# The Philosophy of Joseph Priestley's 1765 Timeline: Abstract Ideas, Time, and Human Progress

## 1 Introduction

In 1765, Joseph Priestley created what may be the world's first modern timeline, *A Chart of Biography.* The chart is a milestone in human representation of time, and it proved enormously influential. Its companion piece, *A Description of a Chart of Biography*, connects the chart with Priestley's philosophical views. Historians of philosophy have explored many aspects of Priestley's work[1] and his timeline has been studied by historians and visual theorists.[2] However, the chart and its description have not been considered by historians of philosophy. This paper offers a new direction for scholarship, enquiring into the philosophy of Priestley's timeline.

This paper proceeds as follows. Section 2 details Priestley's timeline and explains its importance within the history of chronography, the graphic representation of time. Section 3, the largest part of this paper, considers the philosophy underlying the visual innovations of *A Chart of Biography*. One innovation is the use of lines to represent the times of peoples' lives. Difficult as it is to appreciate now, this technique was radical, and Priestley's *Description of a Chart of Biography* works hard to justify it. In a condensed, difficult passage, he motivates this innovation using a philosophical view: time is an abstract idea. I unpack this and argue that Priestley was pushed towards representing times as lines by his views on abstract ideas and time, developed especially in response to John Locke, David Hartley, and Richard Price. Another innovation is the representation of time as uniform. Priestley's *Description* does not give a philosophical motivation for this innovation, but several scholars claim it is grounded in an implicit Newtonian absolutism. Against this, I argue Priestley's decision may simply be grounded in his study of chronology, and there is no textual evidence he accepts Newtonian absolutism. Further, drawing on Priestley's characterisation of time as an abstract idea, there is some reason to think he shares the metaphysics of his friends Edmund Law and William Watson, that time is *only* a creature of the

[1] For example, Popkin (1977) considers Priestley in relation to David Hume; Tapper (2002) in relation to Thomas Reid. Harris (2005, 167-178) explores Priestley on freewill. Mudroch (2005) and Dybikowski (2008) discuss Priestley's epistemology and metaphysics. Fitzpatrick (2008) covers Priestley's political philosophy. Kingston (2019) offers a broad introduction to Priestley's philosophical work. I have recently argued that Priestley contributes to the history of the specious present theory, within the philosophy of time; see Thomas (forthcoming).

[2] The literature includes Twyman (1986, 214-220), Schofield (1997, 128-31), Sheps (1999), Rosenberg (2007), Rosenberg and Grafton (2010, 19-20; 116-140), Boyd Davis & Bevan & Kudikov (2010), Gossman (2011, 17), and Boyd Davis (2012; 2017).

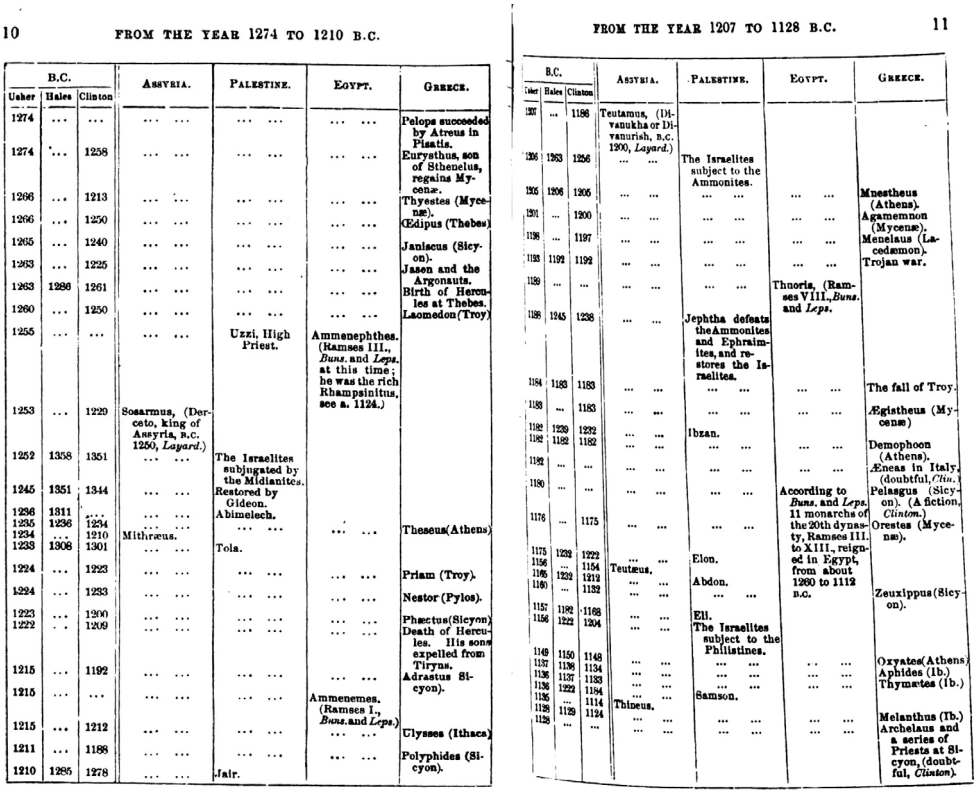
understanding. This enquiry concludes by considering Priestley's characterization of his timeline as a 'river', arguing that this watery metaphor reflects his idea of time.

Having considered the philosophic motivations of *A Chart of Biography*, Section 4 turns to its philosophic *uses*: I argue the chart confirms, and even advances, Priestley's views on human progress. Section 5 concludes by considering the role of Priestley's timeline within the history of space-time parallelism more broadly. Although this tradition stretches back at least as far as Aristotle, I argue Priestley's conception of time as a line made a distinctive contribution to it, and there is reason to believe it travelled into later philosophers, from Immanuel Kant to Henri Bergson. This study should be of interest both to scholars of Priestley's timeline and to historians of philosophy seeking to understand Priestley's philosophical views on ideas, time, and progress.

## 2 The Importance of Priestley's *Chart of Biography*

How do you visually represent time, or events taking place over time? Historians of chronography show that people have struggled with this problem for centuries. Dating to Greek and Roman scholars, a popular format was 'time tables', which display events in matrices or grids. Time tables remained the tool of choice throughout the medieval and early modern period.[3] Priestley engaged with many of them, including Francis Tallents' 1685 *A View of Universal History,* Benjamin Marshall's 1712-13 *Chronological Tables,* and John Blair's 1754 *The Chronology and History of the World*. These chronographies each ran through multiple editions. Figure 1, drawn from a revised edition of Blair, illustrates the genre:

[3] On the history of time tables, see Rosenberg and Grafton (2010, 26-31) and Gossman (2011, 11-15).



10 FROM THE YEAR 1274 TO 1210 B.C.

| B.C. Usher | B.C. Hales | B.C. Clinton | Assyria. | Palestine. | Egypt. | Greece. |
|---|---|---|---|---|---|---|
| 1274 | ... | ... | ... ... | ... ... | ... ... | Pelops succeeded by Atreus in Pisatis. |
| 1274 | ... | 1258 | ... ... | ... ... | ... ... | Eurystus, son of Sthenelus, regains Mycenæ. |
| 1266 | ... | 1213 | ... ... | ... ... | ... ... | Thyestes (Mycenæ). |
| 1266 | ... | 1250 | ... ... | ... ... | ... ... | Œdipus (Thebes) |
| 1265 | ... | 1240 | ... ... | ... ... | ... ... | Janiscus (Sicyon). |
| 1263 | ... | 1225 | ... ... | ... ... | ... ... | Jasen and the Argonauts. |
| 1263 | 1286 | 1261 | ... ... | ... ... | ... ... | Birth of Hercules at Thebes. |
| 1260 | ... | 1250 | ... ... | ... ... | ... ... | Laomedon (Troy) |
| 1255 | ... | ... | ... ... | Uzzi, High Priest. | Ammenephthes. (Ramses III., *Buns.* and *Leps.* at this time; he was the rich Rhampsinitus, see a. 1124.) | |
| 1253 | ... | 1229 | Sosarmus, (Dercето, king of Assyria, B.C. 1250, *Layard.*) | | | |
| 1252 | 1358 | 1351 | ... ... | The Israelites subjugated by the Midianites. | | |
| 1245 | 1351 | 1344 | ... ... | Restored by Gideon. | | |
| 1236 | 1311 | ... | ... ... | Abimelech. | | |
| 1235 | 1236 | 1234 | ... ... | ... ... | ... ... | Theseus (Athens) |
| 1234 | ... | 1210 | Mithræus. | | | |
| 1233 | 1308 | 1301 | ... ... | Tola. | | |
| 1224 | ... | 1223 | ... ... | ... ... | ... ... | Priam (Troy). |
| 1224 | ... | 1233 | ... ... | ... ... | ... ... | Nestor (Pylos). |
| 1223 | ... | 1200 | ... ... | ... ... | ... ... | Phœtus (Sicyon) |
| 1222 | .. | 1209 | ... ... | ... ... | ... ... | Death of Hercules. His sons expelled from Tiryns. |
| 1215 | ... | 1192 | ... ... | ... ... | ... ... | Adrastus (Sicyon). |
| 1215 | ... | ... | ... ... | ... ... | Ammenemes. (Ramses I., *Buns.* and *Leps.*) | |
| 1215 | ... | 1212 | ... ... | ... ... | ... ... | Glysses (Ithaca) |
| 1211 | ... | 1188 | ... ... | ... ... | ... ... | Polyphides (Sicyon). |
| 1210 | 1285 | 1278 | ... ... | Jair. | | |

FROM THE YEAR 1207 TO 1128 B.C. 11

| B.C. Usher | B.C. Hales | B.C. Clinton | Assyria. | Palestine. | Egypt. | Greece. |
|---|---|---|---|---|---|---|
| 1207 | ... | 1186 | Teutamus, (Divanukha or Divanurish, B.C. 1200, *Layard.*) | | | |
| 1206 | 1263 | 1256 | ... ... | The Israelites subject to the Ammonites. | | |
| 1205 | 1206 | 1205 | ... ... | ... ... | ... ... | Mnestheus (Athens). |
| 1201 | ... | 1200 | ... ... | ... ... | ... ... | Agamemnon (Mycenæ). |
| 1198 | ... | 1197 | ... ... | ... ... | ... ... | Menelaus (Lacedæmon). |
| 1193 | 1192 | 1192 | ... ... | ... ... | ... ... | Trojan war. |
| 1189 | ... | ... | ... ... | ... ... | Thnoris, (Ramses VIII., *Buns.* and *Leps.* | |
| 1186 | 1245 | 1236 | ... ... | Jephtha defeats the Ammonites and Ephraimites, and restores the Israelites. | | |
| 1184 | 1183 | 1183 | ... ... | ... ... | ... ... | The fall of Troy. |
| 1183 | ... | 1183 | ... ... | ... ... | ... ... | Ægistheus (Mycenæ) |
| 1182 | 1239 | 1232 | ... ... | Ibzan. | | |
| 1182 | 1182 | 1182 | ... ... | ... ... | ... ... | Demophoon (Athens). |
| 1182 | ... | ... | ... ... | ... ... | ... ... | Æneas in Italy, (doubtful, *Clin.*) |
| 1180 | ... | ... | ... ... | ... ... | According to *Buns.* and *Leps.* 11 monarchs of the 20th dynasty, Ramses III. to XIII., reigned in Egypt, from about 1260 to 1112 B.C. | Pelasgus (Sicyon). (A fiction, *Clinton.*) |
| 1176 | ... | 1175 | ... ... | ... ... | | Orestes (Mycenæ). |
| 1175 | 1232 | 1222 | ... ... | Elon. | | |
| 1156 | ... | 1154 | Teutæus. | | | |
| 1165 | 1232 | 1212 | ... ... | Abdon. | | |
| 1160 | ... | 1132 | ... ... | ... ... | | Zeuxippus (Sicyon). |
| 1157 | 1192 | 1168 | ... ... | Eli. | | |
| 1156 | 1222 | 1204 | ... ... | The Israelites subject to the Philistines. | | |
| 1149 | 1150 | 1148 | ... ... | ... ... | .. ... | Oxyates (Athens) |
| 1137 | 1136 | 1134 | ... ... | ... ... | ... ... | Aphides (Ib.) |
| 1136 | 1137 | 1133 | ... ... | ... ... | ... ... | Thymætes (Ib.) |
| 1136 | 1222 | 1194 | ... ... | Samson. | | |
| 1135 | ... | 1114 | Thineus. | | | |
| 1128 | 1129 | 1124 | ... ... | ... ... | ... ... | Melanthus (Ib.) |
| 1128 | ... | ... | ... ... | ... ... | ... ... | Archelaus and a series of Priests at Sicyon, (doubtful, *Clinton*). |

Figure 1: Detail from 1856 edition of Blair's chronology. This image is in the public domain. It is reproduced from Google Books.

Today, we commonly use timelines to display events, yet these emerged relatively recently. In their landmark study of chronography through Western history, Rosenberg and Grafton (2010, 14) state that the 'modern form' of the timeline, 'with a single axis and a regular, measured distribution of dates', did not come into existence until the mid-eighteenth century. Alongside the publication of traditional time tables, this period saw several chronographic experiments. Describing two of them will help put Priestley's chart in context.

In 1753, *A Chart of Universal History* appeared. Although published anonymously, it is now known to be the work of Thomas Jefferys, a geographer and mapmaker.[4] Jefferys' chronography resembles a large geographic map that could be hung on a wall and scanned all at once. Priestley's chart follows the same format, likely directly inspired by Jefferys' work.[5]

Also in 1753, Jacques Barbeu-Dubourg produced the *Chronographie Universelle*, a 16 meter scroll in a mechanical box that could be cranked back and forth to display different segments

[4] On Jefferys' chart, see Rosenberg and Grafton (2010, 112-6).

[5] Priestley (1781, 5-6) writes that his *Chart of Biography* was inspired by a 'French chart'; he doesn't name the author, perhaps because he didn't know it. Elsewhere, Priestley (1788, 153-4) refers to a '*chart of history* lately imported from France', depicting the origin and duration of kingdoms 'at one view', 'uniting chronology and geography'. Rosenberg (2007, 94-5) argues that Priestley's 'French chart' is 'certainly' Jeffreys. Priestley (1781, 6-7) describes various aspects of the French chart which match Jeffreys, including its coverage of nations and kingdoms, and the way it uses 'four different scales of time'.

of world history.[6] Although Priestley seems to have been familiar with Jeffreys' chronography, there is no evidence he was familiar with this one. In a discussion of chronographies, Priestly (1788, 149-151) mentions several eighteenth century works but not that of Barbeu-Dubourg. Further, in a 1768 letter Barbeu-Dubourg describes viewing Priestley's *Chart of Biography* 'with pleasure', adding that although their chronographies use 'almost the same principles', this occurred 'without plagiarism on either part'.[7] This question of influence matters to scholars seeking to identify inventors of the first modern timeline. Jefferys' chronography does not show dates in a uniform, regular fashion, and so does not meet the criteria for the modern form of the timeline. Barbeu-Dubourg's chronography does, and so may be the first modern timeline. If Barbeu-Dubourg and Priestley both invented the timeline independently, Barbeu-Dubourg still got there first. However, due to its idiosyncratic scrolling mechanism, the appearance of Barbeu-Dubourg's timeline is less similar to today's timelines than that of Priestley's chronography. Perhaps for this reason, Archibald and Rosenberg (2004) describe Priestley's *Chart of Biography* as 'the first of several timelines that contemporary audiences would recognise as such'.

Whether or not the honour of creating the first modern timeline goes to Priestley, his chart proved enormously important. *A Chart of Biography* is literally a wall chart, measuring three feet by two feet - Figure 2 conveys a sense of its size.

[6] On Barbeu-Dubourg's *Chronographie*, see Ferguson (1991), Rosenberg and Grafton (2010, 112), Schmidt-Burkhardt (2011, 13-7), Gossman (2011, 15-16), and Boyd Davis (2017, 15-17).
[7] Barbeu-Dubourg, cited and translated in Ferguson (1991, 202-3).

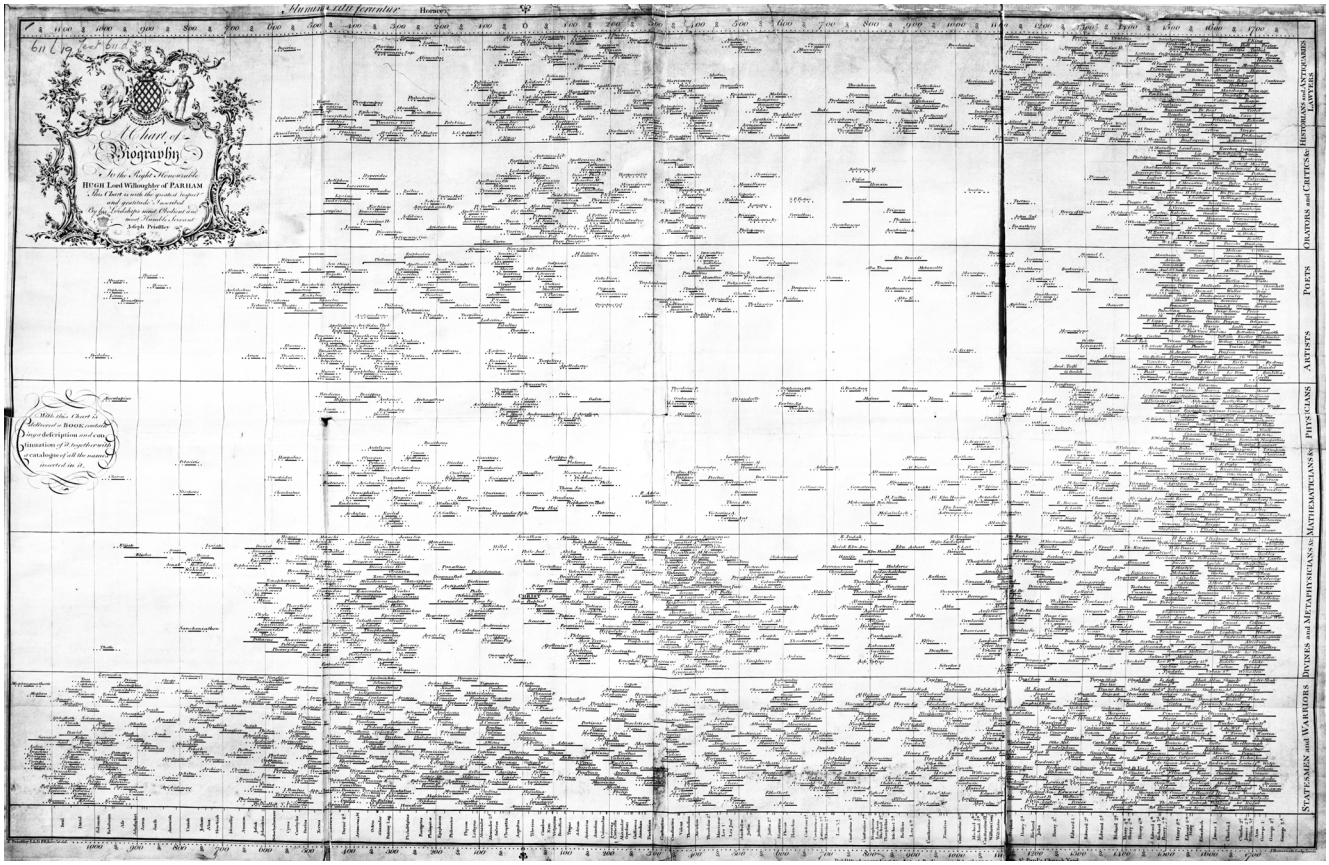



Figure 2: Priestley's 1765 *A Chart of Biography*.
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It plots over two thousand human lives, from 1200 BCE to 1800 CE. Priestley claims it presents the results of great historians and chronologers:

> exhibiting… a comprehensive view of the succession of great men of every kind… showing how they stand related in point of time to one another… [giving] a clearer idea of the time in which they lived, the relative length of their lives, the state of their cotemporaries, and the intervals of time which elapsed between them and their predecessors and successors (Priestley, 1765, 3)

By 'great men', Priestley largely means white European men.[8] The *Chart* is separated into horizontal bands, dividing people into groups such as 'Artists and Poets', 'Statesmen and Warriors', 'Divines and Metaphysicians &c'.

Many scholars have examined the visual innovations of *A Chart of Biography.* One innovation concerns the use of lines to represent the times of peoples' lives. Twyman (1986, 216) writes that Priestley's 'major graphic contribution was to consider time as a line' - his charts are of

[8] Priestley (1765, 18) notes sheepishly, 'I have perhaps inserted rather more English men in proportion than those of other nations'. Priestley has also inserted rather more men than women.

'considerable interest' because they presented information in a way that was 'entirely new'. Similarly, Boyd Davis, Bevan and Kudikov (2010, 356) state that Priestley 'invented the use of a line to represent a lifespan'. Priestley seems to have recognised that he was innovating, for his *Description of a Chart of Biography* spends so much time justifying the technique. His *Lectures on History, and General Policy* discusses the illustrative techniques used in his *Chart of Biography* and compares them with techniques employed by other chronographies; however, Priestley (1788, 154-5) does not mention any other chronographies whilst discussing his use of line.

Another innovation is that his timeline represents time flowing at a uniform pace; Priestley (1765, 4) explains that it divides time 'by an equal scale' into centuries. Years run evenly across its top and bottom. With rare exceptions such as the work of Barbeu-Dubourg, almost all earlier chronographies displaying large-scale histories represented time unevenly, increasing or decreasing the scale of years to effectively speed or slow time.[9] In his day, Priestley was celebrated for both innovations. For example, inventor of diagrams William Playfair wrote in 1801, 'The study of chronology has been much facilitated by making space represent time, and a line of proportional length'. As late as 1853, authors of similar timelines acknowledged 'the clear form which Priestley employed in his *Chart of Biography*'.[10]

Today, it is difficult to imagine how innovative Priestley's *Chart of Biography* was, and that is because the chart and its form proliferated so widely. Priestley himself created another timeline in 1769, *A New Chart of History*, depicting the history of regions and empires on the same scale as its fellow.[11] Following its initial publication, *A Chart of Biography* ran through at least nineteen editions, including American, Dutch, and Italian issues. *A New Chart of History* ran through at least twenty editions.[12] The charts were widely praised and, in the 1766 statement of the Royal Society of London marking Priestley's induction, it is his *Chart of Biography* rather than his scientific work that is mentioned.[13] This is startling given Priestley's other achievements - not least, he is credited with discovering oxygen. Both charts were among the first acquisitions ordered by the new United States Library of Congress. According to *Cambridge Magazine*, they were 'an essential part of a gentleman's library'. The novelist Maria Edgeworth and physician Erasmus Darwin (grandfather of

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[9] For example, Rosenberg and Grafton (2010, 63) describe Mercator's sixteenth century *Chronology*, a time table which moved steadily year by year except for events on which there was especially plentiful information; so, during Noah's Flood, Mercator slowed the table down 'almost cinematically'. They stress how unusual Priestley's *Chart of Biography* was to buck this trend.
[10] See Schofield (1997, 131).
[11] Twyman (1986, 218) notes this may have been called 'new' to distinguish it from Jeffreys' *Chart of Universal History*.
[12] See Schofield (1997, 131).
[13] See Rosenberg (2007, 59).

Charles) recommended their use in women's education.[14] Timelines entered our discipline via William Enfield's 1791 *History of Philosophy*, which included a pullout "Biographical Chart of the Principal Persons Mention'd in this Work" (unpaginated) in the style of Priestley.

Rosenberg and Grafton (2010, 18-19) describe *A Chart of Biography* as 'path-breaking', a 'watershed'. Although Priestley's work built on centuries of experimentation with time representation, the *Chart of Biography* was the first to 'successfully compete' with time tables 'as a normative structure for representing regular chronology'. Rosenberg and Grafton (2010, 123-130) explain that within a few years, variations on Priestley's charts 'began to appear just about everywhere', and in the nineteenth century envisioning history using timelines became commonplace. They claim that Priestley's charts mark a 'crucial transition' in the history of chronography: after their publication, the analogy between historical time and measured graphic space was 'assumed', rather than something that needed to be argued for. Undeniably, today timelines today are everywhere. 2019 even saw a digital 'Interactive Chart of Biography' created using Priestley's design principles.[15]

Having seen the importance of *A Chart of Biography* to the history of chronography, let's move on to explore the philosophy underlying Priestley's visual representation of time.

## 3 Philosophy and the Visual Innovations of *A Chart of Biography*

### 3.1 Times, Lines, and Abstract Ideas

Let's start with the philosophy underlying the chart's first key visual innovation: the use of lines to represent the times of peoples' lives. Priestley's *Description of a Chart of Biography* explicitly grounds this innovation in views on abstract ideas. The pertinent passage is highly condensed. To help unpack it, I give it in full but distinguish five sections, labeled (i) to (v):

> THAT there must be a peculiar advantage in a chart constructed in this manner I shall endeavour to show in as distinct and concise a manner as I can. **[(i)]** As no image can be formed of abstract ideas, they are, of necessity, represented in our minds by particular, but variable ideas; **[(ii)]** and if an idea be capable of *quantity* of any kind, that is, if it admit of the modification of greater and less, though the Archetype, as it is called, of that idea be nothing that is the object of our senses, it is nevertheless universally represented in our minds by the idea of some sensible thing.
> **[(iii)]** THUS the abstract idea of TIME, though it be not the object of any of our senses, and no image can properly be made of it, yet because it **[(iv)]** has real quantity, and we can say a greater or less space of time, **[(v)]** it admits of a natural and easy representation in our minds by the idea of a

[14] On the proliferation of Priestley's *Chart*, see Schofield (1997, 131) and Rosenberg (2007, 96).
[15] See Khulusi et al (2019).

> measurable space, and particularly that of a line; which, like time, may be extended in length, without giving any idea of breadth or thickness. And thus a longer or a shorter space of time may be most commodiously and advantageously represented by a longer or a shorter line. (Priestley, 1765, 5)

This is so condensed it is difficult to read. Nonetheless, as I understand it, sections (i) to (v) contain four premises and a conclusion:

(i) Abstract ideas are necessarily represented in our minds by particular, variable ideas
(ii) Abstract ideas capable of quantity are represented in our minds by the idea of a sensible thing
(iii) Our idea of time is abstract
(iv) Our abstract idea of time is capable of quantity
(v) Our abstract idea of time is necessarily represented in our mind by particular, variable ideas of a sensible thing

Once we have arrived at the conclusion (v), lines offer 'natural and easy' way to represent times. I'll discuss each section in turn.

*(i) Abstract ideas are necessarily represented in our minds by particular, variable ideas.*

Sections (i) and (ii) concern the nature of abstract ideas, and they are best understood in the context of early modern Anglophone debates about abstract ideas more generally. Philosophers such as John Locke, George Berkeley, David Hartley, and Richard Price debated which ideas (if any) are abstract, how our minds produce them, and their precise nature.

Famously, Locke's *Essay Concerning Human Understanding* (1690, 37-8; II.i.2-4) argues all our ideas come from experience: 'sensations', such as our ideas of 'yellow', 'white', 'heat'; or 'reflections' on 'the internal operations of our minds'. One way ideas of reflection are generated is through abstraction, a process which works as follows. Locke (1690, 70; II.xi.9) claims we receive ideas of particulars from particular objects. For Locke (1690, 171; II.xxx.1), the term 'archetype' refers to what an idea stands for, or that on which ideas are based. To create abstract ideas, we abstract away from our ideas of particulars their circumstances of time and place. So, having observed the same colour in chalk, milk and snow, the mind abstracts away from the particulars' circumstances to form an abstract idea of 'whiteness'.[16]

[16] On Locke's account of abstract ideas, see Ott (2004, 53-71) and Lowe (2016, 289-293).

In a few passages, the *Essay* seems to defend a 'picture theory' of ideas: ideas are pictures or images of their objects.[17] Regardless of whether Locke actually held a picture theory,[18] his readers puzzled over how to picture Lockean abstract ideas. Take the abstract idea of a triangle, which Locke holds our mind creates by abstracting away from ideas of particular triangles. Locke (1690, 301; IV.vii.9) writes that the resulting abstract idea of a triangle 'must be neither Oblique, nor Rectangle, neither Equilateral, Equicrural, nor Scalenon; but all and none of these at once'. Our abstract idea of a triangle must somehow be general enough to encompass all kinds of triangles. Yet can we *picture* a triangle that is at once all of these things, and none of them?

Berkeley argued that we can't. In his 1710 *Principles of Human Knowledge*, Berkeley (repr. 2009, 75-6) claims he lacks an idea corresponding to Locke's description of the abstract idea of a triangle, and challenges his readers to check whether they really have such an idea too. Whilst demonstrating propositions concerning triangles, Berkeley accepts that he has in mind the 'universal idea' of a triangle. However, this does *not* mean he has an idea of a triangle that matches Locke's description, that is 'neither equilateral nor scalenon' and so on. Instead, he considers a 'particular' triangle that 'equally stands for and represents all rectilinear triangles whatsoever, and is in that sense universal'. In Berkeley's view, our abstract or universal idea of a triangle is a particular triangle that represents all possible triangles. In his 1738 *Treatise on Human Nature*, David Hume (repr. 1992, 17) endorsed Berkeley's position.

English physician and philosopher David Hartley entered this debate via his 1749 *Observations on Man, his Frame, his Duty, and his Expectations*. I read Priestley as defending Hartley's views, so I set them out in especial depth.

Hartley agrees with Locke that all our ideas come from experience. For Hartley (repr. 1834, 1), 'internal feelings of the mind' include *sensations*, arising from 'impressions made by external objects upon the several parts of our bodies', and *ideas*, comprising 'ideas of sensation' and 'intellectual ideas'. Our ideas of sensation are 'simple' or uncompounded,[19] and they are the elements of all other, 'complex' intellectual ideas. Hence, unlike Locke, Hartley holds that all our ideas derive from sensation specifically: he does not allow for Lockean ideas of reflection. Hartley

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[17] For example, Locke (1690, 72; II.xi.17) compares the understanding to a camera obscura, to 'a Closet wholly shut from light, with only some little openings left, to let in external *visible resemblances*, or Ideas of things without'. A little later, Locke (1690, 86; II.xiv.9) writes that ideas succeed each other like 'the *Images* in the inside of a Lanthorn [lantern], turned round by the Heat of a Candle' (my emphases). For a detailed discussion of Locke's optical metaphors, see Yolton (1984, 125-132).

[18] This issue is usually discussed in the context of Locke's theory of perception: Locke arguably holds that the mind only perceives ideas directly, and those ideas resemble or picture the objects causing them. See Uzgalis (2019, §2).

[19] To complicate this slightly, Hartley (repr. 1834, 36) notes later, 'the ideas of sensation are not entirely simple, since they must consist of parts both co-existent and successive, as the generating sensations themselves do'.

does not hold a picture theory of ideas, for Hartley (repr. 1834, 37) claims all five of our senses can generate ideas of sensation, albeit sight and hearing generating the most vivid.[20] Hartley (repr. 1834, 47-8) claims that simple ideas of sensation can 'run into clusters', and 'coalesce into one complex idea'. This is why our intellectual ideas, such as of 'beauty, honour, moral qualities' are complex, 'composed of parts'. He notes that when many simple ideas compose a complex one, it can *seem* as though the complex idea bears no relation to its compounding parts, nor to the external senses on which the original sensations were impressed. This is because 'each single idea is overpowered by the sum of all the rest', in the same way that the colour white 'is vulgarly thought to be the simplest and most uncompounded of all colours, while yet it really arises from a certain proportion of the seven primary colours'.

Hartley goes on to consider ways that *ideas* are associated with *words*, offering a theory of meaning. He (repr. 1834, 175) claims that words come in several classes. One class is words which 'have ideas only': 'Thus *white, sweet…* excite ideas; but cannot be defined'. In a rare study of Hartley's work, Allen (1999, 219) elucidates this as follows: although one could try to explain the differences between red and green to a person born sightless, such an explanation could only 'very imperfectly' communicate the qualities of these colours - it is not a satisfactory substitute for ideas derived from sight. For Hartley (repr. 1834, 175), another class is words which 'have definitions only': algebraic quantities – such as 'roots, powers, surds' – and 'scientific terms of art'. Hartley writes that a 'definition' could be a 'description, or any other way of explaining a word by other words'. As Allen (1999, 222-4) explains, words in this class derive their meaning from their definitions. Defining words by other words includes not just 'dictionary definitions', but also the practice of 'continued discourse' or 'our agreements concerning their use'.

Our concern lies with the class of words which 'have both ideas and definitions'. Hartley writes of such words:

> The names of natural bodies, animal, vegetable, mineral… excite aggregates of sensible ideas, and at the same time may be defined (as appears from the writings of natural historians) by an enumeration of their properties and characteristics. Thus likewise geometrical figures have both ideas and definitions. The definitions in both cases are so contrived as to leave out all the variable particularities of the ideas, and to be also more full and precise, than the ideas generally are in the parts that are of the permanent nature (Hartley, repr. 1834, 175)

[20] On this, see Allen (1999, 221).

To better understand this class, let's consider a word falling into it: the name of an animal, 'duck'. When I hear this word, it excites aggregates of sensible ideas - ideas obtained through sensations, such as hearing ducks quack or watching ducks fly. Yet the word 'duck' can also be defined by the natural historian in such a way as to leave out particularities, such as 'A waddling waterbird with a blunt bill'.

Hartley (repr. 1834, 226-7) considers two interrelated ways that his views differ from Locke's 'excellent' *Essay*, 'to which the world are so much indebted'. The first is familiar to us: Hartley denies there are ideas of reflection in Locke's sense. The second is that Hartley reads Locke as ascribing ideas to many words, whereas he believes many words lack ideas but have definitions. Hartley argues that Locke made an 'error' in asserting the existence of ideas of reflection:

> We may conceive, that he [Locke] called such ideas as he could analyse up to sensation, ideas of sensation; the rest ideas of reflection, using reflection, as a term of art, denoting an unknown quantity. Besides which, it may be remarked, that the words which, according to him, stand for ideas of reflection, are in general words, that, according to the theory of these papers, have no ideas, but definitions only. And thus the first difference is, as it were, taken away by the second; for, if these words have no immediate ideas, there will be no occasion to have recourse to reflection as a source of ideas; and, upon the whole, there is no material repugnancy between the consequences of this theory, and any thing advanced by Mr. Locke.
>
> The ingenious Bishop Berkeley has justly observed against Mr. Locke, that there can be no such thing as abstract ideas, in the proper sense of the word idea. However, this does not seem to vitiate any considerable part of Mr. Locke's reasoning. Substitute definition for idea in the proper places, and his conclusions will hold good in general. (Hartley, repr. 1834, 227)

On Hartley's reading of Locke, Locke called ideas that he could trace to sensory origins 'ideas of sensation'. However, there remained a group of ideas Locke could not trace to sensory origins, and for want of a better explanation Locke called these 'ideas of reflection'. For Hartley, many so-called Lockean ideas of reflection are not ideas but definitions, so there is no need to posit reflection as a source of ideas. This is why the first difference between he and Locke is 'taken away by the second'. Hartley accepts Berkeley's 'just' observation that there are no abstract ideas in the proper sense, yet Hartley can also accept the 'considerable part' of Locke's reasoning because Hartley's

account of how we acquire so-called Lockean abstract ideas (i.e. Hartleyian definitions) involves a Lockean process of abstraction from particular ideas of sensation.[21]

More briefly, let's consider another work Priestley read closely: Richard Price's 1758 *Review of the Principal Questions and Difficulties in Morals*. Despite his admiration for Locke's 'excellent' *Essay*, Price (1758, 18-20) argues that some of our ideas do *not* originate in experience: the mind also has a faculty of understanding called 'Intuition', 'a spring of new ideas' that are 'simple', 'uncompounded'. Price (1758, 42-3) rejects Locke's view that we obtain abstract ideas through experience, arguing instead we acquire them through this special faculty of understanding. He asserts that all pictures in our imaginations, and ideas of sensation, are 'particular'. Further, he argues, we cannot obtain the abstract idea of a triangle from particular triangles, for the requisite process of reflection 'clearly' implies that the abstract idea is 'already in the mind': 'How else should it [the mind] know how to go to work, or what to reflect on?'.

The language of Priestley's *Description of a Chart of Biography* - such as its use of the word 'archetype' - shows Priestley was familiar with these debates by 1765, and we know he read Hartley's pertinent work at least ten years earlier. Priestley's *Memoirs* (repr. 2010, 18-19) state that he read Hartley's *Observations* between 1752 and 1755, and the book 'immediately engaged my closest attention, and produced the greatest… effect on my general turn of thinking thro' life'.[22]

It will be helpful to set out Priestley's own position on these debates. As I read Priestley, he holds a Hartleyian account of 'abstract ideas': words such as 'triangle' have definitions and are associated with aggregations of sensible ideas. His account can be found in an essay, "Of Complex and Abstract Ideas", appended to a 1775, abridged edition of Hartley's *Observations*, produced by Priestley and titled *Hartley's Theory of the Human Mind.* Referring to the work of his friend Price,[23] Priestley's essay acts as a reply to Price's claim that abstract ideas lack experiential origins. Priestley (1775, xxxiii) opens the essay by describing Lockean ideas of reflection. On Priestley's reading, Locke holds that although 'sensible ideas may give occasion' to ideas of reflection, 'they do not properly *constitute* them'. In contrast, Hartley holds sensations 'furnish the materials' of all our ideas, and so-called Lockean ideas of reflection 'are only ideas of so very complex a nature, and borrowed from so many ideas of sense, that their origin cannot be easily

[21] Hartley downplays the difference between Locke's ideas of reflection and his own definitions, presumably because of his admiration for Locke. However, Allen (1999, 223-6) shows the difference reflects substantial disagreements over meaning, language acquisition, and ultimately the emergence of mind.
[22] Priestley even corresponded with Hartley before the latter's death in 1757 but the letters are not extant; see Allen (1999, 408).
[23] On their friendship, see Schofield (2004b).

traced'. Priestley adds that, whilst it can be difficult to understand how ideas of reflection 'can be composed of sensible ideas', he will elucidate the process.

Against Price, Priestley defends Locke's view that we acquire so-called ideas of reflection via Lockean abstraction:

> consider that short and simple process by which we get the idea of white or whiteness, namely, by leaving out what is particular in all the objects which we have seen of that colour, and restricting the meaning of the term to what is common to them all. (Priestley, 1775, xxxvi)

But, against Locke and with Hartley, Priestley seeks to show that all ideas ultimately derive from sensation. In this context, Priestley (1775, xxxiv-xxxvi) echoes Hartley on how ideas can appear simple when they are not: 'a whole group of ideas' can 'perfectly coalesce into one, as to appear but a simple idea', in the same way that 'whiteness' appears simple but is not. This is why our idea of 'whiteness' seems as though it derives from Lockean reflection or Pricean intuition, when it really derives from sensation.

Priestley tackles Price's claim that we cannot obtain our abstract idea of a triangle via sensation, by explaining how a child acquires it:

> Originally the mind of a child is impressed with the idea of some particular triangle… Afterwards he sees other figures, bounded as that was by *three right lines*; and being taught to call these *triangles*, likewise, he then, and not before, abstracts from his former idea of a triangle whatever was peculiar to the first that he happened to see; and he appropriates the term to the circumstances that they have in common. Then… he has an idea of what a *triangle in general* is, that is, what the strict definition of it is: for still all the ideas of triangles that he actually contemplates, are ideas of particular triangles, but variable, and indefinite. (Priestley, 1775, xli)

This passage reveals Priestley's Hartleyian understanding of abstract ideas. Hartley's class of words possessing definitions and aggregates of sensible ideas includes 'geometrical figures'. Priestley is applying this to the word 'triangle'. The child's abstract or general idea of a triangle is a 'strict definition', such as having 'three right lines'. Yet the ideas of triangles the child 'actually contemplates', by which Priestley presumably means visualises, are of particular triangles. Priestley does not explain what he means by having a 'variable' idea but he is plausibly referring to how we can vary the shape of a particular triangle in our mind (say, from equilateral to non-equilateral). In this way, our abstract idea of a triangle elicits particular, variable ideas of triangles.

Given the linguistic similarities, I argue this account underlies (i) within *A Description of a Chart of Biography*: 'As no image can be formed of abstract ideas, they are, of necessity, represented in our minds by particular, but variable ideas'. Why can't we form images of abstract ideas? Given Priestley's account of abstract ideas, it is presumably because an abstract idea is strictly a Hartleyian definition, and Priestley shares Hartley's Berkleyian view that we cannot conceive non-particular ideas. This is why, for Priestley, when we do represent abstract ideas in our minds, we *necessarily* use particular ideas, not general ones. I note that while Priestley refers to forming *images* of ideas, suggesting he may (arguably like Locke and Berkeley) hold a picture theory of ideas, it's also possible that he exclusively refers to visual ideas here just because he is writing of his visual chart. To sum up, as exemplified by the child who can define a triangle but only possesses ideas of particular triangles, the reasoning behind (i) is that when we represent an abstract idea in our mind we must do so using particular yet variable ideas.

*(ii) Abstract ideas capable of quantity are represented in our minds by the idea of a sensible thing.*

(ii) is difficult to read because Priestley mentions 'ideas' without specifying 'abstract ideas' or 'ideas of sensible things'; and the antecedents of the pronoun 'it' are sometimes unclear. However, as 'abstract ideas' are the subject of the preceding sentence (i), it follows they are also the subject of (ii). Working on this assumption, I have supplemented Priestley's text as follows:

> [(ii)] and if an [abstract] idea be capable of *quantity* of any kind, that is, if it admit of the modification of greater and less, though the Archetype, as it [the Archetype] is called, of that [abstract] idea be nothing that is the object of our senses, it [the abstract idea] is nevertheless universally represented in our minds by the idea of some sensible thing.

Many abstract ideas are capable of quantity, such as 'milk' (half a pint, one pint) or 'ladder' (three feet tall, thirty foot tall). For Locke, an 'archetype' refers to what an idea stands for – that on which ideas are based. The archetypes of some abstract ideas are the objects of our senses: glasses or bottles of milk. However, the archetypes of some abstract ideas are not the objects of our senses. For example, we may have an abstract idea of 'justice', abstracted away from particular 'just deeds', but arguably we do not sense just deeds. Priestley is saying that if an abstract idea is capable of quantity, we represent it using a sensible idea, even if its archetype is not the object of our senses. As we'll see below, this fits with Priestley's understanding of the idea of time as abstract.

*(iii) Our idea of time is abstract.*

Sections (iii) and (iv) concern our idea of time. Again, they are best understood against the background of various early modern debates.

Locke's *Essay* asks how we acquire our temporal ideas of succession, duration, and time. Here is how we obtain the ideas of succession and duration:

> 'Tis evident to any one who will but observe what passes in his own Mind, that there is a train of Ideas… Reflection on these appearances of several Ideas one after another in our Minds, is that which furnishes us with the Idea of Succession: And the distance between any parts of that Succession… is that we call Duration. (Locke, 1690, 84; II.xiv.3)

Having obtained the idea of duration, Locke (1690, 84; II.xiv.9) explains that the mind measures durations, using for example the motion of the sun. Considering duration 'marked by certain Measures' is what 'most properly we call Time'. Locke (1690, 45; II.ii.1) distinguishes 'simple' ideas, which are 'uncompounded', 'not distinguishable into different ideas'; from 'complex' ideas, which are so compounded. Locke (1690, 54; II.vii.9) writes that our idea of succession is simple. Locke (1690, 96; II.xv.9) also writes that our idea of duration is simple, even though all the parts of duration have duration. Importantly, for Locke, our ideas of succession, duration, and time are *not* abstract ideas. Berkeley (repr. 1989, 107; §98) seems to follow Locke in holding that we obtain our idea of time by reflecting on the succession of ideas in our mind, and in *not* claiming that our idea of time is obtained via a Lockean process of abstraction.[24]

Hartley's *Observations* does not comment on how we obtain our ideas of duration or time, nor on whether those ideas are abstract. In contrast, Price's *Review* does. As we saw above, Price claims we obtain some ideas not through experience but through 'Intuition'. These include our ideas of solidity, substance, space, and - importantly - duration:

> The idea of *Duration*, is an idea accompanying all our ideas and included in every notion we can frame of reality and existence. What the observation of the train of thoughts following one another in our minds, or the constant flux of external things, immediately and properly suggests to us, is *Succession*; an idea which… presupposes that of *duration*…
> We, and all things, exist in *time* and *place*… [as] intelligent beings, we must have ideas of them. (Price, 1758, 30-1)

[24] On Berkeley's account of time, see Thomas (2018, 188-9).

For Price, we obtain our idea of succession in the way that Locke suggests. But our idea of succession presupposes an idea we already have by intuition: that of duration.[25] Price slips from writing about the idea of duration to that of time, suggesting he may identify these ideas.

Within (iii), *A Description of a Chart of Biography* baldly refers to our 'abstract idea of TIME'. To explain Priestley's views further, I turn again to his essay "Of Complex and Abstract Ideas." Here, I read Priestley as applying Hartley's work in a new way, to argue against Price that we *do* obtain our ideas of duration and time from sensation:

> To account for the idea of *time*, it appears to me to be sufficient to attend to a few well known facts, viz. that impressions made by external objects remain a certain space of time in the mind… and that traces of these impressions, i.e. *ideas*, may be recalled after the intervention of other trains of ideas… If I look upon a house, and then shut my eyes, the impression it has made upon my mind does not immediately vanish; I can contemplate the idea of the house as long as I please…
> Now do not these facts, and thousands of the same kind, necessarily give the ideas of *duration* and *succession*, which are the elements of our idea of *time*. If all our sensations and ideas were wholly obliterated the moment that an external object was withdrawn, there could be no ideas of duration and succession because there could be no opportunity of comparing our ideas; but upon the contrary supposition… the ideas of *succession*, *duration*, and *time*, are necessarily generated… [These] are no more than other *ideas of reflection*. (Priestley, 1775, xxxix)

For Priestley, we derive our ideas of succession and duration in the same way we derive our idea of whiteness. The mind abstracts away from its sensory ideas of particulars - ideas of chalk, milk - to form an abstract idea of 'whiteness'. Similarly, the mind abstracts away from its sensory ideas of enduring particulars – ideas of things it considered, perhaps one after the other, for different lengths of times – to form the abstract ideas of 'succession' and 'duration'. These abstract ideas compose our abstract idea of time. Presumably, they are the archetype of 'time'; our abstract ideas of 'duration' and 'succession' are not the objects of our senses.

Priestley agrees with Locke and Hartley, against Price, that all our ideas ultimately derive from experience. However, against Locke, Priestley shares Hartley's view that all our ideas ultimately derive from sensation. Priestley uses Hartley's work to show that our ideas of succession, duration, and time derive from sensation; and he uses Locke's work to show that they do so via a Lockean process of abstraction. And of course, strictly speaking, for Priestley, these abstract ideas

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[25] Price's *Review* makes two claims explicitly: we intuit abstract ideas; and we intuit our ideas of duration and time. This raises a question. Does Price implicitly take our ideas of duration and time to be abstract? Price does not say, and I have found no literature on this issue. If Price does hold this view, it could be said to anticipate Kant's position that time is a form of inner sense.

are Hartleyian definitions. Finally, for Locke and Price, the ideas underlying our idea of time – duration and succession – are simple, whilst Priestley takes them to be complex. *A Description of a Chart of Biography*'s terse claim that time is an abstract idea is underpinned by subtle philosophical views.

As far as I am aware, Priestley's view that we acquire our idea of time via a Lockean process of abstraction – and that this abstract idea is a Hartleyian definition – is unique. He may have developed it independently, or as part of a larger trend of thought. In Thomas (2018, 190-7) I have previously explored the work of two English philosophers who also hold that our idea of time is derived via Lockean abstraction: an anonymous 'Learned Writer' that I identify as Daniel Waterland, and the prominent Lockean theologian Edmund Law.[26] I will briefly set out Law's view.

Law argues in several 1730s texts that our ideas of duration and time are Lockean abstract ideas. In 1731, Law published an English translation of William King's *De Origine Mali*, titled *An Essay on the Origin of Evil*. Law peppered his translation with footnotes setting out his own views on various issues, including how we obtain our ideas of 'continuance' (i.e. duration) and time:

> Observing a train of Ideas succeeding one another in our minds at certain distances… we get the Idea of *continuing*. Observing also that several other things *continue* as well as ourselves… we abstract from particular Existences and make one general Idea of *Continuance*, which serves for all, and this is *Duration*.
>
> The Parts or Periods of this common Duration we call *Time*; and every thing which is commensurate to them is measured by it…
>
> I have been the longer on this subject of *Abstract Ideas*, since the nature of 'em seems to be but little understood (Law, 1731, 6-7)

Law reiterates this view in his 1734 *An Enquiry into the ideas of space, time*, where he explicitly argues - like Priestley and unlike Locke - that our idea of duration is complex; see Law (1734, 35).

I have since found another writer who seems to hold that our idea of time is derived via Lockean abstraction: William Watson. In his 1785 *Treatise on Time,* Watson (1785, 8-9) defines a 'notion' as a kind of idea, the apprehension of a perception common to other perceptions, such as the colour 'white'. Watson (1785, 137-8) argues we acquire a notion of time by observing the flux of our perceptions. In Thomas (forthcoming) I read Watson's 'notion' as a Lockean abstract idea, implying his idea of time is also a Lockean abstract idea.

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[26] On Law's stature, see Young (2004).

Notably, Priestley was friends with Law[27] *and* Watson.[28] Indeed, in the preface to his *Treatise*, Watson (1785, vi) explains that it has the 'approbation of that eminent Philosopher Dr. Priestley (who thought it not unworthy of the public eye)'. Watson's *Treatise* (1785, 2) also approvingly cites Law's views on time. Given all this, it is possible that Priestley drew on Law's 1730s position in constructing his own account. Perhaps Priestley even *inspired* Watson's 1785 account; two scholars hint at Priestley's influence on Watson's *Treatise*, although frustratingly neither offer any details.[29]

*(iv) Our abstract idea of time is capable of quantity.*

(iv) states that our abstract idea of time 'has real quantity, and we can say a greater or less space of time'. This is straightforward: our ideas of time can be short (a few minutes) or long (a few years).

*(v) Our abstract idea of time is necessarily represented in our mind by particular, variable ideas of a sensible thing.*

Sections (i) and (ii) claim that abstract ideas capable of quantity are necessarily represented in our minds using particular, variable ideas of sensible things. Sections (iii) and (iv) claim that time is an abstract idea capable of quantity. Putting these together, Priestley is pushed to his conclusion (v): our abstract idea of time can only be represented using the particular, variable idea of a sensible thing. What sort of thing, that is both particular and variable, would be appropriate?

Priestley (1765, 5-6) argues that representing times using lines is suggested by our language, such as the way we describe times as short or long. Particular lines, which can vary in length, allow us to visually represent our abstract, non-sensible idea of time. Given the undoubtedly long history of describing 'spaces' or 'lengths' of time, the idea of a line seems a logical choice. And this is exactly what the final part of our passage above argues: 'the abstract idea of time… admits of a natural and easy representation in our minds by the idea of a measurable space, and particularly that of a line'. Very speculatively, there are remarks in Locke, Berkeley, and Hume that may have

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[27] See Schofield (2004a, 212).
[28] See Schaffer (2004) and Schofield (2004b).
[29] Schaffer's (2004) biography of Watson describes *A Treatise on Time* as 'heavily indebted' to Priestley. Rée (2020, 252) claims, 'Priestley persuaded his colleagues' - including Watson - that, to use Watson's phrase, time is only a 'notion… a creature of the imagination'. Thomas (forthcoming) discusses this possible line of influence further.

suggested this solution. Locke describes infinite duration as an infinite line; and, although they do not connect lines with time, Berkeley and Hume mention lines in their discussions of abstract ideas[30].

### 3.2 Priestley's Uniform Time, Newton's Absolutism, and an Alternative Metaphysic

Let's move on to the next visual innovation of *A Chart of Biography*: its representation of time as uniform. Priestley's description (1765, 26) stresses how time flows 'uniformly'. Priestley himself does not connect the uniform nature of time with Newton. However, Newton famously described time's flow as uniform in the context of advancing absolutism, and Priestley refers to Newton in describing his chart. Consequently, many scholars have claimed that this innovation is grounded in Newtonian absolutism.

Newton's *Principia* (trans. 1999, 408-9) holds, 'Absolute, true, and mathematical time, in and of itself… flows *uniformly* and by another name is called duration' (my emphasis). Newton notoriously divinizes space and time, drawing some deep ontological connection with God. For example, Newton (trans. 1999, 941) writes of God, 'by existing always and everywhere he constitutes duration and space'. Newton's absolutism drew many converts, including Locke[31] and Samuel Clarke. Clarke (1717, 129-131) popularised and extended Newton's divinisation of space and time, describing space and duration as 'properties' of God, *'immediate and necessary Consequences of* His Existence'.

*A Description of Chart of Biography* makes several references to Newton. For example, Priestley (1765, 2) describes Newton as the 'great father of the true philosophy'. Later, he adds:

> I have followed the principles of Newton's Chronology, though they have not hitherto been adopted by any of our later chronologers… Indeed this chart is a kind of ocular demonstration of that system: for here it will be found, upon examination, that kings and other persons whose names occur in sacred history stand near those who are said to have lived the same number of reigns or generations distant from one another in profane history. And the intervals of successions and generations will be seen to be nearly the same in all parts of the chart, as the uniformity of the course of nature requires. (Priestley, 1765, 13-14)

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[30] Locke (1690, ; II.xv.11) writes that infinite duration 'is but as it were the length of one straight line, extended in infinitum, not capable of multiplicity, variation, or figure'. Locke's stricture that it is *in*capable of variation is clearly quite different to Priestley's conception of time as a variable line, but suggestive nonetheless. Meanwhile, Berkeley (repr. 2009, 74) discusses how one line can be used to represent all lines. Hume (repr. 1992, 18-9) used lines to illustrate the impossibility of conceiving an abstract idea without quantity: you cannot imagine a line without imagining to it have a particular length.

[31] At least, most scholars read Locke as a Newtonian absolutist; for discussion, see Gorham & Slowik (2014) and Thomas (2018, 125-149).

Priestley is referring to Newton's 1728 *Chronology of Ancient Kingdoms Amended*, which attempts to date and order historical events within kingdoms such as Greece and Egypt. It is a tortuous work, involving intricate comparisons of historical dating systems and time measurements. To illustrate, Newton (1728, 51-4) spends several pages debunking the Egyptian claim that 'Reigns of Kings' are equivalent in years to 'Generations of men' (they're not, Newton argues, as kings are frequently slain or deposed before passing their thrones to their sons). Newton uses mathematics to estimate generational averages, claiming that generations from father to son may be reckoned at about 33 or 34 years apiece. Newton's *Chronology* is not a chronography; it simply lists dates, rather than offering graphics or visuals.

Several scholars have connected Priestley's *Chart* with Newton's theory of time. For example:

> To many readers, Priestley's charts seemed to offer a picture of time itself. In the context of the Newtonian revolution, this made perfect sense… the theory of time expounded in his [Newton's] physics resonated strongly with the uniformity depicted in Priestley's charts. (Rosenberg & Grafton, 2010, 140)

Others go further, describing Newtonian absolutism as a 'necessary antecedent' to Priestley's chronology. In the context of discussing Priestley's *Chart*, Boyd Davis, Bevan, and Kudikov write:

> before time could be conceived as mappable to a uniform space in this way, it had itself to be perceived as a uniform measure. To do so might seem simply natural, but several prior concepts were necessary…. A necessary antecedent to chronography proper is Newton's 'absolute, true, and mathematical' time as the measure of all events. (Boyd Davis & Bevan & Kudikov, 2010, 357)

In a later paper, Boyd Davis (2017, 17) gives a reason for this view: 'Priestley was devoted to creating the simplest possible 'ocular demonstration' of Newtonian time'; as evidence, Boyd Davis references p14 in Priestley's *Description*. Molesworth (2019, 132) explains how Newton's account of absolute time was adopted by several eighteenth century fields. In this context, he writes that Priestley's timelines were 'Directly inspired by Newton'. These scholars are claiming that Priestley's *representation* of time as uniform is rooted in Newton's *ontological* description of time as uniform and absolute.

I accept that Priestley's uniform representation of time is *consistent* with Newtonian absolutism. But I argue there are two reasons to doubt the further claim that it is grounded in, or

inspired by, absolutism.[32] One is that there is an alternative source stressing the uniformity of time that Priestley's decision could be grounded in, one that he was closely familiar with: chronology. Priestley's *Lectures on History, and General Policy* discusses chronology and chronography at some length. In the context of explaining how chronographies can aid the study of history, Priestley (1788, 153-4) argues that the 'most ingenious and useful' study aid 'is the *chart of history* lately imported from France', likely another reference to Jefferys' *Chart of Universal History*. Yet Priestley criticizes this chart for using 'different scales… to represent the same number of years in different parts of it'. He goes on to discuss several time tables, including those of Tallents, Marshall, and Blair. Priestley (1788, 150) argues it is an advantage when chronological tables 'dispose the events in such a manner, as that the distance at which they are placed… shall give a just idea of the real interval of time between them'. He claims that the chronology which comes closest to this ideal is Blair's. Plausibly, Priestley read the opening of Blair's *Chronological Tables*, where Blair (1754, Preface) argues that Tallents, Marshall and others make a 'great and fundamental Mistake': they aim to contract history 'into as little Room as they could'. Blair argues these rival time tables have lost the 'true Connection and Union' of history; he avoids this mistake by ensuring his table is 'properly proportioned'. Although Blair is committed to representing time in a uniform fashion, he cannot achieve it across the whole book: proceeding yearly from Creation would simply involve too much blank space, as chronologists had less data on early periods. Priestley manages to represent time uniformly across his whole *Chart* by starting from 1200 BCE, rather than from creation.

The other reason to deny that Newtonian absolutism grounds the uniform representation of time in *A Chart of Biography* is that there is no textual evidence indicating Priestley *accepts* Newtonian absolutism. Indeed, to the best of my knowledge, nowhere in his corpus does Priestley offer a positive metaphysics of time. *A Description of a Chart of Biography* references Newton's *Chronology*, not Newton's *Principia*. Some of the scholarly remarks above do not appear sensitive to Priestley's claim that his chart offers an ocular demonstration of Newtonian *chronology*, not Newtonian *time*.

There is also evidence showing Priestley rejects a key part of Newtonian absolutism: its divinisation of space and time. This can be found in correspondence between Priestley and Price, published in 1778. They touch on time in passing, and Priestley (1778, 106) rejects Clarke's thesis that space and time are attributes of God. One of Priestley's objections is that, if infinite space and

[32] In contrast to at least one other mid-eighteenth century chronologist: Hodgson's *Introduction to Chronology* (1747, 2) opens with an almost-verbatim characterisation of absolute time from Newton's *Principia*.

duration were divine attributes because God occupies them, then finite space and duration should also be attributes of finite bodies because bodies occupy them – a consequence he finds absurd. Priestley's rejection of Newtonian absolutism's divinisation of space and time raises the possibility he rejects the position wholesale.

Having argued there is no reason to attribute Newtonian absolutism to Priestley, let's take this opportunity to ask what other kind of metaphysics he may hold. In Thomas (2018, 7-9), I argued that, despite the impression sometimes given by the literature on early modern metaphysics, many more positions were available on time beyond Newtonian absolutism and Leibnizian relationism. Given Priestley's distinctive idea of time, I argue there is reason to believe he holds one of the lesser-known theories.

We have seen that Priestley's account of time as an abstract idea derived via a Lockean process of abstraction has commonalities with that of Waterland, Law, and Watson. Importantly, this is *all* these three men think time is: a mind-dependent idea.[33] This can be seen by extending the passage above from Law:

> I have been the longer on this subject of *Abstract Ideas*, since the nature of 'em seems to be but little understood, otherwise we should never hear of our Ideas of *Infinity*, of *Space, Duration, Number,* &c. requiring an external *Ideatum* or *objective* reality; - of their being real Attributes… of some immense and eternal beings… abstract Ideas… exist… no where but in the Mind, neither have they any other foundation, nor can they be a proof of any thing, beside that power which the mind has to form them. (Law, 1731, 7)

Priestley's *reductio ad absurdum* against Clarke's divinisation of space and time actually echoes an argument made by Law (1734, 62): '~~Is~~ it not full as just to affirm that Extension belongs to all Matter, as to make it an individual Property of one immaterial Being? And if Duration be an Attribute of God, is not the Time of Man's Existence as much an Attribute of Man?'. Watson (1785, 138) also argues that time is 'nothing more' than a notion and creation 'of our own brain', and has no existence outside it. As Priestley lent his approbation to Watson's *Treatise*, we can conjecture that Priestley approved its metaphysics of time.

There is a case to be made that, if one holds anything to be arrived at via a Lockean process of abstraction, one is *committed* to the view that it must be an idea only. On Locke's account of abstract ideas, they cannot exist outside the mind. '*General and Universal*', Locke (1690, 192;

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[33] On time in Law, see Baker (1932, 585-91); on Waterland and Law, see Thomas (2018, 190-195); on Watson, see Thomas (forthcoming).

III.iii.11) writes, 'belong not to the real existence of Things; but *are* the *Inventions and Creatures of the Understanding*, made by it for its own use'. Of our abstract idea of a triangle, Locke (1690, 301; IV.vii.9) states: 'it is something imperfect, that cannot exist; an Idea wherein some parts of several different and inconsistent Ideas are put together'. Ott (2004, 63) reads Locke as conceiving the abstract idea of a triangle to be 'determinable': its shape is not determinate in the way that the shape of a particular triangle is, although its shape can be so determined. On Ott's reading, the *idea* of a determinable triangle is possible, although determinable *things* are impossible. Law (1734, 80-3) actually makes this case, referring specifically to Locke's description of general and universal as not belonging to the real existence of things, asserting furthermore that asbstract ideas do.. He writes it is impossible to show that 'an *abstract Idea*, in Mr. *Locke's* Sense of that Word, can imply or even admit of any proper *Ideatum*' (i.e. objective reality).

If this case has merit, then Priestley might also be committed to the view that time cannot exist outside the mind. Priestley's abstract idea of a triangle is not *even* an impossible thing - it is merely a definition. The same goes for Priestley's abstract idea of time. This would mean Priestley is certainly not a Newtonian absolutist and that he belongs instead to the smaller tradition of Waterland, Law, and Watson. Returning to the innovation that sparked this discussion, it is worth noting that Priestley's representation of time as uniform is perfectly compatible with this tradition. Law (1734, 87) writes that we conceive duration to flow 'regularly', and Watson (1785, 94) seeks to explain why we conceive time as 'uniform'. There is no reason to ground this feature of Priestley's timeline in Newtonian absolutism.

### 3.3 Time as a Visual and Philosophical River

Thus far, we have explored particular visual innovations of *A Chart of Biography*. This section considers how Priestley characterises the chart's visual appearance as a whole:

> TIME is continually suggested to us, by the view of this chart, under the idea of a *river*, flowing uniformly on, without beginning or end… the lives of men… are little more than so many small straws swimming on the surface of this immense river. (Priestley, 1765, 26)

Now we are familiar with Priestley's account of our idea of time, consider how apt this metaphor is. At the bottom of his account lie ideas of sensation, of particular successive, enduring things. What do we get when we abstract from them? The ideas of succession (one thing following another) and duration (flowing or continuing) that comprise our idea of time. Priestley's chart embodies these

ideas: the straws swim one after the other through the flowing water. Law (1734, 132) actually states that our idea of time just *is* 'flowing or continuing': that is what we are left with when we abstract all other circumstances of things away. Further, consider the complexity of Priestley's grand idea of time: it is ultimately composed of particular ideas of successive, enduring things. *A Chart of Biography* is similarly complex. Its grand river of time is filled with small, successive and enduring things: the lives of its straws. Priestley's idea of time involves following, flowing and complexity, and he sees this reflected in his chart.

## 4 *A Chart of Biography* and Human Progress

Priestley likely conceived *A Chart of Biography* as an aid for teaching history.[34] Yet, as he recognized, its uses go far beyond this. The chart confirms, and even advances, one of the deepest themes in Priestley's work: human progress.

Like Hartley, throughout his career Priestley held 'millenarianism': the view that humanity is progressing towards the second coming of Christ. The term itself refers to the prophesied millennium – literally, thousand-year reign – of Jesus prior to the new heaven and earth. His friends struggled to comprehend how such a rational man could believe this age was swiftly approaching. One (almost disbelievingly) reports how Priestley perceived the French Revolution as heralding the next millennium: 'My opinion is founded altogether upon revelation and the prophecies; I take it that the ten horns of the great Beast in revelations, mean the ten crowned heads of Europe: and that the execution of the king of France is the falling off of the first of those horns'. One catalog of Priestley's library listed 27 titles on Biblical prophecy.[35]

*A Chart of Biography* confirms that humanity is progressing. One way it does so is made explicit by Priestley: the chart depicts the number of great men increasing over time.[36] Priestley (1765, 25) expresses pleasure at how the last two centuries are 'full' with men of merit: 'This prospect gives us a kind of security for the continued propagation and extension of knowledge; and that, for the future, no more great chasms of men really eminent for knowledge will ever disfigure that part of the chart of their lives which I cannot draw, or ever see drawn'. I argue the chart also confirms Priestley's view on progress in another, more subtle way.

Priestley used Hartley's account of the brain to advance his materialism about the mind. Priestley (1775, xx-xxi) claimed that a person's mental powers are the result of 'such an organical

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[34] Priestley (1765, 4) writes that his chart was first 'drawn out' for use in his history lectures.
[35] I take these details of Priestley's millenarianism from Garrett (1973, 51-3), who also explains its relationship to that of Hartley. Neither man was evangelical about the millennium, but both took it seriously.
[36] Sheps (1999, 148) and Rosenberg (2007, 68) follow Priestley in commenting on this aspect of his chart.

structure as that of the brain'.[37] A consequence of this is that 'lower animals' differ from us 'in degree only'. Later, Priestley considers the differences between humans and animals. In this context, Priestley (repr. 1797, 46-7) argues that one difference between a dog and a child is that, although both possess ideas, in the child those ideas are highly modified. He writes that through Hartley's 'wonderful sagacity', we know that 'abstract' ideas are especially remote from sense. Although animals may acquire some abstract ideas – for example, a dog's abstract idea of 'hares' allows it to recognize (and chase) unfamiliar hares – they do not seem capable of acquiring 'any ideas of invisible objects, or of very abstract or complex ideas'. Priestley attaches a high value to such ideas:

> On this account it does not seem possible to give a brute animal an idea of God, or of a future state… And in proportion to the number and variety of our ideas, and their combinations, and consequently their remoteness from the elements of which they are composed, is our advancement in intellectual excellence: for in this proportion we recede the farther from mere sense. (Priestley, repr.1797, 48)

Having ideas of 'invisible objects', and 'very abstract or complex ideas' remote from sensation contributes to 'our advancement in intellectual excellence'. Priestley was pleased to discover *A Chart of Biography* confirms human progress by depicting increasing numbers of men on its right-hand side. I suspect he would also have been pleased to realise that the chart confirms human progress via its very existence: it represents an incredibly complex abstract idea, depicting invisible durations removed from sense. That humans can create and comprehend such an object proves their intellectual advancement.

Not only does *A Chart of Biography* confirm human progress by Priestley's lights, I argue it *furthers* human progress by his lights - and Priestley recognised this. In brief, studying his timelines allows us to comprehend a wide swathe of time as God does, making us happier, and thereby encouraging us to advance God's apocalyptic plan. In more detail, this works as follows.

Having compared *A Chart of Biography* to a river, and the lives of men to straws, Priestley's description writes that this 'view' of his chart strongly expresses 'the admirable propriety of those lines of Dr. Watts, concerning the eternity of GOD':

> While, like a tide, our minutes flow,
> The present and the past;

[37] On Priestley's materialism, see Allen (1999, 377-382), Tapper (2002), Schofield (2004a, 59-76), Dybikowski (2008) and Kingston (2019, §5). Hartley himself did not defend materialism; see Allen (1999, 382-6).

> HE fills his own eternal NOW.
> And sees our ages waste. (Priestley, 1765, 26)

For Priestley, this is no throwaway sentiment. He quotes the poem again a few years later, in his 1768 *Essay on the First Principles of Government.* As part of a discussion of government and happiness, Priestley (1768, 1) argues one way a person becomes happier is by considering broader swathes of time: 'By this means his happiness is less dependent on temporary circumstances and sensations'. More specifically, expanding the breadth of time we comprehend allows a person to perceive the relations of cause and effect holding between disparate events and understand how seemingly evil events are subsumed within a common good:

> the sphere of a man's comprehension… which may be called the extent of his *present time*, is greater or less, in proportion to the progress he has made in intellect, and his advancement above mere animal nature… In such minds the idea of things, that are seen to be the cause and effect of one another, perfectly coalesce into one, and present but one common image. Thus all the ideas of evil absolutely vanish, in the greater good of which it is connected, or of which it is productive (Priestley, 1768, 1-3)

Comprehending larger swathes of time in this way makes us happier, and ultimately brings us closer to God's perfect comprehension and happiness:

> To this comprehension of mind… no bounds can be set… This train of thought may, in some measure, enable us to conceive wherein consists the superiority of angelic beings, whose sphere of comprehension, that is, whose *present time*, may be of proportionably greater extent than ours… and even give us some faint idea of the incomprehensible excellence and happiness of the Divine Being, in whose view nothing is past or future, but to whom the whole compass of duration is… present.
>
> "Who fills his own eternal NOW,
> And sees our ages waste." (Priestley, 1768, 3-4)

For Priestley, the larger one's temporal sphere of comprehension is, the happier we are, and the closer we come to God. As with so many things, Priestley's philosophy of happiness likely draws on Hartley.[38]

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[38] For example, Hartley (repr. 1834, 338-9) also claims that when reflecting on past events, we find small pains 'coalescing' with subsequent greater pleasures. For God, 'all time… is present time', and 'all ideas coalesce into one to him'. Thomas (forthcoming) discusses the link between these passages in more detail.

*A Chart of Biography* straightforwardly offers a means by which people can comprehend larger stretches of time: it offers us something approaching a God's-eye view of time, and this can improve our happiness. Priestley (1788, 382-5) once listed inventions that have made people happier, including linen, window-glass, mills, and clocks. To this list, Priestley could add his own timelines.

Confirmation that Priestley was aware of this use for his timelines can be found in his *Description of a New Chart of History*, which writes of that chart:

> It is even easy to show… that wars, revolutions of empire, and the necessary consequences of them, have been, upon the whole, extremely favourable to the progress of knowledge, virtue, and happiness. Nay, so evident is the tendency of the most disastrous events which disfigure the face of history, upon our first looking on it, to bring about the most happy and desirable state of things… that the more we study the conduct of divine Providence, as well as the works of nature, the more reason shall we see to be satisfied… The more we study history in this view, the more thoroughly shall we be satisfied with our situation. (Priestley, 1781, 20)

Not only does Priestley believe that considering this broad view of history will make us happier, he argues it will encourage us to advance God's plan. For the more we understand it:

> the more will our gratitude to the wise and kind Author of the universe be inflamed, and the more solicitous shall we be to promote… that great end, which we perceive the divine Being is pursuing. (Priestley, Desc of New Chart, 1781, 21)

As Priestley saw, his timelines can help us expand our view of time, making us happier, and ultimately encouraging us to bring about God's 'great end'.

## 5 Priestley's Legacy of Times and Lines

This paper has unpacked Priestley's argument for depicting times as lines; argued, against existing scholarship, that his depiction of time as uniform is not dependent on Newtonian absolutism, and indeed he may hold that time is nothing *but* an abstract idea; and shown that his characterisation of the chart as a river flows (pun intended) from his idea of time. I have also argued that *A Chart of Biography* confirms, and even advances, his millenarianism. This final section takes a more speculative turn, considering the philosophic legacy of Priestley's timeline: its place within the history of space-time parallelism.

Many historical philosophers treat space and time symmetrically.[39] Gorham (2012, 24-6) offers a rare study of this practice in the early modern context, which starts by stating: 'The tendency to 'spatialize time', as Bergson put it, originates in the classical touchstone for all subsequent treatments: book IV of Aristotle's Physics'. Gorham explains that, for Aristotle, space is conceptually prior to time: time cannot be understood without space. This conceptual priority made its way into the work of many medieval philosophers, and ultimately into many early moderns, even those who were 'avowedly anti-Aristotelian'. By the seventeenth century, Gorham (2012, 33) claims many philosophers 'simply infer by analogy that what goes for space goes for time'.

Beyond the seventeenth century, there is no doubt that space-time parallelism continued. For example, at the turn of the twentieth century, Mary Calkins (1899, 220) remarks on our 'habit of making time analogous with space'. Sadly, I am not aware of any literature akin to Gorham's study examining space-time parallelism in later philosophy, and clearly there is not space here to undertake such a enquiry. Nonetheless, were such a study to be produced, I want to sketch a case for giving Priestley a special place in it. This is because, after Priestley, philosophers regularly conceived time as a line, in ways that seem important.[40]

Here are some examples. Kant's 1781 *Critique of Pure Reason* refers to Priestley a few times, describing him as 'devoted only to the principles of the empirical use of reason' (A745/ B773). There's a passage on time reminiscent of Priestley: 'Time is nothing other than the form of inner sense… And just because this inner intuition yields no shape we also attempt to remedy this lack through analogies, and represent the temporal sequence through a line progressing to infinity' (A 33/ B 50). Over half a century later, William Whewell (1840, 125) argued at some length that time has 'great analogy with a line', going on to deny however that it is a mere abstract idea. In the *Encyclopædia Britannica*, James Ward (1886, 64) wrote, 'Time is often figuratively represented as a line, and we may perhaps utilise this figure to make clear the relation of our intuition of time to what we call time itself'. Victoria Welby (1907, 391-3) discusses several philosophers who describe time as a line, including Kant, and uses this to bolster her Aristotelian case that our concept of time depends on space. She argues our idea of time derives from our need to measure sequences of changes, and to do this we borrow 'a space idea', measure the changes 'as a line', and call this measure 'Time'. Whilst taking philosophy lectures from G. E. Moore at Cambridge in 1903, budding

[39] Gorham (2011, 23-4) points out that space-time analogies can be found in Newton, Walter Charleton, Locke, Pierre Gassendi, Isaac Barrow, and Henry More. Thomas (2018) discusses space-time parallels in these figures also.
[40] I don't claim that Priestley was the first philosopher to describe time as a line, but he was surely the first to do so with such fanfare. Earlier philosophers who compare times to lines do so incidentally or briefly - certainly not in the context

of creating bestselling, much-imitated timelines. For example, Gorham (2012, 36-7) explains that Barrow exploits the likeness between spatial magnitude and time, to describe time as ‘as a quantity endowed with a single dimension’.

economist John Maynard Keynes wrote a philosophical essay where he opposed the (implicitly philosophical) 'common sense' view of time, which included time conceived as a stretching line.[41] Twentieth century metaphysicians of time frequently represent time using lines without even commenting on the practice; for example, McCall (1994, 3-5) depicts several timelines and cites many more.

I suggest that, after Priestley, space-time parallelism became tangled with conceiving times as lines. Evidence for this tangle can be found in the work of Henri Bergson, who railed against it. In the preface to his 1888 *Time and Free Will*, Bergson (trans. 1910, xix) explains that 'we usually think in terms of space', but many philosophical problems arise by considering 'in space phenomena which do not occupy space', such as time. Much of Bergson's work is devoted to disproving the 'spatialisation' of time, and he especially rejects the conception of time as a line. For example, Bergson (trans. 1910, 181) states firmly, 'time is not a line'; and Bergson (trans. 1910, 191) even depicts a person's conscious states on a line to show the inappropriateness of this image. To really hammer the point home, in the English translation, the book's index entry for "Line" provides page references to 'motion not a' and 'time not a'. Bergson's positive account of time is developed against what he perceives to be the misguided tradition of space-time parallelism, and Priestley's pervasive conception of time as a line had become part of that. A line can be traced all the way from Priestley to Bergson[1].

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[41] "Essay on Time", King's College Archive, Cambridge (JMK/UA/17).


[1] I owe thanks for helpful comments on earlier drafts of this paper to Ken Winkler and Daniel Rosenberg.

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