Kuhnian History of Science and the "Great Man" of Science Model

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Abstract: I argue that forays into history of science in Kuhn's *The Structure of Scientific Revolutions* (1962/1996) are by and large instances of "Great Man" history of science. "Great Man" history is the idea that history is the biography of great men. The "Great Man" of science model not only excludes women and people of color from science but also suggests that only special, exceptional people can succeed in science. If this is correct, then Kuhn (1962/1996) fails to usher in a "historiographic revolution in the study of science" or a "new historiography" (Kuhn 1962/1996, 3), as the book purports to do. Instead, it merely perpetuates the defunct historiography of the "Great Man" of science.

Keywords: Great Man history, Great Man of science model, Thomas Kuhn

1. Introduction

The picture of history of science that emerges from *The Structure of Scientific Revolutions* (1962/1996) is that of a history that is punctuated by periods of conceptual upheaval in which scientific theories are abandoned and replaced by other, incommensurable ones.[1] For Kuhn, scientific change is neither straightforwardly linear nor cumulative. Instead, scientific change alternates between periods of so-called "extraordinary" (or "revolutionary") science and periods of so-called "normal" science. Periods of normal science are cumulative insofar as normal science is "puzzle-solving" and scientists can reasonably expect to accumulate more solutions to scientific puzzles (Kuhn 1962/1996, 35-42), whereas periods of extraordinary (or revolutionary) science are not cumulative insofar as such periods involve an overhaul of accepted scientific beliefs and practices (Kuhn 1962/1996, 92). Some of the accomplishments of preceding periods of normal science can be lost during periods of revolutionary science. This is known as "Kuhn-loss" (Kuhn 1962/1996, 99-100).[2]

I argue that forays into history of science in Kuhn (1962/1996) are by and large instances of "Great Man" history of science. "Great Man" history is the idea that "the History of the world is but the Biography of great men" (Carlyle 1840, 34). The "Great Man" of science model not only excludes women and people of color from science but also "implicitly suggests that only special, exceptional [people] can succeed in science" (Jones et al. 2022, 6). If this is correct, then Kuhn (1962/1996) fails to usher in a "historiographic revolution in the study of science" or a "new historiography" (Kuhn 1962/1996, 3), as the book purports to do. Instead, it merely perpetuates a defunct historiography, namely, the "Great Man" of science model.

[1] On the incommensurability thesis, see Mizrahi (2015), reprinted in Mizrahi (2018b). Cf. Markus (2018) and Bryant (2018). See also Mizrahi (2018c) and Sankey (2018).
[2] "A scientific revolution comes together with certain shifts and losses on theoretical, methodological, and axiological levels in meanings, problems, statements, assumptions, principles, instruments, and the values of scientists" (Argamakova 2018, 47).

2. Kuhnian History of Science is "Great Man" History of Science

The "Great Man" theory of history is the idea "that individuals affect the course of history more than do historical circumstances" (Erickson and Murphy 2017, 71). The picture of the history of science that emerges from Kuhn (1962/1996) is one in which individual scientists affect the course of the history of science more than historical circumstances do. If this is correct, then Kuhnian picture of the history of science in Kuhn (1962/1996) is modeled on the "Great Man" theory of history, namely, the "Great Man" of science model. In this section, I present quantitative evidence suggesting that forays into history of science in Kuhn (1962/1996) are by and large instances of "Great Man" history of science.

Quantitative evidence for the claim that forays into history of science in Kuhn (1962/1996) are by and large instances of "Great Man" history of science can be gleaned from the index of the book. Peter J. Riggs prepared the index for Kuhn (1962/1996, 211-212), for which the author and the publisher claim to be indebted (Kuhn 1962/1996, 211).[3] According to *The Chicago Manual of Style* (2010, 2), "A good index gathers all *the key terms and subjects* (grouping many of the former under the conceptual and thematic umbrella of the latter), sorts them alphabetically, provides cross-references to and from related terms, and includes specific page numbers or other locators" (emphasis added). Provided that the index for Kuhn (1962/1996) is a good index, it is reasonable to expect that it contains the *key terms and subjects* of the book, which is why it is useful to examine it as a way of gaining insight into the historical methodology employed in Kuhn (1962/1996).

In Kuhn (1962/1996), the names of 31 "great men" of science (all of whom are men) are listed in the index and 285 pages of the book are indexed for these names (see Table 1). That is more than twice the number of pages indexed for theoretical terms of the theory of scientific change outlined in Kuhn (1962/1996), such as "paradigm" and "incommensurability" (see Table 2), more than three times the number of pages indexed for scientific terms, such as "electricity" and "planet" (see Table 3), and almost four times the number of pages indexed for other terms, such as "consensus" and "discovery" (see Table 4).

Table 1. Names of "great men" of science indexed in Kuhn (1962/1996) and the number of pages indexed for these names

Names of "great men" of science	**Number of indexed pages**
Archimedes	2
Aristarchus	2
Aristotle	22
Francis Bacon	5
Joseph Black	2
Robert Boyle	5
Tycho Brahe	2
Alexis Clairaut	1

[3] "This index has been prepared by Peter J. Riggs, and both author and publisher are indebted to him for recommending this addition and seeing it into print" (Kuhn 1962/1996). This suggests that Kuhn himself approved of the index.

Copernicus	23
Charles-Augustin de Coulomb	5
John Dalton	10
Charles Darwin	4
Louis De Broglie	1
Rene Descartes	6
Albert Einstein	21
Benjamin Franklin	11
Galileo Galilei	15
James Hutton	1
Lord Kelvin	3
Johannes Kepler	8
Antoine Lavoisier	38
G. W. Leibniz	2
Charles Lyell	1
J. C. Maxwell	13
Isaac Newton	43
Wolfgang Pauli	2
Max Planck	3
Joseph Priestley	16
Ptolemy	12
Wilhelm Roentgen	3
C. W. Scheele	3
TOTAL	**285**

Table 2. Kuhnian terminology indexed in Kuhn (1962/1996) and the number of pages indexed for Kuhnian terms

Kuhnian terms	**Number of indexed pages**
Anomalies	7
Crisis	15
Different worlds	2
Essential tension	1
Extraordinary science	8
Gestalt switch	7
Incommensurability	11
Meaning change	4
Normal science	15
Paradigm	17
Paradigm choice	17
Puzzle solving	4
Revolutions in science	12
Textbook science	3
World changes	4
TOTAL	**127**

Table 3. Scientific terminology indexed in Kuhn (1962/1996) and the number of pages indexed for scientific terms

Scientific terms	**Number of indexed pages**
Annual stellar parallax	1
Electricity	18
Geology	3
Leyden jar	6
Lunar motion	3
Mercury (planet)	2
Neutrino (particle)	2
Nuclear fission	1
Optics	13
Phlogiston	22
Planet(s)	2
Quantum theory	9
Uranus (planet)	2
Venus (planet)	1
X-rays	8
TOTAL	**93**

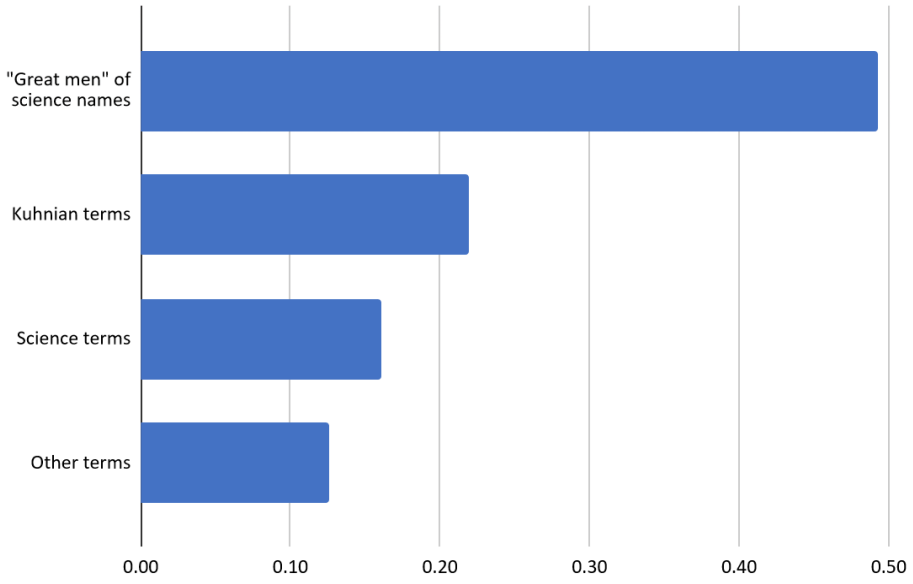
Table 4. Other terminology indexed in Kuhn (1962/1996) and the number of pages indexed for other terms

Other terms	**Number of indexed pages**
Ad hoc	4
Alfonso X	1
Conceptual boxes	2
Consensus	5
Cumulative process	7
Discovery	4
Esoteric problems	1
Falsification	5
Mature science	3
Observation language	3
Perception	2
Sir Karl Popper	4
Progress	5
W. V. O. Quine	2
Resistance	4
Scientific community	17
Tacit knowledge	2
Verisimilitude	1
Ludwig Wittgenstein	1

TOTAL	**73**

Names of “great men” of science, such as Tycho Brahe and Isaac Newton, make up 49% of all terms indexed in Kuhn (1962/1996) as a proportion of the number of indexed pages for the key terms of the book, which include names of “great men” of science, Kuhnian terms, scientific terms, and other terms. By contrast, theoretical terms of the theory of scientific change outlined in Kuhn (1962/1996), such as “paradigm” and “crisis,” make up only 22% of all terms indexed in the book as a proportion of the number of indexed pages for the key terms of the book, which include names of “great men” of science, Kuhnian terms, scientific terms, and other terms. Scientific terms, such as “neutrino” and “X-ray,” make up merely 16% of all terms indexed in the book as a proportion of the number of indexed pages for the key terms of the book, which include names of “great men” of science, Kuhnian terms, scientific terms, and other terms. Finally, other terms, such as “discovery” and “perception,” as well as names of male philosophers, such as Wittgenstein and Quine, make up 13% of all terms indexed in the book as a proportion of the number of indexed pages for the key terms of the book, which include names of “great men” of science, Kuhnian terms, scientific terms, and other terms (see Figure 1).

Figure 1. Proportions of terms indexed in Kuhn (1962/1996) as a proportion of the number of indexed pages for the key terms of the book



While the differences in page proportions are clearly visible, I conducted *z*-tests for proportions to find out if the differences between the proportions of pages indexed for key terms in Kuhn (1962/1996) are statistically significant. First, a *z*-test for proportions indicates that the difference between the proportion of pages indexed for names of “great men” of science (0.49) and the proportion of pages indexed for Kuhnian terms (0.22) is statistically significant ($z = 9.70$, $p < 0.00$, two-sided). Second, a *z*-test for proportions indicates that the difference between the proportion of pages indexed for names of “great men” of science (0.49) and the proportion of pages indexed for scientific terms (0.16) is statistically significant ($z = 12.03$, $p < 0.00$, two-

sided). Third, a *z*-test for proportions indicates that the difference between the proportion of pages indexed for names of "great men" of science (0.49) and the proportion of pages indexed for other terms (0.13) is statistically significant ($z = 13.48$, $p < 0.00$, two-sided). These results suggest that the proportion of pages indexed for names of "great men" of science is significantly larger than the proportions of pages indexed for other key terms in Kuhn (1962/1996). On the assumption that a good index gathers all the key terms and subjects of a book, this means that Kuhn (1962/1996) mentions the names of "great men" of science significantly more than it mentions any other term or subject indexed in the book. This, in turn, suggests that history of science in Kuhn (1962/1996) is by and large "Great Man" history of science. In Kuhn (1962/1996), evidently, the history of science is largely the biography of "great men" of science. In that respect, Kuhnian history of science is modeled on the "Great Man" of science model.

According to Fissell and Cooter (2003, 156), "Although in recent years a focus on science in context has nibbled away at the older historiographical primacy of the ideas of great men, almost unconsciously historians have continued to *reproduce the kind of structure that places a Newton ahead of Newtonianism*" (emphasis added). A quantitative analysis of the key terms indexed in Kuhn (1962/1996) suggests that the book "continued to reproduce the kind of structure that places a Newton ahead of Newtonianism" (Fissell and Cooter 2003, 156). In fact, the name "Newton" occurs 99 times on 43 pages, whereas "Newtonianism" occurs only three times on three pages of Kuhn (1962/1996). This is true for other names of "great men" of science and their associated -isms (see Table 5). In that respect, Kuhn (1962/1996) "continued to reproduce the kind of structure that places a Newton ahead of Newtonianism" (Fissell and Cooter 2003, 156).

Table 5. Number of occurrences of names of "great men" of science compared to their associated -isms in Kuhn (1962/1996)

	"great man" name	**-ism**	***z***	***p***
Aristotle/*Aristotelianism*	21	1	6.03	< 0.00
Copernicus/*Copernicanism*	34	2	7.54	< 0.00
Newton/*Newtonianism*	99	3	13.44	< 0.00
Darwin/*Darwinism*	9	0	4.24	< 0.00

Again, this suggests that forays into the history of science in Kuhn (1962/1996) are by and large instances of "Great Man" history of science.

3. Problems with the "Great Man" of Science Model

According to Carlyle (1840, 34), "Great Man" history is the idea that "the History of the world is but the Biography of great men."[4] In Kuhn (1962/1996), history of science is largely the

[4] According to Boring (1950, 339), "The Great-Man theory of history is as old as history, as old as the kings who caused the records of their deeds to be cut in stone in order to let posterity know how it was that they had also carved out human destiny, as old as man's belief that he himself is a free agent who chooses his acts to shape his own life and the lives of those others whom his deeds affect." As such, "Great Man" theory is suspect not only due to its attribution of unconstrained free agency to humans but also due to its failure to specify "neither the attributes nor the conditions of greatness" (Boring 1950, 339).

biography of "great men" of science, which is evidenced by the fact that Kuhn (1962/1996) mentions the names of "great men" of science significantly more than it mentions any other term or subject indexed in the book. In this section, I argue that the "Great Man" of science model is problematic in at least two respects that undermine the book's claim to have introduced a "historiographic revolution in the study of science" or a "new historiography" (Kuhn 1962/1996, 3). As I do so, I also provide qualitative (textual) evidence that provides further support for the claim that Kuhnian history of science is modeled on the "Great Man" of science model.

One problem with the "Great Man" of science model, with its biographies that romanticize "the 'special', 'pioneering' individual" (Jones et al. 2022, 6), is that it excludes women and people of color from science. Without a fair representation of women scientists and scientists of color, there is no reason to think that forays into the history of science in Kuhn (1962/1996) are a fairly accurate representation of that history. It is also telling that the word "men," as opposed to "scientists," which is used 159 times throughout the book, is used to talk about those who are able to "revolutionize" a scientific field. For example, "Almost always the *men* who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change" (Kuhn 1962/1996, 90). In fact, a "scientific community" is defined, not in terms of *scientists*, but in terms of "*men* who share a paradigm" (Kuhn 1962/1996, 176). And when Kuhn does use the word "scientists" in Kuhn (1962/1996), he makes it clear that he is talking about men. Textual evidence for this includes the following passage (Kuhn 1962/1996, 158):

> if a paradigm is ever to triumph it must gain some first supporters, *men* who will develop it to the point where hardheaded arguments can be produced and multiplied. And even those arguments, when they come, are not individually decisive. Because scientists are reasonable *men*, one or another argument will ultimately persuade many of them (emphasis added).

As Miller and Swift (1980/2000, 12) observe, "By the eighteenth century the modern, narrow sense of *man* was firmly established as the predominant one." They give the example of Edmund Burke who was careful to include the phrase "both sexes" when he used the term "men" (Burke 1844, 144). Then, "By the middle of nineteenth century," Miller and Swift (1980/2000, 12) observe, "most people in Great Britian and America apparently agreed […] that *man* is equivalent to male, at least in their interpretation of statute law." They give the example of John Stewart Mill who "proposed that the term *person* replace the term *man* in the Reform Bill of 1867" (Miller and Swift 1980/2000, 13). Accordingly, the book's continued use of "man" provides further qualitative (textual) evidence suggesting that Kuhnian history of science in Kuhn (1962/1996) is modeled on the "Great Man" of science model according to which science is the domain of men, who are "great" in some unspecified sense, to the exclusion of women.

Arguably, there is no shortage of women scientists who could have been discussed in Kuhn (1962/1996), even from the eighteenth and nineteenth centuries, which are the centuries from which most of the "great men" of science discussed in Kuhn (1962/1996) are. Kuhn (1962/1996) could have included mentions of Emilie du Chatelet (1706-1749), Caroline Herschel (1750-1848), Mary Anning (1799-1847), Mary Somerville (1780-1872), Maria Mitchell (1818-1889), Marie Curie (1867-1934), Lise Meitner (1878-1968), and Irène Curie-Joliot (1897-1956),

to mention just a few. For example, the discussion of radiation in Kuhn (1962/1996) could have included Marie Curie. After all, she shared the Nobel Prize with Pierre Curie and others twice (in 1903 and 1911) for her work on radiation and radioactivity. Instead, it only mentions "*men* like Kelvin, Crookes, and Roentgen" (Kuhn 1962/1996, 93).

It is important to note that merely discussing a few women scientists would not have been enough to allay the aforementioned concern about whether forays into the history of science in Kuhn (1962/1996) are a fairly accurate representation of that history. For if one is merely telling the biographies of great women scientists, then one is still doing history of science in the style of the "Great Man" of science model, even if one is substituting the biographies of great men with those of great women scientists. As Jones et al. (2022, 6) put it, "for a long time, the recovery of women in science followed the familiar 'great man' of science model, with biographers romanticizing the 'special', 'pioneering', individual women, who succeeded in this masculine sphere." In other words, to idolize a special individual genius, who single-handedly made a scientific breakthrough and "revolutionized" an entire scientific field, is to do history of science in the mold of the "Great Man" of science model, whether the individual genius who is being valorized as a scientific hero (or heroine) is a man or a woman. As Des Jardins (2010, 214) puts it, "Biographers of important women scientists imagined them in masculine molds, the success of a token few defined as finding a way into the rarified category of 'Great Men of Science'."

Arguably, too, there is no shortage of scientists of color who could have been discussed in Kuhn (1962/1996), even from the eighteenth and nineteenth centuries, which are the centuries from which most of the "great men" of science discussed in Kuhn (1962/1996) are. Kuhn (1962/1996) could have included mentions of Benjamin Banneker (1731-1806), Carlos Juan Finlay (1833-1915), George Washington Carver (1861-1943), Charles Henry Turner (1867-1923), Ernest Everett Just (1883-1941), Srinivasa Ramanujan (1887-1920), Chandrasekhara Venkata Raman (1888-1970), and Satyendra Nath Bose (1894-1974), to mention just a few. For example, the discussion of mathematical techniques for calculating "the motions of more than two simultaneously attracting bodies" and "the stability of perturbed orbits" (Kuhn 1962/1996, 32), in the context of Newton's celestial mechanics, could have mentioned how mathematical concepts, such as the infinite series, which were integral to Newton's calculations, were first discovered by Indian mathematicians and astronomers of the Kerala School (Joseph 2011, 419). Instead, it only mentions "*Europe's* best mathematicians," such as "Euler, Lagrange, Laplace, and Gauss" (Kuhn 1962/1996, 32).

Again, merely discussing a few scientists of color would not have been enough to allay the aforementioned concern about whether forays into the history of science in Kuhn (1962/1996) are a fairly accurate representation of that history. For if one is merely telling the biographies of great scientists of color, then one is still doing history of science in the style of the "Great Man" of science model, even if one is substituting the biographies of great men with those of great scientists of color (whether those great scientific geniuses are men or women).

In that respect, it is also worth noting that forays into the history of science in Kuhn (1962/1996) are not only prejudiced against women (insofar as they exclude women scientists entirely), and people of color (insofar as they exclude scientists of color entirely), but also

Eurocentric. This is evident from the list of names of "great men" of science in Table 1, which includes only European men, as well as the following passage (Kuhn 1962/1996, 168):

> only the civilizations that descend from Hellenic Greece have possessed more than the most rudimentary science. The bulk of scientific knowledge is a product of *Europe* in the last four centuries. *No other place and time has supported the very special communities from which scientific productivity comes* (emphasis added).

One need only recall the Golden Age of Arabic (or Islamic) science and Baghdad's House of Wisdom to see that these assertions are historically inaccurate (see Renima et al. 2016, 25-52).[5]

Another problem with the "Great Man" of science model is that it "implicitly suggests that only special, exceptional [people] can succeed in science" (Jones et al. 2022, 6). This implication of the "Great Man" of science model is itself problematic in two respects. First, the scientific work of scientific stars, who are celebrated as scientific geniuses and heroes, is made possible by the work of others, including experimenters, artisans, inventors, data collectors, field workers, laboratory technicians and assistants, etc. To paraphrase Newton, if some scientists can see farther, it is only because they stand on the shoulders of others. The "Great Man" of science model gives an incomplete and distorted picture of the history of science by focusing on the work of a select few to the exclusion of the work done by many others. According to Fissell and Cooter (2003, 156), "coffeehouses, barnyards, fields, and ladies' drawing rooms were all important sites for the construction and display of natural knowledge." Since the "Great Man" of science model leaves out such sites of scientific knowledge production, and the people who produce scientific knowledge while working at such sites, it can only paint an incomplete and somewhat distorted picture of the history of science.[6]

Second, by implying "that only special, exceptional [people] can succeed in science" (Jones et al. 2022, 6), the "Great Man" of science model renders any inferences to generalizations from the success stories of scientific heroes and geniuses unwarranted and fallacious. Special and exceptional cases rarely, if ever, warrant inferences to generalizations. Insofar as exceptional individuals, heroes, and geniuses are always the exception, not the rule, no general lessons about the nature of science can be derived from the stories of such exceptional individuals. Yet, the theory of scientific change outlined in Kuhn (1962/1996) purports "to account for the nature and development of the sciences" generally (1962/1996, 207). That is, according to what Bird (2015, 25) calls the "determinist historicism" in Kuhn (1962/1996), "the historian is not limited to describing and explaining particular events but may hope also *to see in the many particular events an underlying pattern*" (emphasis added). In Kuhn's theory of scientific change, the underlying pattern is supposed to be "the cycle: paradigm–normal science–anomaly–crisis–revolution" (Roush 2015, 71). However, if the evidence for this cyclical pattern is supposed to come from the romanticized success stories of a few special, exceptional,

[5] For more on the problems with a Eurocentric history of science, see Poskett (2022).

[6] See Smith (2004) on the notion of "vernacular science," which indicates "how modern science emerged at least partially from the 'bottom up' of artisans' workshop practices" (148). In other words, "vernacular science" refers to the contributions to the production of scientific knowledge made by those who are not celebrated as scientific elites, geniuses, or heroes. See also Tilley (2010).

individual geniuses, then it is difficult to see how such evidence can support an inference to a general conclusion about such a cyclical pattern in science.[7]

The "Great Man" of science model fell out of favor with historians of science in recent decades.[8] As Henry (2008, 555) puts it, "In professional history of science there has been a move away from 'great man' history, and away from heroic discovery accounts."[9] In fact, "Great Man" historiography was labeled "outdated" in the *American Historical Review* as early as 1957 (MacKinney 1957), which is five years prior to the publication of Kuhn (1962/1996). Rather than move away from the "Great Man" of science model, however, Kuhn (1962/1996) is filled with heroic discovery accounts. Although Kuhn himself was supposedly a critic of "the positivist historiography of genius," according to which a scientific discovery is made when a gifted individual has a singular eureka moment, which is what Henry (2008, 555) calls "heroic discovery accounts," the historiography of Kuhn (1962/1996), which is that of the "Great Man" of science model, perpetuates the "eureka-moment notion of a scientific discovery" made by a scientific genius (McEvoy 2010, 23-52). As McEvoy (2010, 32) puts it:

> Like *the Whig historiography of the great men of history*, the positivist historiography of genius involved a revelatory and foundational epistemology, according to which knowledge consists in a pre-established harmony between thought and reality, subject and object, made transparent in the receptive minds of *a few gifted individuals*. Upholding the eureka-moment notion of a scientific discovery, understood as a '*single event of individual labor*', positivism identified the context of discovery with the *singular revelatory experiences of individual luminaries* and the context of justification with the disciplines and traditions generated by the collective memories and discursive articulations of these *singular moments of enlightenment*. Understood as the exfoliation of an underlying *telos, history consisted in the discoveries and achievements of the great men of science* (emphasis added).

This suggest that one could write "Great Man history through Whiggish eyes" (Barr 2018, 183). However, the two are not necessarily the same. A historiography can be said to be Whiggish in many ways. According to Butterfield (1931/1965, 11), to study "the past with reference to the present" such that "historical personages can easily and irresistibly be classed into the *men who furthered progress* and the *men who tried to hinder it*" (emphasis added) is to engage in "the Whig interpretation of history." More recently, Laudan (1990, 56) observed that "any concern with scientific progress as an explanatory challenge has been rejected as 'Whiggism'." In that sense, Hoyningen-Huene (2012, 284) points out, "*Kuhn would be considered a Whig* […] because he believed in scientific progress and did not doubt the possibility of evaluating the actions of past scientists as appropriate or inappropriate, relative to their paradigm, of course"

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[7] Cf. Nickles (2003, 146) who claims, without argument, that Kuhn "was not at all committed to the romantic genius view of scientific creativity." Since Nickles provides no evidence for this claim, it is difficult to evaluate it.

[8] According to Sayers (2018, ix), "historians recognize this sketch [of the life of T. H. Gallaudet] as an egregious example of 'Great Man' historiography, *the now discredited view that social, political, and scientific progress is achieved by daring paradigm shifts made by lone (male) visionaries of genius*" (emphasis added).

[9] The "Great Man" theory of history has been adapted by researchers of leadership into what is now called the "trait theory," but with the acknowledgment that "the Great Man theory itself is antiquated and questionable" (Halaychik 2016, 11), while the leadership traits identified by Carlyle (1840) might still be of some theoretical value.

(emphasis added).[10] Be that as it may, identifying all the ways in which a historiography can be said to be Whiggish is beyond the scope of this paper. For present purposes, the following two points are important to note.

First, unlike the aforementioned senses of Whiggism, the problem with the "Great Man" of science model is that it is unwarrantedly selective. That is, it makes history of science the exclusive domain of not only *men* but also men who are exceptional in terms of being *great*, whatever "great" is supposed to mean (Boring 1950, 339). As Mayr (1990, 302) notes, "selectiveness" is one of the errors "to which the label whiggish might be applied specifically." While historians of science must be selective *to some extent*, as Mayr (1990, 306) notes, they must be "neither biased nor finalistic" when they are being selective. If my analysis is correct, then Kuhnian history of science in Kuhn (1962/1996) is both biased and finalistic. It is biased against women and people of color insofar as it excludes them from the picture of the history of science painted in Kuhn (1962/1996). It is finalistic insofar as it suggests that scientific discoveries are the inevitable outcomes of "the singular revelatory experiences of individual luminaries" (McEvoy 2010, 32).[11]

Second, Hoyningen-Huene (2012, 285) identifies the following as elements of Whiggish historiography: it (a) emphasizes "individual men of genius" (McEvoy 1997, 7) and produces "hero-myths" (Turner 1990, 24-25), and it (b) holds a "eureka-moment version of scientific discovery" (McEvoy 1997, 7). Whether these are elements of Whiggish historiography or not is a question that can be left for another occasion. What is important for present purposes is that the quantitative (see Section 2) and qualitative (textual) evidence presented in this paper points to the presence of both (a) and (b) in Kuhn (1962/1996). For instance, in a discussion of Galileo and how his ideas about motion differ from Aristotle's, the term "genius" is used four times (Kuhn 1962/1996, 119).

> Why did that shift of vision occur? Through *Galileo's individual genius*, of course (emphasis added).

Likewise, the term "brilliant" is used four times when the works of Euler, Lagrange, and Laplace are mentioned (Kuhn 1962/1996, 32-33). Kuhn (1962/1996, 139) even goes so far as to assert that "the sciences, like other professional enterprises, do need their *heroes*" (emphasis added).

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[10] Kuhn (2000, 282) accused other historians of science of being "Whig," e.g., Sarton. See Pinto de Oliviera (2012).

[11] It is worth noting that Kuhn saw himself as breaking with tradition as far as writing history of science is concerned. As the first sentence of Kuhn (1962/1996) suggests, Kuhn took himself to be proposing "a change in methods, a new historiography of science" and "a role for the new historiography of science in the philosophy of science" (Pinto de Oliviera 2012, 115). Kuhn (1962/1996) "depends on the new historiography of science" (Pinto de Oliviera 2012, 115). Contrary to old historiography of science, which is "unhistorical" (Kuhn 1962/1996, 140) and mere "chronology" (Kuhn 1962/1996, 1), the new historiography of science attempts "to display the historical integrity of [a] science in its own time" (Kuhn 1962/1996, 3). As he laments the unhistorical nature of the old historiography of science, Kuhn (1962/1996, 138) also laments the "unhistorical spirit of the scientific community." According to Kuhn (1962/1996, 137-138), "textbooks of science contain just a bit of history, either in an introductory chapter or, more often, in scattered references to the *great heroes* of an earlier age" (emphasis added). However, if my analysis is on the right track, then Kuhn (1962/1996) is just like science textbooks insofar as it merely provides some references to "great heroes" of science that are supposed to support a general theory of scientific change. This is hardly a "historiographic revolution in the study of science" or a "new historiography" (Kuhn 1962/1996, 3), as the book purports to offer.

The ways in which such "great men" of science are described as gifted individuals, "truly clever practitioner[s]" (Kuhn 1962/1996, 179), or scientific geniuses, whose special moments of enlightenment or eureka moments of scientific discovery are singular events of brilliant individual labor in Kuhn (1962/1996), then, provide further textual evidence, in addition to the quantitative analysis in Section 2, suggesting that Kuhnian history of science in Kuhn (1962/1996) is modeled on the "Great Man" of science model.[12]

In addition, and in accordance with the sexism and Eurocentrism of the book, phrases such as "Europe's most brilliant" (Kuhn 1962/1996, 33), "Europe's best" (Kuhn 1962/1996, 69), "Europe's most eminent" (Kuhn 1962/1996, 115), etc., are used throughout the book. For these reasons, Kuhnian historiography is no less problematic than the positivist historiography of genius that Kuhn himself supposedly criticized, since it (namely, the "Great Man" of science model) upholds "the eureka-moment notion of a scientific discovery" (McEvoy 2010, 32), which is construed as a singular event of individual brilliance, and continues "to reproduce the kind of structure that places a Newton ahead of Newtonianism" (Fissell and Cooter 2003, 156).[13] For these reasons, it is difficult to see how selected romanticized stories about the exceptional, heroic discoveries of *individual scientists*, who are unique both in terms of being men and in terms of being geniuses, can provide adequate evidential support for a general theory about scientific change among *scientific communities*.[14]

4. Conclusion

Kuhn (1962/1996, 1) opens as follows: "History, if viewed as a repository for more than anecdote or chronology, could produce a decisive transformation in the image of science by which we are now possessed." I have argued that the historiography of Kuhn (1962/1996) is in the mold of the "Great Man" of science model. If this is correct, then the book fails to give us

[12] According to Kindi (2012, 93), "When Kuhn uses 'paradigm' to account for the consensus of scientists, he appropriates this aspect of 'model', namely, that it is a standard which is being followed rather than imitated in different conditions." In a footnote, Kindi (2012, 106) elaborates on this point by citing Kant's distinction between imitation and following as well as the two senses of the exemplary: (a) the exemplary as an archetype for emulation, and (b) the exemplary as a pattern for imitation. In fine arts, Kindi says, "the work of genius" is an archetype for the emulation of "future geniuses." In science, however, one can learn the work of great geniuses, but one cannot learn to do as they do. If Kindi is right about this, then this is another illustration of how Kuhnian history of science in Kuhn (1962/1996) perpetuates "the historiography of genius" through the notion of "exemplar" (i.e., paradigm in the narrow sense), insofar as these exemplars typically include the Kuhnian usual suspects, namely, "Aristotle's *Physica*, Ptolemy's *Almagest*, Newton's *Principia* and *Opticks*, Franklin's *Electricity*, Lavoisier's *Chemistry,* and Lyell's *Geology*" (Kuhn 1962/1996, 10).

[13] According to Barker (2021, 146), "the first important papers on the connections between Copernicus and Islamicate astronomy began to appear at exactly the same time that Kuhn was completing [*The Copernican Revolution*] (1957) and writing [*The Structure of Scientific Revolutions*]." Copernicus borrowed mathematical methods "from the much more sophisticated mathematical astronomy available in the Islamicate world (the parts of the world governed by Islamic rulers) before and during his life time, but without acknowledging his sources" (Barker 2021, 146). So, the idea that Copernicus could have made such discoveries all "by himself—the last gasp of Great Man historiography—was dramatically implausible" (Barker 2021, 155). If Barker is right, then there is good reason to believe that not only Kuhn (1962/1996) but also Kuhn (1957) is an instance of "Great Man" history of science.

[14] According to Bird (2015, 28), "The determinist strand in Kuhn's thinking [i.e., to see in the many particular events an underlying pattern] gives us his belief that there is *a cyclical pattern in the history of science*" (emphasis added).

anything “more than anecdote or chronology.” It merely gives us selected romanticized stories of a few exceptional men, or scientific geniuses, like Newton and Lavoisier, who are worshiped as scientific heroes. If this is correct, then Kuhn (1962/1996) hardly introduces a “historiographic revolution in the study of science” or a “new historiography” (Kuhn 1962/1996, 3), as the book purports to offer. Instead, it merely perpetuates the defunct historiography of the “Great Man” of science.

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