of the chemical and physical properties of substances can help the historian grasp the processes and ideas that early authors describe incompletely or allusively. Second, and more vividly, a working knowledge of chemistry enables the researcher to try to replicate—and thereby understand better and more deeply—historical processes and results.

Attempting to reproduce experiments has been used to good effect to clarify more recent episodes in the history of chemistry, such as the validity of the formal synthesis of quinine announced in 1944. That announcement was called into question early in the twenty-first century, and experimental investigations published in 2008 supported the announcement (14). Stephen Brush mentions experimental reconstructions approvingly as one way for scientists to bring their skills and knowledge to historical investigations. Brush’s essay argues strongly for a place for scientists in history of science “if they are willing to acquire the skills and background knowledge of the historian of science” (15). That proviso, in his opinion, ought not to deter scientist-historians from investigating presentist topics or employing their scientific expertise in pursuing historical questions.

Hasok Chang adopts a pluralistic attitude toward historiography of science, including whiggish and other presentist perspectives. Indeed, the problem with historiography that has often been criticized as whiggish, he writes, is not present-centeredness but triumphalism,

celebrating the winners in past scientific controversies, whether or not the ideas persist in the present (16).

It seems to me that such triumphalism is part of what Butterfield critiqued; after all, Butterfield included “to praise revolutions provided they have been successful” among the transgressions of whig historians (5, p v). Still, Chang’s distinction is a useful one, for he illustrates how one can be informatively whiggish about phlogiston as a partial antidote to triumphalist narratives about the Chemical Revolution (16). He points out, for instance, that caloric, which is just as imponderable as phlogiston, was a key part of Lavoisier’s explanation of combustion. Long after the phlogiston theory had been discarded, practicing scientists proposed possible reinterpretations for phlogiston as chemical potential energy (William Odling in 1871) or as electrons (G. N. Lewis in 1926). I believe that a historical account of phlogiston that describes Odling’s and Lewis’s suggestions could add to an appreciation of the phenomena that phlogiston explained in its time—albeit clearly in a way that was not accessible to eighteenth-century phlogiston theorists. Similarly, pointing out which ideas of Lavoisier’s were subsequently discarded from explanations of combustion illustrates that today’s explanation did not spring fully formed from anyone’s mind.

More recently, Chang has further developed his ideas on presentist historiography. On the issue of using only the categories available to historical actors, he writes (17),

For the purpose of reaching the most informative and meaningful description or explanation, there is actually no guarantee, not even a very high likelihood, that actors’ categories provide the best framework for it—as the latter-day reinterpretations of phlogiston mentioned above suggest. Here Chang recommends that professional historians of science generally avoid whiggism, but not because it necessarily produces bad history. Rather,

The real problem with whiggish history of science is that it always aligns its value-judgements with the current [scientific] orthodoxy.

Chang also notes that scientists can and will produce whiggish history for themselves, and he sees no need for historians to duplicate their efforts.

Why Are Scientists Attracted to Whig History?

Chang is not alone in associating scientists with whig history of science. In my reading on whiggism in

history of science, it appears that professional historians of science and scientists interested in history of science agree that scientists often do or did write history of science described as whiggish. Even two pointed commentaries in *Nature* from the 1980s which, respectively, celebrated and deplored professionalization in history of science, agree (at least partly) on this point. Colin Russell describes scientists' forays into history of science as "juvenile improvement or geriatric propaganda" and says that such heroic tales "are really caricatures" (18). Edward Harrison, while characterizing history of science by historians who knew little or no science as "priggish," nevertheless admits that many scientists make unsubstantiated connections and tend toward whiggish abridgments when they discuss history (9). (Differences between professional historians of chemistry and chemist-historians across several dimensions are discussed amicably and in detail elsewhere in this issue in a paper written collaboratively by one of each (19).) And we have seen the biologist Mayr, while rejecting the whiggish label, defend historical inquiry whose object is to elucidate the development of current theories (8).

Interest in relating past science to current science is natural for practicing scientists, who believe that the science of the present generally provides better explanations of how the natural world works and better means for extending that understanding than did science of the past. Indeed, this amounts to a general belief in scientific progress as I understand the term. Scientists appreciate that currently accepted theories are tentative and subject to revision. Still, present theories are naturally accorded a privileged status compared to past ones that have been discarded or modified. In short, practicing scientists generally believe that scientific theories usually become more refined, more reliable, and more comprehensive over time—albeit not inevitably and not necessarily linearly. More fundamentally, belief in scientific progress is accompanied by a philosophical belief in the existence of a real and objective natural world—even if today's scientists never think about the philosophy of science in those or any other terms.

A clear and unapologetic example of belief in the progress of science can be seen in the writings of Steven Weinberg (1933-2021), a Nobel laureate in physics. In science, he notes (20),

... there are laws of nature, equally binding on all places and times. It is precisely the story of the growing consciousness of the laws of nature that the whig historian of physics hopes to tell, but the story cannot be told without keeping an eye on our present knowledge of the natural world.

Arthur Silverstein, retired professor of medicine, later observes that whig histories of science written at different times would disagree about who in the past was right and who wrong. Weinberg admits the justice of the observation, since current knowledge is not final knowledge, but adds that (20, 21)

... since the downfall of the phlogiston theory of fire and the caloric theory of heat in the nineteenth century, there has been no generally accepted theory in the exact sciences that has turned out to be simply wrong.

In my opinion, it is important to quote scientists such as Weinberg who are unsympathetic to the project of understanding theories of the past in their own terms or to the suggestion that science is subject to social forces. For example, Weinberg writes that the notion that a scientific theory ought to be judged on how it handled the problems of its own time is "nonsense." He adds "The point of science is not to answer the questions that happen to be popular in one's time, but to understand the world" (20). Apparently there is no room here to see how external factors such as a world war or the COVID-19 pandemic affect "the point of science." To take Weinberg as a model would be to invite dismissal out of hand by historians, philosophers, and sociologists of science who are interested in challenging scientific assumptions and orthodoxies.

Belief in scientific progress need not, indeed ought not, to lead a writer with an eye on the present to simplistic, heroic or triumphalist narratives. Hall notes that in science, some things are wrong and others right. While other historians can see errors in, say, battles or diplomacy, they do not know the right answer; historians of science do. "The historian cannot avoid the burden of superior [scientific] knowledge [of the present]. ... Thus, it seems to me, the Whiggish idea of progress has inevitably to be built into the history of science" (7, p 57).

Recommendations that history of science ought to be "divorced from the idea of progress" (7) were made not long after the professionalization of the discipline. But the notion that a belief in scientific progress was intellectually respectable or defensible has also appeared from time to time in history of science journals. Two decades after Hall (7), Nick Jardine opines that the injunction against historical investigation of scientific progress is excessive (6). Still later, the philosopher David Alvargonzález proposes philosophical criteria for assessing the presence or absence of progress in science and technology. While recognizing that many historians and philosophers of science hold that one cannot speak

of such progress, he concludes that “recognizing some scientific progress in a sequence of sufficiently large and distant events can only be unanimous” (22).

It is easy to see how a belief in progress, even a progress that is non-linear and contingent, coupled with a consciousness that the present is not the final stage, can lead a scholar to devalue discarded past theories. To take the classic example in chemistry, it is easy to treat the phlogiston theory as an obstacle to understanding combustion rather than to appreciate it as an explanatory framework in its own right. A more recent example might be to regard Linus Pauling’s advocacy of the valence bond approach in quantum chemistry as a barrier to more widespread adoption of molecular orbital theory.

It is also easy to see how scientists interested in the past of their discipline but not formally trained in history (among whom I count myself), can fall into the undesirable aspects of whig history. As noted, progressivist narratives come naturally, and can easily turn triumphalist or simplistic if the progressivist assumption is unconscious. It is easy, without critical practice, to make connections between older and newer ideas on the basis of insufficient resemblance, unrecognized divergences in the meaning of terms, or unawareness of differences in purpose between older and more recent actors. With consciousness and practice, these tendencies can be overcome.

Conclusion

I believe that both chemist-historians and historians of chemistry can produce interesting, insightful, and scholarly studies of chemistry and related practices of the past. Such accounts must avoid oversimplification, teleology, and triumphalism, as Butterfield enjoined. But the present need not be barred from such accounts. Chemist-historians ought to be aware of assumptions of scientific progress: narratives of progress require demonstration, not simply assertion, and they must guard against implications of inevitability. Similarly, I would challenge historians of chemistry to consider critically the ingrained assumptions that the present has no place in accounts of the past (23). Judicious relaxation of such strictures can make accounts produced with historians’ skills and attention to context more relevant and interesting to readers outside their own specializations.

When he was President of the American Historical Association, William Cronon gave a measured endorsement to judicious abridgment, at least when historians communicate to a wider public (24):

Whenever historians seek to make their knowledge accessible to a wider world—whether in books, classrooms, museums, videos, websites, or blogs—they unfailingly abridge, simplify, analyze, synthesize, dramatize, and render judgments about why things happened as they did in the past, and why people should still care today. But they need not commit the worst sins of whiggishness when they do so. The characters in their stories need not wear white or black hats, and will feel more richly human for being understood on their own terms.

Acknowledgment

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References and Notes

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2. A. Saini, “Scientific History Should Not be Set in Stone,” *Financial Times (London)*, Feb. 24, 2021, p 19; retrieved from Gale OneFile: News (accessed Apr. 29, 2021).
3. S. Aspinall, “Don’t Judge Historical Figures by Modern Values” (letter), *Financial Times*, Mar. 4, 2021, p 34; retrieved from Gale OneFile: News (accessed April 29, 2021).
4. Scholarly history of any sort is a vastly different mode of portraying the past than the construction of monuments, as was pointed out by a reviewer of this paper, so it may seem odd to introduce an essay on the former by using examples of the latter. I do so partly to illustrate present-day interest in depictions of the past and partly because using present-day considerations in describing the past is directly relevant to the essay.
5. H. Butterfield, *The Whig Interpretation of History*, G. Bell and Sons, London, 1959 [1931]. Butterfield (1900-1979) was Regius Professor of History at the University of Cambridge.
6. N. Jardine, “Whigs and Stories: Herbert Butterfield and the Historiography of Science,” *Hist. Sci.*, **2003**, *41*, 125-140 on 134-135. Jardine was educated in natural science, but most of his academic career was in the department of History and Philosophy of Science at the University of Cambridge.
7. A. R. Hall, “On Whiggism,” *Hist. Sci.*, **1983**, *21*(1), 45-59 on 54. (Alfred) Rupert Hall (1920–2009) was the first professor of the history of science at Imperial College London. His educational background was in history.

8. E. Mayr, "When is Historiography Whiggish?" *Journal of the History of Ideas*, **1990**, 51(2), 301-309.
9. E. Harrison, "Whigs, Prigs and Historians of Science," *Nature*, **1987**, 329, 213-214. Harrison (1919-2007) was a cosmologist and astrophysicist who spent most of his career in the Department of Physics and Astronomy at the University of Massachusetts Amherst.
10. N. Oreskes, "Why I Am a Presentist," *Science in Context*, **2013**, 26(4), 595-609. Oreskes is Professor of the History of Science and Affiliated Professor of Earth and Planetary Sciences at Harvard University. She has both natural science and history of science in her educational background.
11. Quoted from T. S. Kuhn, "History of Science," *International Encyclopedia of the Social Sciences*, Macmillan, New York, 1968, Vol. 14, pp 74-83 on 76-77; quoted in S. G. Brush, "Scientists as Historians," *Osiris*, 2nd ser., **1995**, 10, 214-231 on 218. Thomas Kuhn (1922-1996) was a Ph.D. physicist whose academic career was primarily in the history and philosophy of science.
12. A. Wakefield, "Butterfield's Nightmare: the History of Science as Disney History," *History and Technology*, **2014**, 30(3), 232-251. Andre Wakefield is Professor of History at Pitzer College in California.
13. L. M. Principe, *The Secrets of Alchemy*, University of Chicago Press, Chicago, 2013, p 137. Principe has doctorates in chemistry and in history of science, and his faculty appointment at Johns Hopkins University is in the departments of chemistry and of history of science.
14. The 1944 report (R. B. Woodward and W. E. Doering, "The Total Synthesis of Quinine," *J. Am. Chem. Soc.*, **1944**, 66(5), 849) was a "formal" synthesis: the researchers did not themselves produce quinine, but an intermediate whose conversion to quinine had been previously reported in the chemical literature. That conversion was subsequently called into question. An historical investigation marshalled considerable evidence that supported the original claim (J. I. Seeman, "The Woodward-Doering/Rabe-Kindler Total Synthesis of Quinine: Setting the Record Straight," *Angew. Chem. Int. Ed.*, **2007**, 46, 1378-1413). A year later, an experimental investigation reproducing the questioned steps also supported the original work (A. C. Smith and R. M. Williams, "Rabe Rest in Peace: Confirmation of the Rabe-Kindler Conversion of *d*-Quinotoxine Into Quinine: Experimental Affirmation of the Woodward-Doering Formal Total Synthesis of Quinine," *Angew. Chem. Int. Ed.*, **2008**, 47(9), 1736-1740).
15. Ref. 11 (Brush), p 215. Stephen Brush earned a Ph.D. in physics. Most of his academic career was in history of science at the University of Maryland.
16. H. Chang, "We Have Never Been Whiggish (About Phlogiston)," *Centaurus*, **2009**, 51, 239-264. Chang is Hans Rausing Professor of History and Philosophy of Science at the University of Cambridge. Physics is part of his undergraduate education, and his doctorate is in philosophy.
17. H. Chang, "Presentist History for Pluralist Science," *Journal for General Philosophy of Science*, 52, 97-114, **2021**; doi:10.1007/s10838-020-09512-8.
18. C. Russell, "Whigs and Professionals," *Nature*, **1984**, 308, 777-778. Russell (1928-2013) was Professor of History of Science and Technology at the Open University for most of his academic career. His undergraduate education was in chemistry and his graduate education in history and philosophy of science.
19. P. J. T. Morris and J. I. Seeman, "The Importance of Plurality and Mutual Respect in the Practice of the History of Chemistry," *Bull. Hist. Chem.*, **2022**, 47(1), 124-137.
20. S. Weinberg, "Eye on the Present—The Whig History of Science," *New York Review of Books*, Dec. 17, 2015, pp 82-84 on 84.
21. A. M. Silverstein and S. Weinberg, "The Whig History of Science: An Exchange," *New York Review of Books*, Feb. 25, 2016, p 41. A reviewer of the present article wondered what Weinberg would think about, among other things, "absolute space and time, determinism in classical physics, etc." I suspect that he would have described these as limiting cases and not "simply wrong." I would argue that analyzing those concepts in light of both past and current knowledge enriches our understanding of them. But I would argue (with Chang) that the same holds for the phlogiston theory despite Weinberg's implication that it was "simply wrong."
22. D. Alvargonzález, "Is the History of Science Essentially Whiggish?" *Hist. Sci.*, **2013**, 51, 85-99. Alvargonzález is a philosopher by training. He is professor in the Departamento de Filosofía of the Universidad de Oviedo.
23. Michael Gordin examined the anti-whig orientation of historians of science in an essay review of Hasok Chang's book *Is Water H₂O?: Evidence, Realism and Pluralism* (Springer, Dordrecht, Netherlands, 2012). Gordin writes that "the professional history of science as a discipline is officially and resolutely 'anti-Whiggish,'" and he affirms his commitment to that position. M. Gordin, "The Tory Interpretation of History," *Hist. Stud. Nat. Sci.*, **2014**, 44(4), 413-423. Gordin is Professor of History at Princeton University, and his education is in history of science, including an undergraduate concentration in history and science at Harvard.
24. W. Cronon, "Two Cheers for the Whig Interpretation of History," *Perspectives on History*, **2012**, 50(6), <https://www.historians.org/publications-and-directories/perspectives-on-history/september-2012/two-cheers-for-the-whig-interpretation-of-history> (accessed 21 Sep. 2021). Cronon is an environmental historian. For much of his career he was Frederick Jackson Turner Professor of History, Geography, and Environmental Studies at the University of Wisconsin-Madison.

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