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Abstract	The theme of this volume is biography in the history of physics. In this chapter, I will go beyond the limitation to physics, however, and discuss aspects of the genre of biography and its relations to the history of science in general.	

Chapter 17

The Meaning, Nature, and Scope of Scientific (Auto)Biography



Thomas Söderqvist

The art of Biography is different from Geography. Geography is about maps, but Biography is about chops.
(Bentley 1905)

0 Introduction

1 The theme of this volume is biography in the history of physics. In this chapter, I
2 will go beyond the limitation to physics, however, and discuss aspects of the genre
3 of biography and its relations to the history of science in general. My aims are, [AQ1]
4 firstly, to remind historians of science that the genre of biography, including scientific
5 biography, is about people, not institutions, concepts, or objects; and, secondly, to
6 bring autobiography and memoir into the discussion.

7 I will begin with a discussion of the implications of taking the prefix bio- in
8 the word ‘biography’ seriously. What is the subject matter of biographical studies,
9 and what falls outside its denotation? More specifically, I will question whether the
10 current extension of the use of the word ‘biography’ for historical studies of scientific
11 institutions, theoretical entities, and material objects is sustainable. Can the use of
12 phrases like ‘biography of an institution’, ‘life of a concept’, or ‘biographies of
13 objects’ be justified? Why is the ‘biography’ metaphor so popular?

14 The main part of the chapter is based on the fact that autobiographies and mem-
15 oirs (I use the two words synonymously throughout) are underestimated in the lit-
16 erature about scientific biography and history of science. For example, in two of
17 the major collections of scholarly articles about scientific biography over the last
18 decades (Shortland and Yeo 1996; Söderqvist 2007a) only two chapters out of 26
19 are devoted to autobiography (Outram 1996; Selya 2007). This neglect is to some
20 extent understandable: self-centered accounts traditionally have had a bad reputation

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1

21 among historians of science for being subjective and self-congratulatory, and autobi-
 22 ography brings the old ‘whiggish’ approach (Jardine 2003) to the history of science
 23 into mind. But in the wider scholarly literature on life-writing, studies of biography
 24 and autobiography overlap; for example, one of the leading journals in the field is
 25 titled *a/b: Auto/Biography Studies* and most academic libraries similarly mix biogra-
 26 phies, autobiographies and memoirs physically on the shelves and in the catalogues.
 27 In the main part of the chapter, I identify a number of existing and possible kinds of
 28 scientific auto/biographies and their relation to the history of science. I point out that
 29 writing scientific biography, autobiography and memoirs is not just an aid to history
 30 of science (an *ancilla historiae*), but has many other interesting aims as well, and
 31 suggest that an awareness of this variety of aims can qualify the discussion about
 32 auto/biography in the history of science, including the history of physics.

33 **Auto/Biography Is About Individual** 34 **Persons—not Institutions, Ideas, or Material Things**

35 E. C. Bentley’s famous clerihew in *Biography for Beginners* (Bentley 1905), quoted
 36 in the epigraph to this chapter, wraps up the definition of ‘biography’ succinctly:
 37 it’s about chaps, not about maps, or anything else. While in Bentley’s days, the
 38 word ‘chap’ referred to men only, a clerihew-poet of the twenty-first century would
 39 have to use a gender-neutral synonym that includes women (and other genders), for
 40 example, ‘guys’ or ‘people’. The basic point of Bentley’s whimsical verse is still
 41 valid, however: biographies are accounts of the lives of persons (in writing, pictures,
 42 speech, etc.). Similarly, an autobiography is the account of a person’s life written by
 43 that very same person.

44 A person is an individual human being that possesses a number of defining fea-
 45 tures, such as cognitive abilities, self-consciousness, emotions, memory, morality,
 46 etc., and although the precise definition differs across ages and cultures, personhood
 47 is invariably attached to individual human beings (Carrithers et al. 1985). Institutions,
 48 ideas, material things, etc. are not individual human beings; in other words, univer-
 49 sity institutions are not persons, ideas are held by persons but are not persons, and
 50 things like cars do not have personalities (not even a driverless car). And—with the
 51 exception of some mammalian species, such as apes, dogs and perhaps dolphins—
 52 neither do animals seem to have personalities (Stamps and Groothuis 2010). As a
 53 consequence, institutions, ideas, material things, animal species, and so forth, can-
 54 not have their biographies written, unless the meaning of the prefix ‘bio’ is changed
 55 considerably.

56 Derived from the Greek noun *βίος*—usually translated as ‘life’ (German *Leben*,
 57 Latin *vita*)—it stands for a human  of life or manner of living, for example in
 58 Homer, Aristophanes and Xenophon, or a person’s lifetime, for example in Herodotus
 59 and Plato (Liddell and Scott 1897) in contrast to an animal life, or bare life (*ζωή*:

cf. the prefix zoo- in zoology). Plutarch even adopted *βίος* as a synonym for ‘biography’ in his comparisons between the lives of famous Greeks and Romans (Duff 1999). Traditionally and until recently, the use of the word ‘biography’ has therefore been restricted to accounts of the lives of individual human persons. In the last decades, however, there has been a growing trend to write about different kinds of non-human entities as if they had a life in the sense of *βίος*. Thus there are book length ‘biographies’ of cities, e.g., *Toronto: Biography of a City* (Levine 2015), of nations, e.g., *Australia: A Biography of a Nation* (Knightley 2000), of buildings, e.g., *Hearst Castle: The Biography of a Country House* (Kastner 2000), and of economically valuable animal species, e.g., *Cod: A Biography of the Fish That Changed the World* (Kurlansky 1999). The fact that most of such titles are trade books suggests that the use of the term ‘biography’ for non-human entities is primarily a marketing gambit—life-histories likely sell better than histories of entities—but it is also used increasingly in non-commercial scholarly publishing. A rapid survey of the literature through Google Scholar reveals the frequent use of phrases like “biography of a road”, “biography of a blunder”, “biography of an object”, “biography of a thing”, “biography of a concept”, and so forth; the phrase “biography of an idea” alone results in around 1200 hits. Likewise some of the authors in this volume use the term ‘biography’ for historical accounts of institutions, scientific concepts, and technological objects.

The critical point I wish to make in this section of the chapter is that this proclivity to use the word ‘biography’ in historical analysis of entities that are neither individual persons nor express any of the features of personhood (consciousness, memory, morality, etc.) is at best the adoption of a superfluous metaphor and at worst a shoddy anthropomorphism.

Is It Meaningful to Speak About the Biography of an Institution?

For example, what does it mean that the history of a research institution, like the Brookhaven National Laboratory (Crease 1999), could be written as a ‘biography’? As patterned and regulated collective outcomes of many interacting individuals, institutions are anchored in individual persons, but transcend these individuals by mediating their personal and intentional behavior. Each person can be described in biographical terms, but it is hard to see how the regulated interaction between aggregated individual life-courses can in any meaningful way be called a life-course at a higher organizational level, and accordingly, how an institution could have a ‘biography’. The only defensible way to use the notion of ‘biography’ in histories of institutions without stretching the meaning of ‘mode of life’ (*βίος*) too far is to conceptualize institutions as collections of individual biographies, that is, writing the history of the institution as a collective biography (protopography) (Pyenson 1977;

99 Werskey 1988; for a recent example of a prosopographical approach to the history
100 of a scientific institution, see Svorenčík 2014).

101 In the sense of a collective biography, the term ‘biography’ can thus be defended
102 for writing the history of scientific institutions.

103 **Can Mental Constructs Be the Subject of Biographies?**

104 It is more difficult, however, to see how the use of the term for historical studies
105 of mental constructs, such as ideas, theories, concepts, memes, and so forth—for
106 example the ‘biography’ of the mass–energy equivalence equation $E = mc^2$ (Boda-
107 nis 2000) or the ‘biography’ of the number zero (Seife 2000)—can be justified. Since
108 these books were written by popular science writers for the general public one could
109 argue that the word ‘biography’ in the title is just a marketing word, but scholarly
110 authors, too, have employed it for historical accounts of mental constructs. Theodor
111 Arabatzis’ *Representing Electrons: A Biographical Approach to Theoretical Entities*
112 is probably the best substantiated case in point. According to Arabatzis, theoretical
113 concepts like the electron are “active participants” in science, they have “personal-
114 ities” and “lives of their own”, they are “born”, have an “infancy”, undergo “charac-
115 ter formation”, “gradually reach maturity”, and eventually reach “death”—and can
116 therefore “become the subject of biographies” (Arabatzis 2006, Chap. 2).

117 Surely, throughout human history, persons have entertained, disseminated and
118 adopted ideas and memes, constructed, supported and criticized theories, and pro-
119 posed, used and rejected concepts; the historical sub-disciplines of intellectual his-
120 tory, history of ideas and history of science are specialized in studying the institu-
121 tionalized and intricate ways in which humans create, communicate and apply such
122 mental constructs; writing biographies of the individuals involved in these collective
123 mental processes is one of the many methods for this kind of studies. Yet mental
124 constructs are not persons (or assemblages of persons) and do not have any of the
125 properties of personhood; a concept does not literally have consciousness, memory
126 or emotions, and thus does not have a life of its own. Arabatzis’ and other historical
127 studies concepts and theoretical entities can therefore not be called a biographical
128 study in any meaningful way, unless the terms ‘life’ and ‘life course’ defined so
129 broadly that the denotation of ‘biography’ includes the description and analysis of
130 the change of all kinds of mental constructs over time. But would it add anything
131 to our cultural understanding to speak of ‘a biography of Islam’ (in contrast to a
132 biography of Mohammed) or ‘a biography of post-structuralism’ (in contrast to a
133 biography of Michel Foucault)?

134 Do Things Talk?

135 In my opinion, the most problematic use of the term ‘biography’ concerns the histor-
 136 ical study of material objects. Drawing more or less explicitly on theoretical trends
 137 like actor network theory (Latour 2005), according to which not only humans but also
 138 non-humans and inanimate things (actants) have agency, and on works in anthropol-
 139 ogy that focus on objects themselves, their changing cultural careers and their lives
 140 as social markers rather than exclusively on their social functions and the networks
 141 surrounding them (Appadurai 1986), there has been an upsurge of attempts to write
 142 ‘biographies of things’. Science writers and historians of science, technology, and
 143 medicine have contributed to this misuse of the notion of ‘biography’ into the non-
 144 human material world, as witnessed by book titles such as *The Microprocessor: A*
 145 *Biography* (Malone 1995), *H₂O: A Biography of Water* (Ball 1999), *Biography of a*
 146 *Germ* (Karlen 2000), *Asthma: The Biography* (Jackson 2009), and *The Emperor of*
 147 *All Maladies: A Biography of Cancer* (Mukherjee 2010). Even more philosophically
 148 trained historians of science have contributed to the meme of ‘biography’ of mate-
 149 rial objects; for example, Hans-Jörg Rheinberger has used the phrase “biography of
 150 things” for the historical analysis of material entities that embody concepts (‘epis-
 151 temic things’) (Rheinberger 1997, p. 4), and Lorraine Daston has edited a whole
 152 anthology under the rubric of *Biographies of Scientific Objects* (Daston 2000).

153 With phrases such as ‘evocative objects’, ‘things that talk’, and so for some
 154 authors have even opened up for the implicit possibility of ‘autobiographies of
 155 things’. In the Introduction to *Things That Talk* (Daston 2004), things do not just
 156 have a “life of their own”, they also “talk to us”. They are “eloquent” and “talkative”:

157 some things speak irresistibly, and not only by interpretation, projection, and puppetry. It
 158 is neither entirely arbitrary nor entirely entailed which objects will become eloquent when,
 159 and in what cause. The language of things derives from certain properties of the things
 160 themselves, which suit the cultural purposes for which they are enlisted. (Daston 2004,
 161 pp. 15, 24)

162 In the same vein, the organizers of an Austrian workshop in 2008 not only invited
 163 participants to bring objects to the meeting; they also arranged sessions where par-
 164 ticipants were encouraged to argue and discuss with the objects (“mit den Dinge zu
 165 argumentieren und diskutieren”), hoping that the objects, too, should have their say
 166 in the discussions (“die Dinge gleichsam selbst zu Wort kommen”) (Wiener Arbeits-
 167 gespräche 2008). And when the German Society for Ethnography met in Berlin
 168 later the same year, the organizers not only wished to highlight things and their
 169 materiality but also gave things the status of agents and competent language users
 170 under the catch-phrase “Die Sprache der Dinge” (The language of things). What less
 171 clairvoyant scholars would have called inanimate things were, in the words of these
 172 ethnographers, “Handlungsträger und Akteure” (actors), “Vermittler und Überset-
 173 zer” (intermediary and translator) and “Produzenten von Bedeutungen, von sozialen
 174 Beziehungen und Praktiken, von Identitäten, Wertvorstellungen und Erinnerungen”
 175 (producers of meaning, of social relationships and practices, of identities, moral
 176 concepts, and memories) (Die Sprache der Dinge 2008). In other words, things were

177 acknowledged to be speakers, actors, mediators, translators and producers of all possible
 178 social and cultural meanings. From there it is only a small step to argue that
 179 things can produce their own autobiographies and memoirs.

180 How shall we understand this viral meme that suggests that an object has a life of
 181 its own and can talk to us, maybe even tell us the story of its life? It seems unlikely
 182 that we are witnessing a collective expression of latter-day fetishism, a revival of the
 183 ‘primitive’ religious practice to attribute powers to inanimate objects, like stones or
 184 pieces of wood. Is the meme just bullshit (Frankfurt 2005), or a conceit, as Ludmilla
 185 Jordanova suggests in her devastatingly mocking review of *Things That Talk* when
 186 she lets her protagonist-thing bluntly end its soliloquy with the words “the idea that
 187 [things] talk, isn’t that what’s called a conceit?” (Jordanova 2006). A more generous
 188 interpretation is that it is ‘just’ a metaphor. Thing-theorists are usually aware of
 189 the metaphorical character of their vocabulary, as in the syllabus for a course on
 190 “thing theory” at Columbia University which claims that the new field of material
 191 culture studies “inverts the longstanding study of how people make things by asking
 192 also how things make people, how objects mediate social relationships—ultimately
 193 how inanimate objects can be *read as* having a form of subjectivity and agency
 194 of their own” (my emphasis) (Fowles 2008). This is a clear case of metaphorical
 195 understanding, namely, that intentional human beings read subjectivity, agency and
 196 language abilities into things, but that things themselves do not act. In the same way
 197 Arabatzis claims that his “biographical approach” is metaphorical only; the main
 198 historiographical advantage of this approach, he suggests, is that theoretical entities
 199 become explanatory resources:

200 to explain the outcome of an episode in which a theoretical entity participated, one has to
 201 take into account the entity’s contribution (both positive and negative) to the outcome of that
 202 episode. (Arabatzis 2006, p. 44)

203 The key word here is “participate”, that is, concepts are seen as “active agents”.
 204 Yet he does not want to attribute intentionality to concepts, or imply that they have
 205 “wishes or other anthropomorphic features”; he distances himself from Latour, “who
 206 obliterates completely the difference between human and nonhuman agents” (Ara-
 207 batzis 2006, p. 46) and claims that he uses the term ‘biography’ in a metaphorical
 208 sense only: “my use of the biography metaphor aims at capturing the active nature
 209 of the representation of the electron.” Daston, too, seems to agree, at least to begin
 210 with: things “do not literally whisper and shout”; but then again, even though she
 211 notes that those who are sceptical of talkative things will insist that all this talk is
 212 “at best metaphoric”, she nevertheless seems to accept such sceptical doubts if only
 213 “for the sake of argument”, before concluding that “there is still the puzzle of the
 214 stubborn persistence of the illusion [that things talk], *if illusion it be*” (Daston 2004,
 215 p. 12, my emphasis).

216 Why Is the ‘Biography’ Metaphor so Fashionable?

217 Why are parts of Academia currently obsessed with a vocabulary that suggests that
 218 objects are actors, have a life of their own, can think and talk, and can have biographies
 219 written of them, and maybe even write their own autobiographies? A possible answer
 220 (Söderqvist and Bencard 2010) is that the metaphorical phraseology that permeates
 221 the writing about ‘biography of things’ and ‘things that talk’ is a consequence of
 222 the persistence of the linguistic turn in the humanities. Terry Eagleton notes that the
 223 theoretical interest in the body during the 1980s and 1990s was a way of “having one’s
 224 deconstructive cake and eating it too” (Eagleton 1998, p. 158); books on the history
 225 and culture of the body made the students wriggle under the emotional effects of
 226 reading about sex, death, torture and medicine, while at the same time explaining such
 227 effects away into the mists of language and cultural constructions; like Judith Butler,
 228 who addresses the biological materiality of the body and sex, only to translate it into
 229 a subset of problems about language and discourse (Butler 1993). The materiality of
 230 material bodies and things is both acknowledged and explained away. This linguistic
 231 turn continues unabated.

232 The current ‘things that talk’- and ‘biography-of-things’-vocabulary may thus
 233 be an expression of a wish to pay attention to the ‘thingness’ of things and yet
 234 keep one’s language-centred approach to material culture intact. To allow things
 235 to become actors or actants with an uncanny ability to speak to us, can be seen
 236 as a license to maintain the set of scholarly tools and languages associated with the
 237 linguistic and cultural turns in the humanities, while still doing something apparently
 238 new. By suggesting that things have a life and can talk to us, scholars can maintain
 239 institutionally and traditionally enshrined ideas, while seemingly engaging with a
 240 new agenda. Rather than exploring the presence and effects of things *qua* things,
 241 things are turned into something which we, as academics trained in a discursive and
 242 cultural constructivist tradition, can relate to immediately. It is business as usual on
 243 a new subject matter, which still holds out the promise of being something different.

244 The Many Aims of Scientific Auto/Biography

245 Ever since Thomas Hankins’ seminal article “In defence of biography” forty years
 246 ago, discussions about scientific biography have revolved around its usefulness for the
 247 writing of history of science. Hankins saw biography as a narrative about individual
 248 scientists that could shed light on the history at the macro-level: “We have, in the case
 249 of an individual, his scientific, philosophical, social and political ideas wrapped up in
 250 a single package” (Hankins 1979, p. 5). Since then scientific biography has become an
 251 increasingly acknowledged accepted subgenre of history of science. Several collected
 252 volumes (Shortland and Yeo 1996; Söderqvist 2007a) and special journal issues—for

253 example on “Biography as cultural history of science” in the journal *Isis* in 2006—
 254 have been devoted to reflections about the genre. No serious historian of science
 255 today rejects the genre of biography out of hand.

256 **Auto/Biography as an *Ancilla Historiae***

257 The acknowledgement of scientific biography is almost always confined, however,
 258 to it being a part of the historian’s toolbox. To paraphrase Thomas Aquinas, who
 259 famously relegated philosophy to being an *ancilla theologiae* (a handmaid to theol-
 260 ogy; cf. van Nieuwenhove and Wawrykow 2005), scientific biography has acquired
 261 the identity of a handmaid of history of science—it is usually limited to being an
 262 *ancilla historiae* (Söderqvist 2007c, p. 255ff).

263 The lack of systematic reflections on scientific autobiographies and memoirs
 264 seems to suggest that self-life-writing has not been accepted by historians of sci-
 265 ence to the same degree as biography has. So far, no history of science journal has
 266 published a focus issue on autobiography, nor has the subgenre been the subject
 267 of a collected volume. One possible reason for this reluctance may be that autobi-
 268 ographies and memoirs are considered too subjective to count as serious historical
 269 research; this can, at least partly, explain the lack of attention, but does not justify the
 270 oblivious attitude to the subgenre among historians of science. After all, first-person
 271 accounts are a standard ingredient in mundane historical practices, and historians
 272 and biographers usually realize that bias and subjectivity is a matter of degree; few
 273 would claim that their texts are fully objective and free from ideological or other
 274 biases and interests. The alleged subjectivity of autobiographies and memoirs is thus
 275 just a matter of degree. Even though autobiographies and memoirs are often written
 276 from the standpoint of the author’s interest to set the records straight and emphasize
 277 his/her importance, the historical factual matter is still, at least in principle, more
 278 or less verifiable. Both historians of science and scientific biographers rely more or
 279 less heavily on autobiographies and memoirs, or other pieces of self-writing, such
 280 as diaries, as source material, especially for events that have not generated other
 281 independent sources, thereby lending credibility to autobiographies and memoirs in
 282 the history of science.

283 Another argument in favour of paying more interest to autobiographies and mem-
 284 oirs in the history of science is that the voices of scientists, their first-person opinion
 285 about themselves and their colleagues, and the events they have experienced along
 286 their careers, are in themselves interesting aspects of the past. Scientific objects, the-
 287 ories, concepts and practices, social relations, institutions, and so forth are ordinary
 288 elements of the subject matter of history of science, but so are individual scientists
 289 and their personal opinions about themselves, their life trajectories and more or less
 290 idiosyncratic views of the world around them. Why should the views, opinions, self-
 291 understanding, and memories of individual scientists not be an integral part of the
 292 subject matter of history of science? Even if these views, opinions and memories can

293 be unreliable sources for a more detached history of scientific institutions and prac-
 294 tices etc., they are still part of the reality of the past. Thus scientific autobiographies
 295 and memoirs are part and parcel of the history of science.

296 But biography, autobiography and memoirs are more than an *ancillae historiae*.
 297 I think the distinction already made by Plutarch and other classical authors between
 298 *βίος* and *ἱστορία* as two distinct ways of writing about the past (Momigliano 1971)
 299 is valid (Söderqvist 2007b). History (*ἱστορία*) originally meant ‘an inquiry’, but
 300 in the course of time such inquiries became restricted to historical studies of nations,
 301 classes, economic institutions, political movements, social interactions, cultural phe-
 302 nomena, etc., while *βίος* meant ‘a life’ in the sense of ‘an individual life course’ (cf.
 303 above). The classical distinction between *βίος* and *ἱστορία* remains instructive for
 304 today’s discussions about the uses of scientific biography. Even though most histo-
 305 rians of science today think of scientific auto/biography as a handmaid of history,
 306 writings about the lives of scientists have other, and more independent, roles to play
 307 (Söderqvist 2006; Nye 2006). In the following, I extend my earlier typological anal-
 308 ysis (Söderqvist 2011) of ideal-typical subgenres of scientific biography to include
 309 autobiographies and memoirs.

310 Auto/Biography as Case-Study of Scientific Work

311 Biography has been a preferred format for understanding the origin and construction
 312 of experimental findings, concepts, theories, and innovations. The idea is that sci-
 313 entific results should be understood, not primarily with reference to social, political
 314 or cultural circumstances, but with reference to individuals, their mental states and
 315 actions, such as motivations, ambitions, ideas, feelings, personality traits and per-
 316 sonal experiences. One of the major motivations for writing about the life and work of
 317 individual scientists has actually been to understand science as a primarily individual
 318 achievement. This is not something particular to the historiography of science, but
 319 a methodology which historians of science share with literary historians, art histo-
 320 rians, historians of music, and other historians of cultural artefacts. One of the most
 321 impressive examples is Frederick Holmes’ fine-grained account in two volumes of
 322 how biochemist Hans Krebs came to the understanding of the citric acid cycle in the
 323 1930s: relying on his subject’s daily laboratory notebooks and many hours of inter-
 324 views, Holmes follows the interaction between daily bench-work and biochemical
 325 ideas (Holmes 1991, 1993); this is ‘science-in-the making’ in painstaking detail.

326 Using life-writing to understand the development and psychological basis for
 327 creative work has its parallel in autobiography as well. Among contemporary writ-
 328 ers, King’s (2000) stands out as one of the best introspective observations of the
 329 creative process of a contemporary novelist. Most autobiographies of scientists con-
 330 tain elements of reflections on the creative process; a brilliant example is French
 331 molecular biologist François Jacob, who gives the reader a first-hand introspective
 332 insight into the thinking and passion behind his scientific work in *La statue intérieure*

333 (1987). The history of scientific work and creativity would benefit from more system-
 334 atic  respective case-studies along these lines: but a book-length autobiographical
 335 counterpart to Holmes' detailed study of Krebs is still due.

336 Auto/Biography as Public Understanding of Science

337 Scientific biography is often used as a vehicle for popular science. One of the stan-
 338 dard overviews of public understanding of science (Gregory and Miller 1998) covers
 339 books and magazines, mass media, museums, etc., but makes no reference to biog-
 340 raphy; likewise the *Routledge Handbook of Public Communication of Science and*
 341 *Technology* (Bucchi and Trench 2008) fails to include biography. These are amazing
 342 omissions given the fact that most scientific biographies have been written for a gen-
 343 eral public to create enthusiasm for science. British publishers like Longmans-Green,
 344 John Murray, and Macmillan poured out popular biographies about scientists around
 345 the turn of the last century, and some of the most impressive publications efforts
 346 were made in the German language area in the first half of the twentieth century with
 347 series such as “Grosse Männer” (Great Men) and “Große Naturforscher” (Great Sci-
 348 entists); likewise in the 1950s and 1960s the East German publisher Teubner issued
 349 hundreds of titles of popular biographies in the series “Biographien hervorragender
 350 Naturwissenschaftler, Techniker und Mediziner” (Biographies of Outstanding Sci-
 351 entists, Engineers and Physicians). Although few of them had scholarly ambitions,
 352 most were nevertheless based on earlier scholarly work. In fact, even scholarly sci-
 353 entific biographies have often taken the general educated audience into consideration.
 354 From the perspective of the authors and reviewers scientific biographies are seen
 355 as contributions to the history of science, but from the perspective of the publish-
 356 ers and readers they are also viewed as contributions to the public understanding
 357 of science; thus most scientific biographies occupy a broad middle ground between
 358 narrow scholarly history of science and popular understanding of science.

359 Autobiographies and memoirs, too, contribute to the public engagement with sci-
 360 ence and the history of science; in the same way as biographies make the history of
 361 science more appetizing to general readers by emphasizing the personal dimension
 362 of scientific practice, autobiographies and memoirs make history more approach-
 363 able for the general reader. The first-person narrative voice is a traditional rhetorical
 364 device for creating emotional bonds between authors and readers, making the read-
 365 ers empathize with the lot of the author, and guiding them to see the world through
 366 the eyes of the author. Although it is difficult to quantify their impact on the pub-
 367 lic understanding of science, memoirs like Watson's (1968) and Feynman's (1985)
 368 became immediate bestsellers and have repeatedly been published in new editions
 369 and reprints. Similarly, the widespread positive reviews of Stephen Hawking's short
 370 autobiography *My Brief History* (2013) have undoubtedly contributed to the pub-
 371 lic interest in cosmology. Following the discovery of the structure of DNA through
 372 the eyes of Watson and the rise of quantum electrodynamics through the eyes of
 373 Feynman himself, or understanding the structure of black holes through the mind of

374 Hawking is a form of scientific *Bildung* (education), which can be compared to how
 375 medieval Christians understood God through the eyes of Saint Augustin of Hippo
 376 when reading *Confessions* (Augustin 2017).

377 Auto/Biography as Literature

378 A fourth subgenre of scientific auto/biography verges on literary biography. Although
 379 scientific biographies are probably rarely written primary for literary and aesthetic
 380 purposes, life-writing is nevertheless a genre in which literary features play a major
 381 role. In today's publishing world it is common knowledge that readers tend to
 382 choose biographies as substitutes for novels. Historians of science may be excused
 383 for mediocre writing skills if they dig up previously unknown archival material or
 384 construct new and interesting interpretations and explanations, but biographers of
 385 scientists can hardly get away with a lack of care for the literary qualities; it is diffi-
 386 cult to imagine that a scientific biography that is a middling read becomes successful.
 387 Scientific biographies rarely match the highest literary standards of the biographical
 388 genre, but there are some good exceptions, for example, Janet Browne's two volumes
 389 on Darwin (Browne 1995, 2002), which received the History of Science Society's
 390 Pfizer Prize as well as two literary prizes: the National Book Critics Circle Award
 391 and the James Tait Black Award. Yet historians of science tend to underestimate such
 392 literary qualities as being just an extra bonus on top of the allegedly more impor-
 393 tant historical functions of the genre; accordingly the overlap between scientific
 394 biography and literature biography remains unacknowledged in the metabiographi-
 395 cal literature. Maybe reviewers of scientific biographies are partly to blame for this
 396 ignorance of the literary aspects because they rarely mention the composition, style,
 397 or other aesthetic qualities of the book under review.

398 Autobiographies and memoirs are more frequently read and reviewed for their
 399 aesthetic qualities. Novelists have produced memoirs of high literary standards, such
 400 as Thoreau's (1854), Orwell's (1938), and Joan Didion's *The Year of Magical Think-*
 401 *ing*. Knausgård's *Min kamp (My Struggle)*, published in six volumes 2009–2011,
 402 has set new standards for autobiographical novels. Yet there are only few exam-
 403 ples of this kind of literary autobiography in the history of science. Franklin (1791)
 404 still stands out as one of the most well-written self-accounts of a scientist-engineer;
 405 Jacob's *La statue intérieure* gives not only a unique insight into the formation of a
 406 scientific mind, but is also a work of high literary quality. But Franklin's and Jacob's
 407 memoirs are rather exceptions than the rule; indeed the biography section in science
 408 libraries are filled with self-congratulatory and badly written autobiographies that
 409 often degenerate into mere listings of events and achievements. Readers of scientific
 410 memoirs are therefore looking forward to a Knausgård of scientific autobiography
 411 who will be able to win both a professional history of science award and a prestigious
 412 literary award.

AQ3

413 **Auto/Biography as (Self)Eulogy**

414 To pay one's respect to a deceased person with 'good language' (εὐλογία) is the
 415 oldest use of biography and the function of the first *vitae* of natural philosophers
 416 in the seventeenth century (Söderqvist 2007c), and has remained a strong aspect
 417 of the genre of scientific biography. Most historians of science regard such explicit
 418 eulogistic aims as an embarrassing phenomenon of the past, which today are pro-
 419 duced only at the margins of history of science by amateurs and scientists, who write
 420 about their heroes in scientific journals. But eulogistic commemoration is not at all
 421 absent from mainstream history of science and scientific biography; historians of
 422 science only need to look at their own practice of publishing praises of deceased
 423 famous members of their own profession to realize that the eulogistic tradition is
 424 strongly ingrained in the profession. Likewise the earlier tradition of writing eulo-
 425 gies for nationalistic purposes has given way to biographies written for gender or
 426 ethnic identity political reasons, for example, Linda Lear's hagiographical account of
 427 the famous biologist and conservationist Rachel Carson (Lear 1997) and Georgina
 428 Ferry's unashamedly eulogistic biography of biochemist Dorothy Hodgkin (Ferry
 429 1998). Thus the eulogistic impulse as such has not disappeared from history of sci-
 430 ence and scientific biography, it has just changed focus: from 'dead white men' to
 431 women, ethnic minorities, and members of one's own profession.

432 The situation is quite different when it comes to autobiography and memoirs. Self-
 433 writing is still to a large extent characterized by eulogistic behavior (although they do
 434 not express 'good words' about another person, but about oneself, i.e., auto-eulogy).
 435 More often than not, scientist's autobiographies are self-congratulatory, smug and
 436 complacent textual selfies, which focus on the great achievements of its author, on
 437 accolades, prizes, important keynotes, prestigious grants and awards, highly cited
 438 publications in high-ranking journals, promotions to full professorships, election
 439 to academies—in other words narratives of professional success, in which failures
 440 and disappointments are passed over in silence, and spouses and children are mere
 441 decorations on the main theme.

442 The most common self-congratulatory autobiographical kind of text among sci-
 443 entists is the curriculum vitae (literally 'life's race'), a feature in the life of scientists,
 444 which so far has not been the subject of study from the side of historians or sociol-
 445 ogists of science. As appendices to job applications and grant proposals and put on
 446 the web for the public gaze, the CV is continuously upgraded throughout a scientist's
 447 career. Scientists are thus well honed in writing in a complacent autobiographical
 448 mode throughout their whole career, and much autobiographical writing can thus
 449 be understood as a continuation and enlargement of the curriculum vitae. When
 450 retired scientists transmogrify into emeriti, they no longer have any need for updat-
 451 ing their formal CV, but many of them still wish to look back on their careers in
 452 order to explain, display and legitimize their work and achievements. The scientific
 453 autobiography is the ultimate curriculum vitae.

Existential Auto/Biography

The ideal-typical subgenre of scientific biography in this exposé is that which Keynes' biographer Robert Skidelsky called "a new biographical territory, still largely unexplored": the story of "the life, rather than the deeds, the achievement" (Skidelsky 1988, p. 14), a form of life-writing that takes "us out of our old selves by the power of strangeness, to aid us in becoming new beings" (Skidelsky 1987, p. 1250). I call this type of biography 'edifying' and 'existential' (Söderqvist 1996, 2003a) with an eye to the use of biography that was founded by Plutarch in the *Parallel Lives* (Duff 1999). In the Plutarchian virtue-ethical tradition, biographies of scientists are written and read to explore the question: How to live a life in science in a good way? (Söderqvist 2001, 2003b). The subgenre also rests, implicitly, on the long philosophical tradition highlighted by the classical philologist Pierre Hadot, viz., the pronounced difference between philosophical practice as discourse on theories and conceptual systems, and philosophy as a mode of life based on the classical maxim *γνώθι σεαυτόν* (*nosce te ipsum*, know thyself) and Socrates' recommendation, in Plato's *Apology*, that the unexamined life is not worth living (Hadot 1981). Arguing that modern academic philosophy has largely gone astray in its attempt to objectify (externalize) its object of study, Hadot suggests that it should be more concerned about how its practice influences its practitioners. In Hadot's analysis, philosophy in the broad sense (that is, including the humanities and history) has always basically been a kind of intellectual self-therapy, a means for 'knowing oneself' or a care of self (*souci de soi*); a reading of the classical philosophers that had a seminal influence on the thinking of the late Michel Foucault and the third volume of his history of sexuality, subtitled *Le souci de soi* (Foucault 1984).

I think Hadot's argument for philosophy is applicable to scientific practice as well. One could say that it is a good and admirable thing to do science in order to understand the physical world, but another, and equally good and venerable thing, to be a scientist as a special mode of life. The same reasoning is also applicable to the history of science; it is a good thing to understand the history of, say, physics, but another, and equally good thing, to study the history of physics as a way of practicing *souci de soi*. Similarly, one could argue that it is a good thing to write about recent scientists in order to understand their work and their lives, but it is an equally good thing to write about them as a way of practicing the care of one's own scholarly self. Writing the history of science or *βίοι* of contemporary scientists are thus practices by which historians, biographers, and scientists can explore the perennial question of how to craft a worthwhile life-course out of talent and circumstances. Historians and biographers of science produce books, articles, lectures, etc., but from the point of view of the *souci de soi*-tradition, this is not the ultimate purpose of scholarship; according to Hadot, the basic aim of all humanistic writing is rather "to effect a modification and a transformation in the subjects who practice them" (Hadot 2002, p. 6).

The subgenre of existential and edifying biography described here has its counterpart in autobiographies and memoirs that aim to help their authors and readers to

497 live better lives and prepare them for the inevitable death. This tradition for writing
 498 autobiography as an art of life (*Lebenskunst, ars vivendi*) and art of dying (*Kunst*
 499 *des Sterbens, ars moriendi*) can be traced back to classical antiquity too. In addition
 500 to the idea of ‘know thyself’ and ‘care of self’ mentioned above (Hadot 1981,
 501 2002)—where the aim of autobiography and memoir writing is not to contribute
 502 to history, or understand the psychology of scientific creativity, or write well, or
 503 produce the final curriculum vitae and self-eulogy of one’s life, but to undergo a
 504 personal transformation in the process of writing it—there is also a strand of existen-
 505 tial autobiography which goes back to Augustine’s *Confessions*, in which the church
 506 father portrays himself as a thief, a liar, and a lustful, adulterous sinner until his con-
 507 version to the Christian faith (Augustin 2017); as a guide to introspection for both
 508 religious and secular people, confessional autobiography has remained a paradigm
 509 for autobiographical writing for almost 1500 years, and is still reprinted and emu-
 510 lated, although today’s confessional autobiographical writers are probably motivated
 511 more by a secular desire to shock their readers (Morrison 2015). A third strand of
 512 existential and edifying introspective autobiographical writing is the early fifteenth
 513 century *ars moriendi* (the art of dying) manuals which were written as instructions
 514 for one should deal with the last period before death; it was followed by a tradition
 515 of writing and reading death manuals throughout the following centuries, and has
 516 recently got the attention of scholars in the medical humanities (Leget 2007).

517 So far, none of these strands of existential autobiography has found its well-
 518 established practitioners among scientific memoirists. There are a few attempts: for
 519 example, *Surely You’re Joking Mr Feynman!* (Feynman 1985) has some amusing
 520 passages with personal confessions, and the psychologist and notorious scientific
 521 fraudster Diederik Stapel does some apparently honest soul-searching in his attempt
 522 to atone for his massive fabrications of research data (Stapel 2012). But no truly
 523 confessional autobiography of an entire scientific career has yet been published.
 524 Similarly, to my best knowledge, no scientist in modern times has written an auto-
 525 biography in the spirit of *souci de soi* or broadened the notion of *ars moriendi*
 526 to cover the whole scientific career. Thus, scientific autobiographers and memoirists
 527 still have some exciting and yet unexplored avenues to thread.

528 Conclusion

529 I have discussed two major aspects of the relation between the genre of biography
 530 and history of science (including history of physics). First, I analyzed what falls
 531 inside and outside of the genre; more specifically, whether the use of the word ‘bio-
 532 graphy’ for historical studies of scientific institutions, theoretical entities, and material
 533 objects is justified. My conclusion is that the notion of biography should be limited
 534 to accounts of the life courses of individual persons and avoided as an alternative
 535 term for histories of institutions, concepts, and objects. Then—after reminding the
 536 reader about the significance of autobiography and memoirs—I identified a number
 537 of kinds of scientific auto/biographies, thereby making the point that life-writing is

not merely an aid to history of science (an *ancilla historiae*) but also has many other aims, and that an awareness of these can hopefully make future discussions about the relation between scientific auto/biography and the history of science more varied and interesting.

In other words, I believe that further discussions about scientific auto/biography and the history of science would benefit from a cognitive process of simultaneous restriction and expansion of the notion of biography. I suggest that the extension (denotation), i.e., the phenomena to which the notion can be applied, should be restricted to human life courses in order to avoid scholarly confusion. Vice versa, the restriction of the extension of the notion should go hand in hand with an expansion of its intension (connotation), i.e., its properties and qualities, in order to increase its conceptual richness. What is needed is a much sharper and simultaneously richer notion of what scientific auto/biography is and can do.

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References

- Appadurai, A. (Ed.). (1986). *The social life of things: commodities in cultural perspective*. Cambridge: Cambridge University Press.
- Arabatzis, T. (2006). *Representing electrons: a biographical approach to theoretical entities*. Chicago: Chicago University Press.
- Augustin. 2017. *Confessions* (S. R. L. Trans.). New York: Modern Library.
- Ball, P. (1999). *H₂O: A biography of water*. London: Weidenfeld & Nicolson.
- Bentley, Edmund Clarihew. (1905). *Biography for beginners*. London: T. Werner Laurie.
- Bodanis, David. (2000). *E = mc²: A biography of the world's most famous equation*. New York: Walker.
- Browne, J. (1995). *Charles Darwin, vol. 1: Voyaging*. London: Jonathan Cape.
- Browne, J. (2002). *Charles Darwin, vol 2: The power of place*. London: Jonathan Cape.
- Bucchi, M., & Trench, B. (Eds.). (2008). *Handbook of public communication of science and technology*. London: Routledge.
- Butler, J. (1993). *Bodies that matter: On the discursive limits of 'sex'*. New York: Routledge.
- Carrithers, M., Collins, S., & Lukes, S. (Eds.). (1985). *The category of the person: Anthropology, philosophy, history*. Cambridge, UK: Cambridge University Press.
- Crease, R. P. (1999). *Making physics: A biography of Brookhaven National Laboratory, 1946–1972* (p. 1999). London: University of London Press.
- Daston, L. (Ed.). (2004). *Things that talk: Object lessons from art and science*. New York: Zone Books.
- Didion, J. (2005). *The year of magical thinking*. London: Fourth Estate.
- Die Sprache der Dinge. (2010). kulturwissenschaftliche Perspektiven auf die materielle Kultur, Berlin, 21–22 November. In *H-Soz-Kult Newsletter*, 19 September 2008, www.hsozkult.de/event/id/termine-9883. Accessed 6 May 2010.
- Duff, T. (1999). *Plutarch's lives: Exploring virtue and vice*. Oxford: Clarendon Press.

- 581 Eagleton, T. (1998). Body work. In S. Regan (Ed.), *The ecocriton reader* (pp. 157–162). Oxford:
582 Blackwell.
- 583 Ferry, G. (1998). *Dorothy Hodgkin: A life*. London: Granta Books.
- 584 Feynman, R. (1985). *Surely you're joking, Mr. Feynman!: Adventures of a curious character*. In R.
585 Leighton, & E. Hutchings (Eds.). New York: W.W. Norton.
- 586 Foucault, M. (1984). *Histoire de la sexualité, tome 3: le souci de soi*. Paris: Gallimard. English
587 edition: Foucault, M. 1990. *The history of sexuality, volume 3: the care of the self* (R. Hurley,
588 Trans.). London: Penguin Books.
- 589 Fowles, S. (2008). Thing theory course description, Columbia University. <http://www.columbia.edu/~sf2220/TT2008/web-content/Pages/syllabus.html>. Accessed 13 November 2018.
- 590 Frankfurt, H. G. (2005). *On bullshit*. Princeton, NJ: Princeton University Press.
- 591 Franklin, B. (1791). *Mémoires de la vie privée de Benjamin Franklin, écrits par lui-même, et adressés à son fils*. Paris (Many English editions.).
- 592 Gregory, J., & Miller, S. (1998). *Science in public: Communication, culture, and credibility*. London:
595 Plenum Trade.
- 596 Hadot, P. (1981). Exercices spirituels et philosophie antique. Paris: Études augustiniennes. English
597 edition: Hadot, P. 1995. *Philosophy as a way of life: spiritual exercises from Socrates to Foucault*
598 (Ed: A. I. Davidsson, & M. Chase, Trans.). Oxford: Blackwell's.
- 599 Hadot, P. (2002). *What is ancient philosophy?*. Cambridge, MA: The Belknap Press.
- 600 Hankins, T. (1979). In defence of biography: The use of biography in the history of science. *History*
601 *of Science, 17*, 1–16.
- 602 Hawking, S. (2013). *My brief history*. New York: Bantam Books.
- 603 Holmes, F. L. (1991). *Hans Krebs: The formation of a scientific life 1900–1933* (Vol. 1). New York:
604 Oxford University Press.
- 605 Holmes, F. L. (1993). *Hans Krebs: architect of intermediary metabolism 1933-1937* (Vol. 2). New
606 York: Oxford University Press.
- 607 Jackson, M. (2009). *Asthma: The biography*. Oxford: Oxford University Press.
- 608 Jacob, F. (1990). *La statue intérieure*, 1990. Paris: Odile Jacob, 1987. English edition: F. Jacob,
609 1988. *The Statue Within: An Autobiography* (F. Philip, Trans.). New York: Basic Books.
- 610 Jardine, N. (2003). Whigs and stories: Herbert Butterfield and the historiography of science. *History*
611 *of Science, 41*, 125–140.
- 612 Jordanova, L. (2006). Review of Lorraine Daston (ed.), Things that talk, 2004. *British Journal for*
613 *the History of Science, 39*, 436–437.
- 614 Karlen, A. (2000). *Biography of a germ*. New York: Pantheon Books.
- 615 Kastner, V. (2000). *Hearst Castle: The biography of a country house* (p. 2000). New York, London:
616 Harry N. Abrams.
- 617 King, S. (2000). *On writing: A memoir of the craft*. New York: Scribner.
- 618 Knausgård, K. O. (2009–2011). *Min kamp*, 6 vols. Oslo: Oktober. English edition: K. O. Knausgaard,
619 2014–2018. *My struggle* (D. Bartlett, Trans.). London: Penguin Random House.
- 620 Knightley, P. (2000). *Australia: A biography of a nation* (p. 2000). London: Jonathan Cape.
- 621 Kurlansky, M. (1999). *Cod: A biography of the fish that changed the world*. London: Vintage.
- 622 Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford:
623 Oxford University Press.
- 624 Lear, L. (1997). *Rachel Carson: Witness for nature*. London: Allen Lane.
- 625 Leget, C. (2007). Retrieving the ars moriendi tradition. *Medicine, Health Care and Philosophy, 10*,
626 313–319.
- 627 Levine, A. G. (2015). *Toronto: Biography of a city*. Madeira Park: Douglas & McIntyre.
- 628 Liddell, H. G., & Scott, R. (1897). *A Greek-English lexicon*. Oxford: Clarendon Press.
- 629 Malone, M. S. (1995). *The microprocessor: A biography*. Santa Clara, CA: Telos.
- 630 Momigliano, A. (1971). *The development of Greek biography*. Harvard: Harvard University Press.
- 631 Morrison, B. (2015). The worst thing I ever did: The contemporary confessional memoir. In Zachary
632 Leader (Ed.), *On life-writing*. Oxford: Oxford University Press.
- 633 Mukherjee, S. (2010). *The emperor of all maladies: A biography of cancer*. New York: Scribner.

- 634 Nye, M. J. (2006). Scientific biography: History of science by another means? *Isis*, 97, 322–329.
- 635 Orwell, G. (1938). *Homage to Catalonia*. London: Secker & Warburg.
- 636 Outram, D. (1996). Life-paths: Autobiography, science and the French Revolution. In M. Shortland
637 & R. Yeo (Eds.), *Telling lives in science: Essays on scientific biography* (pp. 85–102). Cambridge:
638 Cambridge University Press.
- 639 Pyenson, Lewis. (1977). ‘Who the guys were’: Prosopography in the history of science. *History of*
640 *Science*, 15, 155–188.
- 641 Rheinberger, H. J. (1997). *Toward a history of epistemic things: Synthesizing proteins in the test*
642 *tube*. Stanford, CA: Stanford University Press.
- 643 Seife, C. (2000). *Zero: The biography of a dangerous idea*. London: Souvenir.
- 644 Selya, R. (2007). Primary suspects: Reflections on autobiography and life stories in the history of
645 molecular biology. In T. Söderqvist (Ed.), *History and poetics of scientific biography* (pp. 199–
646 206). Aldershot: Ashgate.
- 647 Shortland, M., & Yeo, R. (Eds.). (1996). *Telling lives in science: Essays on scientific biography*.
648 Cambridge: Cambridge University Press.
- 649 Skidelsky, R. (1987). Exemplary Lives. *Times Literary Supplement*, 13–19 November.
- 650 Skidelsky, R. (1988). Only connect: Biography and truth. In E. Homberger & J. Charmey (Eds.),
651 *The troubled face of biography* (pp. 1–16). London: Macmillan.
- 652 Söderqvist, T. (1996). Existential projects and existential choice in science: science biography as
653 an edifying genre. In R. Yeo & M. Shortland (Eds.), *Telling lives: Studies of scientific biography*
654 (pp. 45–84). Cambridge: Cambridge University Press.
- 655 Söderqvist, T. Immunology à la Plutarch: biographies of immunologists as an ethical genre. In A.
656 M. Moulin, & Cambrosio (Eds.), *Singular selves: Historical issues and contemporary debates*
657 *in immunology*, pp. 287–301. Paris: Elsevier.
- 658 Söderqvist, T. (2003a). *Science as autobiography: The troubled life of Niels Jerne*. New Haven:
659 Yale University Press.
- 660 Söderqvist, T. (2003b). Wissenschaftsgeschichte á la Plutarch: Biographie über Wissenschaftler als
661 tugendethische Gattung. In H. E. Bödeker (Ed.), *Biographie schreiben* (pp. 287–325). Göttingen:
662 Wallstein Verlag.
- 663 Söderqvist, T. (2006). What is the use of writing lives of recent scientists? In R. E. Doel &
664 T. Söderqvist (Eds.), *The historiography of contemporary science, technology, and medicine: Writing recent science* (pp. 99–127). London: Routledge.
- 665 Söderqvist, T. (Ed.). (2007a). *The history and poetics of scientific biography*. Aldershot: Ashgate.
- 666 Söderqvist, T. (2007b). Plutarchian versus Socratic scientific biography. In J. Renn & K. Gavroglu
667 (Eds.), *Positioning the history of science* (pp. 159–162). Berlin: Springer.
- 668 Söderqvist, T. (2007c). ‘No genre of history fell under more odium than that of biography’: The
669 delicate relations between twentieth century scientific biography and historiography of science.
670 In T. Söderqvist (Ed.), *The history and poetics of scientific biography* (pp. 242–262). Aldershot:
671 Ashgate.
- 672 Söderqvist, T. (2011). The seven sisters: Subgenres of bio of contemporary life scientists. *Journal*
673 *of the History of Biology*, 44, 633–650.
- 674 Söderqvist, T., & Bencard, A. (2010). Do things talk? In H. Trischler, et al. (Eds.), *The exhibition*
675 *as product and generator of knowledge* (pp. 92–102). Berlin: Max Planck Institute for History of
676 Science.
- 677 Stamps, J., & Groothuis, T. G. (2010). The development of animal personality: Relevance, concepts
678 and perspectives. *Biological Reviews*, 85, 301–325.
- 679 Stapel, D. (2012). *Ontsporing*. Amsterdam: Prometheus Books. English edition: D. Stapel, 2014.
680 *Faking science: a true story of academic fraud* (trans: Brown, Nicholas). <https://errorstatistics.files.wordpress.com/2014/12/fakingscience-20141214.pdf>. Accessed 26 November 2018.
- 681 Svorenčík, A. (2014). MIT’s rise to prominence: Outline of a collective biography. *History of*
682 *Political Economy*, 46(suppl. 1), 109–133.
- 683 Thoreau, H. D. (1854). *Walden; or life in the woods*. Boston.
- 684
- 685

- 686 Van Nieuwenhove, R., & Wawrykow, J. (Eds.) (2005). *The theology of Thomas Aquinas*. Notre
687 Dame: University of Notre Dame Press.
- 688 Watson, J. D. (1968). *Double helix: A personal account of the discovery of the structure of DNA*.
689 New York: Atheneum.
- 690 Werskey, G. (1988). *The visible college: A collective biography of British scientists and socialists
691 of the 1930s*. London: Free Association.
- 692 Wiener Arbeitsgespräche zur Kulturwissenschaft, Vienna 2008. <http://www.trafik.or.at>. Accessed
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