

Existential projects and existential choice in science: science biography as an edifying genre

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All the people of this lonely world, have a piece of pain inside.
(Eurhythmics, 'When the day goes down')

Introduction

During the last decade an increasing number of high quality biographies of scientists have appeared on the book market¹ – Richard Westfall's Newton study, *Never at Rest*, William Provine's *Sewall Wright and Evolutionary Biology*, Crosbie Smith and Norton Wise's study of Lord Kelvin and Victorian England, David Cassidy's Heisenberg biography, Geoffrey Cantor's study of Faraday, Adrian Desmond and James Moore's Darwin tome, and Frederic Holmes's first volume on Hans Krebs – just to name some of the most admirable works.² Although still within the traditional confines of the genre, these and similar biographies are more detailed, better researched, more stylishly written, and more penetrating than almost any biography written just a generation ago. Each new biography seems to be unrivalled. For someone who browses through the history of science shelves of an academic bookstore these works indicate that science biography stands out as a most – if not *the* most – impressive genre of the discipline.

¹ I use the expressions 'science biography' and 'biographies of scientists' instead of 'scientific biography', partly because 'scientific biography' implies a bias in favour of the scientific activities as opposed to other activities in life, and partly because it has a built-in ambiguity ('scientific' as opposed to 'unscientific').

² Westfall (1980), Provine (1986), Smith and Wise (1989), Cassidy (1991), Cantor (1991), Desmond and Moore (1991), Holmes (1991).

In spite of the recent flourishing state of science biography, however, there is a widespread ambivalence and uncertainty as to the role and place of biography among historians of science. Biographical studies have dominated the history of science for most of its existence: whether cast in the form of life-and-times monographs, or in the form of studies of a scientist's contribution to the history of an idea or to the creation of an institution, biography was a universally respected and unproblematic genre. The eighteen volume *Dictionary of Scientific Biography* stands out as a testimony of this classical age of science biography. But while its popular attraction remains unshattered, its traditional privileged status and appeal in academia have been under siege during the last decades. Emmanuel Le Roy Ladurie referred as much to science biography when stating in the late 1970s that '[p]resent-day historiography, with its preference for the quantifiable, the statistical and the structural, has . . . virtually condemned to death . . . the individual biography'.³ Its loss of academic status has repeatedly been regretted throughout the past decade, from Thomas Hankins, who noticed that 'modern trends in the history of science seem to leave little room for biography',⁴ over Helge Kragh's reference to the 'diminishing respectability of the biography',⁵ to Michael Sokal's recent conclusion that there exists a widespread scepticism about the value of biographical inquiry.⁶

Hence, anyone who sets out to write a biography of a scientist these days can hardly avoid being confronted with a number of questions concerning the aims of the genre. What is the legitimate place of biography in history of science? Is it simply a sort of sophisticated entertainment, the scientist's bedside companion after the daily torments in the laboratory or at the desk, and thus better handed over to novelists, or is biography a possible and valuable scholarly pursuit in itself? If so, is it primarily an aid for the history of science, a tool for understanding the succession of theories or ideas of a certain time, or a looking glass through which we can investigate institutional structures or the social construction of scientific knowledge? Is it a generator of cases for the philosophy, psychology or sociology of science that may help us explain the origin of theories or the problem of creativity? Or will biographical narratives be able to fulfil more fundamental needs, even providing

³ Le Roy Ladurie (1979), 111.

⁴ Hankins (1979), 3.

⁵ Kragh (1989), 168.

⁶ Sokal (1990).

exemplars through which we can learn to tackle the existential problems we confront in our intellectual lives?

In this chapter I discuss these and similar recent challenges to the genre, with the intention of formulating an argument for an existential approach to biographies of scientists. My argument, based on experience from my research during the last couple of years for a biography of a leading contemporary immunologist, Niels K. Jerne (1911–1994), is that the aim of biography is not primarily to be an aid for the history of science, nor to be a generator of case studies. Instead of adding to the ‘hermeneutics of suspicion’ that governs so much of today’s history and sociology of science, the main purpose of science biography is, I suggest, as a genre that can provide a variety of exemplars of existential projects of individual scientists – narratives through which we can identify ourselves with others who have been confronted with existential choices and struggled with the existential conditions for living in and with science. Such life stories not only provide us with opportunities to understand ourselves, intellectually as well as emotionally, but may also change and create ourselves. Hence, biographies of scientists are ‘edifying’ – they can help us reorient our familiar ways of thinking about our lives in unfamiliar terms, and ‘take us out of our old selves by the power of strangeness, to aid us in becoming new beings’.⁷

The sociological redefinition of science biography: social biography as an auxiliary to the social history of science

The prevailing uncertainty about science biography is to a large extent the result of an increasing uneasiness over the years among historians of science about dealing with the personality of the individual scientist. Thus, three successive waves of suspicion against (even dismissal of) biography and the scientist as a person can be identified: one philosophical, the other sociological, and the third post-structuralist. The first, indirect, blow against the genre was a result of the merger between history and philosophy of science by which the historiography of science became increasingly influenced by philosophers who emphasised the logical structure of scientific ideas and disregarded the importance of relating it to the scientist. The individual scientist was not ignored as such – for example, I. B. Cohen considered Alexandre

⁷ Rorty (1980), 360.

Koyré's *Etudes galiléennes* to be a brilliant attempt to go behind formal presentation and 'to understand the mind and thinking process of an important scientist',⁸ and the individual scientist was frequently used as case-material for the rational reconstruction of the history of ideas and research programmes. However, all but pure cognition – the personality, the passions, and the idiosyncratic aspects of scientific work – was squeezed out by this joint history and philosophy of science programme. The life, particularly the personal, embodied, life of the scientist, was taken to be irrelevant for the understanding of science, as if public faces in private places were nicer and wiser than private faces in public places. This was an attitude reinforced by the privileged role attached to the 'context of justification' as compared with studies of the 'context of discovery'.⁹ Distracting voices, such as Michael Polanyi's, which reminded fellow philosophers about the passionate nature of 'private' and 'tacit' knowledge, did not have any impact on the history of science or science biography.¹⁰

This view was, and is probably still, supported by many scientists themselves. For example, Albert Einstein, at least publicly, showed a disdain of the 'merely personal' aspects of his life,¹¹ quite similar to Hannah Arendt's opinion that biography 'is rather unsuitable for . . . the lives of artists, writers, and generally men and women whose genius forced them to keep the world at a certain distance and whose significance lies chiefly in their works, the artifacts they added to the world, not the role they played in it'.¹² It should be noted that this rejection of the personal and biographical aspects of the intellectual life has an interesting parallel in literary history and criticism. Authors and literary critics, such as Paul Valéry and Marcel Proust in France and T.S. Eliot in England laid the groundwork for the anti-biographical programme of New Criticism, whose proponents rejected the earlier strong programme of biographical writing and claimed that an understanding of the state of mind of the author was of no use for understanding a work of art. What interests us, said Eliot, is the inner composition of the work of art, its style, symbolism, and so forth. The 'objective correlative', not the author behind it, can move the reader into a particular state of

⁸ Cohen (1987), 55–6.

⁹ In his autobiography, Popper (1974, 47) describes a traumatic youth experience which 'ultimately led even to my distinction between world 2 and world 3'. He does not, however, reflexively consider the consequences of this autobiographical understanding for his later philosophy.

¹⁰ Polanyi (1958) and (1966).

¹¹ Bernstein (1985).

¹² Young-Bruehl (1982), xvi.

mind.¹³ Similar repudiations of biography for being too focused on the personal and individual have later been made by art historians.¹⁴

During the last two decades the philosophically inspired history of science has gradually been replaced by a concern for the social and political context of science. Not to the advantage of biography, however, for the philosophical dismissal of the personal has been followed by a sociological dismissal of the individual. The genre of biography has been challenged by social historians and sociologists who consider studies of individual scientists and their personalities to be largely irrelevant for the history of scientific disciplines, research schools, and scientific societies, or for understanding the social construction of scientific knowledge. Richard Lewontin summarises the social historical point of view when he warns against the danger that 'by concentrating on the individual creators of ideas or fashions, one may easily fail to ask what social circumstances engendered the problematic in the first place'.¹⁵ The merger between history and sociology of knowledge¹⁶ has further strengthened the doubts about the value of biography. Not even Charles Rosenberg's cautious plea for an actor-oriented approach to history of science has been accepted by the more hard-nosed sociologically oriented historians.¹⁷ Steven Shapin warns against '[t]he risk . . . that the admirable historical goal of understanding actors' categories can wind up dissolving the subject-matter of history of science into atomising particularism'. Instead, he continues, 'the individualistic reflexes that characterize much history may be usefully disciplined by the sociologist's collectivism'.¹⁸ Likewise the recent turn towards discourse analysis and rhetorics of science has, by concentrating on the text, further weakened the interest in the individual scientist and severed the work from the author.¹⁹

¹³ Eliot (1960), 100.

¹⁴ See, for example, Krauss's (1985) attack on 'art as autobiography', that is the view that paintings are expressions of the life of the artist.

¹⁵ Lewontin (1986).

¹⁶ Golinski (1990).

¹⁷ Rosenberg (1988).

¹⁸ Shapin (1992), 354–5. Likewise Krauss (1985) finds the richness of art history in all the different 'ways of understanding art in transpersonal terms: ways that involve questions of period, style, of shared formal and iconographic symbols that seem to be the function of larger units of history than the restricted profile of a merely private life' (p. 25), and believes that an art history that turns 'militantly' away from all that is transpersonal in history, i.e., 'style, social and economic context, archive, structure', is symbolised by an art history 'as a history of proper names'. By 'proper names' Krauss means the tendency among art historians to interpret works of art as representing concrete persons, and the 'art as biography' interpretation amounts to showing whom the artist had in mind as a model when painting. Krauss' main objection to this practice of 'positive identification' of the picture with an identifiable person is that it restricts the space of interpretations.

¹⁹ Smocovitis (1991).

The sociological challenge to science biography has been particularly strong from the side of structuralists such as Fritz Ringer, who criticises what he considers to be an implicit methodological individualism in intellectual history and history of science, rejects the search for the 'subjective project' of the intellectual agent, and insists that it is imperative to disregard the authorial intentions of individual texts.²⁰ He asserts that intellectual fields 'are entities in their own right, that must not be reduced to aggregates of individuals', and, stressing the need to understand a great text 'positionally' by understanding its relationships to an intellectual field, he advocates instead studies of the relation between the text and 'an existing field of other texts':²¹ We must learn 'to understand a cluster of texts as a whole, or as a set of relationships, rather than as a sum of individual statements'.²² While not rejecting the genre of biography altogether, Ringer relegates it to a secondary, and (to my best understanding) impossible role: 'I believe that biographies are more difficult to write than surveys of intellectual fields, and that they are likely to fail, unless they can draw upon prior investigations of their fields'.²³ Ringer's position (or rather, to follow his own recommendation, the quoted position in the network of relationships, i.e. the proper name 'Fritz Ringer') is extreme, but at the same time consistent. His is a clear top-down view of the relation between structural history and biography: biographies makes sense only when you have identified the positions in the intellectual field; therefore, first map the field, then (perhaps) write biographies.

The impact of social historical and sociological approaches to history of science has certainly had its positive effects on the genre of science biography. The biographers of the 1980s are much more aware of the cultural, social, and political context of the lives of their subjects than were biographers of earlier generations, thereby implicitly endorsing Thomas Mann's view that a man lives not only his personal life, as an individual, but also, consciously or unconsciously, the life of his epoch and of his contemporaries. Indeed, the value of biography as a means for demonstrating the social context of science is the most common argument for the use of biography in our day. Through the life story of the individual scientist we are supposed to understand the culture and the time: 'The historical biographer tries to see through the personality to obtain a better understanding of contemporary

²⁰ Ringer (1990); Ringer is primarily inspired by Pierre Bourdieu (1975).

²¹ Ringer (1990), 277, 272.

²² *Ibid.*, 275.

²³ *Ibid.*

events and ideas', writes Hankins;²⁴ 'most importantly, biographies can be used for the intellectual history of the times in which they are written', adds Paul Theerman.²⁵ But there is a negative side-effect of the impact of social historical and sociological approaches in that many seem to believe that to provide cases for the interplay between social, political and other factors is the only use there is of the genre. For example, Robert M. Young advocates biography as the genre *par préférence* for demonstrating the contextualisation and historicity of science,²⁶ and Pnina Abir-Am, in a recent critical evaluation of science (auto)biographies, finds these works useful only if they 'reflect awareness of the social, political, and cultural context', illustrate 'gender assymetry', help focus on 'intermediary units of sociohistorical analysis' or illuminate phenomena such as 'the rise of new sociocognitive hierarchies'.²⁷ Hence, the individual is reduced to a mere instance in contextual history.

As a consequence, science biography has become an ambiguous genre with regard to the role of the individual and the personality in historical narrative. This ambiguity has repeatedly been expressed programmatically during the last decade, for example, by Evelyn Fox Keller, who maintains that a biographical portrait is 'always' done 'against the background of the community' and that biographies 'of necessity' must serve 'simultaneously as biography and as intellectual history'.²⁸ Similarly, while advocating an actor-oriented approach to history of science, including a sensitivity to the individual's choices during his life-course, Rosenberg nevertheless wants to appropriate the individual scientist in order to transcend the idiosyncratic, 'to use an individual's experience as a sampling device for gaining an understanding of the structural and normative'.²⁹ A similar ambiguity can be found even in Hankins's defence of biography. On the one hand, he maintains that 'letters written under great emotional stress are the best grist for the biographer's mill, because they lead straight to the heart of the subject's personality and reveal the groundsprings from which his actions come', but on the other hand, he endorses the view of the person as the focal point of larger social

²⁴ Hankins (1979), 2.

²⁵ Theerman (1985).

²⁶ Young (1988).

²⁷ Abir-Am (1991), 342.

²⁸ Keller (1983), xiii.

²⁹ Rosenberg (1988), 569. Rosenberg asserts that he does not want to 'denigrate biography as a genre or prescribe a particular style of biography' (note 3), but it is nevertheless difficult to read the quoted passage as anything but an acceptance of the subsumation of biography under social or institutional history of science.

factors: '[Biography] gives us a way to tie together the parallel currents of history at the level where the events and ideas occur. . . . We have, in the case of an individual, his scientific, philosophical, social and political ideas wrapped up in a single package', writes Hankins.³⁰

This ambiguity has not favoured 'pure biography'.³¹ On the contrary, the renaissance of science biography in the 1980s coincides with a largely tacit redefinition of the genre as 'social biography':³² from being an art of telling individual lives in science to becoming an auxiliary to the social history and sociology of science. This shift of aims may be one of the reasons why Susan Sheets-Pyenson, in spite of so many voices to the contrary, believes that '[h]istorians of science today . . . have scarcely rejected the biographical approach'.³³ A recent example of the tendency to redefine biography in terms of social biography is Smith and Wise's otherwise laudable study of Lord Kelvin, unfortunately subtitled 'a biographical study' in spite of the fact that the authors deliberately chose to write about a person who left very few sources about his personal life.³⁴ Another, more subtle, example is provided by Desmond and Moore, whose purpose with *Darwin* is to correct the portraits painted by 'textual analysts and historians of disembodied ideas', and to write a biography that follows in the wake of 'the recent upheaval in the history of science, and its new emphasis on the cultural conditioning of knowledge'.³⁵ Their Darwin is a person plagued by self-doubt, stomach aches and constant worries about his respectability, but he is nevertheless primarily 'a product of his time' and of the social context, and consequently theirs is 'a defiantly social portrait': only by showing Darwin against the background of reform bills, poor law riots, industrial innovation, and so forth, will 'his evolutionary achievements make sense', the authors suggest.³⁶

The general trend during the last decade to shift the focus of the genre, from the life of the scientist to social biography, is not just a matter of programmatic statements and the intentions of individual biographers. It is also an effect of the way biographies are read and received. Although readers' responses are notoriously difficult to evaluate, the favourable attitude to social biographies displayed by most reviewers, derive, I believe, from the

³⁰ Hankins (1979), 5.

³¹ Kendall (1986), 49.

³² Eickelman (1985), xv.

³³ Sheets-Pyenson (1990), 399.

³⁴ Smith and Wise (1989).

³⁵ Desmond and Moore (1991), xviii–xx.

³⁶ *Ibid.*

fact that the genre of science biography today is embedded in a broadly defined sociological discourse – a discourse centered around science and scientists as products of a specific culture and a social and political context. For instance, in an essay review of the ‘Darwin industry’, Timothy Lenoir, although sensitive to the problem of the formation of Darwin’s identity, nevertheless emphasises that it is ‘by concentrating on the social matrix’ within which Darwin worked out his professional identity that we can gain new insights into his theoretical development.³⁷ Another reviewer simply suggests that the problem of biography’s relevance for ‘the new [i.e. social] history of science’ can be solved by redefining the genre of biography – instead of focusing on the personality of individual scientists, the historian should use biographical material as a ‘convenient indicator of the possibilities for action offered by a particular society’.³⁸

The post-structuralist challenge to the biographical subject

The guiding idea of this chapter is that science biography is not just a ‘convenient indicator’ of social action, but a genre with a clearly defined topic of its own – the individual scientist and his existential project. Throughout my work on the Jerne biography I have been able to draw on rich material, including diaries, private correspondence, and in-depth interviews that provide access to these aspects of his life. I have indeed often been tempted to utilise the papers and the interviews with Jerne and other contemporary immunologists to write the history of recent immunology instead, particularly since as this history has only recently begun to be explored.³⁹ Jerne was a major actor in the cellular and molecular transmutation of immunology in the 1950s–1970s, as the discipline evolved into ‘a subtle and sophisticated science out of the boredom of blind serology’.⁴⁰ Through his theoretical and methodological work on the antibody problem – the selective theory of antibody formation, the identification of single antibody producing cells, and the network approach to the immune system – Jerne placed himself at the centre of the disciplinary discourse for almost three decades.

But a temptation to write history of science is not identical with a ‘necessity’: there is no historiographical ‘iron law’, not even an unwritten law of

³⁷ Lenoir (1987), 127.

³⁸ Morus (1990), 520.

³⁹ Corbellini (1990), Moulin (1991); Tauber (1994).

⁴⁰ Pernis and Augustin (1982), 1.

good writing manners, that demands that life stories must serve simultaneously as biography and as history of science. Whatever rich contextualisation science biographies might provide of the relation between science and society, social biography is only one among several approaches to the understanding of a life in science. Thus, neither the philosophical dismissal of the person, nor the sociological dismissal of the individual has fundamentally shaken the legitimacy of the genre as such. The task of freeing biography from the cognitive reduction of philosophy of science is rather unproblematic – the rigid separation of cognition from passion, mind from body, and reason from imagination has become increasingly difficult to defend, even philosophically.⁴¹ Likewise, the task of freeing the genre from the false necessity of always having to take the social context into consideration is unproblematic, since it only demands the drawing of a clear distinction between seeing life histories in their historical situatedness versus as ‘an important subject in its own right’ – this involves, as Jerald Wallulis points out, another conception of consciousness: ‘The consciousness of having been enabled, as a necessary and useful complement to historically effected consciousness’.⁴²

Hence, the problem with the turn towards social biography is not its presence as such, but rather the hegemonic ambitions and derogatory attitudes from the side of some of its promoters towards those who study scientists in their own right – a tendency that has recently provoked L. Pearce Williams to stem the tide of ‘the social swamp’, as he calls it, with a polemical defence for the right to focus on the uniqueness of the individual scientist. He does so with an argument that can be traced back to the dictum of Thomas Carlyle, that ‘history is the essence of innumerable biographies’, a position that was systematised by Wilhelm Dilthey in the last century in his foundation of the *Geisteswissenschaften*. ‘There is only a society which each individual constructs for him- or herself. . . . Every person, then, at least in part, lives in a different society’, says Williams, echoing Dilthey, who saw biography and autobiography as the beginning and the end, respectively, of the human sciences.⁴³ Williams’ position is a healthy antidote to the sociological reflexes that characterise much history of science today, and which may be usefully undisciplined by the biographer’s individualism. But his main argument against social historians and sociologists of science (‘there are giants,

⁴¹ Johnson (1987).

⁴² Wallulis (1990), 134–5.

⁴³ Williams (1991), 207; Dilthey (1989).

and I think it important to study them')⁴⁴ is impotent against the third wave of challenge to biography – the post-structuralist critique of the foundational character of the subject. During my work on Jerne, I have been repeatedly shaken by the prospect of losing the subject of my work, since adherents to late structuralism (post-structuralism) have raised such serious questions about what they claim to be a naive realist conception of the subject that their criticism seems to preclude not only the 'giants' but the genre altogether.

The pivotal element in post-structuralist thinking is the problematic character of the referent: '[I]n the field of the subject, there is no referent', said Roland Barthes.⁴⁵ On this view, language is not referential, there is nothing outside the text, and meaning is only produced textually; hence, the referential character of concepts is dissolved into metaphors and figures of speech. The human subject is thought to be no exception: it is 'merely an effect of language',⁴⁶ a product of discourse, constituted through language and rhetoric, 'dispersed, divided and decentred by language'.⁴⁷ Since persons are textually produced, they are said to lose any given nature, any unitary identity; human beings are simply 'incarnated vocabularies'.⁴⁸ The post-structuralist notions of the deconstruction of the subject and the pronouncement of the 'death of the author' have had a widespread influence on the interpretation of autobiographical texts.⁴⁹ Although the genre of biography has been slower in giving up the notion of referentiality, it has been increasingly squeezed between anti-referential autobiography and anti-referential tendencies in historical writing. Critics of literary biography question the 'myth of personal coherence' and emphasise the 'discontinuity' of the self.⁵⁰ With reference to the works of Michel Foucault and Jacques Derrida, critical art historians likewise denounce the ontological primacy of the author, reject the traditional genre of art biography with its implicit idea of the artist as essence, and consider biographies to be full of naive and undocumented attempts to relate a particular work of art to the psychological life of its maker.⁵¹

The step to announcing the disappearance of the subject of science

⁴⁴ Williams (1991), 204.

⁴⁵ Barthes (1977), 56.

⁴⁶ *Ibid.*

⁴⁷ Christie and Orton (1988), 556.

⁴⁸ Rorty (1989), 88.

⁴⁹ For a review of the referentiality problem in autobiography, see Eakin (1992).

⁵⁰ Clifford (1978), 44–5.

⁵¹ See, e.g., Cranshaw and Lewis (1989).

biography is a short one. In fact, one sociologist of science recently announced the death of the individual subject in science: 'The physicist as an individual is extinct', 'the epistemic subject is no longer the single scientist', and '[s]ubjectivity seems to be pretty much lost in the process'.⁵² Therefore, we can soon expect science biography to be challenged by the same post-structuralist critique that has already haunted literary biography and art biography.⁵³ In his anti-biography of Edison, David Nye suggests that 'the fundamental error of biography lies in the attempt to construct a definitive figure at all': since individuals are 'divided selves who remain essentially unknowable in their endless variations', their lives cannot be recovered.⁵⁴ Nye's correction for the alleged error of biography is to avoid constructing a narrative line in the pursuit of a central consciousness. True, he claims that biographers must take the continuity of the living body and its stream of consciousness for granted – but this does not require a continuity in mind contents, in habits or in behaviour, or in ways of being in science or being an intellectual, he says: 'If [the person] may be expressed as sixteen different figures, [the biographer] will do so rather than perform a reduction'.⁵⁵ Not *the* Edison, but a plurality of Edisons. The recipe for science biography from the side of post-structuralism seems to be that Holmes should rather have written 'Hans Krebs: a Proper Name with Sixteen Unfixed Identities', instead of *Hans Krebs: The Formation of a Scientific Life*.⁵⁶ Thus, from the ideal vantage point of post-structuralism, the enterprise of science biography seems to be an impossible one. With the substitution of 'Anxieties of Discourse' for 'Portraits of the Artist' the post-structuralist critique seems to undermine any attempt to write science biographies that focus on whole persons.⁵⁷

Yet, a number of arguments can be given against the post-structuralist dismissal of the biographical subject. A pragmatic argument is that biographies are substitutes for the traditional novel and are read the way novels used to be read before literary modernism dispensed with the author and the

⁵² Karin Knorr-Cetina in a lecture at Program in History of Science, Stanford University, November 1991. Note that this view has much in common with the classical philosophy of science view of science. Scientists were supposed to view science as if the 'author is dead' and to read texts intertextually instead; and they were supposed to treat the history of science from a 'presentist' stance.

⁵³ For a discussion of a post-structuralist literature biography, see, Clifford (1978); Nadel (1984) and Epstein (1987).

⁵⁴ Nye (1983), 17–18, 8.

⁵⁵ *Ibid.*, 19.

⁵⁶ Holmes (1991).

⁵⁷ Bradbury (1992), 8.

subject – hence, the identification of the reader with a real biographical subject constitutes the fundamental motive for the reader's interest in biography.⁵⁸ Second, post-structuralists bring to the extreme only one aspect of the modernist account of our relation to the social context, namely, that our lives are shaped by social and rhetorical institutions and practices. As Roberto M. Unger points out, however, this is to focus on one side of modernity only while neglecting the other side of its grand lesson: 'That we can always break through all contexts of practical and conceptual activity'.⁵⁹ (After all, I suppose that the reason why even post-structuralists remain in academia is the inherent potentiality that scholarly work gives for self-expression and creation of spaces of their own). A related counter-argument is that post-structuralists have a metaphysical subject hidden in the closet. To take their position seriously, one would expect that the deconstruction of the subject applies symmetrically to themselves. Whenever they talk about their own work, however, even when they do so reflexively, they talk autobiographically about themselves and their intentions, so that willingly or unwillingly, reflexively or autobiographically they refer to their own authorial identity. Yet another related objection is that the deconstruction of the subject is 'parasitic', to borrow an expression from Richard Rorty, upon reference to personal identity.⁶⁰ Deconstruction is a necessary restraint to our easy habits of typifying other humans and then believing that the typifications correspond to reality. But to insist on continuing deconstruction where common sense or, as I suggest in this article, an existential understanding, would do – 'to make ourselves unable to view normal discourse in terms of its own motives, and able to view it only from within our own abnormal discourse' – is 'not mad, but it does show a lack of education'.⁶¹ And to attempt to deconstruct the human subject without even recognising the abnormality of the stance 'is madness in the most literal and terrible sense'.⁶²

Post-structuralism provides us with an anonymous smorgasbord of texts – take what you can use for your own purpose, a piece here, a piece there, and construct your own story from the fragments. In the next moment the story will again be fragmented, and some of it used to construct new

⁵⁸ Cf. Eakin (1992), 36.

⁵⁹ Unger (1984), 8. Cf. Giddens (1991): 'The self is not a passive entity, determined by external influences: in forging their self-identities, no matter how local their specific contexts of action, individuals contribute to and directly promote social influences that are global in their consequences and implications' (p.2).

⁶⁰ Rorty (1980), 365.

⁶¹ *Ibid.*, 366.

⁶² *Ibid.*

texts, and so forth, *ad infinitum*; a vision of intellectual work that corresponds to undisciplined word-processing. In this vision of intellectual life, the question of authorship is indeed superfluous. In contrast, biography brings in not only the author but the *Oeuvre*, the accomplishments of a lifetime. There is, as Alisdair MacIntyre points out, a narrative unity to life.⁶³ Criticising MacIntyre's thesis of the narrative unity of life, David Cooper believes that its thrust can be saved by casting it in the prescriptive mood: 'If a person's life has not possessed narrative unity, there is only one way, formally speaking, by which he can, without self-deceit, come to view it as if it had. And this is to do something which actually confers narrative unity upon it'.⁶⁴ Thus, even if we do not believe in the narrative unity of life, we can believe in the possibility of constructing our lives. I cannot see any great difference, however, between MacIntyre's position and Cooper's advocacy of the Nietzschean demand 'that we so live now and in the future as to confer a telos on the past by our exploitation of it'.⁶⁵ Would not MacIntyre be able to say that the Nietzschean demand can be made by everybody, at any time in his life, so that at any point in time, a person can so live as to confer a telos on the past by his exploitation of it? If so, the person's life could be seen as a succession of points in time when he has applied the Nietzschean demand. There is no reason why this succession of points in time could not be made seamless, simply by increasing the number of points in time until they coalesce, and as a consequence one ends up with a continuous narrative life-course, which was MacIntyre's original thesis.

Furthermore, the post-structuralist argument for dismissing the unity character of the scientist is compelling, but hard to uphold in the long run when one embarks on writing a biography of a contemporary scientist based on repeated interviews during an extended time period. In the beginning of this work, I was inspired by the idea of a polyphonic biography.⁶⁶ Each interview with Jerne, and particularly with his friends and colleagues, gave rise to a slightly different 'Niels Jerne'. Not even narratives of the same historical event were identical, since each informant gave a new story about the person and his achievements. Sixteen accounts would simply not do it. Obviously, 'Niels Jerne' varied, both with the context of earlier interactions between him and the informant and with the context of the

⁶³ MacIntyre (1982).

⁶⁴ Cooper (1988). 168.

⁶⁵ *Ibid.*, 170.

⁶⁶ Particularly by Eickelman (1985).

interaction between me and the informant during the interview. This experience first led me to a view of biography similar to that of the post-structuralist vision. But with an increasing number of interviews with Jerne, after 50–100 hours of discussion, the notions of seemingly endless variability of texts, the ‘death of the author’, and the non-referentiality of the proper name became increasingly absurd. I came to the conclusion that it is only occasional acquaintances that can be seen as intertextually constituted. In other words, as the result of a long period of interaction the biographical subject turns from an ‘it’ to a ‘thou’.⁶⁷ Through empathic engagement in a series of interviews, and through the repetitive character of the interaction itself, the abstract character of the biographical subject becomes increasingly concrete. As Jamie Ferreira writes with reference to Søren Kierkegaard’s notion of ‘repetition’: ‘A concrete being is, because free, irreducible; the irreducible requires endless exploration, eternal re-seeking, endless demanding back. Thus, the inexhaustibility and complexity of the concrete are what both allow and require repetition in order that justice be done to the concrete’.⁶⁸

Finally, even if we should for a moment accept the idea that lives are linguistically and socially constituted and that a biographer cannot refer to any foundational self for choosing one biographical narrative over the other, we do nevertheless, in practice, choose some narratives and vocabularies over others. Rorty, who is otherwise an advocate for the linguistic constitution of the subject, argues that we should choose vocabularies that increase human solidarity and heighten our awareness of human suffering.⁶⁹ Rorty’s hero, the liberal ironist, does not believe in any foundational common truth or common goal that binds humans together, and therefore rejects the classical humanistic conception of a human essence. But he believes that we share a common selfish hope – that our own understanding of the world will not be destroyed and humiliated by others. By reflecting upon the pain so inflicted, we will not arrive at a reason for caring about the other, says Rorty, but we can nevertheless make sure that we notice suffering when it occurs.⁷⁰ However, is not this occurrence of suffering and pain precisely an essential conception of the subject? How should we be able to notice and heighten our awareness of it unless we take for granted that it is

⁶⁷ Buber (1958).

⁶⁸ Ferreira (1989), 22.

⁶⁹ Rorty (1989).

⁷⁰ *Ibid.*, 93.

a universal human trait? Evidently, human solidarity demands that we treat at least the suffering human subject as having referential reality.

An existential approach to science biography

In Rorty's vision the imaginative ability 'to see strange people as fellow sufferers' is not a task for (literary) theory, but for genres such as reportage, docudrama, theatre, movies, and particularly the novel.⁷¹ To this list I would add biography: I suggest that we can overcome 'the fundamental error of biography' by means of existential biography. So far, however, existential thinking has made very little impact on the history of science or on the art of science biography, compared with the impact of psychobiographical approaches, including psychoanalytical thinking.⁷² Given the character of scientific research as compared with many other human activities, including its creative aspects, the elements of high risk enterprise, and its often transcendental character,⁷³ this lack of interest in the existential approach among historians of science in general and science biographers in particular is remarkable. A notable exception is Maila Walter with her biography of Percy Bridgman. While also conveying the sensibilities of the time (as reflected in its title), *Science and Cultural Crisis* is primarily 'a story about the meaning of science – its meaning for an individual in a particular culture in a particular era'.⁷⁴ Walter focuses on the existential grounds of scientific truth and demonstrates in detail how Bridgman's physics, and his later particularist philosophical outlook, was thoroughly embedded in his personal struggle. The portrait reflects its subject's own view of science: 'The checking and judging and accepting that together constitute [scientific] understanding, are done by me and can be done for me by no one else. They are as private as my toothache and without them science is dead', wrote Bridgman in his philosophical reflections.⁷⁵ Other exemplary biographies from the point of view of an existential approach to intellectual lives are Ray Monk's portrait of Ludwig Wittgenstein, with its focus on the

⁷¹ Ibid., xvi.

⁷² The situation is not much different for biography as a genre in general. In his overview of psychobiography, Runyan (1984) mentions a number of alternatives to psychoanalytic psychobiography, including humanistic and existentialist biography, but says nothing about existential biography beyond references to Sartre's biographies.

⁷³ Forman (1991).

⁷⁴ Walter (1990), 1.

⁷⁵ Quoted in Walter (1990), 170.

philosopher's search for a purity in thought he realised he would never be able to achieve,⁷⁶ and James Miller's recent study of Michel Foucault, which approaches the philosopher's writing 'as if it expressed a powerful desire to realise a certain form of life'.⁷⁷

An existential approach does not mean a rejection of the importance of the social life of the individual, nor does it involve an uncritical individualist viewpoint. The relation between the individual and society – the contrast between the life of an autonomous and authentic individual and the life of a public individual immersed in society – is a persistent theme in twentieth-century existentialist writings.⁷⁸ On the one hand, the individual has been seen as a participant in, or even a product of, a public, social world, and formed by the 'Look', by the judgements and categorisations by others. But this characterisation of a life does not tell the whole story about a human existence. The decisive point is that even if a large portion of every human life is lived inauthentically under the spell of others, human beings have the capacity to undo this condition – authenticity can be won in struggling out of an everyday condition of inauthenticity – a conclusion which is particularly significant in the sphere of human activities called science. One can, and most scholars in science studies in the last decade have done so, emphasise the communal aspects of science, how the members of scientific 'disciplines' are objects formed by the 'Look of the paradigm' or the 'episteme'. But one can also emphasise the constant efforts that scientists make to break out, their disobedience to the rules and discipline of the discipline, and their attempts to retain what Karl Jaspers called the 'original potential': 'Although my social I is . . . imposed upon me, I can still put up an inner resistance to it. . . . Although I am in my social I at each moment, I no longer coincide with it. . . . I am not a result of social configurations . . . [for] I retain my own original potential'.⁷⁹

To what extent is existential biography different from the well-established biographical subgenre of psychobiography?⁸⁰ Several science biographers have attempted to apply a coherent psychological theory, including psychoanalytic theory and developmental psychology.⁸¹ There are many good reasons for doing so: scientific psychology in different guises is so integrated

⁷⁶ Monk (1990).

⁷⁷ Miller (1993), 5.

⁷⁸ Cooper (1990), particularly Ch. 7.

⁷⁹ Quoted in Cooper (1990), 110.

⁸⁰ Runyan (1984) and Runyan (ed.) (1988).

⁸¹ E.g., Manuel (1968), Sokal (1990).

in our culture that it is hard for a biographer to avoid incorporating elements of it in narratives of lives of scientists. Psychological models are obviously also of great use in biographical case-studies, and for generalisations about scientific reasoning, creativity, the life-course and so forth.⁸² Nevertheless, a certain amount of precaution is to be recommended. The genre of biography is not primarily a generalising, explanatory science, nor is it a critical inquiry by which the subject is analysed with detachment and scepticism and quoted to illustrate some general sociological, philosophical, or psychological principles – it is primarily a genre through which we try to bring to life again the unique individual: ‘The life itself is the achievement; not the explanation of it’.⁸³ Or as Miller says, quoting his subject, the aim with the Foucault biography has not been to conjure up the deep psychological subject, ‘but rather the one who says “I” in the works, the letters, the drafts, the sketches, the personal secrets’.⁸⁴ Furthermore, existential science biography is ultimately also an analysis of the life of the concrete, individual researcher, not a case-study of what it means to be a scientist in general. For Kierkegaard, the analysis of man is not an abstract investigation into ‘humanness’ in general, but an analysis of the factual, concrete human life as actually lived. In that sense existential biography transcends the generalising demands of social history and psychobiography.

The notion of existential biography has mainly been used in connection with Jean-Paul Sartre’s biographical works, particularly the biographies of Flaubert, Baudelaire, and Genet.⁸⁵ Yet, these biographies are problematic as models for the notion of existential biography developed here, on the ground that Sartre’s ambition is to redescribe the lives of his subjects into his own mixture of existentialist, Freudian, and Marxist ideas, and thus has difficulties distinguishing the life of the subject from his own literary ambitions.⁸⁶ In fact, biographical redescription is an old device in the arsenal of knowledge-power discourses:⁸⁷ psychoanalytical thinking, for example, has repeatedly been criticised on this ground. As Rorty points out, ‘most people do not want to be redescribed, they want to be taken on their own terms – taken seriously just as they are and just as they talk’. To redescribe people’s experiences in

⁸² See, e.g., Gruber (1981).

⁸³ Skidelsky (1987), 1250.

⁸⁴ Miller (1993), 5.

⁸⁵ Scriven (1984).

⁸⁶ Shapiro (1986), 357.

⁸⁷ Söderqvist (1991).

other terms is 'potentially very cruel'.⁸⁸ The science biographer who applies a psychological theory to his subject, threatens the scientist's final vocabulary and ability to make sense of himself in his own terms rather than the biographer's, and thereby suggests that the scientist's self and his world 'are futile, obsolete, *powerless*'.⁸⁹ I suggest that the degree of redescription is one of the criteria that distinguishes existential biography from social biography and psychobiography.

The biographer cannot, of course, avoid seeing the scientist as a social being, or drawing psychobiographical conclusions altogether. A certain amount of hermeneutical distance is necessary – the biographer must try to make the experiences of the scientist comprehensible in terms of his own historical, sociological or psychological training, and compare the experiences of the scientist with those of other individuals using other vocabularies about self and the world. The biographer's very task involves a certain amount of redescription. In addition to the necessary distance, however, the biographer must, in one way or the other, adopt an empathetic stance which does not falsify the scientist's position by imposing an alien vocabulary.⁹⁰ Biographers who try to respect the subject as a human being must, as far as possible, be sensitive to the vocabulary the person uses about himself, his work and the world around him. Accordingly, the biographer is free to compare, contrast, and challenge the vocabulary of his subject with other vocabularies of his choice – but not to redescribe the scientist in terms of these other vocabularies alone. To a certain extent biographers must then, to borrow a common notion from contemporary anthropology, 'go native'. Since the greatest demand the writing of biography makes 'is an initial respect for the subject as a human being',⁹¹ scientific psychology is therefore not necessarily the most obvious choice for a biographer who focuses on scientists in their own rights, unless, of course, the scientist in question experiences, understands, and describes himself in terms of some scientific psychology (something not even B.F. Skinner was able to do in his autobiography, however).⁹² As a consequence, psychological approaches, for example, cognitive psychology, which is otherwise an excellent tool for case-study work, should be applied with care when the aim of the work is to understand the

⁸⁸ Rorty (1989), 89.

⁸⁹ *Ibid.*, 89–90.

⁹⁰ Frank (1985).

⁹¹ Anderson (1981), 403

⁹² Skinner (1984).

richness and fullness of the life of a concrete individual and his experiences, and to stimulate an 'awareness of the worth of the subject as a human being' as a means for edification.⁹³

Different scientists use different vocabularies when trying to make sense of their lives in interviews and autobiographical writings. In principle, therefore, each biographical interpretation has to be based on the personally unique vocabulary of the subject. Let me illustrate this with reference to the biography of Niels Jerne. Throughout his life, in letters and diaries, in our conversations, and in biographical interviews, Jerne often used a vocabulary about the self and the world that incorporates elements from classical authors such as Shakespeare, from nineteenth-century romantic philosophers such as Kierkegaard and Friedrich Nietzsche, and from modernist authors such as Fyodor Dostoyevsky, Franz Kafka, and Marcel Proust. Kierkegaard's ideas have been particularly prominent in his understanding of self and other human beings. Jerne himself says that he discovered Kierkegaard during his high-school years in Holland: 'I believe I was sixteen at the time . . . I found him in my father's library, and I could read him in Danish',⁹⁴ and adds that he felt intellectually related with Kierkegaard, a person 'who is like me': 'Oh, he has impressed me, because he writes with courage, with intelligence, a merry mind – undescrivable. . . . I like the whole thing. He is so funny, you can laugh, and at the same time so deep. There is so much resonance, like when listening to Mozart'.⁹⁵ Several of his colleagues and friends have borne witness to his passion for the great Danish existential philosopher: 'He was drawn to Kierkegaard like a magnet', says a visitor to the Danish State Serum Institute in the late 1940s, 'because some of his longings and perhaps also some of his experiences, tragic experiences of life, made him understand what Kierkegaard's deepest concerns are'.⁹⁶

Jerne's use of Kierkegaard's language emphasises, more than many other ways of speaking about the self and the world, the existential and passionate dimensions of life. It carries a vocabulary of vulnerability and doubt, anxiety and existential loneliness, with little of the pragmatic, energetic jargon of so many biographies and autobiographies of scientists. It has, of course, been

⁹³ Anderson (1981), 403.

⁹⁴ 'Ich glaube ich war sechzehn damals . . . Ich fand ihn in der Bibliothek meines Vaters, und ich konnte ihn auf danisch lesen'. Anon. (1985), 8.

⁹⁵ 'der ist so wie ich': 'Oh, er hat mir imponiert, denn er schreibt mit einer Wucht, mit einer Intelligenz, einem Frohsinn – unbeschreiblich . . . Es ist das ganze, was mir gefällt. Er ist so lustig, man kann lachen, und gleichzeitig so tief sinnig. Es gibt so einen Nachklang, wie wenn man Mozart hört.' Anon. (1985), 9.

⁹⁶ Interview with Hans Noll by Thomas Söderqvist, September 12, 1989.

modified by later readings and life experiences, and it has increasingly been replaced by a technical immunological vocabulary, but the existential and passionate way of speaking is identifiable also in the scientific correspondence. In an autobiographical essay Jerne even suggests that ‘reverberations of Kierkegaard’ may have ‘contributed to the idea of a selective mechanism of antibody formation’,⁹⁷ a case analogous to that suggested for the relation between Kierkegaard and Niels Bohr.⁹⁸ Accordingly, I have chosen in my own biographical work to utilise an existential vocabulary that resonates with and magnifies Jerne’s own understanding of self and others. Throughout this work, I have also come to believe that the value of an existential approach is by no means limited to this particular biographical work. It may be that many scientists have not had Jerne’s explicit recourse to a modernist and existential vocabulary, but I am convinced that this approach might provide a language that resonates with the experiences of other scientists as well – provided, of course, that the archive or the interview transcripts contain the necessary source material.

Passion and existential projects in science

I concluded above that human solidarity demands that we treat the suffering human subject as having referential reality as a unitary person. But why stop at suffering? By noting and reflecting on the passions of the scientist – both negative emotions, such as anguish and anxiety, despair and dread, embarrassment and fear, frustration and sadness, and positive emotions such as joy, hope and love – we will be able to transcend the idea of the scientist as a mere ‘convenient indicator’, and become aware of him instead as a discrete, embodied mind. In contrast to its central position in biographies of artists and authors, however, the topic of passion is not a matter of course in science biography. In fact, the widespread use of the term ‘scientific biography’ implies a focus on the intellectual and cognitive aspects of the lives of scientists, and a peripheral treatment of the passions. Usually restricted to ‘a passion to know’, as a collection of journalistic essays on scientists is titled,⁹⁹ the passions have so far been marginally treated in science studies.¹⁰⁰ The

⁹⁷ Jerne (1966), 301.

⁹⁸ Jammer (1966), 1040ff.

⁹⁹ Hammond (1984).

¹⁰⁰ A few psychologists have dealt empirically with the emotional life of the scientist and of scientific work, e.g. Eiduson (1962). The affective relations in science are also central to Lorraine Daston’s the ‘moral economy of science’. See Daston (1995). Otherwise the present interest in passions in

sociological turn in history of science has not remedied this traditional neglect of the passionate aspects of science: scientific knowledge is socially, linguistically, and rhetorically contextualised, but rarely seen as having anything to do with the passions of the scientist, an attitude that has also spilled over to social biography.¹⁰¹

It has sometimes been claimed that passions are socially constructed too;¹⁰² on the view taken here, however, the passions of the scientist are not social products but integral elements in the realisation of existential projects, defined here as the individual's view of how to live in a way that gives a measure of sense, unity, and value to his life.¹⁰³ In our struggles to overcome the threats of humiliation, suffering, anxiety and pain, and in our hopes of being able to join with others, we invoke widely different existential projects. Rather than offering social visions, these projects offer guidance to our life-courses, particularly to our strivings for empowerment. In Unger's combined modernist and Christian-Romantic account of personality, empowerment amounts to the successful diminishing of the conflict between the conditions that enable us to assert ourselves as persons: on the one hand, our desire to engage with other people and through this engagement to establish ourselves in the world; on the other hand, our need to prevent this engagement from subjugating and depersonalising us.¹⁰⁴ The passions embody the realisation of the tension between the conditions for self-assertion: fear, despair, vanity, pride, jealousy and envy are the results of a failure to achieve empowerment; hope, faith and love are expressions of our success in this respect.¹⁰⁵

From the point of view of existential biography, this ability to handle the enabling conditions of self-assertion lies at the heart of the life and work of every scientist. In our attempts to assert ourselves through scientific and scholarly work, we are permanently at risk. In projecting our existential projects into the social space, in acts of 'world-making',¹⁰⁶ we are constantly at the peril of being rejected and overwhelmed by others. Scientists who choose

science is negligible – as reflected by a recent textbook on the psychology of science (Gholson *et al.*, 1989) which mentions passion and emotion only in passing.

¹⁰¹ Even though Desmond and Moore (1991) treat Darwin's emotions at length, 'his fears and foibles' are said to make sense primarily against the background of activities such as economic investments and living a squire's life. If one disregards their introductory programmatic professions to the cultural conditioning of knowledge, however, their Darwin portrait in the bulk text takes on a much more existential character.

¹⁰² Harré (1986).

¹⁰³ Unger (1984), 47ff.

¹⁰⁴ *Ibid.*, particularly 115ff.

¹⁰⁵ Unger (1984).

¹⁰⁶ Goodman (1978).

to go their own way are committed to acts of courage, 'always risking a fearful penalty if they are wrong'.¹⁰⁷ In autobiographical reports several scientist have used a varied passionate lexicon, for example, the intense feelings of pain associated with trying to solve a problem, the joy when the solution comes, and at the same time the feeling of fear, anxiety, even terror during the process. Despite its seemingly collective nature, science is one of the most lonely activities in the modern world, and it is often a painful one as well. The pain may have its origin in activities outside the walls of the laboratory, or it may have its roots in the despairs within. But whatever its source, pain colours and runs through the life of the scientist, irrespective of his scholarly standing. In her collection of short biographies of woman scientists, Joan Dash points out that the passions of scientists are strong and pervade their whole existence. Scientific research has its drudgeries and long stretches of boredom and routine, 'yet it seems universal among those engaged in original research, from the merest postdoctoral fellow to men of Nobel caliber, that they tend to describe their feelings about their work in such vivid terms that everything else in life – everything – sounds pale beside it'.¹⁰⁸ As one scientist says:

You go through this long, hard period of filling yourself up with as much information as you can. You just sort of feel it all rumbling around inside of you. . . . Then . . . you begin to feel a solution, a resolution, bubbling up to your consciousness. At the same time you begin to get very excited, tremendously elated – pervaded by a fantastic sense of joy. . . . But there's an aspect of terror too in these moments of creativity. . . . Being shaken out from your normal experience enhances your awareness of mortality. . . . It's like throwing up when you're sick.¹⁰⁹

Similar passions and bodily sensations go through many autobiographical narratives. In somewhat less dramatic terms Jerne describes how he felt the weeks before he formulated the somatic generation theory of antibody diversity.¹¹⁰

[In early July of 1969] I was hit by a spell of creativity that lasted until the day before yesterday. Being aware, I followed my own behaviour quite carefully; I felt that all the chores (such as farewell

¹⁰⁷ Goodfield (1981), 235.

¹⁰⁸ Dash (1973), 279.

¹⁰⁹ Quoted in Dash (1973), 318.

¹¹⁰ Jerne (1966).

speeches in Frankfurt, etc) were merely nothingness. I had the feeling that I had a good idea somewhere though I did not quite understand what it was. Fact is, that I was very nervous, stopped eating, writing, etc. until 20 July. Like a log coming slowly to the surface of a lake, I knew what I wanted to understand. It is now laid down in the attached manuscript that I got finished a few days ago.¹¹¹

Likewise Paul Dirac speaks about the ‘feelings of a research worker when he is hot on the trail and has hopes of attaining some important result which will have a profound influence’.¹¹² He is filled with hopes and fears: ‘I don’t suppose one can ever have great hopes without their being combined with great fears’.¹¹³ With specific reference to H.A. Lorentz’s ‘near miss’ of the theory of relativity, Dirac discusses how fear can hold a scientist back from completing his work: ‘He did all the hard work – all the really necessary mathematics’, Dirac say, ‘but he wasn’t able to go beyond that and you will ask yourself, why?’:

I think he must have been held back by fears. Some kind of inhibition. He was really afraid to venture into entirely new ground, to question ideas which had been accepted from time immemorial. He preferred to stay on the solid ground of mathematics. So long as he stayed there his position was unassailable. If he had gone further he wouldn’t have known what criticism he might have run into. It was the desire to stay on perfectly safe ground which I presume was dominating him.¹¹⁴

The point here is not whether Dirac was right in his interpretation of Lorentz or not, but the fact that he identified passions, such as fear, as an important element in scientific work.¹¹⁵ Other biographical and autobiographical portraits remind us that to the scientist, perhaps no fear is stronger than that which Harold Bloom calls the ‘anxiety of influence’, the ‘horror of finding

¹¹¹ Jerne to Günther Stent, August 8, 1969 (Jerne papers, Royal Library, Copenhagen).

¹¹² Quoted in Dresden (1988), 462.

¹¹³ Ibid.

¹¹⁴ Ibid.

¹¹⁵ Dirac’s awareness of the role of passion in science seems to be contradicted by Kragh, who in summarising the wealth of anecdotes circulating about the austere and shy physicist, concludes that theoretical physics was for Dirac ‘a substitute for human emotions’ (Kragh 1990, 255). However, this biographical portrait has been questioned by Dresden, who, having known Dirac personally, rather remembers him as a ‘deeply compassionate human being . . . with concerns, hopes, fears, and ambitions’, and therefore repudiates Kragh’s portrait for ‘its lack of passion’ (Dresden 1990).

himself to be only a copy or a replica'.¹¹⁶ It is not only the fear that one's works will be forgotten or ignored, but also that, 'even if they are preserved and noticed, nobody will find anything distinctive in them',¹¹⁷ that they will be redescribed in terms of other findings, or reduced to replicas.

Max Dresden's biography of Hendrik Kramers provides another example of the pervasive impact of fear in a scientist's life and work.¹¹⁸ As a university professor in the 1920s, Kramers was supposed to live 'in a world of pure reason, a world where there is no fear, anxiety, inadequacy, anger, or passion'.¹¹⁹ Kramers knew that it was a caricature, and privately he frequently expressed frustration: 'He was more often torn by doubts and beset by fears, which often guided him in paths which led nowhere. Fear and anxiety about his role in physics were his constant companions'.¹²⁰ Did these passions have cognitive implications as well? Lewis Feuer suggests that scientists look for conceptual worlds that will answer to their 'emotional longings' and that established theories are 'isomorphic' with the world 'emotionally sought': '[W]e must necessarily enter upon biographical and psychological considerations to ascertain what indeed were the basic emotional longings of the scientist, what the kind of world it was that he, on emotional grounds, sought to realise in his scientific theorising'.¹²¹ What, in other words, asks Feuer, was the scientist's '*emotional a priori*'?¹²² In the Kramers case, Dresden demonstrates that the Dutch physicist was continuously plagued by doubts and concerns about the shortcomings of his accomplishments and returning feelings of fear and uncertainty. He 'expected to mold [the development of his science] and guide it along lines consistent with his views. The resulting struggles, disappointments, successes, heartbreaks, frequently missed opportunities, and rare moments of elation – all these are now hardly remembered. Yet it is only through a detailed understanding of these conflicts and struggles that a genuine appreciation of the significance of the advances can be obtained',¹²³ claims Dresden, and he identifies a connection between Kramers' difficulties in committing himself to his wife and his difficulties in committing himself to physics: 'There is a striking similarity between Kramers' unwillingness or inability to commit himself to physics in

¹¹⁶ Bloom (1973), 80.

¹¹⁷ Rorty (1989), 23–4.

¹¹⁸ Dresden (1988).

¹¹⁹ *Ibid.*, 444.

¹²⁰ *Ibid.*, 486.

¹²¹ Feuer (1978), 378, 380.

¹²² *Ibid.*, 402.

¹²³ Dresden (1988), 7.

his student years, thereby giving up all other intellectual pursuits, and his indecision in his relation to Storm [his wife] – which would similarly involve a commitment, with a corresponding renunciation of other options'.¹²⁴

Hope is also an 'emotional a priori'. In a study of Ilya Metchnikoff, the founder of the phagocytosis theory of immunity, Alfred Tauber and Leon Chernyak speculate about the relation between Metchnikoff's personality disturbances and his theoretical achievements.¹²⁵ During the early years of his career, the Russian zoologist not only expressed a pessimistic *Weltanschauung* and a belief in the disharmony in Nature but also had physical problems combined with a depressive character. Tauber and Chernyak argue that Metchnikoff's research concerned with the problem of harmony (organismic integrity) resulted both in elaborating a pessimistic personal philosophy and the tragic existential posture that led him to suicide attempts. The turning point was 'the hope . . . that he might solve the problem of integrity' which 'changed not only the direction and the field of his scientific occupation but also his philosophical ideas and apparently deeply altered his personality'.¹²⁶ The role of 'hope' in Metchnikoff's life and science points, like the role of 'fear' in Dirac's and Kramers' lives, to the centrality of the notions of passion and existential project in the genre of science biography.

Existential choice in science

In this section I will develop some preliminary remarks about another central topic in an existentially oriented science biography, namely the problem of existential choice. The connection between life and work is a classic problem in science biography, and several attempts have been made either to solve or avoid it. From the point of view of the existential approach to science biography discussed above, life and work are necessarily inseparable: theoretical thinking, experimental design, empirical observation, writing a paper and

¹²⁴ Ibid., 116. Paul Forman (1991) has recently accused Dresden for falling prey of attachment to a quasi-religious sentiment of 'transcendence' in science, for having celebratory intents and for expressing 'metaphors of religious transcendence, salvation and saintliness' (p. 76) – in short for being whiggish. Scientists should refrain from trying to write biographies of (other) scientists, says Forman, unless they can stay clear of the transcendent sentiment. But are scientists really that handicapped? Even though approving of Dresden's 'considerable sensitivity, even courage, in dealing with the personality and personal relations of his subject', Forman does not acknowledge that this sensitivity to Kramers' existential predicaments probably stems from the author's transcendent attitude and experiences of personal involvement in scientific work. It is presumably easier for someone who has felt the hopes and anxieties of scientific work in his own mind and body to understand the existential dimension of other scientists.

¹²⁵ Tauber and Chernyak (1991).

¹²⁶ Ibid., 176.

participating in a meeting are integral parts of existential projects, that is, visions that guide our strivings for empowerment. A biography is existential also if it expresses the dilemmas of a person who, trying to assert himself through creative work, has to deal with the fundamental choices of his existence. Contrary to the idea that the scientist is socially constructed, or 'a product of his time', the point of departure for the existential approach is therefore to understand the scientist as he is confronted with his freedom, with his anxiety as he fathoms the consequences of his choices, and, having made the choice, with his feelings of guilt.

To Polanyi rational knowing involves an existential participation of the knower: 'The shaping of knowledge is achieved by pouring ourselves into new forms of existence',¹²⁷ and he describes 'the tacit dimension' of scientific discovery as involving 'existential choice':

We start the pursuit of discovery by pouring ourselves into the subsidiary elements of a problem and we continue to spill ourselves into further clues as we advance further, so that we arrive at discovery fully committed to it as an aspect of reality. These choices create in us a new existence, which challenges others to transform themselves in its image. To this extent, then, 'existence precedes essence', that is, it comes before the truth that we establish and make our own.¹²⁸

In her story of a discovery based on interviews with the rank and file life scientist 'Anna', June Goodfield implicitly draws on an existential understanding of the scientist, and points out that science involves a series of choices. It is first expressed in the very act of deciding to become a scientist at all, then in the 'choice of the particular road one goes down', or in 'choosing not to go down it at all'.¹²⁹ The initial strategy of the scientist's experiments may be socially determined; still it is the individual scientist who chooses to reject the preselected strategy and strike out on her own. The choice can be trivial, as whether to choose to work in the lab or in the archive, but it can have severe consequences as well, as in the case of Bridgman, who, by adopting the standpoint that science is essentially private, 'not only gave up the comfort offered by the warmth of community, but the possibility of certainty as well. He was alone in an indifferent world'.¹³⁰

¹²⁷ Polanyi (1959), 34.

¹²⁸ Polanyi (1966), 80.

¹²⁹ Goodfield (1981), 234.

¹³⁰ Walter (1990), 174.

There is a more fundamental meaning of the notion of choice involved here, however. The notion of existential choice was defined by Kierkegaard in his discussion of the choice between the aesthetical and ethical in *Either/Or*.¹³¹ The 'either-or' dichotomy does not denote a choice between this or that action, or even between good and evil, but a choice between an ethical life, that is, to live a life where questions of good and evil guide your actions, or to remain in an aesthetic life stage, where questions of good and evil are basically irrelevant.¹³² Kierkegaard in fact operates with two aesthetic modes: on the one hand the sensuous and immediate aesthete, as exemplified by Don Giovanni in Mozart's opera, and the reflective and abstract aesthete, for example, Johannes in *The Diary of the Seducer*, on the other.¹³³ By implication scientists are reflective aesthetes, as illustrated by the autobiography of the molecular biologist James D. Watson.¹³⁴ The leap into an ethical stage does not imply that the scientist abandons science, but that aesthetic priorities (search for beauty, or truth, or doing research for the sake of joy and so forth) become subordinated to ethical priorities.

What would an ethical life in science look like in contrast? '[T]he ethical individual is transparent to himself', says Kierkegaard, 'and does not live *ins Blaue hinein* as does the aesthetical individual'. This makes the whole difference. He who lives ethically has seen himself, 'knows himself, penetrates with his consciousness his whole concretion, does not allow indefinite thoughts to potter about within him, nor tempting possibilities to distract him with their jugglery; he's not like a witch's letter from which one sense can be got now and then another, depending upon how one turns it. He knows himself'.¹³⁵ However, *gnothi seauthon* is not enough to characterise an ethical life according to Kierkegaard: 'The ethical individual knows himself, but this knowledge is not a mere contemplation (for with that the individual is determined by his necessity), it is a reflection upon himself which itself is an action, and therefore I have deliberately preferred to use the expression "choose oneself" instead of "know oneself"'.¹³⁶

Thus, how one scientist may choose himself as an ethical individual, how this choice penetrates his scientific work and achievements, and, conversely,

¹³¹ Kierkegaard (1946); Kierkegaard points back to Socrates as the paradigmatic 'ethical' individual.

¹³² *Ibid.*, 143ff.

¹³³ *Ibid.* The distinction between the sensuous and the reflective aesthete is not so obvious in *Either/Or*, but becomes clear in *Concluding Unscientific Postscript* (Kierkegaard, 1992). I am grateful to Timothy P. Jackson for pointing this out.

¹³⁴ Watson (1968).

¹³⁵ Kierkegaard (1946), 216.

¹³⁶ *Ibid.*

how another scientist may refrain from choosing himself, and thus remain in the despair of an aesthetic life – these are the core issues in an existential biography. An existential reconstruction of the subject's life is therefore made from the inside, in an attempt to narrate the development of his life 'as it is directly experienced by the biographical subject'.¹³⁷ Hence, existential biography is distinct from (a) social biography, in which the individual is contextualised with reference to his 'situatedness' in a certain time, a certain culture, etc; (b) psychobiography, in which certain traits of the subject's personality or his achievements are explained with reference to psychological theory; and (c) biographical case histories aimed to generalise about genius, creativity, or the life cycle. All such approaches are external to the experiencing individual confronted with his existential choices.

The focus on subjective experience can be further qualified by Kierkegaard's distinction between 'inward' and 'outward' life history. Outward life history is the story of the strife through which the individual tries to acquire something, the strife in which he overcomes the hindrances to possess something. The conscientious biographer, who tries to understand the significant events in the subject's life, and the scientist-as-autobiographer both describe the life in the same way as Kierkegaard's reflective aesthete, the author or the poet, who relates an individual life as it was concentrated in the moment:

Imagine, then, a knight who has slain five wild boars, four dragons, and delivered three enchanted princes, brothers of the princess whom he worships. In the romantic chain of reasoning this has complete reality. To the artist and the poet, however, it is of no importance at all whether there are five or only four monsters slain. . . . He hastens on to the moment. He perhaps reduces the number, concentrates the toils and dangers with poetic intensity, and hastens on to the moment, the moment of possession. To him the whole historical succession is of comparatively little importance.¹³⁸

Kierkegaard's description of the aesthete's concentration on the 'moment of possession' is similar to the way most scientific lives are written. Neither biographers nor scientist-autobiographers see any point dragging in all the details. The daily routines do not really matter. What matters for them is the significant moment – the moment of discovery, the moment when a new model of Nature was conquered and possessed.

¹³⁷ Scriven (1984), 45.

¹³⁸ Kierkegaard (1946), 112–13.

When it comes to inward history, however, the life of the individual cannot be concentrated in one, or a few, single moments, since it deals with the succession of a life in time where ‘every little moment is of the outmost importance’.¹³⁹ Whereas pride can be represented in the outward history (‘for the essential point in pride is not succession, but intensity in the moment’), humility cannot, ‘because here if anywhere we are dealing with succession’.¹⁴⁰ Romantic love can be represented in the moment, but not conjugal love, ‘because an ideal husband is not one who is such once in his life but one who every day is such’.¹⁴¹ The same goes for courage versus patience, the hero versus the cross-bearer. Accordingly, the biographer who focuses on the significant events of the life of the scientist, and the scientific aesthete who in his autobiographical concentration deals with the moment, both have difficulties in catching the non-dramatic succession of all the small events in the ethical life of the individual scientist – the many times when he cared for a graduate student, the seemingly infinite number of times when he waited patiently for the experimental results to come, and the humility with which he accepted contradictory data. Nothing of this lends itself to a dramatic biographical narrative, and yet it is an essential aspect of what it means to lead an ethical life in science. In the annals of history it is outward contributions that counts, whereas in the ethical life of the individual the inward succession of everyday life means everything. To grasp the inwardness and yet write a biography that anybody cares to read and can read intelligibly – this is the challenge to an existential approach to science biography.

Science biography as an edifying genre

Let me in conclusion return to the question that opened this chapter. What is the aim of science biography? The last two decades of social history and sociologically informed history of science have demonstrated beyond any doubt the ‘contextual’ nature of science – in the context of society at large, in the context of social and political institutions, in the context of gender, class and race, and in the context of the local, contingent settings of the scientific laboratory or in the field. Few would deny the permanent value of this research programme. But it is important to remember that much of this

¹³⁹ Ibid., 113.

¹⁴⁰ Ibid.

¹⁴¹ Ibid., 114.

history and sociology of science is driven by what Paul Ricoeur calls a 'hermeneutics of suspicion'.¹⁴² The demonstration of the social and political context of science and the socially constructed character of scientific knowledge has often been seen as ways to deconstruct 'naive realism', to dispel illusions about the power structures operating within and behind science, and to lay bare a naive scientific ideology of a value-free and context-independent 'search for truth'. An illustrative example is Bruno Latour's *Science in Action*, the explicit normative agenda of which is to help individual scientists by exposing how the machinery of 'Technoscience' works and 'to provide a breathing space to those who want to study independently the extensions of all these networks'.¹⁴³

It should not be denied that this joint sociological and historical discourse constitutes a healthy antidote against traditional history of science and science biography with its authors' often seemingly mindless focus on the chronology of events and achievements of the individual scientist, and strong tendencies towards uncritical hero worship. My only caveat is this: whatever working according to this agenda may expose, it leaves the individual scientist defenseless against the very same powers its promoters want to disclose. Exposure strategies have rarely produced any 'breathing spaces', as the general failure of one of these, namely Marxism, has amply demonstrated. Individual scientists may become more disillusioned, and probably also more cynical, after reading studies that demonstrate the constructed character of knowledge and one-sidedly focus on the social and political context of science. But they hardly become more able to resist 'technoscience'. For that reason scientists do not need more historical or sociological studies of the system of science to acquire breathing spaces – they need to strengthen their personal ability to breathe.

This is where existential biography enters the picture. The basic argument of this chapter is that the aim of science biography is not primarily to be a genre that adds yet another means for disclosing the contextual and socially constructed nature of science. Its primary aim is to be a genre which conveys an understanding of what it means to live a life in which scientific work and rational thinking are part of an existential project and involves existential choices. The aim of existential biography is to help scientists and non-scientists alike to strengthen their abilities to live fuller and more authentic

¹⁴² Ricoeur (1970).

¹⁴³ Latour (1987), 257.

intellectual lives.¹⁴⁴ Instead of adding to the hermeneutics of suspicion that governs so much of today's history and sociology of science, science biography should rather contribute to a 'second naïvité', a 'hermeneutics of belief', based on trust and a willingness to listen in order to understand.¹⁴⁵ The ironic relationship imposed between the biographer, his subject and the reader is denied to the existential biographer. Similarly, the reader is asked primarily to identify with the biographical subject rather than just contemplate his plight or withdraw into judgement.¹⁴⁶

An existential approach to biography points to a dimension of uniqueness and individual choice. To stress the notion of the existential project and the notion of empowerment that goes with it is not to deny the importance of the social and political contexts of our actions. But those who stress the notion of social context neglect the other side of the modernist coin, that is, that we *are* able to break through these contexts. To give attention to our abilities to break contexts is to give the freely acting, ethically responsible, individual scientist the privileged role in science biography. Contrary to Clark Elliott, who grants the value of biography for understanding pre-World War II science as one of several approaches to history of science, but questions whether organised Big Science and team research in post-World War II science 'leave a legitimate place for the study of individual lives',¹⁴⁷ the guiding normative idea of this chapter is that it is precisely the emergence of Big Science, collective team research, and anonymous technoscience structures that makes it urgent to focus on the lives of individual scientists without the constant, often ritualistic, recourse to the social context. On this view, the aim of science biography is to provide us with stories through which we can identify ourselves with other human beings who have chosen to spend their lives in scholarly or scientific work. Such stories can make us understand and change ourselves – scientists, historians of science and laymen alike. In that sense, biographies of scientists are useful as exemplars for what Kierkegaard considered to be the core of freedom in an ethical life: the continuous renewal of oneself.¹⁴⁸

Hence, existential biographies of scientists may be edifying; they may provide us with opportunities for reorienting our familiar ways of thinking about our lives in unfamiliar terms, 'to take us out of our old selves by the

¹⁴⁴ For a discussion of authenticity in late modernity, see Taylor (1992).

¹⁴⁵ Klemm (1983).

¹⁴⁶ Cf. Nelson (1986), 465.

¹⁴⁷ Elliott (1990).

¹⁴⁸ Cf. Giddens' (1991) revival of Kierkegaard's vision in terms of 'life politics'.

power of strangeness, to aid us in becoming new beings'.¹⁴⁹ That is, by avoiding redescription of the scientist in the vocabularies of sociology or psychobiography, and by being sensitive instead to the vocabulary used by the scientist himself when trying to make sense of his life, biographers of scientists can, paradoxically, provide the exemplars we need for redescribing ourselves. Notwithstanding her programmatic flirtations with social biography, Keller's portrait of Barbara McClintock is primarily a story about what a marginalised and lonely woman's life in science was like. By retelling the struggles McClintock had to go through to succeed eventually in convincing other geneticists that the early molecular biologists' view of genetics was too simplistic,¹⁵⁰ Keller's portrait functions as a model for women scientists trying to cope with their own lives in science. Likewise Walter, by telling Bridgman's life story as a constant struggle with ethical choices in science, sensitises the reader to similar possible conflicts in his own life. In fact, both biographies, like Monk's Wittgenstein, provide examples of modern science hagiography – in the literal, not pejorative, sense of the word to be sure. Hagiography, as James McClendon points out in his discussion of theological biography, does not have to be understood as blind worshipping, but rather, 'at its best', as 'a mode of communal self-scrutiny'.¹⁵¹ In that sense, I believe that one good existential biography of a scientist can better contribute to a remaking of the practices of science than a score of revealing social historical and sociological investigations of science.

Is this vision of science biography much different from that during the nineteenth century and the first half of the twentieth century, when the major purpose of the genre was to tell stories of the lives of great scientists,¹⁵² or from Williams's wish, quoted above, to refocus on the great individual scientist? In one sense the answer is no – in fact, Robert Skidelsky has recently suggested that the biographer's main purpose indeed is 'to hold up lives as examples'.¹⁵³ He advocates biography as 'ancestor worship', as a genre that can recover the lessons older members of our community have made for us: 'The only way biography as an undertaking can recover its main function of good story-telling is to go back to . . . ancestor worship'. In another sense, however, a revival of this recurrent, but now widely rejected,

¹⁴⁹ Rorty (1980), 360.

¹⁵⁰ Keller (1983).

¹⁵¹ McClendon (1990), x. I am grateful to Geoffrey Cantor for making me aware of McClendon's book.

¹⁵² Theerman (1985).

¹⁵³ Skidelsky (1987).

theme of traditional science biography must certainly be very different. The hermeneutics of suspicion cannot, and should not, be undone. I am certainly not advocating a return to the uncritical hagiographic tradition, with its unqualified praise and glorification of the achievements of scientific 'giants'. Skidelsky uses the term 'ancestor worship' tongue-in-cheek: ancestor does not necessarily refer to a white, Anglo-Saxon, Protestant male, as Kenneth Manning's portrait of the black biologist Ernest Everett Just reminds us,¹⁵⁴ and worship does not refer to uncritical hagiography. The problem with traditional science biography was not that it provided personal models as such, but that these models were too bright and too unrealistic – stories of scientific heroes with whom it was difficult to empathise. What distinguishes existential biography from more traditional ancestor worship is the much greater range of lives to learn from, so that 'whereas in the past the exemplary principle worked in favour of tradition, today it works in favour of pluralism'.¹⁵⁵ Exemplars do not have to be positive models. They can be negative, even Raskolnikovian, figures as well, models that teach us moral dilemmas, like John Heilbron's study of Max Planck as a lesson of 'heroic tragedy'.¹⁵⁶ Exemplars do not even have to have a great reputation; they can be ordinary members of the profession, like 'Anna'.¹⁵⁷ In fact, although a big contributor to science may provide a good example of the struggle between an ethical and an aesthetical life in science, lesser contributors (lesser egos) are probably more suitable to illustrate what it means to live an ethical life in science.¹⁵⁸

Finally, even though the vision of science biography described here is motivated by a serious concern for commitment and edification, the style does not have to be boring. For a biography to be edifying does not exclude the possibility that it could be guided by stylistic consciousness. The time is ripe for science biographers to experiment with stylistic inventions such as collage, narrative discontinuity, multigenre narratives, unsuspected time-shifts, with stream of consciousness, symbolism, poetical reconstructions, and polyvocal texts, and so forth. In this respect, the art of science biography can also learn from film directors such as David Lynch (for example, *Wild at Heart*), Baz Luhrmann (*Strictly Ballroom*), or Wim Wenders (for example,

¹⁵⁴ Manning (1983).

¹⁵⁵ Skidelsky (1987), 1250.

¹⁵⁶ Heilbron (1986), viii.

¹⁵⁷ Goodfield (1981).

¹⁵⁸ Cf. Hull (1988), who claims that those scientists who are most selfish and egotistical are the greatest contributors to science, and conversely that the least productive scientists tend to behave the most admirably.

Wings of Desire) who are able to integrate an edifying message and a strong commitment to human values with stylistic inventiveness and an ironic distance to the plot and the characters.¹⁵⁹ Maybe we can even expect unconventional approaches such as that of Simon Schama, who relies heavily on imagination and impressionistic tales in bringing the past to life, to the extent that he challenges traditional notions of historical accuracy and reliability.¹⁶⁰ We can expect science biographies to become as adventurous and experimental as modernist novels – Russel McCormmach’s fictional *Night Thoughts of a Physicist* being a pioneer example¹⁶¹ – and particularly contemporary movies. In conclusion I see no reason why postmodern playfulness should not be able to coexist with the view of existential science biography advocated here.

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¹⁵⁹ A small step in this direction is provided by Holmes (1991) who introduces a voice-over element in his Krebs biography.

¹⁶⁰ Schama (1991).

¹⁶¹ McCormmach (1982).

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