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

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

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Introduction

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. My aims are, firstly, to remind historians of science that the genre of biography, including scientific biography, is about people, not institutions, concepts, or objects; and, secondly, to bring autobiography and memoir into the discussion.

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

The main part of the chapter is based on the fact that autobiographies and memoirs (I use the two words synonymously throughout) are underestimated in the literature about scientific biography and history of science. For example, in two of the major collections of scholarly articles about scientific biography over the last decades (Shortland and Yeo 1996; Söderqvist 2007a) only two chapters out of 26 are devoted to autobiography (Outram 1996; Selya 2007). This neglect is to some extent understandable: self-centered accounts traditionally have had a bad reputation among historians of science for being subjective and self-congratulatory, and autobiography brings the old 'whiggish' approach (Jardine 2003) to the history of science into mind. But in the wider scholarly literature on life-writing, studies of biography and autobiography overlap; for example, one of the leading journals in the field is titled *a/b: Auto/Biography Studies* and most academic libraries similarly mix biographies, autobiographies and memoirs physically on the shelves and in the catalogues. In the main part of the chapter, I identify a number of existing and possible kinds of scientific auto/biographies and

their relation to the history of science. I point out that writing scientific biography, autobiography and memoirs is not just an aid to history of science (an *ancilla historiae*), but has many other interesting aims as well, and suggest that an awareness of this variety of aims can qualify the discussion about auto/biography in the history of science, including the history of physics.

Auto/biography is about individual persons – not institutions, ideas, or material things

E. C. Bentley's famous clerihew in *Biography for Beginners* (Bentley, 1905), quoted in the epigraph to this chapter, wraps up the definition of 'biography' succinctly: it's about chaps, not about maps, or anything else. While in Bentley's days, the word 'chap' referred to men only, a clerihew-poet of the 21st century would have to use a gender-neutral synonym that includes women (and other genders), for example, 'guys' or 'people'. The basic point of Bentley's whimsical verse is still valid, however: biographies are accounts of the lives of persons (in writing, pictures, speech, etc.). Similarly, an autobiography is the account of a person's life written by that very same person.

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

Derived from the Greek noun *βίος*—usually translated as 'life' (German *Leben*, Latin *vita*)—it stands for a human mode of life or manner of living, for example in Homer, Aristophanes and Xenophon, or a person's lifetime, for example in Herodotus 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 1,200 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 (prosopography) (Pyenson 1977, Werskey 1988; for a recent example of a prosopographical approach to the history of a scientific institution, see Svorenčík 2014).

In the sense of a collective biography, the term 'biography' can thus be defended for writing the history of scientific institutions.

Can mental constructs be the subject of biographies?

It is more difficult, however, to see how the use of the term for historical studies of mental constructs, such as ideas, theories, concepts, memes, and so forth—for example the 'biography' of the mass–energy equivalence equation E =

mc^2 (Bodanis 2000) or the 'biography' of the number zero (Seife 2000)—can be justified. Since these books were written by popular science writers for the general public one could argue that the word 'biography' in the title is just a marketing word, but scholarly authors, too, have employed it for historical accounts of mental constructs. Theodor Arabatzis' *Representing Electrons: A Biographical Approach to Theoretical Entities* is probably the best substantiated case in point. According to Arabatzis, theoretical concepts like the electron are "active participants" in science, they have "personalities" and "lives of their own", they are "born", have an "infancy", undergo "character formation", "gradually reach maturity", and eventually reach "death"—and can therefore "become the subject of biographies" (Arabatzis 2006, Ch. 2).

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

Do things talk?

In my opinion, the most problematic use of the term 'biography' concerns the historical study of material objects. Drawing more or less explicitly on theoretical trends like actor network theory (Latour 2005), according to which not only humans but also non-humans and inanimate things (actants) have agency, and on works in anthropology that focus on objects themselves, their changing cultural careers and their lives as social markers rather than exclusively on their social functions and the networks surrounding them (Appadurai 1986), there has been an upsurge of attempts to write 'biographies of things'. Science writers and historians of science, technology, and medicine have contributed to this misuse of the notion of 'biography' into the non-human material world, as witnessed by book titles such as *The Microprocessor: A Biography* (Malone 1995), *H_2O: A Biography of Water* (Ball 1999), *Biography of a Germ* (Karlen 2000), *Asthma: The Biography*

(Jackson 2009), and *The Emperor of All Maladies: A Biography of Cancer* (Mukherjee 2010). Even more philosophically trained historians of science have contributed to the meme of 'biography' of material objects; for example, Hans-Jörg Rheinberger has used the phrase "biography of things" for the historical analysis of material entities that embody concepts ('epistemic things') (Rheinberger 1997, p. 4), and Lorraine Daston has edited a whole anthology under the rubric of *Biographies of Scientific Objects* (Daston, 2000).

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

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

In the same vein, the organizers of an Austrian workshop in 2008 not only invited participants to bring objects to the meeting; they also arranged sessions where participants were encouraged to argue and discuss with the objects ("mit den Dinge zu argumentieren und diskutieren"), hoping that the objects, too, should have their say in the discussions ("die Dinge gleichsam selbst zu Wort kommen") (Wiener Arbeitsgespräche 2008). And when the German Society for Ethnography met in Berlin later the same year, the organizers not only wished to highlight things and their materiality but also gave things the status of agents and competent language users under the catch-phrase "Die Sprache der Dinge" (The language of things). What less clairvoyant scholars would have called inanimate things were, in the words of these ethnographers, "Handlungsträger und Akteure" (actors), "Vermittler und Übersetzer" (intermediary and translator) and "Produzenten von Bedeutungen, von sozialen Beziehungen und Praktiken, von Identitäten, Wertvorstellungen und Erinnerungen" (producers of meaning, of social relationships and practices, of identities, moral concepts, and memories) (Die Sprache der Dinge 2008). In other words, things were acknowledged to be speakers, actors, mediators, translators and producers of all possible social and cultural meanings. From there it is only a small step to argue that things can produce their own autobiographies and memoirs.

How shall we understand this viral meme that suggests that an object has a life of its own and can talk to us, maybe even tell us the story of its life? It seems unlikely that we are witnessing a collective expression of latter-day fetishism, a revival of the 'primitive' religious practice to attribute powers to inanimate objects, like stones or pieces of wood. Is the meme just bullshit (Frankfurt 2005), or a conceit, as Ludmilla Jordanova suggests in her devastatingly mocking review

of *Things That Talk* when she lets her protagonist-thing bluntly end its soliloquy with the words "the idea that [things] talk, isn't that what's called a conceit?" (Jordanova 2006). A more generous interpretation is that it is 'just' a metaphor. Thing-theorists are usually aware of the metaphorical character of their vocabulary, as in the syllabus for a course on "thing theory" at Columbia University which claims that the new field of material culture studies "inverts the longstanding study of how people make things by asking also how things make people, how objects mediate social relationships – ultimately how inanimate objects can be *read as* having a form of subjectivity and agency of their own" (my emphasis) (Fowles 2008). This is a clear case of metaphorical understanding, namely, that intentional human beings read subjectivity, agency and language abilities into things, but that things themselves do not act. In the same way Arabatzis claims that his "biographical approach" is metaphorical only; the main historiographical advantage of this approach, he suggests, is that theoretical entities become explanatory resources:

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

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

Why is the 'biography' metaphor so fashionable?

Why are parts of Academia currently obsessed with a vocabulary that suggests that objects are actors, have a life of their own, can think and talk, and can have biographies written of them, and maybe even write their own autobiographies? A possible answer (Söderqvist and Bencard 2010) is that the metaphorical phraseology that permeates the writing about 'biography of things' and 'things that talk' is a consequence of the persistence of the linguistic turn in the humanities. Terry Eagleton notes that the theoretical interest in the body during the 1980s and 1990s was a way of "having one's deconstructive cake and eating it

too" (Eagleton 1998, p. 158); books on the history and culture of the body made the students wriggle under the emotional effects of reading about sex, death, torture and medicine, while at the same time explaining such effects away into the mists of language and cultural constructions; like Judith Butler, who addresses the biological materiality of the body and sex, only to translate it into a subset of problems about language and discourse (Butler 1993). The materiality of material bodies and things is both acknowledged and explained away. This linguistic turn continues unabated.

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

The many aims of scientific auto/biography

Ever since Thomas Hankins' seminal article "In defence of biography" forty years ago, discussions about scientific biography have revolved around its usefulness for the writing of history of science. Hankins saw biography as a narrative about individual scientists that could shed light on the history at the macro-level: "We have, in the case of an individual, his scientific, philosophical, social and political ideas wrapped up in a single package" (Hankins 1979, p. 5). Since then scientific biography has become an increasingly acknowledged accepted subgenre of history of science. Several collected volumes (Shortland and Yeo 1996, Söderqvist 2007a) and special journal issues—for example on "Biography as cultural history of science" in the journal *Isis* in 2006—have been devoted to reflections about the genre. No serious historian of science today rejects the genre of biography out of hand.

Auto/biography as an *ancilla historiae*

The acknowledgement of scientific biography is almost always confined, however, to it being a part of the historian's toolbox. To paraphrase Thomas Aquinas, who famously relegated philosophy to being an *ancilla theologiae* (a handmaid to theology; cf. van Nieuwenhove and Wawrykow 2005), scientific

biography has acquired the identity of a handmaid of history of science—it is usually limited to being an *ancilla historiae* (Söderqvist 2007c, p.255ff).

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

Another argument in favour of paying more interest to autobiographies and memoirs in the history of science is that the voices of scientists, their first-person opinion about themselves and their colleagues, and the events they have experienced along their careers, are in themselves interesting aspects of the past. Scientific objects, theories, concepts and practices, social relations, institutions, and so forth are ordinary elements of the subject matter of history of science, but so are individual scientists and their personal opinions about themselves, their life trajectories and more or less idiosyncratic views of the world around them. Why should the views, opinions, self-understanding, and memories of individual scientists not be an integral part of the subject matter of history of science? Even if these views, opinions and memories can be unreliable sources for a more detached history of scientific institutions and practices etc., they are still part of the reality of the past. Thus scientific autobiographies and memoires are part and parcel of the history of science.

But biography, autobiography and memoirs are more than an *ancillae historiae*. I think the distinction already made by Plutarch and other classical authors between *βίος* and *ἱστορία* as two distinct ways of writing about the past (Momigliano, 1971) is still valid (Söderqvist 2007b). History (*ἱστορία*) originally meant 'an inquiry', but in the course of time such inquiries became restricted to historical studies of nations, classes, economic institutions, political movements, social interactions, cultural phenomena, etc., while *βίος* meant 'a life' in the sense of 'an individual life course' (cf. above). The classical distinction between *βίος*

and *ἱστορία* remains instructive for today's discussions about the uses of scientific biography. Even though most historians of science today think of scientific auto/biography as a handmaid of history, writings about the lives of scientists have other, and more independent, roles to play (Söderqvist 2006, Nye 2006). In the following, I extend my earlier typological analysis (Söderqvist 2011) of ideal-typical subgenres of scientific biography to include autobiographies and memoirs.

Auto/biography as case-study of scientific work

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

Using life-writing to understand the development and psychological basis for creative work has its parallel in autobiography as well. Among contemporary writers, Stephen King's *On Writing* (2000) stands out as one of the best introspective observations of the creative process of a contemporary novelist. Most autobiographies of scientists contain elements of reflections on the creative process; a brilliant example is French molecular biologist François Jacob, who gives the reader a first-hand introspective insight into the thinking and passion behind his scientific work in *La statue intérieure* (1987). The history of scientific work and creativity would benefit from more systematic introspective case-studies along these lines: but a book-length autobiographical counterpart to Holmes' detailed study of Krebs is still due.

Auto/biography as public understanding of science

Scientific biography is often used as a vehicle for popular science. One of the standard overviews of public understanding of science (Gregory and Miller, 1998) covers books and magazines, mass media, museums, etc., but makes no reference to biography; likewise the *Routledge Handbook of Public Communication of*

Science and Technology (Bucchi and Trench 2008) fails to include biography. These are amazing omissions given the fact that most scientific biographies have been written for a general public to create enthusiasm for science. British publishers like Longmans-Green, John Murray, and Macmillan poured out popular biographies about scientists around the turn of the last century, and some of the most impressive publications efforts were made in the German language area in the first half of the twentieth century with series such as "Grosse Männer" (Great Men) and "Große Naturforscher" (Great Scientists); likewise in the 1950s and 1960s the East German publisher Teubner issued hundreds of titles of popular biographies in the series "Biographien hervorragender Naturwissenschaftler, Techniker und Mediziner" (Biographies of Outstanding Scientists, Engineers and Physicians). Although few of them had scholarly ambitions, most were nevertheless based on earlier scholarly work. In fact, even scholarly scientific biographies have often taken the general educated audience into consideration. From the perspective of the authors and reviewers scientific biographies are seen as contributions to the history of science, but from the perspective of the publishers and readers they are also viewed as contributions to the public understanding of science; thus most scientific biographies occupy a broad middle ground between narrow scholarly history of science and popular understanding of science.

Autobiographies and memoirs, too, contribute to the public engagement with science and the history of science; in the same way as biographies make the history of science more appetizing to general readers by emphasizing the personal dimension of scientific practice, autobiographies and memoirs make history more approachable for the general reader. The first-person narrative voice is a traditional rhetorical device for creating emotional bonds between authors and readers, making the readers empathize with the lot of the author, and guiding them to see the world through the eyes of the author. Although it is difficult to quantify their impact on the public understanding of science, memoirs like James D. Watson's *Double Helix* (1968) and Richard Feynman's *Surely You're Joking Mr. Feynman!* (1985) became immediate bestsellers and have repeatedly been published in new editions and reprints. Similarly, the widespread positive reviews of Stephen Hawking's short autobiography *My Brief History* (2013) have undoubtedly contributed to the public interest in cosmology. Following the discovery of the structure of DNA through the eyes of Watson and the rise of quantum electrodynamics through the eyes of Feynman himself, or understanding the structure of black holes through the mind of Hawking is a form of scientific *Bildung* (education), which can be compared to how medieval Christians understood God through the eyes of Saint Augustin of Hippo when reading *Confessions* (Augustin 2017).

Auto/biography as literature

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

Autobiographies and memoirs are more frequently read and reviewed for their aesthetic qualities. Novelists have produced memoirs of high literary standards, such as Henry David Thoreau's *Walden* (1854), George Orwell's *Homage to Catalonia* (1938), and Joan Didion's *The Year of Magical Thinking.* Karl Ove Knausgård's *Min kamp* (*My Struggle*), published in six volumes 2009-2011, has set new standards for autobiographical novels. Yet there are only few examples of this kind of literary autobiography in the history of science. *Mémoires de la vie privée de Benjamin Franklin* (1791) still stands out as one of the most well-written self-accounts of a scientist-engineer; Jacob's *La statue intérieure* gives not only a unique insight into the formation of a scientific mind, but is also a work of high literary quality. But Franklin's and Jacob's memoirs are rather exceptions than the rule; indeed the biography section in science libraries are filled with self-congratulatory and badly written autobiographies that often degenerate into mere listings of events and achievements. Readers of scientific memoirs are therefore looking forward to a Knausgård of scientific autobiography who will be able to win both a professional history of science award and a prestigious literary award.

Auto/biography as (self)eulogy

To pay one's respect to a deceased person with 'good language' (*εὐλογία*) is the oldest use of biography and the function of the first *vitae* of natural philosophers

in the seventeenth century (Söderqvist 2007c), and has remained a strong aspect of the genre of scientific biography. Most historians of science regard such explicit eulogistic aims as an embarrassing phenomenon of the past, which today are produced only at the margins of history of science by amateurs and scientists, who write about their heroes in scientific journals. But eulogistic commemoration is not at all absent from mainstream history of science and scientific biography; historians of science only need to look at their own practice of publishing praises of deceased famous members of their own profession to realize that the eulogistic tradition is strongly ingrained in the profession. Likewise the earlier tradition of writing eulogies for nationalistic purposes has given way to biographies written for gender or ethnic identity political reasons, for example, Linda Lear's hagiographical account of the famous biologist and conservationist Rachel Carson (Lear 1977) and Georgina Ferry's unashamedly eulogistic biography of biochemist Dorothy Hodgkin (Ferry 1998). Thus the eulogistic impulse as such has not disappeared from history of science and scientific biography, it has just changed focus: from 'dead white men' to women, ethnic minorities, and members of one's own profession.

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

The most common self-congratulatory autobiographical kind of text among scientists is the curriculum vitae (literally 'life's race'), a feature in the life of scientists, which so far has not been the subject of study from the side of historians or sociologists of science. As appendices to job applications and grant proposals and put on the web for the public gaze, the CV is continuously upgraded throughout a scientist's career. Scientists are thus well honed in writing in a complacent autobiographical mode throughout their whole career, and much autobiographical writing can thus be understood as a continuation and enlargement of the curriculum vitae. When retired scientists transmogrify into emeriti, they no longer have any need for updating their formal CV, but many of them still wish to look back on their careers in order to explain, display and legitimize their work and achievements. The scientific 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, Söderqvist 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, Söderqvist 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 *γνῶθι 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 live better lives and prepare them for the inevitable death. This tradition for writing autobiography as an art of life (*Lebenskunst*, *ars vivendi*) and art of dying (*Kunst des Sterbens*, *ars moriendi*) can be traced back to classical antiquity too. In addition to the idea of 'know thyself' and 'care of self' mentioned above (Hadot 1981, Hadot 2002)—where the aim of autobiography and memoir writing is not to contribute to history, or understand the psychology of scientific creativity, or write well, or produce the final curriculum vitae and self-eulogy of one's life, but to undergo a personal transformation in the process of writing it—there is also a strand of existential autobiography which goes back to Augustine's *Confessions*, in which the church father portrays himself as a thief, a liar, and a lustful, adulterous sinner until his conversion to the Christian faith (Augustin 2017); as a guide to introspection for both religious and secular people, confessional autobiography has remained a paradigm for autobiographical writing for almost 1500 years, and is still reprinted and emulated, although today's confessional autobiographical writers are probably motivated more by a secular desire to shock their readers (Morrison 2015). A third strand of existential and edifying introspective autobiographical writing is the early fifteenth century *ars moriendi* (the art of dying) manuals which were written as instructions for one should deal with the last period before death; it was followed by a tradition of writing and reading death manuals throughout the following centuries, and has recently got the attention of scholars in the medical humanities (Leget 2007).

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

Conclusion

I have discussed two major aspects of the relation between the genre of biography and history of science (including history of physics). First, I analyzed what falls inside and outside of the genre; more specifically, whether the use of the word 'biography' for historical studies of scientific institutions, theoretical entities, and material objects is justified. My conclusion is that the notion of biography should be limited to accounts of the life courses of individual persons

and avoided as an alternative term for histories of institutions, concepts, and objects. Then—after reminding the reader about the significance of autobiography and memoirs—I identified a number 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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