THE VERNACULARISATION OF MODERN NEUROSCIENCES: A CASE STUDY OF NEURO-AUTOBIOGRAPHIES IN THE AGE OF COMPLEXITY

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A DISSERTATION SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN HUMANITIES

YORK UNIVERSITY

TORONTO, ONTARIO

MAY 2020

ABSTRACT

This dissertation explores the vernacularisation of modern neurosciences which refers to the everyday communication and materialization of neuroscientific concepts for and by a lay population in order to reframe society's understanding of 'brain disorders', 'mental illness', and ultimately the 'self'. Taking this social phenomenon into account, this dissertation examines how neuroscientific knowledge may get 'entangled', 'enfolded', 'unfolded' as in the case study of self-narratives written by professional women with neurological conditions which are coined here as 'neuro-autobiographies'. The interaction between the neuroscientific knowledge and the autobiographer's lived experience with a brain condition contributes to a complex process of life-writing and rhetorical expressions, which creates an ecological relation with various agents, contexts, and networks that emerge organically out of noise, disturbances, interruptions, and fluctuations; ultimately, such interactions can challenge the order-disorder of the discourses. In this view, the neuro-autobiographies transcend the concept of a literary genre, once they are considered part of a communication system that is dynamic, non-linear, and self-organized.

The theoretical framework developed in this dissertation is interdisciplinary, grounded in concepts from applied linguistics, complexity thought (e.g. complex adaptive systems), women's autobiography studies, and pedagogical studies. This dissertation applies a qualitative methodology based on discourse analysis (e.g. rhetorical and stylistic devices) to examine five self-narratives in order to identify how underlying neuroscientific concepts are entangled with personal experiences and knowledge through the use of a vernacular language. The five autobiographers are: Temple Grandin, Siri Hustvedt, Jill Bolte Taylor, Barbara Arrowsmith, and Francesca Martinez.

The interdisciplinary approach allows the neuro-autobiographies to be studied as open systems in interaction with the vernacularisation of the neurosciences in distinct contexts such as the educational one. With this in mind, this study holds an applied component to collaborate with higher education by proposing a vernacular neurosciences course that focuses on the neuro-autobiographies examined in this dissertation. The proposed course syllabus aims to develop a vernacular neurosciences literacy through a transdisciplinary approach that envisions to bridge the divide between the humanities and the sciences in academic settings. The teaching and learning of threshold concepts based on the neuro-autobiographies aim to foster students' critical thinking by questioning how the vernacularisation of the neurosciences can reframe our understanding of the human brain in relation to the 'self', and to 'women' in particular, who live with certain neurological conditions.

ACKNOWLEDGEMENTS

The culmination of this dissertation derives from my long-term ambition to pursue a doctoral degree brought from afar to Canada. Authoring this dissertation felt like drafting part of my life story in which fluctuations, oscillations and bifurcations have marked the attempts to complete it. Certainly, this project could not have been materialized if it were not for the various individuals that directly and indirectly have supported and influenced my thoughts, feelings, and behaviour at scholarly and personal levels.

I would like to express here with much honor and sincerity, my wholeheartedly gratitude to my supervisor and supervisory committee for their assistance, encouragement, and comments to my dissertation: to my supervisor Professor Steve Bailey who kindly supported me when I had to make some risky maneuvers and detours along my dissertation; to Professor Celia Popovic for her pedagogical and academic insights and mentorship; and to Professor Logan Donaldson for crossing wide disciplinary borders in order to move this dissertation forward. Likewise, I would like to greatly thank the external examiners, Prof. Sarah Bigi and Prof. Emilia Nielsen, for their time and expertise by accepting the task of reading my dissertation, and for contributing intellectually to it. I would also like to acknowledge Professor Victor Shea, the Graduate Program Director, for his academic support during the final stages of my dissertation as well as the administrative assistants for kindly dealing with the logistics.

In a retrospective style, I would like to acknowledge the following individuals who have influenced my academic and professional development during my PhD project:

I would like to thank the Graduate Program in Humanities where my dissertation is housed, and Professor Markus Reisenleitner for welcoming me into the program in 2010 as an MA

graduate. I would also like to thank my course professors for their teachings which somehow shaped my intellectual articulations, in particular, Professor Marlene Kadar and Professor Susan Ingram for their insights into women's autobiography studies.

During my PhD in the Humanities Program, I met many colleagues with whom I exchanged lively scholarly casual conversations; among them, I would like to thank Mr. Chris Satoor for his philosophical insights and to Mr. Shlomo Gleibman for his ongoing academic support.

I am very grateful for the funds the Graduate Program in Humanities and the Canadian Center for German and European Studies granted me along my doctoral studies which helped me enhance my academic curriculum with conference presentations and summer courses in the UK and Germany. Among them, I would like to thank Professor Alberto Gil for the opportunity to audit his classes in rhetoric, and to Professor Christof Vatter and Professor Hans-Jürgen Lüsenbrik for having me as a visitor junior scholar to their applied linguistic graduate program while spending a summer term at Saarbrucken University in 2014.

During my PhD candidacy, I had the honor to have the Teaching Commons former Director, Professor Celia Popovic, as my mentor while taking the Senior Teaching Assistant Program and later on while pursuing further educational development opportunities. Moreover, I would like to thank Dr. Mandy Frake-Mistak and Dr. Natasha May for the many opportunities to collaborate in educational development workshops delivered for TAs and faculty while I held a Teaching Commons Tutor position. I would also like to thank all the TAs I had coached, in particular Ms. Mariela Giuliano, for they opened my eyes to the academic diversities across York Departments.

I would like to thank Professor Antonella Valeo for acknowledging my ESL credentials and my teaching experience and skills while offered me a position as a course director at the Department of Languages, Literatures, Linguistics at York, where I have the pleasure to work

with a friendly Faculty and Staff and instruct international students. This teaching job opportunity has strongly reinforced my intentions to complete this dissertation with more determination

Beyond this decade of scholarly retrospective, I would like to show my respectably appreciation to Professor Rafael J. Cataño who has accompanied me along my professional trajectory and given me the strength and support whenever I need. I have been immensely and infinitely grateful for our ongoing collegial and intellectual exchanges since we met in my first IADA conference in Goteborg 2001.

I would like to thank the following scholars in the field of the humanities for their friendly academic exchanges and professional conversations which have kept me motivated at the last stages of my dissertation: Dr. Cornelia Ilie, Dr. Ivanka Mavrodieva, Dr. Miguel Neneve, Dr. M. Raffaella D. Valle.

Likewise, I extend my warmest gratitude to Mr. Kivanç Babacan whose scholarly expertise in physics has illuminated my initial steps into complexity studies, and with whom I share ongoing stimulating conversations about the universe.

Last, but not least, I would like to thank my family for offering me the resources to alleviate the load of my PhD project whenever it felt too heavy for me to carry on my own.

I could not end this acknowledgement without mentioning my son, A.V.S., who has been incredibly patient, understanding, and supportive to my PhD project and who has taught me more about his mind/brain than I ever thought. Thus, I dedicate this dissertation to him.

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INTRODUCTION: Brain as Muse

I.

The human brain has become a source of inspiration for artists, novelists, filmmakers, and graphic designers among others, who influenced by recent neuroscientific findings, make crafts, art installations, and storylines about the brain and the everyday of people with neurological conditions. Society's growing interest in neurosciences in North America is likely to have emerged as a consequence of two US government interventions: a) the Presidential Proclamation 6158, known as the 'Decade of the Brain', in 1990[1], set to improve public awareness of brain research benefits due to increase diagnosis of neurogenetic diseases and degenerative disorders such as schizophrenia, Autism, and Alzheimer's; and b) the launch of BRAIN (Brain Research Through Advancing Innovative Neurotechnologies) in 2013 with support of private and public institutions to accelerate breakthroughs in brain imaging techniques and research. Both initiatives have strongly supported neuroscience programs in higher education through massive funds and incentives to attract national and international senior experts and ambitious junior scientists to work in competitive labs. Such incentives have also supported neuroscience to collaborate outside its 'niche', reaching out to the so-called 'soft' sciences – humanities and social sciences – through interdisciplinary projects that have culminated in the addition of the prefix *neuro-* to "create hybrid disciplines" such as neuro-anthropology, neuro-marketing, neuro-economics, neuro-linguistics, neuro-education, neuro-cinema, and neuro-humanities, among others (Pickersgill and van Keulen 2012). Thus, it comes as no surprise that neuroscience has become a

[1] For the *Decade of the Brain: Presidential Proclamation 6158* (Library of Congress). See: http://www.loc.gov/loc/brain/proclaim.html

'buzz word' inside and outside university, attracting scientists, scholars, and artists in the field of the humanities, social sciences, biological sciences, and technology.

From a perspective in the humanities, I conjecture that there is an ambiguous attitude towards the representations of a neurobiologically-oriented society in response to a current existential crisis that is affecting the field of the soft sciences and to the uncertainties that cast gloom upon their future inside universities. Many scholars and artists have decided to follow the 21st century "neuroscientific turn" (Johnson and Littlefield 2012) in high hopes of elevating the standards of *Der Geist* in the humanities and alleviating the anxieties generated by the recent economic reforms that imperil their future. For instance, to capitalize on the emergence of modern neuroscience beyond the academic setting, mass culture industry such as cinema and TV has produced films and shows that portray characters with neurological conditions such as Autism Spectrum Disorder (ASD), Bipolar Disorder, and Alzheimer's (Nordahl-Hansen 2018; Conn and Bhugra 2011; Heather 2006). In best-selling literature, the rise of auto-fiction, coined as either 'neuronovel' or 'neurofiction', has attracted a lay readership keen to consume life narratives. Currently, one of the most famous best-selling writers in this genre is Lisa Genova, a neuroscientist from Harvard, who has stepped in to write neuronovels motivated by her own experience of dealing with a grandmother with Alzheimer's. [2] Lisa Genova's popularity only came after her novel *Still Alice* (2007) was adapted into a film that received a 2015 Oscar for its best female actress (Julianne Moore). Despite being a new literary genre, 'neurofiction' is likely to be considered an evolution of a writing practice developed by a well-known neurologist, Oliver Sacks, who in the 1970s began to narrate his patients' bizarre neurological disorders in a literary fashion. Through his writing craft, Sack has helped disseminate complex brain

[2] For Genova' short biography, see: http://lisagenova.com/about-lisa/

pathologies to a lay audience. Nonetheless, Sacks' writing style reminds us of Freud's psychoanalytical narratives of his patients' case studies; hence, I suggest situating Freud as one of the forefathers of neurofiction genre, with his writing style serving as a literary model for prospective 'neuro-writers' such as Genova and Sacks.[3]

In line with Freud's case studies which were constructed by an "imaginative writer's license with fantasy" (Britzman 2011, 29), I defend that an intersection of the humanities with the neurosciences had already been established prior to the proclamation of the 'Decade of the Brain' or to the skeptical welcoming of 'The 21st Century Brain' as seen in Rose's critique (2006). Nevertheless, what strongly pulls Freud's neuro-psychoanalytical writings away from current neuroscientific texts is the focus on the high-tech tools in neuroimaging techniques such as CAT-scan (computed tomography scan), fMRI (functional magnetic resonance imaging), and PET (positron-emission tomography), which can provide us with precise details of the brain cells (i.e. neurons) that were once previously unimaginable. In view of this, sciences and industrial technology have merged with possibilities of generating lucrative investments that lead to an increased prestige of the neuroscience field above other disciplines. In contrast, in the context of higher education, economic austerities have been imposed on university programs in the humanities and the social sciences, forcing departments to search for alternatives such as interdisciplinary joint ventures with neuroscience programs (e.g. psychology department in liaison with neuroscience) in order to bring them some funding relief.

[3] See: http://www.theatlantic.com/health/archive/2015/05/oliver-sacks-knows-what-it-really-means-to-live/393410/

II.

My interest in investigating the intersection of the humanities (e.g. life-story narratives, rhetoric, and communication) with the neuroscience transcends historical, political, and economic reasons. I have been a 'brain aficionado' since I was a child, growing up in one of the suburbs in Rio de Janeiro, Brazil. Because this section consists of an introduction to my doctoral dissertation, I paradoxically restrict my short autobiographical narrative to 'scientific facts' and 'objectivity', as I leave trauma and drama to the reader's imagination.

When I turned seven during the 1970s,[4] I suffered from a life-threatening brain infection that led to temporary seizures along with changes in my behaviour, speech, and motor skills, and subsequently, to long-term mild and invisible sequelae. In those days, when brain imaging technology was in its early developmental stages and was non-existent in clinical settings, medical professionals had limited evidences and resources to provide patients and family members with a precise diagnosis of brain injuries. Instead, doctors had to rely solely on their clinical experience, medical training and judgment, which patients had to accept either with some conviction or skepticism. In my case, I believe my family followed the local culture, which is marked by hybridity, that is, by socially accepting a medical diagnosis as a dogma based on science and by incorporating some indigenous belief practices as seen in Afro-Brazilian rituals that channel spiritual beings to 'cure' one's soul.

After five years of being under periodical monitoring with electroencephalogram exams (EEG) and of having a childhood put on hold, I got finally my brain medication suspended with a final diagnosis that stated I could lead a 'normal' life like any child. Nonetheless, the adaptation

[4] Brazil was under a military dictatorship that lasted twenty years (1964-1985). During the 1970s, there were poor vaccination campaigns, affecting mostly the less privileged areas in the country; meningitis and measles outbreaks were common and the period became known as 'epidemic under censorship' (Domingues et al, 2012).

to a new life of a 'normal kid' was challenging to say the least, mainly when puberty was forthcoming. Only later, when I was an undergraduate in a physiotherapy program, did I suspect that the symptoms I had had as a child were mostly like those of encephalitis, although I have never received an official diagnosis of my brain condition. In my third undergraduate year, I quit my studies, internship, and social activities without being aware that I was having a 'Victorian breakdown', or better, 'shattered nerves', as Siri Hustvedt would call in her autobiography. My family could neither figure it out whether it was signs of depression, nor could I, and to make matters worse, I was stigmatised for dropping out of college during my last year, while I 'locked my door upon myself'. One of the major triggers to my depression was the repetitive social negligence I experienced during my volunteer work as a physiotherapist assistant to underprivileged children with serious neurological disorders. In other words, I was overwhelmed by the local government's negligence to treat impoverished disabled children, while I was left to my own devices without suitable professional support. A year later, I managed to overcome the depression, with perhaps a spiritual hand of a '*Preto Velho,*'[5] and I applied for an undergraduate program in the humanities, later majoring in English language and EFL education at a local state university. Only after the first quarter of my lived experience (i.e. *Erlebnis*) as a woman marked by fading traces of neuropsychological turbulences, could I realize (i.e. *Erfahrung*) that an individual's body/mind health was dependent on socio-economic conditions, environment, cultural practices, and genes.

[5] In the Afro-Brazilian religion called Umbanda, *preto velho* is "identified as an old, good, wise and experienced slave" (12), as his spirit possesses and channels an individual (known as medium) to give comfort, advice or heal a living person (Velho, Gilberto. *Projeto e Metamorfose: antropologia das sociedades complexas*. Jorge Zahar Ed., 2003).

In this regard, an individual's ecological health (mostly of the less privileged one) is not only subordinate to medical practices, but also to political agendas that are intricate to hegemonic discourses represented by institutions of power.[6] Women's bodies and minds are particularly vulnerable to institutional practices; for example, mainstream journalistic discourses tend to frame activist women's radical actions as a sign of a mental illness or a symptom of a brain disorder. To illustrate this assertion, I draw on an earlier study I conducted about a turbulent life story of a 'terrorist woman' named Ulrike Meinhof. She was a prominent left-wing German journalist who underwent a brain tumor surgery at the beginning of the 1960s; afterwards, she joined a local urban guerilla group (known as *Red Army Faction*). Meanwhile mainstream European journalism speculated about Meinhof's personality changes as a result of surgical procedures to remove her brain tumors.[7] She was arrested in 1972 and sent to Stammheim Prison, known as a supermax prison in Stuttgart. Her controversial suicide took place in 1976 (Meinhof and Bauer 2008). Without her family's consent, Meinhof's brain was removed and kept separate from her buried body in order to be examined in a laboratory at the University of Tübingen. Scientists were curious to investigate whether there was any abnormality in Meinhof's brain or any similarity to the brain of a murderer (cf. Bauer)[8]. Only after two decades later were Meinhof's family members able to legally intervene and recover her brain from the German government to be properly buried in 2002.

Meinhof's brain is a compelling case that casts questions upon reference to ethical practices in neuroscience, a current burning issue that arises among humanities scholars and social activists.

[6] The military dictatorship period in Brazil censored public health communication to the population due to government's negligence and poor administration, which was catalyst for the 'meningitis epidemic' . For further information see: http://www.ccms.saude.gov.br/revolta/pdf/M9.pdf

[7] http://news.bbc.co.uk/2/hi/europe/2455647.stm

[8] Meinhof, Ulrike M, and Karin Bauer. *Everybody Talks About the Weather We Don't: The Writings of Ulrike Meinhof*. Seven Stories Press, 2008. Print.

To address this matter, a Canadian filmmaker, Bruce Labruce, produced a film titled *Ulrike's Brain* in 2012, which was only released in 2017 at the Berlin International Film Festival. The film is a parody of Ulrike's brain story with the goal to raise public awareness of government's ownership of individuals' body and of dubious *post-mortem* practices being performed as well as to highlight society's current obsession with the human brain. The film *Ulrike's Brain* may serve us as an additional evidence to support my claim that a current 'brain mania' has transcended the scientific realms and has reached a lay audience through the work of popular culture at the level of representations and fictionalizations. Yet, in this dissertation, the published autobiographies written by individuals with brain disorders not only meet the basic functions of popular culture (e.g. to entertain) but also educate a lay readership by translating neuroscientific information through an everyday language.

III.

No more than a century ago, either a man or a woman showing bizarre or eccentric behaviours that did not fit into society's category of 'normality' could end up being ostracized from their community. In the case of women, the isolation could be even worse, since it was a common practice to label them as 'madwoman' and confine them in an attic or in an asylum for their scandalous behaviour judged as either hysterical or retarded.[9] Furthermore, brain studies were incipient and limited to a close-knit community of mostly European medical scientists who would circulate their research among specialized journals and academic circles, without intentions to

[9] The 'madwoman' metaphor is borrowed from Gilman and Guba's *The Madwoman in the Attic* (1984), a collection of articles analysing 19th women's literary writings under feminist perspectives. Among them, the authors cite the short story by Charlotte Perkins Gilman, "The Yellow Wallpaper" (1892) that portrays a woman whose physician-husband confined her in an attic as a form of treating her postpartum psychosis. Gilman's story is based on her experience of being treated in a similar manner for her nervous disorder.

reach out to a lay population. Since ordinary people did not have access to medical scientific information, their knowledge of mental or neurological disorders was restricted to actions of demonic possessions or supernatural forces which were translated into everyday tales about hermits, witches, and feral children. For example, popular tales of a Bavarian man called Kaspar Hauser (Murray 40), found as a feral child, and of a Cornish woman named Joan Wytte "renowned as a witch" (Guiley 398), have been passed down from generation to generation. Today in western societies, women diagnosed with either autism, epilepsy, Alzheimer's, or cerebral palsy, among other neurological conditions,[10] will not be secluded, but still may face stigma (Goffman),[11] with some of their actions being limited legally and or being under surveillance by family members.

Since the proclamation of 'The Decade of the Brain', there has been a growing movement to communicate and teach neurosciences to a lay population mainly through online science journalism and institutional websites, as for example, *Neurosciencenews.com*, *BrainFacts.org* and *Dana.org*; the last two claims to be, as described on their website respectively, an "authoritative source of information" and "your gateway to responsible information" about the brain. Parallel to this movement, neuroscience has been represented in popular culture through films, sitcoms, TV commercials, neuro-fiction, and arts (e.g. paintings, installations, and crafts), which use an everyday language (i.e. vernacular) to reach out to a wide lay audience. Not to mention, the recent marketing of portable neuro devices, known as, 'brain-wearables,' which are

[10] In this project I will use the word 'condition' as an umbrella term when dealing with different neurological disorders as its semantics has an ambivalent value, that is, a condition can be good or bad; therefore, it carries a neutral value unless specified. Yet, a disorder always implies a functional impairment, that is more consistent, and can hinder an individual's everyday (See the American Medical Association website - AMA https://amastyleinsider.com/2011/11/21/condition-disease-disorder/)

[11] Goffman, Erving. *Stigma: Notes on the Management of Spoiled Identity*. Reissue edition. New York: Touchstone, 1986. Print.

designed for a healthy population to either energise or calm down one's brain for a couple of minutes a day. The portable neuro-wearables can be easily purchased from online retail stores with prices comparable to popular smartphones, making them an accessible consuming gadget. It seems that a 'brain fetishism' is on the rise, making the human brain a commodity which is supported by a neuro-culture movement that popularizes neuro-autobiographies, neuro-arts, and neuro-technologies. Hence, I call this phenomenon the 'vernacularisation of neurosciences', a process that involves complex dynamic communication systems through the dissemination and circulation not only of everyday objective perspectives and material manifestations of neurosciences such as portable brain-wearables, but also of subjective views and discursive practices such as neuro-stories.[12] This dissertation focuses on the latter because the neuro-narratives have offered the means (e.g. space, medium, and territory) to enable those marginalized women once labeled as 'mentally retarded' or 'mad' to reposition themselves and voice their lived experiences of their brain/mind conditions through autobiographical practices. Hence, I name the personal neuro-narrative as 'neuro-autobiography'.

Historically, women (healthy or not) have been granted restrict access to 'speak up' in public spaces (Baxter 2003; Cameron 1992), which consequently, underestimated their rhetorical abilities and communication skills. For this reason, I have selected neuro-autobiographies of five professional women who have overcome socio-cultural barriers by disclosing their experiences of living with neurological conditions to a broader audience. The confessional tone marked in those neuro-autobiographies finds its roots in the Christian tradition of 'confessional narratives' which

[12] Here the communication of neurosciences is seen as a multilayered system which is complex, dynamic and non-linear involving various agents such as writer, producer, distributer, reader, audience, consumer, reviewer, message/text, object, and medium.

have been wholeheartedly embraced and embedded in the Anglo-American culture.[13] Moreover, the second-wave feminist movement has had catalytic effects on women's life-writings,[14] reinforcing a confessional practice currently seen in various published memoirs, autobiographies, and websites of women (e.g. female celebrities) about their experiences with drug addiction, sexual orientations, and political scandals among others. Therefore, disclosures of personal narratives with neurological disorders in an Anglo-American context may find more favourable conditions than in other cultures, although stigma still lurks in those life writings.

Briefly, this dissertation investigates how the vernacularisation of neurosciences is communicated through neuro-autobiographies of real, living professional women by analysing their experiences (the experiential self) with brain conditions through a vernacular language in dialogue with the scientific knowledge. On an applied level, this dissertation aims to contribute to a pedagogy of those neuro-autobiographies as a potential architecture to bridge the gap between the 'two cultures' (i.e. the humanities and sciences) by integrating them into a general education curriculum in post-secondary education[15]. This study draws upon concepts developed in applied linguistics combined with complexity thought in order to offer a systemic view of the neuro-autobiographies within the vernacularisation of the neurosciences on the first decades of the 21st century. In this sense, I raise the following questions to guide this research:

1- How do the five autobiographers discursively construct a corpus of vernacular neurosciences in their narratives, in other words, how do they 'unpack' the scientific knowledge and discourse?

[13] Boynton, Victoria. *Encyclopedia of Women's Autobiography*. Greenwood Press, 2005.

[14] The second-wave feminist movement in North America emerged during the civil rights movements in the 1960s. According to Brock (2016, p.17), second-wave feminist thinkers and activists reclaimed "autobiography" or "life-writing" "as authentic accounts to women's experiences" under the popular motto "the personal is political".

[15] Here I use the expression 'two cultures' (in lowercase) as a metaphor to refer to the humanities and the sciences triggered by C.P. Snow's 1959 Lecture 'The Two Cultures', which is explored in Chapter One.

2- How do the autobiographers frame their neuro-identities, self-images, and intersubjectivities in their narratives under a complexity paradigm?
3- What discursive patterns (e.g. rhetorical and stylistics) can be mapped in those neuro-autobiographies in order to construct a corpus of vernacular neurosciences?
4- How can those neuro-autobiographies offer insights to bridge the gap between the humanities and the sciences once they are situated within self-narratives as open systems rather than being simply as a genre?
5- How can neuro-autobiographies contribute to the teaching and learning of vernacular neurosciences in post-secondary education?

IV.

The vernacularisation of the neurosciences in the first decades of the 21st century is the result of a complex historical development of other disciplines in the field of natural and life sciences, which have influenced the formation of modern neurosciences. A philosopher of neurosciences, Carl F. Craver, states that "Neuroscience includes and draws upon aspects of anatomy, behavioral psychology, biophysics, cognitive and developmental psychology, computer science, evolutionary and molecular biology, endocrinology, ethology, immunology, neurology, neurophysiology, mathematics, pharmacology, physics, physiology, and psychiatry" (2014, 16). This multidisciplinary aspect makes me consider neurosciences in the plural, with the addition of the suffix –s, as it is usually referred to in the Romance Languages (e.g. as seen in the Portuguese, Spanish, and French translations); however, the English version tends to keep it singular, minimizing a set of disciplines that neurosciences draw upon. I will use both forms throughout this dissertation, since the singular and plural forms hold different contextual

meanings. I keep the singular form to refer to the discipline in its reduced aspect that draws upon biology and anatomy-physiology (i.e. the study of the nervous system), and the plural one to refer to its holistic aspect, as a set of other disciplines that contribute to the development of the neurosciences beyond its biological aspect. In this vein, the vernacularisation is not only oriented towards neuro/biology, but also to an integral aspect of the neurosciences that is complex.

This dissertation aims to support a transdisciplinary dialogue through the articulation of concepts taken from the field of neuroscience, communication, discourse studies, complexity studies, psychology, philosophy of mind, and education. Thus, I coin the term 'vernacularisation of neurosciences' to refer to the dissemination of modern neurosciences as a complex phenomenon in the western societies and its influence upon our everyday during the first decades of the 21st century. Moreover, I support a new perspective of autobiography studies that align with systems approach by enabling network, interaction, and dialogue among various writing practices. With this in mind, I explore the neuro-autobiographies as a holistic writing practice in which experiential and discursive markers are considered to represent the narrators' views of their lived experiences with the neurological conditions. As a final point, I discuss how those neuro-narratives can contribute to the creation of a curriculum of the vernacularisation of the neurosciences in post-secondary education.

This dissertation is divided into six chapters. Chapter One, "The Humanities and Neuro-Sciences", deals with my experiences and reflections as a humanities junior scholar participating in a mainstream neuroscientific conference, where I presented a poster on the representations of the brain in TV commercials. This serves as a hook to explore the interactions between the humanities and the sciences, referred here as the 'two cultures', based on traditional debates that have reinforced tensions and gaps between these two fields for over the past two centuries. In this

regard, this section articulates ways to bridge the divide. Next, I explore the current state of modern neurosciences as a transdisciplinary subject at the crossroad of the humanities and the sciences, by mapping its development throughout the twentieth century. It shows how government policies (e.g. Decade of the Brain) and recent advances in imaging technology (e.g. neuro-technoscience) have boosted the brain studies along the academic setting, and their contributions to the vernacularisation of neurosciences outside laboratories and research centers so that it can reach out to a lay population.

Chapter Two, "Vernacularization of the Neurosciences", deals with the communication of the modern neurosciences to a lay audience in contrast to a scientific discourse that focuses on a specialized community. It discusses the term 'vernacular' and its variations from an applied linguistic perspective in order to understand how it nominalizes the current manifestation of modern neurosciences in the everyday. Moreover, it explores humor as one of the features of a vernacular discourse and as a key rhetorical and stylistic device to 'mind the gap' between the two cultures in terms of their writing practices. For this reason, Chapter Two explores humor from a language study perspective since such rhetorical device is also present in the life narratives analyzed in this dissertation.

Chapter Three, "Neuro-Autobiography in the Age of Complexity," deals with the broad field of autobiography by reviewing main theories in Women's Autobiography. It identifies rhetorical specificities in woman's writings that can contribute to an ecology of communication that is compatible with complexity studies. Thus, Chapter Three explores complexity thought as a grounding theory that frames this dissertation. It reviews the main characteristics of complexity thought and discusses its contributions to autobiography studies. Within this frame, I use the term 'neuro-autobiography' to refer to life stories written by individuals with neurological disorders or

conditions; hence, exemplifying it as one of the manifestations of the vernacularisation of neurosciences. Furthermore, Chapter Three highlights the contributions of two scholars to the field of complexity thought – Edgar Morin and Ilya Prigogine – as proponents to develop a dialogue between two cultures gap, and whose works have been recently reedited and translated for an English speaking audience. Chapter Three wraps up with the implications of the complexity thought to current studies in the humanities.

Chapter Four, "Exploratory Mapping of Five Neuro-Autobiographies", consists of a qualitative analysis of the neuro-autobiographies inspired by an ethnographical method to explore discourse, context, and participants (referred here as the autobiographers) in relation to the research questions aforementioned. The autobiographies are narrated by two scientists, one literary scholar, one entrepreneur in special education, and one stand-up comedy artist, respectively: Temple Grandin, Jill Bolte-Taylor, Siri Hustvedt, Barbara Arrowsmith, and Francesca Martinez. The authors are public figures with a wide media presence mainly on social media and websites, where they can circulate their published autobiographies on how they live with neurological conditions. Chapter Four begins with a synthesis of the narratives through the perspective of the complexity thought in order to offer a 'bigger' picture of how these autobiographies can come together. Then, it maps the narratives based on a 'coded' analysis, in which they are classified according to themes or categories that emerge out of the personal stories (i.e. data) by bringing forth the narrators' voices.

Chapter Five, "Mapping Complexity in Neuro-Autobiography", identifies and discusses complex themes that are related to key concepts in the neurosciences such as neuroplasticity and mind-brain problem. Moreover, it maps and discusses how the five neuro-autobiographies approach the question of the two-cultures divide; in other words, it examines how each narrative

deals with scientific knowledge and humanistic values based on each narrators' lived experiences with their neurological condition.

Last, Chapter Six, "Contributions to Higher Education Curriculum," concludes how this study can be applied to a curriculum design in post-secondary education. It promotes the five neuro-autobiographies as educational resources for the teaching and learning of vernacular neurosciences. I propose a credit course on *Vernacular Neurosciences* as part of a general education curriculum, in which the five neuro-autobiographies can be used as pedagogical tools (instructional manuals) to cover neuroscientific and humanistic concepts in order to narrow the two cultures gap. The main objective is to promote neurosciences literacy through a vernacular approach, based on a dialogic model that fosters reflection, action, and transformation with a commitment to develop students' advanced critical thinking.

Hence, by the end of this dissertation, I will have demonstrated the complexities of the vernacularisation of modern neurosciences to society through a case study of neuro-autobiographies and their applications to a post-secondary context in order to encourage transdisciplinary dialogues across the humanities and the sciences.

CHAPTER ONE: The Humanities and the Neurosciences

1.1 Autoethnography: CAN-ACN Conference 2016

I start Chapter One with an "autoethnography", a term Ellis et al. define as "an approach to research and writing that seeks to describe and systematically analyze (*graphy*) personal experience (*auto*) in order to understand cultural experience (*ethno*)" (2010, n/p). The autoethnographical account enables me to describe my experience of attending my first 'neuro-scientific' conference and to reflect upon the socio-cultural interactions I experienced before and during the event. The *Canadian Association of Neuroscience*/*Association Canadienne des Neurosciences* (CAN-ACN) holds annual conferences in different major cities across Canada, attracting a community of senior and junior neuroscientists from domestic and international institutions with 'special guests', that is, Nobel Laureates to deliver keynotes. In 2016, from May 29th to June 1st, I attended *The 10Th Annual Canadian Neuroscience Meeting* that took place in my hometown, Toronto. Despite being traditionally a hard-core scientific conference, there is usually a small space for poster presentations in the field of the humanities. Bearing this in mind, I decided to submit an abstract on "Advertising & Articulating Neuroscience: Human Brain in Performance on Commercial Ads" (see figure 1). When I received the final program online, I noticed that there were a total of 533 posters split into three-day presentations during the conference, organized under the following themes: A- Development, B- Neural Excitability, Synapses and Glia: Cellular Mechanisms, C- Disorders of the Nervous System, D- Sensory and Motor Systems, E- Homeostatic and Neuroendocrine Systems, F- Cognition and Behaviour, G- Novel Methods and Technology Development, H- History, Teaching, Public Awareness and Societal Impacts in Neuroscience; and IBRO – International Brain Research Organization.

Clearly, my poster fell under 'category H' along with only two others; one was about neuroscience research findings reported in Canadian journalistic media, and the other was about online teaching of neuroscience for undergraduates. Examining the poster titles, I realized the poster presentations were concentrated on neurobiology research that includes lab experiments with animals, mainly rodents. Therefore, I was concerned about how favorably my poster would be received among a reductionist-oriented community of neuroscientists, as it became clear that the humanities category was underrepresented, not even composing one percent out of the total posters. Moreover, it illustrated how life sciences and the humanities/social sciences remain disconnected from each other during the first decades of the 21st century.

Despite my pessimistic observations, I could not deny that the Canadian Association of Neuroscience has made some progress towards the inclusion of the humanities in the conference program. As I investigated CAN-ACN online archive for the past meetings, I noticed that its first meeting was in 2007, and to my surprise, the category for poster presentations within the field of the humanities (Category H) did not exist until the 6th Annual Meeting (2012) held in Vancouver. During that Annual Meeting, the 'category H' had four posters, two of them under the supervision of Dr. Jules Illes, a professor of Neurology and a Canadian Research Chair in Neuroethics at the University of British Columbia, within the theme of brain imaging and neuroethics in mental health. The two other posters concerned the teaching and learning of neuroscience in science camps and the use of blog as a pedagogical tool. I suspect that the inclusion of Category H was motivated by a growing interest in the field of neuroethics (i.e. neuro-philosophy) by neuroscience organizations, which may have received support from the Canadian Research Chair in Neuroethics. In the following Annual Meeting in 2013, there were only two posters under Category H; one concerning Alzheimer's in community health, and the

other, pain and ethics. In 2014, the CAN-ACN Annual Meeting was held in Montreal. The humanities category for poster presentations was once again underrepresented (with four abstracts accepted with themes in neuroethics, pedagogy, and journalistic media), despite the existence of a well-known research center for neuroethics housed at McGill University. The absence of Category H in the next CAN-ACN Annual Meeting held in Vancouver 2015, with no posters in the humanities field led me to conclude that the intersection of the humanities and the neuroscience is fragile, unstable, and oscillatory due to external conditions such as incentives and market demands. Its existence seems to be solely dependent on researchers' efforts and interests to bridge the two cultures; a solo venture that faces challenges to pass it on to the next generation of young researchers.

Nevertheless, I was pleased that my abstract was accepted for the 10th Annual Meeting, carving a tiny space in the association. My poster for the Canadian Association for Neuroscience Conference (CAN-ACN) presented in 2016 dealt with the vernacularisation of modern neurosciences in TV commercial ads. The human brain becomes a protagonist, represented and disembodied through the use of rhetorical visuals such as a cartoon, a mascot, a prototype, and a computer graphic. The human brain is personified to advertise mundane products such as cars, deodorants, and cell phones. A close reading of the data shows that some commercial ads replicate and reinforce an old belief that the brain is the organ responsible for our rational attitudes, whereas the heart for our emotional behaviours. Also, the representation of a disembodied brain disconnected from a body showing autonomy and agency reinforces the notions of "cerebral self" and "brainhood", which can validate the superiority of the human brain above other organs. This superiority is enfolded in the commercial narratives through humor, which has been identified as a rhetorical element in the process of the vernacularisation. Yet, the

TV ads have ignored updated neuroscientific information such as neural plasticity and connectivity in their script, limiting the role of the personified brain as a selling tool.

On my first day attending the CAN-ACN Meeting, I had a chance to talk to some poster presenters, mostly graduate students from Canadian universities representing their lab/research groups. They were very enthusiastic; however, I observed that their presentation style, best characterised as 'I'll guide you through the poster' sounded mechanised, based on rote and strong scientific jargon. Most of the poster presentations I attended needed a sound level of proficiency in neurobiology or a strong background in quantitative methods which I lacked. Moreover, I was uncomfortable with the fact that most of the lab experiments were conducted on animals, in particular, on rodents, making me wonder how to translate those neuroscientific findings to a human being, who is a complex bio-socio-cultural being in constant interactions with the environment. After discussing with some graduate researchers about such lab practices, I had most of them agreeing with me that experiments on animals can provide neuroscientists with solid information on a cellular level, but much is yet to be understood about the human brain beyond a 'cerebral-hood' perspective.

I also realized the unbalanced distribution for funds and incentives among the types of research conducted: much emphasis on neurobiology, some on neuroscience behaviour, and little on clinical neuroscience. Too much reliance on rodents for brain research has already been vocalized in some articles, such as "Rodent models in neuroscience research: is it a rat race?" (Ellenbroeck and Youn 2016) and "Is 21st Century Neuroscience Too Focussed on the Rat/Mouse Model of Brain Function and Dysfunction?" (Manger et al. 2008). The British scholars Hilary Rose and Steven Rose state that a reliance on "well-established laboratory stalwarts," such as rats, mice, cats, and sometimes monkeys, also brings "problems of translation

between animal and human brains" (2016, 14). I left disconcerted with my conclusions, feeling much convinced that my poster presentation on the following day would not draw participants' attention in any manner. My poster about the human brain representation in TV commercials was neither experimental nor statistical; therefore, a workable dialogue between the neuroscientific audience and myself looked flimsy.

I was one of the early-bird participants to set up my poster on the last day conference. The area reserved for *Category H* was still empty, with my poster anxiously awaiting the two others that showed up some time later. The poster next to mine was about neuroscience findings in Canadian media journalism, presented by a young graduate from the Institute of Medical Science at the University of Toronto, who told me she looked forward to entering law school and was not much keen on neuroscience studies (to my surprise). The third poster was set up later, and it was about teaching and learning neuroscience in an online course presented by three undergraduates on behalf of their supervisor. After attending all the morning plenary sessions, I had an attendee who chatted with me while I was having my lunch. She was a PhD student in a neuroscience program and holding a master's degree in psychology from a university in Ontario. As I described my poster to her in an apologetic tone for its distinctive feature of following a qualitative methodology, my interlocutor showed herself very receptive to my project. She agreed with me that there was an "imbalance" (her own term) in the representation of poster themes and wished there were more humanities-oriented posters with diverse methodologies and more clinical research that could be applied to 'real' people. She even proposed that we should fill in a conference feedback form to state the underrepresentation of humanities in the program. To my surprise, she was not the only participant missing the 'humanities' element at the CAN-ACN meeting. Contrary to what I expected, I had a few visitors to my poster who were curious to know

more about media representation of the brain in TV commercials; not to mention their interest in the novelty of my research on the 'vernacularisation of neurosciences' as a sub-theme of science communication. Although I still had a modest number of visitors in comparison to the mainstream posters (there were 170 posters being concurrently presented), I had meaningful conversations with some graduates and even with a science journalist, who all seemed interested in the intersection of the humanities and the neurosciences.

It seemed to me that graduate students in neuroscience programs lack a humanities element in the curriculum, which could offer them opportunities to enhance their critical thinking and to engage in a transdisciplinary dialogue, analogous to what occurred during my poster presentation. For example, some of the visitors to my poster engaged with each other to talk about philosophical and pedagogical issues such as body/mind problem and teaching/learning practice in neuroscience programs. This experiential opportunity has helped me identify more concretely a crucial need to foster dialogue between the neurosciences and the humanities in a university context. It seems that the current neuroscience curriculum in the university programs focuses on neurobiology and brain imaging techniques, which disembody the human brain and ignore humanistic values (e.g. 'personhood') in their research outcomes. Bearing this in mind, this dissertation will explore these issues through an examination of neuro-autobiographies in order to engage both the humanities and neurosciences in a meaningful dialogue.

1.2 The Two Cultures

The autoethnography aforementioned brings to memory a traditional division between the sciences and the humanities, once famously coined as 'The Two Cultures' by the British physicist and novelist C.P. Snow while delivering a Rede's lecture in Cambridge, "The Two Cultures and

the Scientific Revolution" in 1959.[16] In his lecture, Snow (4) identified two opposite poles that he called "The Two Cultures": on one end, the 'literary intellectuals' (i.e. humanities), and on the other one, the 'natural scientists' (i.e. physical scientists). Snow inherited a certain disdain to 'literary intellectuals' with whom he did not identify even though he was a literary writer himself. Yet, in a later revised article, Snow was more concerned about denouncing the social prestige British literary élite held than devaluing the humanities as a cluster of disciplines itself. Thus, Snow's criticisms of the humanities in his lecture targeted an elitist group of intellectuals that controlled the field from spreading beyond their own context. Moreover, Snow did not consider the pedagogical aspects of curriculum organization in the humanities and the sciences in the British universities, which might have reinforced a 'gap'. Instead, Snow's focus was on the humanities and the sciences as 'culture', which he defined as disciplines that share "common attitudes, common standards and patterns of behaviour, common approaches and assumptions" (9). Comparing the two clusters (e.g. humanities and sciences) as separate and distinct, Snow characterized each culture within a set of values that intellectuals and scientists live by. Over time, Snow's term "two cultures" became consolidated into the everyday to synthesize a lack or poor dialogue between the humanities and the sciences, solidifying the divide.

Yet, the tension between the humanities and the natural sciences, referred as Snow's "two cultures", can be dated back to the 19th century, when disciplines were formed, that is, when they became specialized and hierarchical, influencing the organization of education in major European universities. The tension was as a matter of fact a symptom of an underlying cause: the expansion of capitalism across the western societies which has been motivated by a "reciprocal relationship between sciences and technology" (Rose and Rose 10). Eventually, the 19th century 'man' of the

[16] Those were public lectures running at Cambridge University and named after a public English figure, Sir Robert Rede.

belle-letters would have to face the challenges to compete with specialized labour and skills (e.g. technology) that natural sciences would provide. Thus, a scientific vocational education was preferred to a holistic one, which could serve the new demands of the market economy, a condition that still reverberates in our time.

A neo-Kantian division of knowledge (fact v values) marked the British and American intellectual environments at the end of the 19th century, when public talks were delivered by deputies of the sciences and of the humanities at prestigious institutions. One of the most famous British debates occurred between a natural scientist T.H. Huxley and a classicist Mathew Arnold (Cartwright and Baker 2005, 275), which ended up polarizing the sciences and the humanities throughout the 20th century. The first round of lectures started in 1879 as result of Arnold's involvement with an education reform act being debated in the Parliament. Arnold's speech was "to reemphasize the moral dimensions of education which he thought modern science ignored" (Roos 1977, 317). The following year, Huxley had a chance to publicly reply to Arnold's liberal education by delivering a speech on "Science and Culture", in which he stressed that only through the "scientific method" one can reach "truth" (Roos 1977, 318). Their speeches were labeled controversial "debates" only after Arnold delivered his Rede Lecture at Cambridge in 1882 with his talk "Literature and Science" in which he emphasized a "distinction that art and literature pursue some eternal thing which is not "positive", that is, scientific." (Roos 320). The Arnold-Huxley controversy continued for another year, with Huxley responding to "Literature and Science" by supressing "any direct reference to Arnold" (Roos 321). Moreover, Roos points out that Huxley's speeches were marked by tones of sarcasm and disdain for the arts and literature, being "veiled threat to anyone who might want to challenge the expansion of science in

the modern world" (322). The Arnold-Huxley controversy left a legacy for the next generation in the irreconcilable differences between the liberal arts and the sciences.

The 'debates' resumed with C.P. Snow's famous lecture as aforementioned; subsequently, a humanities scholar, Frank Raymond Leavis, replied to Snow during an annual Richmond lecture in 1962, with the presentation "Two Cultures? The Significance of C.P. Snow" (Collini in Leavis 2013, 7), attracting the local mainstream media such as the BBC. Leavis' lecture has unleashed reactions among scientists and intellectuals from the English-speaking countries to the present day (Kagan 2009, Yudkin 2009, Hustvedt 2016). Snow-Leavis' disputes involving the two cultures referred to mostly literature (the canon and the classics/humanities) and sciences (natural);[17] in the long run, the two cultures have become an umbrella term encapsulating, problematically, opposing pairs such as subjectivity/objectivity, idealism/materialism, hermeneutics/experimental, qualitative/quantitative. Above all, the dichotomy has influenced mostly the methodologies used in the natural and human sciences, that is, quantitative and qualitative, respectively. The psychology scholar Jerome Kagan (2009) describes his memories of dealing with the tension between exact sciences (i.e. math and logics) and the humanities (i.e. arts) during his school years:

> As an adolescent I believed the verbal and mathematical arguments declaring that the Earth was round but suspect that I could have been persuaded to change my mind if new evidence led scientists to alter their opinion. But after I saw the picture of our planet taken from a spacecraft my commitment to its round shape became irreversible. Pictures are indeed worth a thousand words (33).

[17] Michael Yudkin revised the debates in a paper presented at a conference entitled "Revaluing Leavis", held at Downing College, Cambridge, 2009 (Leavis, 28).

The debates between representatives of the humanities and the sciences reflect economic, political, and cultural changes that have marked the educational ground in the western societies. For example, the current 'divide' between the two cultures seen in our higher education system stems from internal and external agents such as academic centers, research institutes, faculty departments, and government organizations that contribute to the compartmentalization of knowledge into specialized 'disciplines'. Individuals (e.g. scholars, researchers, professors, instructors, and students among others) are driven by their knowledge, interests, and 'aptitudes' to join a certain discipline to study it in isolation or in their own niche. Therefore, it creates a scholarly system that emphasizes reduction, fixation, localization, and closeness. However, for the past few decades, some scholars, mostly from a natural sciences background, have attempted to establish dialogue between the two cultures. Among those scholars, we can cite some feminist philosophers such as Sandra Harding, Donna Haraway, and Karen Barad who hold natural science degrees that work to their advantages in their attempts to develop a dialogue between science epistemology and feminist critiques. Based on these examples, I observe that natural scientists seem to be in an advantageous position in terms of navigating through humanities disciplines as the existence of pre-requisites are usually waived. For instance, a physicist may not face interdisciplinary obstacles to compose a poem about the cosmos; whereas, an English academic would face some constraints to write about the laws of thermodynamics, if they have not obtained previous knowledge of physics. Thus, the efforts to bridge the gap from the humanities perspectives may require immense efforts and perseverance, as some scholars have observed such as Siri Hustvedt, a novelist and English scholar. Siri Hustvedt is one of the very few in the humanities currently willing to deal with the challenges of bridging the two cultures divide. In her recent book, *A Woman Looking at Men Looking at Women: Essays on Art, Sex, and*

the Mind (2016) – a collection of essays drawing upon insights from both the humanities and the sciences – Hustvedt alludes to C.P. Snow's *The Two Cultures* by stating that "In the last decade or so, I have repeatedly found myself standing at the bottom of Snow's gulf, shouting up to the persons gathered on either side of it. […] Time and again, I have witnessed scenes of mutual incomprehension or, worse, out-and-out hostility" (Hustvedt, x). Hustvedt's tone sounds rather pessimistic as she predicts a weak reconciliation between the two cultures based on her experience of attending an 'interdisciplinary' conference at Columbia University, where neuroscientists and artists were invited:

> The scientists (all stars in the field) gave their presentations, after which a group of artists (all art-world stars) were asked to respond to them. It did not go well. The artists bristled with indignation at the condescension implicit in the very structure of the conference. Each bearer of scientific truth gave his or her lecture, and then the creative type, lumped together on a single panel, were asked to comment on science they knew little about. During the question-and-answer period, I made a bid for unification, noting that despite different vocabularies and methods, there really were avenues open for dialogue between scientists and artists. The scientists were puzzled. The artists were angry. Their responses were commensurate with the position they had been assigned on the hierarchy of knowledge: science on top, art on the bottom. (x-xi)

Hustvedt's perception of the conference reinforces an argument in which translation and research methods do not seem to be the effective tools to bridge the two cultures gap, as they get 'stuck' in their own specificities. Hence, Hustvedt believes that there are other "avenues" open for dialogue. This dissertation defends Hustvedt's view of opening other avenues to create a dialogue between both cultures so that humankind can benefit from an integral, holistic

development. This position should be neither seen as naïve nor as optimistic per se, since disciplines such as biology, chemistry, physics, etc. used to be considered 'natural philosophy' until the development of the modern sciences that were initiated in the 18th century.[18] Since then, an ongoing breaking-down into disciplines for the sake of specialization can lead to tribalism inside academia, as Hustvedt remarks: "The fragmentation of knowledge is nothing new, but it is safe to say that in the twenty-first century the chances of a genuine conversation among people in different disciplines has diminished rather than increased" (x). Furthermore, the belief that humanities have lost their importance in society as a result of some postmodern theories that emphasise an anti-scientific posture, with an impact on research methods by discrediting the value of methodology is shared among some scholars (cf. Kagan 227). For this reason, we may not find many scholars from the humanities attempting to bridge the gap, and the very few that attempt to do it, have been misinterpreted by their peers due to an anti-science movement that has started since the 1960s. Thus, this dissertation tends to side with the very few current humanities scholars that attempt to establish an authentic dialogue between the two cultures through value, appreciation, and respect, rather than through skepticism and rancor that may hinder the relationship, or through a dose of naivety that may misguide a dialogue.

Yet, published work in the unification of the two cultures appears more often among natural science scholars. Here, I briefly explore a couple of ideas that have been well received among scientists. The socio-biologist Edward Wilson's *Consilience: The Unit of Knowledge* (1998), defines the notion of consilience based on William Whewell's use of the word, in 1840, to "a jumping together of knowledge by the linking of facts and fact-based theory across disciplines to

[18] The scholar Nicholas Maxwell has addressed the two cultures divide with much breadth and depth along his decades of scholarship; his recent works discuss the crisis across the sciences (human and natural) as a result of educational institutions not moving from knowledge to wisdom inquiry (i.e. humanistic science). See: Maxwell, Nicholas. *From knowledge to wisdom: A revolution for science and the humanities*. Pentire Press, 2007.

create a common groundwork of explanation" (Wilson 8). Another scientist is Stephen J. Gould, also a biologist (paleontologist) who has vocalized his interested in 'bridging the gap' between the two cultures in his work *The Hedgehog, the Fox, and the Magister's Pox: Mending the Gap between Science and the Humanities* (2003). Gould writes in response to *Consilience*, as he argues that Wilson's view of consilience is based on reductionism, as the author states:

> This form of unification by reduction joins the humanities to the sciences by granting them topmost positions as empirical studies of maximally complex and various systems, but then asking them, as it were, to "trade" the virtues of the penthouse for what many people and institutions have long and fiercely regarded as the most inalienable of respectful attributes: independence. For, to gain the geometric summit, the humanities must submit their distinctive phenomenologies to explanation by reduction to scientific principles regulating the component parts of their maximal complexity. (247)

Gould's major criticism of Wilson's notion of consilience lies in limiting the humanities to empirical scientific methods that prevent the humanities to keep their identities and methodologies. In this vein, Gould remarks that "The sciences and humanities have everything to gain (and nothing to lose) from a consilience that respects the rich, inevitable, and worthy differences, but that also seeks to define the broader properties shared by any creative intellectual activity" (258). Gould expands the notion of consilience taken from Whewell into a pluralist perspective, in which both the humanities and the sciences keep their own methodologies and approaches to construct knowledge. Nevertheless, he does not clearly illustrate how this consilience can be applied, keeping his arguments to abstractions of an ideal joint venture to mind the gap, instead of mending it.

Not only have life science scholars been interested in mending the gap between the two cultures, but also physicists and chemists who have been engaged in those discussions for some time. For some experts, the gap is getting narrower, as it may appear to the Nobel Laureate chemist, Ilya Prigogine, who had an optimistic view of reuniting the two cultures. This is illustrated in an inaugural lecture he delivered under the title "The Arrow of Time" for a workshop on "The Chaotic Universe" held in the city of Pescara, Italy (1999).[19] Prigogine states:

> But I believe that philosophy and science are connected; they're both expressions of human culture, and you cannot make philosophy without taking into account the science of your time, or do science without understanding what are the problems, which are of interest to your contemporaries. I even feel that in some sense the philosophers and artists and writers have anticipated what is happening now. For example, Kandinsky or Duchamp repeat "Determinism cannot be true," and André Breton goes even so far as to state, "We should destroy laboratories because laboratories are giving us a false idea of men and of their existence."[20] (n. pag.)

Prigogine identifies that the two cultures have always been entangled, one interconnected with the other, as they build shared knowledge from different dimensions. Nevertheless, they have been separated to fulfill the needs of third parties (e.g. universities, research centers, government and industry incentives and grants). He also recognizes the role of different 'languages' in knowledge construction. For example, he describes that the language of classical sciences once

[19] For Prigogine's keynote lecture see: Gurzadyan, Vahe G., and Remo Ruffini, eds. *The Chaotic Universe: Proceedings of the Second ICRA Network Workshop*, Rome, Pescara, Italy, 1-5 February 1999. Vol. 10. World Scientific, 2000.

[20] For the full lecture, please see http://www.icra.it/publications/books/prigogine/motivation.htm.

based on the geometry is now shifted to 'narratives'. Prigogine remarks that "Now science becomes more a narration and the world appears more like a construction; a construction which is going on since the big bang" (n. pag.). He considers his scientific work an example of reconciliation of the two cultures by affirming that "In some way I see my own work as the work of reconciliation. I wanted to show that the direction of time can be inserted in the microscopic level of dynamics, and therefore, the famous dichotomy between the two cultures, between people like Heidegger and Einstein, loses its sense" (n. pag.). Thus, by considering the "arrow of time" in his work on natural sciences, Prigogine believes that this is a way of reconciling the two cultures.

Furthermore, in one of his public talks, "Only an Illusion" (1982), available on the website "The Tanner Lectures in Human Values", Prigogine implies that reconciliation should be based on a dialogue between natural sciences and the humanities, from which a fruitful outcome may emerge. Moreover, Prigogine believes that a "new dialogue of man with nature" is possible because it is not limited to "reversibility and deterministic" views (46) that would impair such interaction. Thus, inspired by Prigogine's vision, this dissertation attempts to reconcile the gap between the two cultures through a mutual dialogue by examining the neuro-autobiographies as a space for reconciliation and transdisciplinary growth.

The philosopher David R. Griffin endorses Prigogine's reconciliation by stating that Prigogine's understanding of the two cultures gap has nothing do with the fact that "scientists have not read enough humanities and humanists enough science, but that there has been nothing in common between the two worlds" (1986, 16). Griffin reinforces Prigogine's position by emphasizing that "what lies at the root of the cleavage is the fact that humanities and social sciences are timely oriented, whereas "classical science has been non-temporal" (16). Thus, for

both Griffin and Prigogine, it is the presence and absence of time that would separate the two cultures; while the humanities is time oriented as seen in traditional narratives, history, and anthropology, natural sciences are atemporal focused on lab experiments that are detached from social contexts.

Moreover, Griffin justifies Prigogine's arguments by remarking that "…this non-temporal view has been part and parcel of an alienating science that has portrayed a dead, debased nature, creating an inevitable opposition between humanity and nature" (16). In this view, time becomes a fundamental marker in establishing dualism, and to overcome it (e.g. matter/non-temporal and life/temporal) Griffin argues for an "enlarged science with a new idea of time" so that a new concept of matter can be established, "capable of 'perception' and 'communication" (16). Thus, this new emergent science searches for a new 'alliance' between the humanities and the sciences, which stresses a "nondeterministic process, in which there is intrinsic randomness" (Griffin 17). Griffin's position may side with one of Prigogine's main concepts, the 'irreversibility' of time. It would be interesting to explore in further investigations how this concept could orient the humanities in narrative studies (e.g. life-writing, history). In this dissertation, for example, the neuro-autobiographical accounts deal with women's lived experiences about their neurological conditions as a dynamic process that has a transformative function, and for this reason, time becomes 'irreversible'; however, once those experiential moments are translated, narrated, and performed, they become 'abstract', or "artificial" in Prigogine's term, or even better, "conceptualized", and therefore, "simplified to make them conform to the conceptual tools of a reversible dynamics" (Griffin 19). In this vein, this dissertation suggests that Prigogine's notion of irreversibility can be an essential element to consider in narrative studies especially in life-writing in order to examine changes and turning-points in one's life.

1.3 Can We Bridge the Gap?

One of the challenges to narrow the gap among disciplines is to translate key concepts from one discipline to another within the same 'clusters' or fields (e.g. from physics to chemistry). The work of translation becomes even a herculean effort when dealing with disciplines that belong to distinct fields (e.g. from life sciences to humanities). Most of the time, the act of translation may prefer a connotative (e.g. metaphor) use of a key concept in the target discipline to support a semantic-pragmatic force. For example, the notion of 'entanglement' (cf. Schrödinger) used in physics to objects that are distant but connected at the same time may not find an equivalent concept in the humanities.[21] Therefore, there is a tendency to keep its morphology 'as is', and to use it metaphorically, as a trope, when referring to situations that are 'entangled', that is, interwoven and independent of time-space constraints. An example of entanglement 'travelling' to the field of the humanities can be seen in the following book titles: *Entanglements, or Transmedial Thinking about Capture* (Chow 2012), *Archaeology of Entanglement* (Der and Fernandini 2016) and *Literary/Liberal Entanglements: Towards a Literary History for the Twenty-First Century* (Harol and Simpson 2017). In those examples, the metaphorical use may 'subvert' or misrepresent its denotative meaning, which may not collaborate with the process of narrowing the divide. In this case, the conventional translation of words or concepts from one discipline to another may not be an effective method of reconciliation. Thus, to work on a

[21] In quantum mechanics, entanglement, as in Erwin Schrödinger's translation of *Verschränkung*, refers to two separate particles that interact at a distance as he defines: "If two separated bodies, each by itself known maximally, enter a situation in which they influence each other, and separate again, then there occurs regularly that which I have just called entanglement of our knowledge of the two bodies" ([1935] 1980, 332). See Trimmer's translation for Shrödinger's paper.

possible dialogue between the two cultures alternative methods should be explored, as it is discussed next

Some scholars in the humanities and social sciences have attempted to bridge the gap by adopting 'scientific methods' from the natural sciences into their research design. For example, psychology has adopted a rigid research methodology solidly based on statistical methods (e.g. SPSS software and R), experimental methods (i.e. controlled group, placebo effect, etc.), and more currently, brain imaging techniques used in neurosciences, such as fMRI (neuropsychology). Sociology also applies similar research methods that can combine quantitative and qualitative tools such as statistical software, focus group, surveys, and ethnography.

The differential among disciplines might bring us to a current notion of the "three cultures" as referred in Kagan's work, where he reviews Snow's *The Two Cultures* in his book *The Three Cultures* (2009) by including social sciences as a third group separate from the humanities since they have been ignored in Snow's writings. Kagan's book deals with a brief history of sciences, with a focus on Newton's ideas during the Enlightenment when natural sciences and philosophy were still entangled. The author delineates the changes over the last two centuries when the disciplines got compartmentalised and became dependent on technology. The bifurcation of the three cultures became clear during the 20th century, when the humanities started losing ground in the academic setting and society; the divide became visible once dialogue was muted. Kagan states that the lack of dialogue was because "concepts in the social sciences and the humanities refer to emergent phenomena that cannot be described with the vocabulary used by natural scientists" (14). The author recognizes that the inability to translate concepts from one culture to another is likely to be attributed to the lack of equivalence between the two cultures as both

require "their own vocabulary" to describe a concept or phenomenon. To defend this claim, Kagan stresses that emotions (e.g. fear) and cognitive functions (e.g. recall) cannot be translated into a statement (i.e. be verbalized), "the meaning psychologists attribute to the terms remember, count, or fear cannot be replaced with statements referring only to brain states or structures" (14). As aforementioned, the translation of key concepts becomes a recurrent issue (e.g. untranslatability) which may widen the gap, and eventually, may hinder a dialogue between the two or even three cultures. Nevertheless, Kagan's identification of a 'third' culture is yet to be fully acknowledged by national research associations; as for utilitarian reasons, allocation of funds and grants are usually towards the cluster 'the humanities and social sciences'. Due to this, the expression 'two cultures' is preferred throughout this dissertation.

By trying to narrow the gap between the two cultures, some scholars in the humanities and social sciences have started collaborative work outside their fields so that they can equip the humanities (e.g. literature) with some 'robust' scientific research methods (e.g. statistical programs and experimental models). To illustrate this trend, I cite some academic associations such as IGEL and IAEA, [22] with members mostly from literature, arts, and psychology, carrying out quantitative experiments to analyse reader's/audience's responses to literature, arts, and media, instead of taking solely an interpretative approach (e.g. hermeneutics) commonly used in the humanities.[23] Currently, the expansion of cognitive studies towards literature and art push psychology and literature scholars towards neuroscience through research methods such as brain

[22] For further information see websites for the International Society for the Empirical Studies of Literature and Media (IGEL) and the International Association of Empirical Aesthetics (IAEA), respectively: https://www.igel.uni-goettingen.de/ and http://www.science-of-aesthetics.org/

[23] Since scholars involved in 'empirical studies' of literature, media, and arts have borrowed research methods outside the usual practice in the humanities, I cast the following questions: Should the humanities keep its own research methodological tools and traditions, or should start borrowing them from other sciences? How to prepare prospective scholars in the humanities to creatively use research tools and methods that are simultaneously considered valid and accredited by the academic and scientific communities on a global level?

scanner in order to 'visualize' and 'map' an individual's brain while interacting with a literary text or a piece of arts. Brain scanners such as fMRI have attracted collaborative projects with multidisciplinary researchers (e.g. neuroscientists, psychologists, music, literary and media scholars) to investigate human brain activities such as emotions in response to literary work, film, TV commercials, arts, and others.

Considering the growing interest in using brain scanners in reader response research, I raise the following questions: Is it possible that brain imaging techniques become a research method capable of narrowing the gap between the humanities and the natural sciences to eventually foster an 'authentic' dialogue? If this is the 'technological' direction humanities should take in terms of research methods, what will be the implications for future scholars in the humanities? For example, should we start taking a brain imaging crash-course such as "Principles of fMRI course" to be neuroscience literate? The probability of a positive answer may score high since free introductory courses are already available online for a lay audience .[24] However, as discussed previously, many humanities scholars are likely to be averse to incorporate scientific methods such as brain-imaging into their research practices because it is not the tools that should guide a research design, but its inquiry.

Whether the use of a brain scanner as a popular research tool in the humanities may seem too futuristic or inconceivable, the dialogue between the two cultures should not be delayed. For this reason, this dissertation takes a step forward by fostering a dialogue between the humanities and the sciences through the reading of neuro-autobiographies based on theories of complexity thought, which are themselves transdisciplinary as they draw on both human and natural sciences knowledge.

[24] See link for an online course on brain imaging accredited by American National Health Institutes and Organizations: https://fmrif.nimh.nih.gov/course/2017/01_Bandettini_20170602

The vernacularisation of the neurosciences has indirectly promoted a reencounter of the humanities and social sciences with life sciences by attracting scholars from different disciplines in the humanities (e.g. philosophy, literature, political sciences, and arts) to collaborate with neurosciences, cognitive studies, and medical studies. This collaboration is still very insipient and isolated from the mainstream education system that rules across humanities associations and graduate programs. The reticence is seen among scholars such as Malabou, Rose and Rose, and Vidal who consider this liaison with skepticism as seen in their critique of brain research studies. They not only understand neurosciences as a product of neoliberal practices, but also as a new 'philosophy' that denies the 'personhood' in favour of "brainhood" (cf. Vidal 2009). In other words, the 'soul', 'mind', and the 'Self' are reduced to a materialistic perspective, as seen in the following examples: "my fMRI is me" (Rose and Rose 2016, 35) and "You are just a brain" or "I am my brain", in online popular science magazines and blogs[25]. Although the autobiographies studied here may be seen as a by-product of neoliberal trends (e.g. self-marketing), their value lies in bringing back the notion of personhood and selfhood amid the modern neuroscience research that currently holds a reduced notion of a disembodied brain.

Despite being vulnerable to criticisms from their cohorts, very few humanities scholars such as Polvinen (2017), Philips and Rachman (2015), and Miall (2006) have attempted to mend the gap by adopting a 'language' of the privilege, that is, the neuro/sciences. The evidence is the quantitative research methods those scholars choose (e.g. experimental design, brain imaging techniques, and statistical analysis) over qualitative approaches in the humanities (e.g. ethnography, focus group, and textual analysis). There is no doubt, however, that a collaboration

[25] See links for respective examples:
https://www.newscientist.com/article/mg22029450-200-the-benefits-of-realising-youre-just-a-brain/
https://larvalsubjects.wordpress.com/2012/03/08/i-am-my-brain/

with the neurosciences can benefit the humanities to regain their social value by means of re-contextualization. In other words, a 'robust' research methodology can confer to the humanities some degree of 'validity' and 'credibility' when facing hard-core scientific communities and funding agencies. Nevertheless, a robust and reliable research methodology such as lab experiment is likely to be frown upon by most humanities scholars who side with interpretive research approaches (e.g. hermeneutics) to distance themselves from positivist traditions.

Despite this, some recent attempts towards a 're-contextualization' of the humanities through a 'robust research' have been observed. For example, two humanities scholars, Phillips and Rachman, have conducted an experiment with fMRI to examine student-volunteers' brains while reading Jane Austin as seen in their article "Literature, Neuroscience, and Digital Humanities" (2015). Their research illustrates that Snow's 'unbridgeable gap' between the humanities and sciences has become outmoded. The two researchers have relied on a multidisciplinary team to conduct the investigation, although they have emphasized that the orientation should come from the humanities to neurosciences. They remark that humanities researchers should look "precisely for a mode of analysis that is also a mode of critique that seeks to clarify the manifold ways that experimental practices, techniques for visualizing neuroscientific results, and the popular tendency to read brain images as facts require careful framing and interpretation" (315).

By including fMRI as a methodological tool in empirical studies of literature and media, the scholars recast themselves as "literary neuroscientists", making it appear to be 'the next big thing'. Despite the novelty in terms of method and tools, their research question which is based on reading for pleasure and for education/formation does not sound original; this type of question has been already under investigation among reader response researchers through more

'traditional' methodological tools such as questionnaires and interviews. [26] However, what seems original is the visualization and mapping of the sections in the brain where certain neurons fire when participants engage in reading classical novels. The authors argue that "rather than using literary neuroscience to critique traditional humanistic practices, such as close reading, our experiment explores its complexity, finding new ways to demonstrate the cognitive intricacy and value of teaching literary analysis" (319). In other words, they use neuroscientific innovations to prove that 'traditional' reading practice such as close-reading still has its place in the teaching and learning of the humanities since such reading skill requires from readers a certain level of "focus and concentration" which are important cognitive functions necessary to perform many activities in the everyday.

Despite their enthusiasm towards experiments that can lead to a dialogue between the humanities and the neurosciences, the two researchers emphasize the use of technology (e.g. brain scanner) over participants' behaviour while reading for pleasure and or for learning; their reading experience does not seem to have received equal attention. [27]Although brain scanners in a neuro-humanities experiment can give an academic community a sense of 'rigorousness', they can be easily misevaluated by the technological supremacy that overpasses participants and researchers. In this regard, neuro-humanities researchers should be aware of the neuro-lab context with its 'robust procedures' that are set in artificial environments where participants are requested to perform certain tasks under certain rules so that data can be collected, organized, and

[26] One example among many others was a reading response project conducted during 1999-2000 between German and Brazilian undergraduates in terms of reading classical literature for pleasure and for education, led by Prof. Zynger from the Federal University of Rio de Janeiro, and Prof. Achim Barsch from Germany; a project in which I was one the research assistants. Later, the project was expanded to include Canadian undergraduates led by Prof. Miall and Prof. Kuiken from Alberta University.

[27] It does not account for a combination of reflective approach (e.g. think-aloud protocol experiment) in which participants could express themselves with more 'agency'.

manipulated by sophisticated computational programs. For the sake of scientific rigor, participants' agency is likely to be ignored. Moreover, by electing brain imagining as a methodological tool in the neuro-humanities or 'literary neuroscience'– due to its capacity to replicate findings – researchers might fall into the trap of being guided by tools rather than by research questions that are based on human beings' needs and problems. Following this train of thought, a humanities scholar Patrick C. Hogan (2014) notes that brain imaging methods can have a significant role in the intersection of the humanities and the sciences, but he carefully advises that such methodological tools can favour neuroscientists mostly. In his article "Literary Brains: Neuroscience, Criticism and Theory", Hogan states that "the brain imaging of literary response is a neuroscientific pursuit, even if it is one that takes literature as its object. Put simply, it is and will be done in neuroscience departments, not in literature departments" (302). Thus, as shown here, the attempts to bridge the gap between the two cultures lead to asymmetrical relations. Although there is a tendency to privilege the neuro/scientific methods (e.g. brain imaging techniques) over the ones used in the humanities due to its novelty and methodological preciseness, they may seem impractical to expand across the humanities since brain scanning methods are expensive, require specialized technicians and lab resources, and provide limited scope to research questions beyond brain functions.

The brain-imaging technology as a contributing element to the advances of neuroscience has also been an object of discussion among the neuro-autobiographies explored in this dissertation; the narrators refer to the use of brain imaging technology as an objective tool to diagnose their neurological conditions. Temple and Jill highlight the technological advances that have taken place in the neurosciences to assist with their diagnosis , whereas Siri and Francesca are concerned about doctors' dependence on technological tools in their clinical practices. The

autobiographers' positions concerning neuroscience and its technology will be further explored across Chapters Four and Five. As a final note, in Chapter Six, I provide an alternative to the question of the two cultures by proposing a course on Vernacular Neurosciences to undergraduate students in liberal arts and sciences. I discuss how the teaching and learning of neuro-autobiographies can be a starting point to promote a neuroscience literacy to undergraduate students through a transdisciplinary curriculum.

1.4 Modern Neurosciences

This section deals with the development of the modern neurosciences as an academic discipline that emerged during the 20th century. One could attribute the development of neuroscience as primarily a history of human brain while leaving the term 'modern neurosciences' for what it became in the 20th century: a multidisciplinary subject that according to Shepherd, "It is not one discipline but many, spanning virtually every field of learning, from physics and chemistry to psychology and sociology to philosophy, politics, and religion" (2010, 2). In turn, the traditional history of the brain can be traced back to the old civilizations, such as the Ancient Egyptians and Greeks. For example, during the Greek period, concepts such as memory, perception, and emotion had already appeared in the work of Hippocrates, Plato, and Aristotle among others (Wickens 2015). Here, Hippocrates should be highlighted because he was the first physician to understand that emotions were processed in the brain rather than in the heart as most of his cohort used to believe. He thought that epilepsy, for example, was a disorder of the brain, an organ in which emotions and intellect were processed. Since then, empirical and theoretical studies about the nervous system have been humbly developed and recorded in the western world. Yet, it was during the 19th century that clinical studies of the nervous system

gained some momentum due to the advances in biological science technology. Despite this, studies about the brain were restricted to a traditional method of post-mortem, a disembodied method that emphasized the brain simply as an object of inquiry detached from a human being. Moreover, brain studies were influenced by phrenology during the first decades of the 19th century, but it was soon rejected as a "pseudoscience" (van Wyhe 2004, 4) that focused on the relationship of the skull with human behaviour; for example, a bump on the skull or an odd shaped-head could be related to one's personality (Satel and Lilienfeld 2013, 10). Phrenology also considered a notion of localization, that is, certain areas in the brain were said to be responsible for specific functions. Although phrenology has been completely discredited, the localization principle is still "broadly correct and informs several important clinical practices today" (Satel and Lilienfeld 11), as seen in the practice of neuro-imaging which maps areas in the brain to certain functions, for instance, Broca's area (located in the inferior front gyrus in the left hemisphere) to some language processing (e.g. syntactic processing).[28]

By the end of the 19th century, neurology became an established discipline to study the nervous system (i.e. peripheral and central) and its disorders; its focus was on the nerve cell, neuron, as microscopic anatomy was evolving with the aid of technology, for example, the invention of stroboscope (Gazzaniga et al. 2002, 6). Hence, at the turn of the 20th century, two major branches came out of neurology: psychoanalysis and psychiatry. Modern neuroscience emerged as a third branch around 60 years later. One of the main differences between modern neuroscience and its older siblings is its origin: neuroscience was born in a laboratory, with a focus on brain research rather than on a clinical practice like neurology and psychiatry. This

[28] Broca's area is itself a contested region in the brain which has been named after Pierre Paul Broca, a 19th century physician who treated patients that suffered lesions in the left frontal lobe and became aphasic. See further discussions about Broca's area and speech production in: Grodzinsky, Yosef, and Katrin Amunts, eds. *Broca's region*. Oxford University Press, 2006.

distinction is important because modern neuroscience research is often oriented to understand both the 'healthy' and the 'unhealthy' brain; yet, neurology and psychiatry, for instance, are concerned with disorders and diseases in the nervous system of an unhealthy brain and mind (Northoff 2014, p. 75).

Not only did modern neurosciences emerge from life sciences and medical disciplines but also from information technology and cognitive studies in psychology. From the mid-1950s onwards the development of neuroscience has gone hand in hand with technology. For example, information theory lead by Claude Shannon in 1948 and cognitive studies contributed to the metaphor of the human brain as a computer, which "describes people as information processing systems, thinking as data processing, the brain as a powerful parallel computer, and memory as storage" (Pörksen 2014,138). The metaphor came out of the studies of European cyberneticists that used to participate in an annual conference known as the American Macy Foundation. The scientists Norbert Wiener, John von Neumann, Gregory Bateson, Heinz von Foerster were the founders and leaders of the American cybernetics during the 1950s.[29]

The idea of "information process" influenced the biological and neuroscientific perspectives of the nervous system as a "communication machine", meaning that "the neuron—is an entity that transmits information along its axon to other neurons, using a neural code" (Christen 2008, 208). Thus, the notion that information (e.g. sensorial, motor) travels through the neurons via synapses (i.e. inter-connections) in order to be 'gathered', 'transformed', 'imprinted', and 'translated' (cf. Oyama 2000) reinforced an understanding of the human brain as a computer,

[29] Christen explains that "The Macy conferences—organized by the Josiah Macy, Jr. Foundation between 1946 and 1953—are widely acknowledged as one of the first attempts to establish interdisciplinary cooperation between scientists of different fields in the general context of cybernetics and systems theory. Topics related to neuroscience were regularly present on the agenda of the Macy conferences" (209).

debunking an old behaviourist metaphor that considered the brain a 'black box', without any knowledge of its internal functions.[30] The cyberneticists during the 'cognitive turn' seeded the grounds for the development of the computational neuroscience and for the current field of artificial intelligence (Gardner 1987).

Hence, modern neurosciences emerged out of the intersection of multidisciplinary subjects such as neurology, cognitive sciences, cybernetics, biology, and chemistry, among others. Modern neurosciences started taking shape as a discipline in North America after the establishment of the Neurosciences Research Program (NRP) set by Francis O. Schmitt, the Head of Biology, at the MIT in 1962 (Adelman 2010,15). According to Adelman, Schmitt put together an "assembly of eminent, worldwide scientists from various biological, medical, and physical sciences; all of whom were interested in the investigation of how the brain controls behavior, including the mental behavior of humans" (15). Schmitt envisioned a type of "Unity of Science" through the establishment of neurosciences, seen as a multidisciplinary subject, to tackle the question of how the mind/brain works. The NRP quickly grew out of the result of frequent academic activities that mobilized senior and junior scientists along with graduate students to participate in weekly meetings and activities such as disseminating an NRP bulletin, organizing intensive study program, and inviting guest scientists (Adelman 21).

In 1969, *The Society for Neuroscience* was founded, which motivated the creation of international neuroscience societies such as the *European Society of Neurosciences* and the *International Brain Research Organization* (IBRO). Despite their primary plan to create "Unit of Science" to bridge natural and human sciences, most of the scientists involved were from disciplines that ranged "from physics and sub molecular biology and genetics to the higher

[30] Oyama defines information as "a prime commodity, and when it is used in biological theorizing it is granted a kind of atomistic autonomy as it moves from place to place, is gathered, stored, imprinted, and translated" (2000,1).

reaches of behavior, cognition, and psychiatry" (Adelman 22), leaving behind the humanities, more specifically, philosophy. To illustrate the development of modern neurosciences, see figure 2.

Metaphors and analogies have helped scientists to identify theories that underlie the brain studies; once during Newtonian period, human beings were associated with the notion of 'machine' as seen in *L'Homme Machine* by the French philosopher Julien Offray de la Mettrie, published in 1748; two hundred years later, the brain was compared to a 'black box', a metaphor used due to the popularity of the works by a Russian physiologist, Ivan Pavlov and an American psychologist B.F. Skinner. Subsequently, modern neurosciences have been widely associated with 'computer' due to the influence of cybernetics and Artificial Intelligence. Currently, there is a growing trend to move from a machine metaphor of the brain to biological and ecosystem analogies (e.g. 'brain as muscle', 'brain as a network', respectively), inspired by the advancements on neural plasticity and interconnectivity research. The former neurologist and writer Oliver Sacks explained that brain network function as:

> more than an assemblage of autonomous modules, each crucial for a specific mental function. Every one of these functionally specialized areas must interact with dozens or hundreds of others, their total integration creating something like a vastly complicated orchestra with thousands of instruments, an orchestra that conducts itself, with an ever-changing score and repertoire. (104)

The representations of the brain have shifted alongside the development of modern neurosciences, ranging across structure, system, modularity, and network. At a micro level, neuroscience, more commonly studied as neurobiology, focuses on anatomical structures, neuron system (i.e. nerve cells), and synaptic connections (i.e. interconnectivity), which have triggered

humanities scholars to develop a critique of the consciousness and the 'self' against a biologically oriented concept. The neuronal-identity and consciousness based on neuroscientific research has motivated humanities scholars to critically examine the construction of self-identity based on 'neuronal self' and 'neurochemical self', as seen in the work of Pitts-Taylor (2010) and Nikolas Rose (2003), respectively. Parallel to it, I have a working-in-progress paper about advertisements of portable neuro-wearable devices to healthy population in which I identify the self as a 'neurotech-self'.[31]

There is no doubt that the entanglement between (neuro)sciences and technology has contributed to a paradigm shift influencing research and methodology in the studies of the brain, leading to a promising field of 'neurotechnologies' that humanities scholars should not ignore. The entanglement of neurosciences and technology has led to what Hilary Rose and Steven Rose call "neurotechnoscience" (2016, 18), influencing not only the types of tools used in a neuro-lab research but also their applicability to our society. In the case of brain imaging techniques, visual representations of the brain sustain a prominent level of scientific authority, as Crawford remarks: "there is no arguing with a picture of a brain" (2008, n/p). This type of 'rhetorical' authority is used as an 'oracle' that influences courtroom decisions, public policymaking, and psychiatric assessments (Beaulieu 2002; Restak 2006; Meynell 2012).

This dominating aspect of the visual as an epistemology of brain imaging has reinforced scientific objectivity and has created its own discipline, known as neuroimaging. As a response to

[31] Valente, Andrea C. "Online Advertisements of Personal Brain Wearables in the Everyday: *Click Here, Learn More*!" *International Association of Dialogue Analysis (IADA) Conference 2017*, Universita di Bologna, Italy, October 11-14, 2017.
Valente, Andrea C. "Can Brain Wearables Hack your Mood? Ethical Concerns in Neurostimulation Devices". *Communication Ethics Conference*. Duquesne University, Pittsburgh, June 2-4, 2016.

its development, studies in neuro-ethics have grown in importance as well (Illes et al. 2005; Roskies 2008; Farah 2010). As aforementioned, the brain imaging technology has played a significant role in the development of the modern neurosciences by influencing a 'paradigm shift' on how brain research has been conducted. Despite achieving prestigious status, modern neurosciences stir tensions among scholars and researchers in terms of objectivity and subjectivity. One of them is the evidence-based research supported by brain imaging techniques which have overwritten researcher's interpretations and physicians' clinical eyes as Dumit reports in his ethnographic research conducted inside a neuroscience lab (2004).[32]

Yet, endorsed in popular science journalism, neuroscientific research is simplified, and it creates a false impression that brain imaging techniques work similarly to an X-Ray, omitting the fact that they are created out of complex statistical map readings. This is likely to send mix-messages to general readers who may think that brain images stem directly from individuals' brain scanning, and not through software interpretations.[33]

The success of brain imaging techniques in the scientific and vernacular contexts is justified by the authoritative status that visuals have acquired in our culture. According to Ortega and Vidal (2011), privileging brain images in clinical diagnosis "as tools for compiling and communicating information" to a lay audience creates a necessary belief that "scientific images represent reality in the mode of mechanical objectivity [to be trusted]" (15). Moreover, the authors observe that recent representations of the brain as the most important human organ as

[32] Although images can convey themselves authority and objectivity, their meanings can only be tagged by researchers or neuro-specialists who are in the position of experts to interpret and translate scanned brain images to a lay audience or a patient.

[33] Not only has brain imaging technology being recently explored in popular science media but also in legal settings. For example, there has been a growing practice of using neuroimages in courtroom decisions, which may lead to serious implications to the accused. To avoid misuses or misinterpretations, brain image technology should be a complementary tool rather than a single resource to judge an individual's life future.

promoted in popular culture have fostered an emergent neuro-culture movement with proponents not only from neuroscientific circles but also from lay groups such as artists, novelists, and filmmakers. Since visual representations of the brain have become dominant in our society, we cannot ignore the fact that the neuro-culture movement has contributed to the vernacularisation of the neurosciences to a certain extent.

As a research tool in neuroscientific studies, neuroimaging technology translates brain pictures into a variety of diverse brains, ranging from a 'normal' to a 'schizophrenic brain', as if neuroimaging technology were autonomous to translate images with objectivity against researchers' subjectivity.[34] The authority of the mechanical objectivity has important overtones for psychiatric diagnosis, developments in the pharmaceutical industry, verdicts in the courtroom, and disability policymaking, which are all entangled with the politics of life in our society, known as 'bio-politics', limiting individuals' agency over their own body.

In contrast to neuroimage technology, the emergence of neuro-autobiographies enables self-narrators to restore their agency over their body, brain, and mind, by expressing their volitions, decisions, and choices. The neuro-autobiographies communicate neuroscientific knowledge based on autobiographers' experiences of their neuro-disorders, prevailing subjectivity over objectivity; a subject matter further explored in Chapter 3.

This brief review of the modern neuroscience since the 20th century shows a strong dependence on incentives and technological advances to foster its development beyond scientific clusters. Modern neurosciences received national projection in North America after the

[34] Mathis observes that "neuroscience is no foolproof ticket to true knowledge" (342), an assertion that reveals the tension between the objectivity of the scanned image and the subjectivity of the researcher's interpretation. This tension in neuroscience is seen when researchers struggle to find a consensus on how to interpret the findings of an empirical research.

presidential proclamation of the Decade of the Brain with the goal to educate the population on mental health issues as stated on the presidential website, "to enhance public awareness of the benefits to be derived from brain research".[35] More recently, the brain has received a recognition boost on a global level with the recognition of the 'Century of the Brain' (Yuste and Church 2014). In 2013, the White House government administration launched an initiative called BRAIN (Brain Research through Advancing Innovative Neurotechnologies),[36] granting millions of dollars to leading technology firms, research institutes and universities. Likewise, in Europe, a similar project has been developed known as European Human Brain Project, which has also mobilized millions of euros to support brain studies across public and private institutions.[37] If we are to live in the century of the brain, with modern neuroscience guiding the future of humanity, we must become 'literate' in this new interdisciplinary subject, by reading it critically under the lens of ethics and scientific reasoning, as well as, by valuing narratives told by individuals with neurological disorders so that we can benefit from genuine advances of brain studies and their applications to society in a holistic manner.

I began Chapter One with a personal anecdote to illustrate my interaction with modern neuroscience as a humanities scholar attending a neuroscientific conference for the first time. This personal account shows that we are divided by two cultures. In this manner, in the following section of the chapter I identified and reviewed an ongoing debate between the two cultures and explored how the two-cultures divide may influence our perceptions of modern neurosciences. Last, I reviewed the development of modern neuroscience as a discipline throughout the

[35] *Decade of the Brain: Presidential Proclamation 6158 (Library of Congress)*. http://www.loc.gov/loc/brain/proclaim.html. Accessed 13 Feb. 2015.

[36] *Brain Research through Advancing Innovative Neurotechnologies (BRAIN) - National Institutes of Health (NIH)*. https://www.braininitiative.nih.gov/. Accessed 4 Dec. 2017.

[37] *Human Brain Project Home*. https://www.humanbrainproject.eu/en/. Accessed 4 Dec. 2017.

twentieth century and examined how current technology (e.g. neuroimaging) has boosted brain studies through ‘neuro-technoscience’ and has contributed to its popularity outside the laboratory setting.

Figure 1: Poster 2016 "Advertising and Articulating Neuroscience: Human Brain in Performance on Commercial Ads"

DEVELOPMENT OF MODERN NEUROSCIENCES

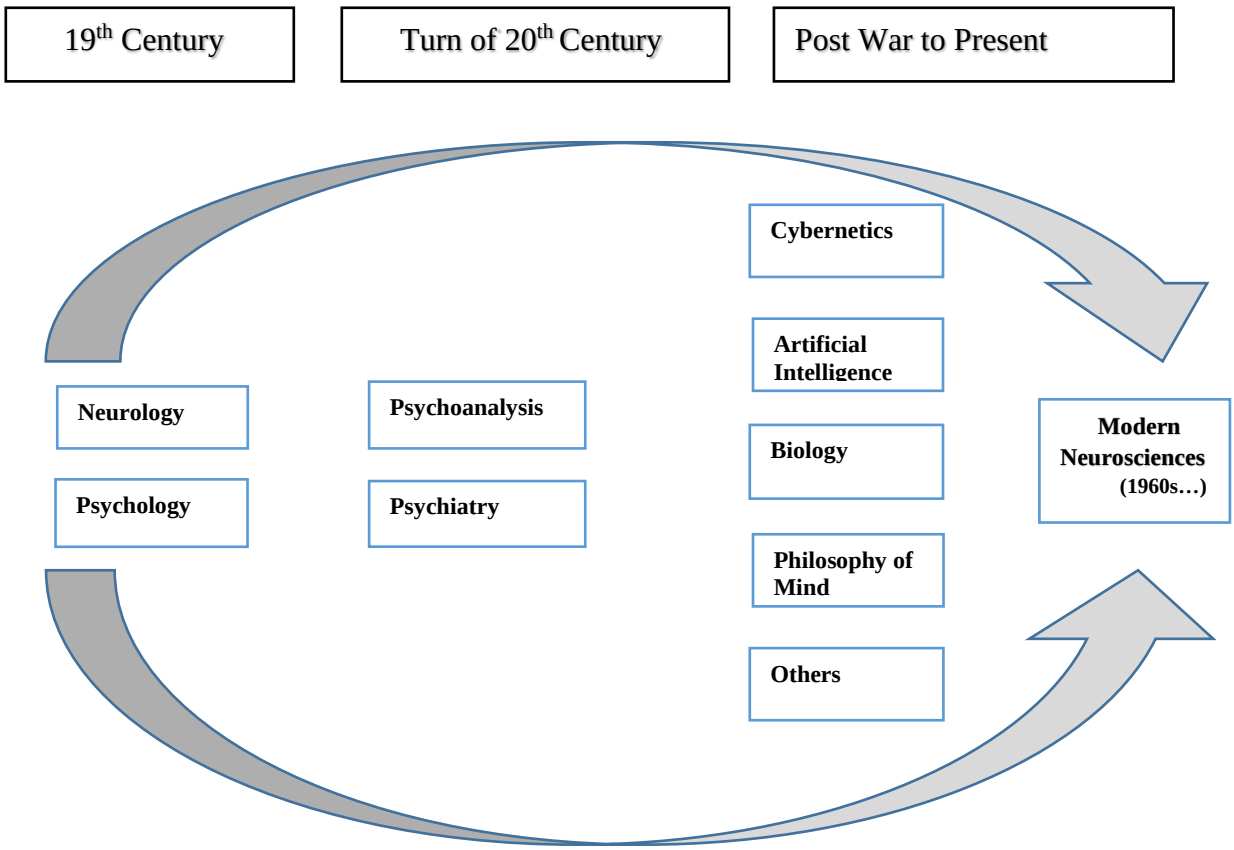

Figure 2: The Development of Modern Neurosciences (©Andrea C. Valente)

CHAPTER TWO: The Vernacularisation of the Neurosciences

2.1 Communicating Neurosciences Today

As seen in Chapter One, institutional incentives and technological advances in neuroimaging techniques have proven to be a catalyst for the development of the modern neurosciences, contributing to their popularization outside labs by reaching out to a non-specialized lay audience. Moreover, as modern neurosciences become the 'next big thing', or in other words, the new 'philosophy' for the 21st century, it is paramount to communicate and disseminate scientific breakthroughs and 'neuro philosophies' that hard-core neuroscientists have debunked, such as 'free will', 'consciousness', and even 'mind'. Natural science communication has traditionally used two major channels to disseminate its findings: one that is 'authorized' by the scientific community through specialized writing and speech (jargon), such as research articles and conferences talks; and the other one that is endorsed by journalism (old and new media) through a vernacular language (written and oral) usually used in popular science magazines, documentary films, and TV programs. Neuroscience communication has followed similar channels and media; nowadays, however, the vernacular channels have become part of a complex mediatised system that disseminates neurosciences not only through verbal expressions (e.g. storytelling practices, graphic novels, cartoons, etc.), but also through brain artifacts, installations, performance, fashion, and even personal brain-wearables. Such manifestations are part of a socio-cultural-economic phenomenon that I call the 'vernacularisation of the neurosciences' which involves complex dynamic communication systems in which various agents are engaged in the process of production, circulation, and consumption of everyday practices of the neurosciences to a lay

population.[38] For example, in self-help literature, a growing trend in personal stories narrated by individuals with mental illness and neurological conditions have attracted many readers. In art installations brain motifs and paintings have become another trend that brings neuro-specialists, artists, and curators together. Recent wearable technology such as brain wearable devices has been marketed to healthy consumers as an alternative practice to enhance one's cerebral functions and to help relax one's mind. Thus, the vernacularisation phenomenon enables an intersection between the neurosciences and the humanities through communication systems that include various media and contexts across our society.

Bearing this in mind, Chapter Two explores the term vernacular and its variations (e.g. vernacularisation) by borrowing the term as seen in applied linguistics in order to understand its semantic-pragmatic implications when used in conjunction with the everyday practices of neurosciences outside a scientific environment. Moreover, this section recognizes the process of vernacularisation as a response to neuroscientific communication and as a by-product of neuro-culture movement. Last, it discusses humor as a specific rhetoric and discursive marker in vernacular texts and practices as explored in the neuro-autobiographies in this dissertation.

2.2 Vernacular Practices

The use of the term vernacular in this dissertation is borrowed from studies in applied linguistics, more specifically from sociolinguistics which relates vernacular to non-standard language communicated in the everyday, in opposition to a mainstream language usually used among institutions. In linguistic studies, vernacular is traditionally associated with dialectic

[38] The various agents consist of human and non-humans such as writers, publishers, distributers, readers, reviewers, message, object, and medium.

varieties, 'non-educated' forms, marginalized speech, and indigenous expressions. Most studies in the vernacular focus on oral communication used in the everyday by a certain community and its relation to ethnicity, social class, or gender. In this dissertation, I use the concept of vernacular to refer to an everyday language (i.e. informal register) used in the neuro-autobiographies in contrast to a scientific language and discourse used in the medical sciences with their formal and specialized register Moreover, the use of vernacular here is not only in relation to an informal register of words or expressions, but also to a personal narratives in which neuroscientific information becomes entangled with the autobiographers' thoughts, emotions, and experiences of living with a certain neurological condition.

The term vernacular in applied linguistics is usually associated with the scholarly work of an American sociolinguist named William Labov who conducted extensive research on dialectic variation of African-American English in the 1970s. The vernacular is usually associated with a variation form usually stigmatised as being 'non-educated' which has led to serious implications for the education and integration of African-Americans into the mainstream society. Instead of defining vernacular in contrast to the mainstream, as expected, Labov defined it as 'the style in which the minimum attention is given to the monitoring of speech' (Labov 1972c, 208). By linking vernacular to "style", Labov frames it in accordance to a speaker's personal meanings of expression that involves "*subjective, concrète et affective*", which "deviates" from the mainstream language (Bally 1909, 286). From this view, I defend that the vernacular is linked to an individual's biological and socio-cultural identity expressed in a 'relaxed' style without being repressed by one's internal censors or social rules that constrain one's speech. Moreover, Based on Labov's definition, I reinforce that the vernacular is an organic form of using language that is grounded in life experience rather than in a specialized knowledge which is usually impersonal

and reconstructed. In other words, vernacular is close to the notion of home, which enables an individual's emotional language and corporeal expressions to manifest as action and reaction to an environment. Thus, this notion of vernacular plays an important role in the understanding of the neuro-autobiographies analyzed in Chapter Four.

While studies of the vernacular have been around for fifty years in North America, historical linguistics has shown that the concept of the vernacular dates to the Roman Empire with the notion of 'Vulgar Latin'. Due to space and scope in this dissertation, I omit the historical implications, but instead, I point out the complex position the vernacular languages have occupied in relation to both sacred texts and scientific discourse along the formation of western societies. For example, in Medieval Europe, the vernacular was used in opposition to the languages of the sacred and religious texts written originally in Hebrew, Greek, and Latin. From the Middle Ages on, the translations of canonical writings (e.g. religious and alchemy texts) into vernacular languages (i.e. Modern Languages) such as English, German, and Spanish assisted with the spreading of Christianity across Europe.[39] In this sense, the socio-cultural role of the vernacular as a translation tool not only helped circulate local elite's knowledge, but also strengthened the use of the modern languages across different social classes. Over time, vernacular languages (i.e. modern languages) became incorporated into the mainstream, losing their 'marginal' status and achieving hegemony. In this manner, I point out that our understanding of vernacular should be dynamic, non-linear, and context-specific. For example, a minority language can achieve mainstream status due to political and socio-economic factors that

[39] It is neither my intention to simplify the historical function of the vernacular languages during the Middle Ages and onwards, nor to generalize the role of the vernacular language across Europe. For further historical perspective see: Geary, Patrick J. *Language and power in the early Middle Ages*. UPNE, 2013.

play in its advantage. Nevertheless, it can lose status and return to its marginal position (or even disappear) if the context is antagonist.

To illustrate this, we can cite the dialect Ladino (i.e. known as Jewish Spanish) spoken by Sephardic communities in the multicultural city of Salonika during the Ottoman Empire. The use of Ladino was complex; although coming from a marginal position, it achieved some mainstream status due to economic factors. Subsequently, Ladino lost its position due to a series of drastic political changes that affected the region during the first decades of the 20th century, which eventually led to a Ladino community diaspora. Moreover, with the Holocaust during the Second World War, Ladino has faced a risk of extinction (Borovaya 2012; Melammed 2013; Rodrigue and Stein 2012).

The dynamic, non-linear, and cyclical characteristics of the vernacular is not only particular to the case of languages such as Ladino. It can be also attributed to the case of vernacular knowledge. For example, vernacular healing practices such as acupuncture and yoga have held a marginal status in western societies, whereas they have played a traditional role in eastern societies. However, with the globalization phenomenon, these vernacular healing practices have become more popular in western societies, being more acceptable and included into the everyday. For example, some health insurances currently cover acupuncture, and some universities include yoga philosophy as a credit course in eastern studies curriculum. Yet, the reverse takes place in eastern societies. There was a time when acupuncture and yoga were considered the mainstream form of healing practices in Asian societies; however, with the globalization process, those ancient practices have lost prestige to ‘western’ medicine, which has pushed them to the margins. Based on the examples above, I argue that both vernacular language and vernacular knowledge are susceptible to the social context, that is, to time and space, which makes them dynamic,

cyclical, transitional, non-linear, with an uncertain status. Bearing this in mind, the vernacularisation process (including language, knowledge, and culture) should be understood within a complexity theory framework, which is further elaborated in Chapter Three.

2.3 Vernacular: Language and Knowledge

Here, I defend that the vernacularisation of the neurosciences consists of vernacular language and vernacular knowledge which both should be treated as of equal value since they are interconnected. For this reason, I first explore the concept of vernacular language by returning to the sociolinguist William Labov for further insights. Next, I review how the term has been applied among other scholars in the field of language and communication studies. Last, I explore the term vernacular in relation to knowledge.

For over forty years Labov has conducted extensive sociolinguistic research about the inner-city Black Americans language, known as Black English Vernacular (BEV), in comparison to the English spoken by the white American middle-class communities. According to him, BEV has been considered "illogical and non-conceptual", stigmatising its language and speakers, in this case, Afro-Americans. Labov's research about BEV has had repercussions far beyond sociolinguistics such as folklore studies and anthropology, as seen in the work of Richard Bauman, for example, who has been a proponent of vernacular language and knowledge as an alternate expression to the term 'deficit'. Similarly, a contemporary to Labov, Dell Hymes, a linguistic anthropologist, has done a comprehensive study on non-standard languages as well, by attempting to remove the stigma attached to the vernaculars. More recently, scholars in line with health anthropology such as Goldstein and Shuman have focused on the de-stigmatization of the vernacular by giving voice to individuals who have been considered 'stigmatized' in society for

carrying certain illnesses or addictions. The authors discuss not only the stigmatized individuals' emic experiences (i.e. their personal accounts), but also the stigmatized language identified in their narratives, which are referred as "contagious", and therefore, it should be repudiated, as they remark: "the way it spills over beyond the topic into the means of articulation" (Goldstein and Shuman 2012, 116).

Likewise, moving away from a reductionist approach that focuses on linguistic variations of the vernacular (e.g. phonological, morphological, and grammatical variations), Bauman offers an integral view of the vernacular through a communicative modality with resources and practices from communities in informal instructions or settings. As a communicative modality, the vernacular is negotiated in interpersonal interactions, based on the interlocutors' everyday experiences. Bauman states that the vernacular:

> can only be understood in dynamic relation to the cosmopolitan; they are opposing vectors in a larger communicative field. If the vernacular pulls toward the informal, immediate, locally-grounded, proximal side of the field, the cosmopolitan pulls toward the rationalized, standardized, mediated, wide-reaching, distal side. (33)

As seen so far, the vernacular faces a push-pull force by being in constant tension to adapt to a communicative context that is driven by opposing poles; for example, rural language v. cosmopolitan language, minority v. standard, everyday knowledge v. scientific knowledge, and so on. This tension results from a dialectical relation between the opposing vectors that behave in an 'action-reaction' movement.

Vernacular language and knowledge have also been approached by ethno-methodologists and conversational analysts such as Goffman, Garfinkel, Sacks (Lynch 2007) since the 1970s. Their object of study is the everyday, which implies investigations of vernacular languages and

cultures. Garfinkel describes the role of an ethno-methodologist who "analyzes everyday activities as members' methods for making those same activities visibly-rational-and-reportable for-all-practical-purposes, i.e. 'accountable', as organizations of commonplace everyday activities" (Garfinkel 1967, vii). The everyday practices mentioned are grounded in informal interactions (e.g. conversation) by ordinary individuals with one another. In the ethno-methodology tradition, conversation analysis has become a methodological tool for researchers. While Sacks, Schegloff, and Jefferson (1974) have extensively studied the everyday conversations of white middle-class speakers, Labov has studied everyday narratives among Afro-American groups. Both approaches, known as Conversation Analysis (CA) and Narrative, respectively, have contributed to the studies of vernacular language as a communicative modality by focusing on interpersonal relations and social interactions in everyday contexts and environment.

Definitions of the vernacular (language) point towards an informal speech grounded in real, mundane situations, usually in private interactions that are genuine and unmonitored as most sociolinguists have defined it. For instance, Milroy states that the vernacular is about "real language in use" (1992, 66); yet, Poplack defines it as a "spontaneous speech reserved for intimate or casual situations" (1993, 252). More recently, Tagliamonte (2009), in her review of the vernacular, mentions that Sankoff et al.'s ideal target of investigation for variation analysis is "every day speech". All these definitions illustrate an organic and non-institutionalised (or even counter-institutionalized) view of the vernacular language that can be manifested through verbal and non-verbal expressions such as our speech, senses, and body. In contrast, standard language is usually formal, technological, scientific, scripted, abstract, and public.

Recently, Labov has reaffirmed his definition of the vernacular by emphasizing a positive attitude in order to remove stigma or inferior status usually carried by marginal communities. He states that "My answer is that there is one style of speech that is superior to all others – from the linguistic point of view – which we call vernacular. It is the form of language first learned, most perfectly acquired, which we use automatically and unthinkingly in conversation with family and intimate friends" (2013, 3). In his view, vernacular language holds a 'native' status; it is "systematic and rule-governed", autonomous, and self-managed. Moreover, Labov sees it as genealogically driven and original, serving as the foundation of an individual and collective history. In Labov's words: "The history of a language is the history of its vernacular" (3). His words may sound nostalgic, interpreted as a reaction to the current status of the vernacular as being heavily mediated by technology even in the most intimate interactions, as for example, sending text messages through social media to congratulate someone's achievements (e.g. getting a job and having a baby) or to give unwelcome news (e.g. break-ups and someone's passing away). It seems that the vernacular, the most genuine part of our language acquisition, cannot escape from the material/technological culture we live in nowadays.

Yet, Michael Halliday, a distinguished scholar in systemic functional linguistics, compares and contrasts vernacular with scientific language in relation to how human beings make use of it in social interactions. For example, he mentions that scientific discourse is used by a technocratic elite that holds prestige and power over a lay population (2006). For Halliday, the vernacular stems from language that is grounded in folklore culture through the expressions of puns, humour, proverbs, and riddles, which are considered stylistic elements often absent in a 'man-

made' text such as the scientific discourse.[40] For him, proverbs are attached to experience of a community in a certain context. Halliday remarks that proverbs are "generalizations about experience; they are general truths, but in most cases, construed as specific illustrations. But they are discursively contextualized, of course, so that the sort of theory they are propounding becomes accessible because it is triggered by some instance already under discussion" (45). Like Labov, Halliday sounds nostalgic in his concept of vernacular language in terms of its genealogy. Studying folklore knowledge can be a mark of resistance against the technological culture and knowledge that has shaped the everyday language we use nowadays.

It is no surprise that political hegemony and power dynamics regulate language in use in contexts that follow a top-down model. In this instance, the mainstream or the status quo is situated above the vernacular or the every day language. Halliday recognizes that there is an ideological goal to keep the vernacular away from the mainstream, seen as the language that represents the religious and scientific institutions in order "to exclude everyone else from taking part in political processes" (45). It is important to note that institutions communicate from a top-down orientation which enable them to control language in its style, register, and form to meet their agenda. Sharing a similar standpoint, the humanities scholar David Bleich believes that religious and scientific languages can sustain hegemony because they are institutional, impersonal, and detached from emotions, contrary to the vernacular that is community-based, private, and driven by emotions. Bleich mentions that "The language of science creates a fantasy that 'I'm not there'; it pretends that the subject is absent" (2013, 385) so that it can get away with experiences and emotions. It seems that Bleich refers to examples of scientific articles that follow

[40] His focus is on developing a vernacular grammar in order to study the everyday spoken language grounded in "commonsense knowledge" rather than in the scientific one. His interest lies particularly in the study of proverbs as part of the vernacular knowledge, as he mentions that "the discourse of the commonsense knowledge is proverb" (45).

rigid guidelines to maintain research accuracy. Following this train of thought, I conclude that the vernacular is the language of the 'I', of the Self, driven by experiences, reflections, and emotions; whereas the scientific language is driven by a third-person point of view, usually followed by scientific logic and objectivity, which is deprived from humor, puns, or affective language.

Another point to raise here is the question of agency in the vernacular. Halliday believes that the vernacular may be prone to lack agency because it is excluded from the interactions with the mainstream, usually represented by institutionalised discourses (e.g. technology, science, religion, government). Halliday argues that "The discourses of science gain their theoretical power precisely because they are not translatable into commonsense terms" (48). It seems that for Halliday the discourses of science are placed in a more privileged position as they hold language control which is not easily translatable to the everyday due to technical jargon and knowledge. Moreover, I speculate that this untranslatability becomes a justification articulated by the representatives of institutional discourses to keep non-specialized communities under control (e.g. legal discourse).

Challenging Halliday's views, I defend that vernacularisation can facilitate some degree of translatability through rhetorical and discursive tools such as humour, puns, proverbs, and lexical choices. To illustrate this, I cite the case of feature films that have approached certain neurological conditions from a vernacular perspective. For example, characters with Autism Spectrum Disorder have been widely represented on the screen since the Oscar-awarded film *Rain Man* (1988), reaching its peak at the turn of the 21st century. Such popularity in portraying characters in the spectrum in American films may be attributed to society's anxiety in dealing with an "autism epidemic" which has been frequently reported in mainstream media (Eyal et al. 2010). Despite some scholars and activists have pointed out misrepresentations or stereotypes of

characters with autism on the screen (Draaisma 2009; Conn and Bhugra 2012; Nordhal-Hansen 2018), such films , should be used as pedagogical resources to raise viewers' awareness of society's behaviour in dealing with the disorder. In this case, I conclude that the vernacular can offer some translatability functions.

So far, the literature review of the vernacular explored here aims to support an argument that the vernacularisation has the potential to unpack scientific language with the support of rhetorical and discursive devices, such as analogies, tropes, and humor. As Halliday points out, the unpacking "brings it back into the family, into the local world of face-to-face encounters" (48). Hence, in this dissertation, I explore how the autobiographers, based on their lived experiences of dealing with their neurological conditions and mental health, can 'unpack' the medical discourse and the neuroscientific knowledge in their narratives.

Broadening the scope of the vernacular, I move towards an anthropological understanding of the term that takes into account human experience. The autobiographical narratives of the everyday of women with brain disorders can be seen an example of vernacularisation or "vernacularity", a term preferred by some scholars. According to Roger D. Abrahams, a folklorist scholar, "Vernacularity refers to the process by which the lowest and the highest memorable voicings and revoicings are drawn upon, residing just below the surface of consciousness, containing the most recent slang and the most ancient and archaic turns of phrase that draw attention to themselves" (2005, 12). An important aspect is that vernacularity encapsulates human experiences and memories (e.g. traumas) in their discursive forms; as Halliday remarks, human experience "ultimately resides in the non-technical construal of local, everyday knowledge, in the typically congruent mode of the local, everyday grammar" (48). In this regard, memory becomes an important rhetorical element in the neuro-autobiographies since it encapsulates resolved

(positive experiences) and non-resolved (trauma) past events in the autobiographers' life. Since memories are intimate and private, they are expressed in a vernacular mode at their best.

Vernacularity, *vernacular language* and *vernacularisation* are not only a key concept among linguists, anthropologists, and folklorists but also among psychologists. Nevertheless, not all of them share positive attitudes towards this notion; some scholars have been skeptical in relation to the vernacular and its derivatives. One of them is a famous 20th century behaviourist, B.F. Skinner. In his first work dated 1938, Skinner wrote in defense of an experimental method in psychology that would take an objective approach based on scientific methods. By doing so, psychology distanced itself from the humanities (e.g. philosophy) and approximated to the natural sciences, as seen in North American universities nowadays, where psychology is mostly housed in health science departments. His defense in favour of an experimental method rejected a naïve psychology that he described as 'folk psychology'. 'Folk psychology' takes some form of vernacular, which he criticized as being "clumsy and obese" in the following fragment, "We must not take over without careful consideration the schemes which underlie popular speech. The vernacular is clumsy and obese; its terms overlap each other, draw unnecessary or unreal distinctions, and are far from being the most convenient for dealing with data" (1938, 7). Psychology scholars who tend to adopt lab research methods (e.g. experimental research) may align with Skinner by acknowledging that a sample taken from its vernacular form (i.e. raw material) is the least convenient when used to analyse data, since experimental research usually generates 'sanitised' data to be manipulated. This is a similar position among generativist linguistic scholars who work with 'fabricated' sentences (as if they were created in a lab) rather than with natural speech derived from real-life events in daily conversations.

Skinner's metaphorical description of the vernacular or folk knowledge as being "clumsy" can be alluded to Francesca Martinez's neuro-autobiography, where she identifies herself as "clumsy", due to her neurological condition, cerebral palsy (CP). Francesca chooses the vernacular word 'clumsy' to translate her neurological condition to her readers instead of using the medical term 'cerebral palsy' in her narrative. Following this train of thought, I frame personal narratives as a context where scientific concepts can be negotiated, networked, and translated into a vernacular mode, contrary to statistical writings that limit translatability.

In conclusion, Skinner's exclusion of life narratives from psychology research was seen at that time as a rejection to Freud's well-known psychoanalytical methods that used to include client's narratives (e.g. repressed memories and dreams) to reveal their inner world conflicts (Id). In contrast to Freud's approach, Skinner defended rigid methods based on behaviourism (i.e. strict observations of participants' reactions to a certain stimulus) in order to restrict researchers' interpretations and participants' subjectivities that could hinder the scientific objectivity. Years later, the socio-cognitivist psychologist Jerome Bruner opted for a narrative approach in his work to counter-react to Skinner's behaviourism, since a narrative approach has the mechanisms to allow experiences, thoughts, and emotions to emerge from stored and encoded memories. Following this line of thought, I defend that a narrative approach allows writers and speakers to express themselves with linguistic flexibility and creativity which can reframe their memories with vernacularity through the use of metaphors, analogies, and humor.

2.4 Minding the Gap with Humor

Humor is a rhetorical and stylistic marker in vernacular language. For this reason, I briefly explore humor studies in this section by focusing on its concept in relation to discourse studies –

although research in humor have gained insights from philosophy, psychology, anthropology, sociology, biology, and recently, neuroscience. From a linguistic and communicative perspective, humor involves a mix of verbal and non-verbal forms; a joke, a mirth, or a pun may not sound 'funny' if it is not properly told with certain paralinguistic features (e.g. prosody, facial gestures, and body movements) that can enhance the speaker's performance to invoke responses of a laugh or a smile from an audience. Although a laugh or a smile may be a reaction to humor, research in medical sciences have shown that a laugh is not directly correlated to humor, as one can laugh because of a physical stimulus, such as tickling a sensitive body part.

The concept of humor is itself complex. The well-known humorist, Stephen B. Leacock, in his book *Humor and Humanity* (1937), explains that 'humor' is a Latin word that refers to 'wetness', 'humidity'. The 'original meaning' (humour) was taken by the Greek Hippocrates and his successors to refer to a body fluid that flows through the human body – phlegm, blood, yellow bile, and black bile. To be in 'good health' meant that the body fluid was in an equilibrium. Thus, the doctor's role was to keep patients in good humour when they lacked humour (Leacock 10). Then, the meaning of humor shifted. In premodern medical science, humor determined a person's disposition, temperament, or mood, distancing itself from a clinical meaning; eventually, the body fluid hypothesis associated with humor was discredited in medical science, although the motto 'laugher is the best medicine' was incorporated into vernacular or folk knowledge. The usage of humor evolved over time, from a rude 'Homeric laughter' (i.e. showing a lack of empathy, as in the notorious case of a person slipping on a banana peel) to something odd but funny, amusingly incongruous. It is the latter usage that humor found its place in literature, "when the spoken and written words become the prevalent method of communication of human

beings […]. And more and more it became possible to derive humorous satisfaction out of the incongruities of speech itself, queer inconsistencies and oddities of speech" (Leacock 15).

According to William Fry, a psychiatry scholar proponent of humor and laughter as therapy, states that "humor is now considered to be a genetic, biologic characteristic of the human race" (1994, 111). In this view, humor becomes a genetic trace that some people may carry, which erases the possibility of humor being also understood as a social construct, dependent on cultural practices of a certain community. Fry's position reduces humor to a question of genes ignoring the psycho-social dimensions that involve humor; for this reason, his position is likely to be criticized by scholars from the humanities and social sciences. However, in this dissertation, both views are recognised, that is, the biological and the psycho-social aspects as both are complementary to each other. The social environment as well as the genetic components contribute to an individual's development and processing of humor, with both having the capacity to either enhance or hinder it. Some individuals have a natural disposition for having a good sense of humor or being a gifted 'joker', but socio-cultural contexts may either promote or hold it back.

I illustrate it with a case of an American-Palestinian stand-up comedian named Maysoon Zayed who has cerebral palsy (CP)[41]. She uses TED Talk presentation as a medium to share her neurological condition and disability stories with her lay audience. She tells her personal stories as a woman with CP who immigrated from the Middle East with her family when she was a child. Her language flourishes with jokes, puns, and personal anecdotes; moreover, she uses a playful and theatrical style to explain her neurological condition that has impaired her activities

[41] https://www.ted.com/talks/maysoon_zayid_i_got_99_problems_palsy_is_just_one

of daily living. The rhetorical devices she uses in her jokes are efficient and felicitous, since they can provoke positive emotional responses from the audience that reacts through a laugh.

The following sequence illustrates how Maysoon explains what CP means to her audience through the use of humor: “CP is not genetic. It’s not a birth defect. You can't catch it. No one put a curse on my mother's uterus, and I didn't get it because my parents are first cousins, which they are (audience laughs)”. The vernacularity in this example takes not only linguistic but also cultural forms which are grounded in Maysoon’s life experience shaped by her Middle Eastern upbringing. As belonging to a community in which intermarriage among first-cousins (i.e. consanguineous marriage) seems to be a traditional practice, Maysoon makes a joke out of it to highlight her family cultural differences as being immigrants in the US;[42] however, Maysoon’s main point is to clarify to her audience that her CP condition is not attributed to such non-western marriage practice, and therefore, her parents are not to be blamed for causing her a disability as being a first-cousin couple. The intentionality of her message is shaped in humor and in theatrical performance that mitigates the seriousness of her disability.

Maysoon has shown an innate gift to tell jokes, which seems to be nurtured among her family members who have trusted her abilities rather than her disabilities. In her TED Talk, she gives credit to her family for their support: “A lot of people with CP don't walk, but my parents didn't believe in "can't." My father's mantra was, “You can do it, yes you can” (audience’s laughing). Yet, children who have been brought up in a repressive family, for example, may not have similar chances to develop a good sense of humor, if they are aware that they will be punished for telling a joke. If repressive parental practices are recurrent, they will affect children’s personality; solid

[42] It is well-known that communities that practice consanguineous marriage are prone to some genetic disorders and health issues. See: Younis, Mohd, et al. “Genetic Analysis, Health Issues and Consanguineous Marriage in Muslim Community.” (2018).

research in developmental psychology (see Patterson's work 1982) has shown that humor is "an important ingredient" in "exceptional well-functioning families" (Maccoby 1992, 1013).

More recently, humor has seen a revival in the medical context due to its healing properties, as seen in 'laughter therapy' used as alternative treatment for patients with cancer (Christie and Moore 2005). Telling a joke and or listening to one can have a positive impact on our brain which activates certain functions and responses that improve one's mood; therefore, it is not surprising that cognitive and linguistics studies have attempted to create theories and approaches to understand humor, as they are briefly explored here. Being influenced by Michael J. Apter's personality studies (e.g. Reversal Theory, 1982), Victor Raskin, a well-known linguist scholar defines humor as nothing exceptional, just simply part of the everyday. Raskin remarks that "funny situations, funny stories even funny thoughts occur every day virtually to everybody" (1985, 1). We can draw upon his thought that humor is part of vernacular culture, language, and knowledge. Humor is embedded in the everyday communicative interactions; whenever tension arises, interlocutors release it through a joke or funny behaviour. Raskin states that "humor is a universal human trait" with different functionalities according to a context (2). He situates humor in the individual's psychology, as a frame of mind or a manner of perceiving life, but he does not situate it in an interactionist context. Thus, his concept of humor as competence may be understood first in line with Saussure's discussion of language competence, that is, *langue*, seen as an arbitrary system, detached from communication. Second, Raskin' concept of humor also moves towards a universal grammar, which can be aligned with Chomsky's work, by considering individuals cognitively equipped to access an internal grammar to produce and process jokes.

Humor studies in linguistics have been mostly at the semantic level pioneered in Raskin's work, and more recently, in his former doctoral student, Salvatore Attardo's. Both scholars share

similar linguistic views of the study of humor; Attardo has adopted Raskin's classification for humor (2008), which follows a pattern of incongruity (i.e. contrast, incongruity/resolution), hostility (i.e. aggression, superiority, triumph, derision, disparagement) and release (i.e. sublimation, liberation, economy).[43]

Because hostility and release theories seem not to offer much in terms of linguistic developments, most scholars in humor studies opt for a cognitive or structuralist approach to side with the incongruity theory. For example, Raskin has initially developed a *Semantic Script Theory of Humor* to work at a discursive level through narratives based on Gregory Bateson's notion of frame called 'script', while arguing that humor is a "violation of Grice's cooperative principle" (108). [44] Later on, Raskin and Attardo have revised and replaced the initial theory with *General Theory of Verbal Humor* (GTVH) to include 'context'; however, their theory is still restricted to semantical principles that exclude interactional linguistics or pragmatics views, as pointed out in Yus' rebuttal to Raskin's work, who defends an understanding of humor through relevance theory (2003).[45] Despite theoretical duels among semanticists and pragmatists, Raskin and Attardo claim that their revised theory takes into account a discursive approach, which includes examples of narratives, instead of isolated or fragmented sentences.

[43] Attardo states that incongruity theory dates to Aristotle, which was later reinstated in Kant's and Schopenhauer's works. Hostility theory, on the other hand, dates to Plato and has not gained the same attention as incongruity theory. According to Attardo, some recent scholars in hostility theory claim that "one finds humorous a feeling of superiority over something, of overcoming something, or aggressing a target" (2008, 103). Hostility theory can be observed in some racial, ethnic, and political jokes usually seen in yellow journalism. Yet, the 'release theories' based on Freud's release of psychic energy are still relevant because they pay attention to linguistic mechanisms of humor and to emotional responses as part of a healing outcome.

[44] Raskin's theory is grounded in the following presupposition: two scripts that overlap and are opposed to each other (108). Raskin's initial *Semantic Script Theory* has been criticized because it can be reduced to a matter of interpretation. To respond to their critics, Raskin and Attardo worked to revise the theory, by recalling it *General Theory of Verbal Humor* (GTVH). As per its name, the theory excludes any attempt to include nonverbal language, yet it still works within an incongruity approach.

[45] *Relevance Theory* is studied within the field of linguistic pragmatics, which has been expanded by Sperber and Wilson (1986). It focuses on what an individual (hearer/reader) infers from their interlocutor's (speaker/writer) utterance or information based on relevant principle during a communicative activity (see Yus, 2015).

Yet, linguist scholars argue that humor studied under pragmatics views such as relevance theory may not necessarily generate a humor theory. In other words, relevant theory per se can be sufficient for the understanding of humor in human communication from a macro level perspective, that is, relevance principles and inferential process. What lies underneath those theories is academic tensions between semantics and pragmatics scholars which fall out of the scope of this dissertation. My goal is, however, to consider humor as a relevant and frequent rhetorical and stylistic element observed in those five narratives which I explore it under the lens of discourse analysis (cf. Norrick 2009).

Norrick believes that linguistic studies of humor should move beyond a semantics-pragmatics model (as seen in Attardo's and Raskin's works), for its limitations to textual samples (e.g. joke narratives). Instead, Norrick believes that humor studies should take examples from real-world conversations. Moreover, Norrick is interested in developing a 'humor competence' inspired by scholars who work within a communicative competence approach such as Hymes (Norrick 2009). He remarks that the focus should be on action and performance: "how to perform and how to receive and respond to humor and jokes, and this will encompass an account of timing for both the tellers and recipients" (2009, 261). Although Norrick's concept of 'humor competence' is used to stress performance and reception, the word 'competence' is usually attributed to innate internal grammar in language acquisition studies and to the universal feature of language as seen in Chomsky's work. Therefore, to encompass and complement Norrick's views of humor I draw upon Weigand's work on "competence-in-performance" (2010), which is based on a dialogic action model, or "mixed game theory" as she names it. Weigand's view is indirectly inspired by complexity studies, as she situates language as dialogue that transcends turn-taking models usually studied by Conversational Analysts. Weigand remarks that "the minimal autonomous

whole thus emerges as the cultural unit of dialogic action game in which human beings try to come to an understanding about how to coordinate their views and actions" (41-42). Inspired by Weigand's model, I suggest adding to Norrick's humor competence theory the notion of 'humor competence-in-performance', which enables an integral perspective of humor that is not restricted to a linear turn-taking model; but instead, it incorporates cultural aspects based on biosocial competence and performance (i.e. social interaction).

To account for cultural aspects that involve one's identity Norrick's work on humor in everyday personal anecdotes is fundamental here because "we present personal identities for ratification by the other participants in the conversation. To the extent that we accept the identities presented in the personal narratives we tell each other, we create solidarity and rapport" (274). To create an individual's positive self-image in a narrative through the use of humor as a rhetorical marker may indicate that one has a sense of humor, "which counts as a virtue in our society and they present an identity with an ability to laugh at problems and overcome them – again an admirable character trait" (274). In this way, one's life story is likely to be more "tellable" than others. Norrick concludes that "Humor enlivens conversation and introduces an atmosphere of play into interaction" (278). This can be relevant for narratives that deal with individual's trauma such as life stories of people with neurological conditions, mental health issues, and disabilities as explored in this dissertation.

Although the incongruity model has been extensively studied in linguistics, it is also an object of study in psychology and neurosciences in terms of how it is processed during communication. Fry states that incongruity is nowadays the "sine qua non characteristic of all verbal humor and much, if not all, physical humor" (2002, 316), and "incongruity is one of the most powerful sources of complexity in human communication" (318). What seems necessary to point out here

is that incongruity is not exclusive to humor. For example, individuals with psychosis (e.g. schizophrenia and bipolar disorder) usually present communication disturbances marked by semantic incoherence such as incongruity and ambiguity because of disorganized thoughts (Kuperberg 2010). Because incongruity theories do not take the context into account, it would be more prudent to affirm that humor depends on both incongruity and context, so that one can distinguish incongruity as part of telling a joke as seen in Maysoon's case, rather than being part of communication disturbances.

To sum up, this chapter has explored the concept of vernacular and its variations based on the scholarship of applied linguistics with its focus on language, culture, and knowledge. It offered a literature review to pave the ground for a better understanding of the term vernacularisation and its variations and how it can relate to the neuro-autobiographies. Moreover, it briefly reviewed humor as a significant rhetorical and stylistic marker in vernacular communication to fulfill discursive functions that are usually absent in scientific writings.

CHAPTER THREE: Neuro-Autobiographies in the Age of Complexity

3.1 Autobiography Studies

Women's autobiography has been traditionally considered a literary genre, widely explored in literature studies in North America. The word autobiography has been sometimes alternated with the expression 'life-writing'; however, some scholars argue that the concept of 'life-writing' may offer a broader scope by covering various formats of 'writing' the self, which includes old and new media. Moreover, life-writing include narratives either from a first-person or a third-person perspective; yet, the root of the word autobiography refers to a first-person account of one's own life (auto = self; bio = life; graphy = writing), which disregards a third-person point of view. Due to it, some scholars opt for a more malleable form such as 'AutoBiography', as it includes first- and third-person. To keep feeding this discussion might seem endless and pointless because there are no better or worse forms; whatever term a scholar adopts, its usage should be clarified (Ingram 2003). In this regard, this dissertation opts for the form 'autobiography' because it can offer some 'plasticity' within the word itself, enabling some manipulation so that it can be shaped at one's own convenience. In other words, the term 'autobiography' accepts word additions (i.e. prefixes) and absences (i.e. sometimes 'bio' is omitted) such as 'autopathography', 'autoethnography', 'autography', and 'autohagiography', among so many other creative forms (Smith and Watson 2010). Other times, it alternates with 'life writing' for stylistic purposes only.

The notion of the self has also undergone profound changes since the Enlightenment period, when a fixed, immutable, and established self was considered a perfect model to represent the 'great man', as part of the ascension of the European bourgeoisie (Anderson 2011). Yet, in

consequence of the civil rights movements spread across the North America and beyond in the 1960s, a fragmented, fluid, and nomadic self emerged, empowering a multitude of voices, once silenced, to start speaking out. Among them, there was the feminist movement to denounce gender inequalities and to empower women. Because women have had restricted access to manifest themselves in public, autobiographical practice became a space in which they could 'write' themselves. Since then, minorities' life narratives by immigrant women, the disabled, and the disenfranchised have found a haven in life writing communities either inside or outside academia, not to mention the current digital autobiographical practices encouraged by the advent of the Internet 2.0.

Mediatisation (Couldry 2008; Krotz 2009; Lundby 2014) has facilitated the emergence of different formats of life writing such as letters, diaries, journals, memoirs, bio-documentaries, blogs, websites, social media, vlogs, and the most current, 'selfies'[46]; it can converge new and old media (Jenkins 2008). Following this trend, verbal and non-verbal manifestations of the self populate our everyday, transcending literary studies where autobiography has traditionally been housed. Margaret Jolly, a humanities scholar, observes that media convergence has become an important feature in contemporary autobiographical studies as it allows "visual-verbal-virtual contexts of life narrative" (2012, 56) to mediatise the self.

Not only have historical and technological changes influenced autobiographical practices, but also the paradigm shifts within the humanities and social sciences that have taken over for the past 50 years – such as post-structuralism, post-modernism, post-colonialism, and feminism – have guided autobiographical studies. These paradigm shifts overlap to some extent; however,

[46]"Mediatization describes the process whereby communication refers to media and uses media so that media in the long run increasingly become relevant for the social construction of everyday life, society and culture as a whole" (Krotz 24).

four major trends under the influence of postmodernist thought have been prominent in autobiography studies. The first trend receives linguistic support from the French Feminists; as Jolly observes, women's life writing fell under "the spell of French philosophy and the social movements of the 1960s" (50), leading to *écriture feminine* – a sub-genre that attempts to subvert the male rhetorical tradition and positivist attitudes concerning truth (Cixous 1976). In its translation for the Anglo feminist audience, *écriture feminine* turns out to be usually referred to 'women's life writing/autobiography'. The second trend lies in cultural history intersecting with literary studies by focusing on women's autobiography. Following this trend, some scholars such as Kadar (1992), Miller (2007), and Steedman (1992) work within interdisciplinary perspectives that bring together literature, psychoanalysis, gender, and cultural studies. A third trend is influenced by postcolonial studies with the aim of destabilizing mainstream historical narratives by enabling marginalized voices to emerge. In a postcolonial model, for example, life writing turns into a site of political struggle in which contested narratives surface. Following this, we have the polemic case of Rigoberta Menchú, a native activist from Guatemala who wrote a collaborative autobiography with an anthropologist, Elisabeth Burgos-Debray (1984), and subsequently, had her story disputed against 'official' documents and local witnesses (Stoll 1999). The last trend is grounded in postmodern thought, in which scholars such as Smith and Watson have pioneered in 'shaping' women's autobiography theory in North America, by acknowledging the role of different genres in writing the self (1996; 2005). They have also recently recognized that with the rise of the digital age, life narratives have been influenced by performativity, positionality, relationality, and automediality (Smith and Watson 2009; 2010). Drawing upon Smith and Watson's ideas, Jolly believes that it is automediality that needs current attention because of its novelty: "its modes produce a self that is networked into multiple intimate

public spheres" (56). Considering the spreading of life narratives on the internet in various platforms (e.g. blog, vlog, social media, etc.) many questions are raised such as privacy and security of one's narratives, commodification of the genre, and ethical issues in digital narratives.

Departing from the fourth trend, an emergent position based on an anthropological view of the self tries to move autobiographical narratives beyond the literary realm. The anthropological component defends the idea that human beings are meant to tell stories of oneself or others in different settings over time and space (Bruner 2001, 2004). Paul Eakin (1999, 2001, 2004) has taken a further step. To some extent, Eakin's anthropological view of autobiographies intersects with the work of some scholars in autobiography studies such as Couser's (2004) studies on 'vulnerable subjects' (e.g. disability), Smith and Watson's work on vernacular narratives of 'getting a life' (1996), and Karpinski's (2012) immigrant women's fictional stories in 'borrowed tongues'. Nevertheless, Eakin's (2008) current project differs from those authors and others in the sense that he tends to locate the narrated self outside discursive practices, since he intersects life writing with neurobiological studies of the self. His position may conflict with an already well-established psychoanalytical tradition in autobiographical studies, not to mention possible reactions among deconstructivists, who are likely to be skeptical about linking the humanities to neurosciences. Still, Eakin's project to expand the borders of autobiographical studies has been inspired by Oliver Sacks' neuropathological stories of his patients and by Antonio Damasio's popular publications on neurosciences for a lay audience. Because Eakin's proposal may sound pioneering and even controversial for humanities scholars who belong to any of the four trends described above, this literature review examines Eakin's project due to its capacity of providing resources to narrow the gap between the two cultures, and of fitting into the current 'neuroscientific turn' in the humanities.

In the article, "What are we reading when we read autobiography?", Eakin defends the idea that the source of the self (i.e. conscience) is in the body, or better, in neurological structures, since the process of self-narration happens in the brain, which is usually taken for granted. According to him, it is only when the identity story system is ruptured, as in the case of some neuro-pathologies, that the self's integrity is put into jeopardy. Drawing upon examples of life writings about individuals with Alzheimer's, Eakin remarks that "once we lose our consciousness of saying who we are, we likely become 'de-storied individuals'" (123). To read autobiographical narratives that deal with "de-storied selves", Eakin suggests a neuroscientific approach based on Damasio's studies of the embodied self. Thus, Eakin's first philosophical question lies in the location of the self, that is, whether it should be situated either in the text or in the mind, however, both possibilities seem to be out of the question. If we located the self in the text, we may fall into a Lacanian psychoanalytical interpretation, which would not meet Eakin's point. Instead, he suggests we "trace the self in our bodies" (125), rephrasing Damasio's assertion that the "self is not an effect of language but rather an effect of the neurological structure of the brain" (125). Eakins is inspired by Damasio's anti-Cartesian approach that locates the self in the conscious mind and not separate from it as the dualists usually claim. Eakins continues professing Damasio's ideas that a self is 'of and about the body', or better, the "self is a name for a feeling embedded in the physiological processes necessary for survival" (126). This view attempts to overwrite the dualistic view of body and mind by bringing a monistic view (Damasio has been influenced by Spinoza's ideas) to autobiographical studies of the self within a literary tradition.

At this point, we might wonder how humanities scholars would respond to Eakin's project. Margareta Jolly and Celia Hunt's (2008) article on Paul Eakin's project acknowledges his shift to a neuroscientific approach as proof of his sincere commitment to understand the self and of his

scholarly evolution by moving away from psychoanalysis in autobiographical studies to a neuroscience-driven approach. Jolly and Hunt remark that "Eakin is less preoccupied with what restricts, what betrays, the nascent self, but what may enable it, and also how it may find in the autobiographical act the means to continuity rather than fragmentation" (15). In this view, it is a self in process, neither a fixed self as remnants of the Enlightenment, nor a fragmented and reconfigured one as defended by postmodern scholars in autobiographical studies. Nevertheless, scholars in gender and sexuality studies might also react to Eakin's work since it seems to neutralize the gendered self, because the autobiographical self is embodied in the brain only – neither in the sexual organs nor in gender performativity. Nevertheless, there is no doubt that Eakin's project can benefit the study of autobiographical narratives that deal with neurological pathologies and disorders, as well as be a supplementary approach along with the well-established cultural studies in women's life writing.

In reply to George Butte's reaction against Eakin's neuroscientific concepts in autobiography studies, Eakin attempts to theorize the autobiographical self as an element that can narrow the two cultures gap. For Eakin, the self not only lies in the brain, and therefore, has biological roots, but also lies in the narrator as the creator of the story (i.e. teller) and in their interactions with an audience. For the latter, Eakin argues that the self "is not only reported but performed" (311) by an autobiographer to a reader/audience. This view enables a holistic understanding of the self that consists of internal and external elements that are neurocognitively and socio-culturally oriented, respectively. Eakin's notion of being performed means that the self is not only a narrative entity but also an act ready to be activated through a writer, a speaker, or a reader. This notion of doing something or acting out has its origins in performance based on theater studies and anthropology (e.g. ritual studies). Bauman, for example, sees performance as an act of verbal and non-verbal

communication within a specific context, as he remarks that "all performance, like all communication, is situated, enacted, and rendered meaningful with socially defined situational context" (1992, 46).

Bauman's ideas seem to by Austin's work (*How to Do Things with Words*, 1962), an eminent language philosopher. Austin reworded the term 'performance' to 'performative' in order to deal with sentences that imply doing something as one speaks.[47] His objective was to elevate the status of performative sentences, which cannot be judged by truth but by actions (i.e. felicities), and to debunk the privileged position that the 'constative' (declarative) sentences held because of their truth value as studied in analytical philosophy. Austin's analysis of performative sentences was based on the formula, *I + performative verb*, when applied to certain conventions such as rituals, ceremonies, and formal events. For example, they are uttered when a priest performs a christening ceremony and baptizes a baby as he says, "*I baptize you …"*, while performing the act. The performative sentences imply the 'doing' of an event instead of descriptions or accounts of one's actions. In this manner, performative sentences create action and effect (e.g. action/reaction as seen in Weigand's dialogic model); in other words, as a speaker utters a sentence, they perform something which may cause the listener to behave or react accordingly.[48]

Austin's work offers some insights to the analysis of the neuro-autobiographies explored in this dissertation in relation to the pragmatic functions that those narratives fulfill, which can offer

[47]Austin argues that to "say something is to do something" (1962, 12).

[48] However, Austin later realized that the performative function could be also applied to other types of sentences, including even constative forms, thus refuting his earlier arguments. As an alternative, he developed Speech Act Theory based on the assumption that 'speaking is action', by which sentences exercise three types of forces: 1- *locutionary* referring to the sentence itself; 2- *illocutionary* referring to the performative force of the sentence; and 3- *perlocutionary* which refers to the effect of the act upon the hearer. Briefly, we could equate the three types of forces with the Aristotelian rhetoric: *logos* with locutionary that falls within the sentence and content (information), *ethos* with illocutionary that falls within the speaker's intention (knowledge), and *pathos* that falls within the audience's response (emotion).

a holistic view of those stories within a context. From this view, I investigate the rhetorical strategies used in those neuro-autobiographies in order to identify the illocutionary and perlocutionary forces that are permeated in those narratives that lead to their pragmatic functions (e.g. to educate, to debate, to politicize, etc.), as seen on table 1, Chapter Four.

As performative studies have developed, it is no surprise that Austin's ideas have provoked proponents and critics, which led to certain advances and modifications. For example, the structural linguist, Émile Benveniste supported Austin's first argument that differentiates performative from constative because this difference could lead to important understandings of (inter)subjectivity in language (Benveniste 1971, 229). Yet, non-analytic scholars attempted to deconstruct Austin's performative studies. In the article, "Signature, Event, Context", Derrida develops the notion of 'iterability' taken from Austin's Speech Act Theory, in which each performative sentence provides an opportunity for repetition and rehearsal, erasing the original every time communication occurs. In his reading of Derrida's article, Cooren remarks that 'iterability' of practices "is what makes them possible in order to be performable and recognizable, these performances must be repeatable, iterable for another next first time" (2010, 37). Yet, it is Judith Butler, and not Derrida, who gains academic visibility for reworking and even for unsettling Austin's performative concept, by applying a socio-construction theory of gender and recasting it as 'performativity'.[49]

Yet, this dissertation considers both the terms 'performance' and 'performative', with their origin from anthropological and linguistic traditions, respectively, in order to gain insights to the

[49] For Butler, gender is performed socially, a central notion that gains support in queer studies in contrast to essentialist views. In this way, she completely distances herself from Austin's Speech Act Theory as she states: "performativity is not a singular act, but a repetition and a ritual in the context of a body that is not only linguistic but also gesticulatory" (1999, xv). Butler's performativity concept 'subversively' translates Austin's notion of 'doing something with words' into 'doing and also undoing gender'.

analysis of the autobiographical self in the neuro-narratives. In the mid-1950s, around the same time as Austin's work was published, a Canadian sociologist named Erving Goffman (1959) also developed a concept of 'performance' (cf. Loxley 2007, 150) with some differentials. Goffman argued that "when the individual presents himself before others, his performance will tend to incorporate and exemplify the officially accredited values of the society, more so, in fact, than does his behaviour as a whole" (1959, 35). In other words, individuals perform identities according to certain conventions and norms established by social institutions, as if they were actors expected to role play based on scripts within a certain setting. In this view, one's agency becomes vulnerable since social conventions may curtail individual's action in society. His sociological concept of performance relates to the idea of an individual's compliance with social rules. Goffman critically draws our attention to the notion of "disciplined performer" by referring to an individual with self-control (216), who attempts to keep his/her performance free from disruption by "unmeant gestures". In this sense, an individual may supress their agency, identity and emotions in order to comply with social scripts for the sake of maintaining a status quo or 'homeostasis' (cf. Goffman's face-saving acts, 1967). This might resonate with the notion of 'acting normal' in society, which can be a challenge for individuals with disabilities and neurological conditions, because they may not succeed in keeping up with the 'normal' group that holds hegemony. This notion is boldly expressed in Francesca's neuro-autobiography. As a trained stand-up comedian, Francesca can perform her 'disability' in order to 'act normal'; a detailed analysis of her writing is offered in Chapter Four.

In general, the aforementioned review on performative studies deny an essentialist position with its focus on concepts of 'origin', 'truth', and 'dualism'. Instead, performative studies offer concepts that deal with doing and acting upon someone or something in private and or public

spaces, relying on actors' creativity, iterability of communication, and multi-voiced dialogues (i.e. polyphony) in social interactions. Performative studies grounded in drama studies may intersect with a rhetoric that goes beyond a classical model usually based on persuasion. It is in Kenneth Burke's (1969) rhetoric work that the notion of performative finds some commonalities; his work is based on a "dramatistic" perspective (i.e. act, scene, agent, agency, and purpose) to human relations, which is interconnected with language or its "symbolic action" (Burke 1966, 44) to challenge a 'scientific' model based on positivism. The motive to link rhetoric to life experience lies in the fact that they are based on human communication, as Albaladejo remarks, "we live with rhetoric" (2014, 20). The dramatistic approach offers an understanding of rhetoric based on human relations, or better, on identification by establishing rhetoric as an organic, dynamic, and on-going arrangement among the pentad elements, which move completely away from merely persuasion techniques as once argued in Plato's "Gorgias."[50]

3.2 Women's Autobiography and Rhetoric

In this section I review the position of woman as a writer or rhetor (e.g. the neuro-autobiographer) who holds agency over her life narrative, by collaborating and creating dialogue with other texts and 'voices' in order to weave a story with knots that enable reflective readings. In this manner, I situate the five neuro-autobiographers as rhetors who choose how to represent their 'self-narrator' in their life writings.

Both classical and modernist rhetoric studies have been developed based on the analysis of speeches by prominent historical male figures (i.e. rhetors). In a similar vein, with the establishment of women's autobiography studies in North America, feminist rhetorical studies

[50] See text: http://classics.mit.edu/Plato/gorgias.html

emerged in the 1970s by acknowledging women as rhetors, a position once restricted to men. Feminist scholars such as Lunsford (1995), Foss and Griffin (1999), Sutherland and Sutcliffe (1999) reclaim women's writings from different historical periods to offer alternative perspectives that focus on 'collaboration' and 'vernacular writings' (i.e. known as *sermo*) to rhetoric studies. In their view, women as rhetors achieve social roles as communicators and translators of transformative knowledge emerging from the margins of linguistics and communication studies (Foss, Foss and Griffin 1999). The idea of women rhetors as translators of one's experience and knowledge is well argued in Philippa Spoel's article "Re-inventing a Rhetorical Epistemology" (1999). Spoel articulates the feminist work of Donna Haraway and Nicole Brossard to an embodied rhetoric that provides "possibilities for re-integrating bodily, emotional ways of knowing in the process of invention; that is, into the process through which rhetors and audiences generate together socially and historically situated knowledges" (201). Moreover, Spoel endeavours a rhetoric that embraces collaboration as opposed to individualism, which has been a mark in male rhetoric, as Spoel puts it: "less by the desire for 'power-over' than the desire for 'power-with', for working with other women and feminists to create a more just society" (205).

Thus, feminist theory challenges classical rhetoric, which is usually "masculine, unified, stable, autonomous, and capable of acting rationally on the world through language" (Ede, Glen and Lunsford 1995, 412) in favour of intimate and lived experience. Ede et al. advocate an embodied rhetoric in opposition to a rhetoric based on a 'conquest model' that invokes "patterns of arrangement aimed at winning [and] control" (415), which eventually leads to exclusion. To support those arguments, a variety of writings by women rhetors from ancient, modern, and contemporary periods have been examined. For example, Margaret Fuller, apparently the only

19th century female member of the Transcendental Club of Ralph W. Emerson, developed a writing style based on a "conversational and collaborative structural pattern, rather than one based on traditional ways of disposing an argument" (417). It is no surprise that during that period, Fuller's writing style was devalued and criticized (i.e. misjudged) because it rejected patriarchal ideas of individualism and conquest; instead, it favored "collaboration, relationality, and mutuality" (419), an arrangement that Suzanne Clark calls "dialogic rhetoric" (1995, 309). Furthermore, feminist rhetoricians have acknowledged that a delivery mode should also be linked to performance as it depends entirely on the 'language of the body' to create pathos in the audience. However, not all women's writings are 'scandalous'; some have followed stylistic conventions of traditional western discourses to claim authority and agency to keep up with the mainstream.

Nonetheless, it becomes clear that a collaborative model lies in the heart of women's rhetoric studies, and it may manifest through different media formats. Nowadays, with the fast spreading and popularisation of virtual communities, numerous websites are designed to allow individuals to gather and write about their everyday experiences with physical and mental issues either from a patient's or a caregiver's perspective. Forums, blogs, and vlogs on personal accounts of mental illness such as bipolar disorder have proliferated online, attracting an audience that is willing to share their life stories with each other. Since symptoms of bipolar disorder are usually depression and or mania, with abrupt breakups between people in relationships, posts by female partners sharing their stories and giving support to each other become frequent, even though bipolar disorder can affect both sexes. For example, a website called *experienceproject.com* has had a virtual community with a subgroup on "I have a bipolar husband", where the 'wife' partners collaborate with each other by sharing their experiences. Another example is a forum website

healingwell.com, where a spouse, for example, by the name of Rose, posts "Is my husband bipolar? Please HELP!" Her scream is heard by other women, who share their experiences and offer support. Sharing one's life story as a female caregiver of a spouse with bipolar disorder and offering virtual support to other members of a group has become a frequent practice that involves collaborative and dialogic rhetoric. In reference to those cases, I observe that they are examples of 'extra-textual' collaborations, seen as forum members who collaborate with each other based on the telling and sharing of their lived experiences with the disorder, which turns into 'lived rhetoric', as I call it.

The process of lived rhetoric seems to be a specific composition practice observed in online forum as it creates a network of extra-textual collaborators who post their messages in a dialogic manner. The extra-textual collaborators may also make use of a collaborative writing style to convey an 'intertextual' dialogue with previous texts (and authors) within their writing. The collaborative nature in women's writings has been at the center of women's composition studies. In Jane Donawerth's work, "Authorial Ethos, Collaborative Voice, and Rhetorical Theory by Women" (2005) the author deals with a dialogic collaboration observed in four women's writings from the 17th and the 19th centuries. One of Donawerth's examples is Madeleine de Scudéry's writings, where she states that "Scudery constructs a rhetoric for salon conversation that models the advice she gives, adapting the classical rhetorical dialogue as a vehicle for her own theories of domestic discourse – conversation and letter writing" (111). Moreover, Donawerth notes that another strategy to highlight a dialogic voice in Scudéry's writings was the inclusion of quotations by male writers in order to offer her female readership "men's knowledge", which she 'translates' into her own writing. The dialogic collaboration based on a conversational style establishes an intertextual relation since "the words of others are embedded in their own

arguments, creating an ethos based on self-in-relation-to-others rather than a self-sufficient authorial self" (119). The notion of intertextuality is echoed in Bakhtin's work "Discourse in Novel". His notion of 'dialogism' can supplement women's collaborative rhetoric with his notion on 'heteroglossia' as a "multiplicity of social voices and a wide variety of their links and interrelationships (always more or less dialogized)" (263),[51] which has been echoed in women rhetors' writings over the centuries. Kristeva's readings of Bakhtin led her coin the term 'intertextuality' to refer to a text as a "mosaic of quotations; any text is the absorption and transformation of another" (1986, 37).

I acknowledge that the autobiographers selected for analysis here are 'white professional women' coming from a middle-class background, with university degrees, and therefore, they would be considered privileged according to some scholars nowadays. While sexuality might be an issue to be investigated when dealing with neurological disorders, this variable falls out of the scope in this study, although I regard that sexual identity is a significant marker, since, traditionally, biomedical and natural sciences have been under man's jurisdiction and writing. In this vein, the five women studied in this dissertation are not only protagonists but also human beings that represent themselves through life narratives. In this sense, their life stories involve discursive, rhetorical, and experiential practices, where the autobiographers become, perform,

[51] Bakhtin's novel discourse is represented by stylistics, genre, images, utterances, and memories that add external voices to a certain narrative. The textual space turns into a 'zone of contact', where other voices come together, as he remarks, "it is the novel's special relationship of extra-literary genres, with genres of everyday life and with ideological genres" (33). I read Bakhtin's "zone of contact" close to a current idea of interconnectivity of "genres" that marks our mediatised society, in which points of connection (i.e. network) are established along one's life narrative, in which verbal and non-verbal languages are performed. In this sense, narrative discourse should move beyond linguistic borders, as it is embodied with *anima*, while performed by living agents. As Bakhtin states, "languages interanimate each other and objectify precisely that side of one's own (and of the other's) language that stands out" (62). His view supports a materialist, embodied understanding of language that is situated in "real-life time-space" (i.e. chronotope) and performed by 'real-world' subjects. In this vein, autobiography creates a suitable space for subjectivities and inter-subjectivities to emerge.

negotiate, and network with other agents and the environment. This interactional model includes a conglomeration of 'actions' that "always establish relationships" (Arendt 1998,190) which are dynamic.

Hence, to understand the "real" woman as a social actor, or better, as an interactant with agency and interconnected with other beings (human and non-human) and objects (technology) brings us close to Bruno Latour's ideas of Actor-Network Theory (ANT). Latour's ANT defines actors within a network perspective that sets up points of connection that allows for mobility (2005). According to him, actors work in conjunction with others, never isolated. As he claims: "an actor on stage is never alone in acting" (46); however, depending on the complexity of the network, one might wonder who is carrying out the action. For Latour, action is 'dislocated' not at the point of the source, but away from it, as he identifies action as 'borrowed, distributed, suggested, influenced, dominated, betrayed, translated" (46).

Actor-Network Theory is about generating knowledge through activities of 'recording and describing' that Latour inherits from his background in ethnography. But different from ethnographical practices, which employ the term 'informants' to refer to its participants, Latour opts for 'actors' and 'actants' to indicate human and nonhuman beings, respectively. He remarks that "actors are also able to propose their own theories of action to explain how agencies' effects are carried over" (57), which implies that agency is not only an internal force, but also an external one embodied in institutions that lead Latour to call it 'figurative'. Somehow, Latour's ANT work may fall upon some lack of accountability for sexual differences concerning the notion of actor, a critique that could also be partially extended to Haraway's 'project on cyborg', or Hayles' 'informatics'. The 'androgynous' feature, or better, the neutralization of actors' gender identity may limit one's agency, since individuals' sexual differences can facilitate or not, their

(inter)-actions and networks that associate them with other actors/actants, because of gender inequalities that are infused in our society. For example, in this study, the neuro-autobiographies deal with subject matters such as anatomy, neurology, and physiology which have been founded by male scientists, setting up the boundaries that prevented female scientists from participation unless 'invited'. Therefore, sexual difference is an important marker to identify the types of interactions and networks female autobiographers can establish themselves; for this reason, this dissertation recommends this point for further research.

Although Latour defines a network as a "string of actions where each participant is treated as a full-blown mediator" (128), he claims that there is no guarantee of certainty because it depends on the "ability of each actor to make other actors do unexpected things" (129); but according to him: "whatever the word, we need something to designate flows of translations" (132).[52] In this sense, the concept of translation is central to ANT, as a way of transferring scientific and cultural knowledge to others. Latour notes that translation in ANT acquires a new connotation, one that deals with "a relation that does not transport causality but induces two mediators into coexisting" (108). In other words, when an individual interacts, communicates, and socializes at different public spheres (e.g. scientific, political, or literary) they create associations that can be traceable.

To sum up, this study views women's life narratives as an organic activity, performed by speakers/writers (i.e. actors) "who think, talk, and act in a setting that is social and historically concrete" (Bakhtin 49). In this vein, discourse narrative is embodied, verbal, and non-verbal, capable of being transposed to different media formats that allow interaction, network, and dialogue among many other voices. So far, the concepts explored in this chapter have shown that

[52] The problem with the word 'network,' as Latour observes, is that it gets mixed with a technical sense; the term 'network' was initially employed in opposition to notions of surface (e.g. society, institution, etc.). He even proposes an alternate expression such as 'work-net' to avoid confusion as it may generate nowadays.

we are not dealing with simple or complicated matters, but with complex entities that may hold multiple meanings since they are dynamic and non-linear.

The complexity has been already touched in Latour's Actor-Network Theory; however, his theory is grounded in sociology and in anthropology without intentions to transcend social sciences. For this reason, I turn to complexity thought (CT) due to its transdisciplinary elements which can offer further resources to bridge the gap across disciplines. Moreover, I defend that complexity thought can also offer insights to supplement autobiographical studies in the 21st century because personal narratives have been used across various disciplines (e.g. education, psychology, medicine, marketing, and nursing) to meet different purposes that go beyond the field of literary studies, where it has been traditionally housed. Thus, in the following sections I show how complexity studies can offer a holistic framework to autobiography studies and how they can rework some notions such as life, autobiographical agents, and text.

3.3 Autobiography in the Age of Complexity

In the age of the machine, autobiographies of public men were set as examples of a successful bourgeois life that emphasized stability, order, and uniformity: A life writing form and style that used to stand very much in parallel to a Newtonian model concerned with closed systems, linear direction, and deterministic relations during the Industrial Revolution. In Newtonian mechanics, there were fixed laws (described mathematically by equations of motions) to explain how particles moved and how they were responsible for the changes observed in the physical world. In this view, the universe was considered a machine that ran under fixed laws (e.g. law of gravity) of divine origin. Capra and Luisi explain that "The mechanistic view of nature is thus closely related to a rigorous determinism, with the giant comic machine completely causal and

determinate" (2014, 29). The Newtonian worldview had a strong influence on how Western society organized itself in terms of economy, politics, and culture. In the case of autobiographical practices, Anderson explains that self-writing was limited to "people of lofty reputation who had something of 'historical importance' to say" (8); [53] moreover, the autobiographer was concerned about representing a self that was stable, uniform, with a fixed version to a public audience. Eventually, the flaws in one's character were to be revealed through a secular 'confession' in the sake of truth and reason. The most famous example of a secular autobiography is by Jean Jacques Rousseau, *Confessions* (1781), who "believed that his task as autobiographer was to tell or 'confess' all and make himself as transparent to his readers as he was to himself" (Anderson 2011, 42).

The mechanistic worldview was replaced by a new paradigm shift that has evolved since the middle of the 20th century, propelled by the advent of the Information Society, and subsequently, by the World Wide Web, demanding new technological and scientific visions of the everyday, which has become accelerated, disordered, uncertain, and diverse with an emphasis on non-linear relations. New theories in natural sciences, such as quantum and chaos theory, have indirectly influenced the humanities and social sciences to a certain degree. Likewise, the autobiographical genre has evolved, becoming decentralized from the literary canon, and diverse by including ordinary people's life writings which have been translated and (self)-narrated (Bruner 1987; Smith & Watson 2004). In this vein, autobiographical practice equates with narrative, be it oral, written, and visual, constituting an everyday form of human communication. According to Eakin, "…for narrative is not only a literary form but part of the fabric of our lived experience" (2008, 2). Furthermore, internet 2.0 has facilitated and democratized the record of one's life narrative

[53] According to Anderson, the term autobiography has its earliest established usage in the late 18th century, (2011, p. 6).

through blogs, social media, vlogs, and 'selfies', supporting autobiographical practices that emphasize an open system with the emergence of a 'networked self' as Jolly observes. Therefore, narratives have gotten entangled as a result of the new technological tools available for creation, distribution, and reception. Hence, autobiographical practices, much like literature in general, become complex, unstable, and non-linear as part of a literary writing system. A systemic view of literature has been already explored in a pioneer study conducted by Siegfried Schmidt and his group in Germany (1982; 2010) and in conjunction with Tötösy de Zepetne in North America (1992).

By following a systemic thinking, I propose to approach autobiography as a self-organized organism, inspired by Edgar Morin's notion of "self-eco-organised system" (1992; 2008), and by Ilya Prigogine's work on dissipative system and chaos theory as observed in complex behaviours. Both scholars' works deal with open systems that are in constant interaction and communication with internal and external parts through synergetic movements that are dynamic, non-linear, and 'far from equilibrium' (Prigogine and Stengers 1984; Nicolis and Prigogine 1989). Based on these ideas, the autobiographical 'self' becomes a complex entity that interacts with the environment (i.e. other beings and objects) in order to restructure itself internally and externally (i.e. self-organized) which are based on experiential functioning. Inspired by Prigogine's ideas, Kaplan and Kaplan state that "A person functions as he or she "knows how to" actively read the environment and how to be continually regulating his or her experiential self as stable in relationship to a continuously changing environment" (1991). Thus, such shift, that means, from a genre perspective to a self-organization system, requires a new understanding of biography studies such as complexity thought (CT) – not because the well-known physicist Stephen Hawking (2000) once stated that the 21st century would be the century of complexity – but

because complexity opens opportunities for relationships between the humanities and sciences. Hence, defining complexity is a 'complex' task because of its transdisciplinary and plurality features that involve a dialogue among the humanities and sciences. For this reason, some authors prefer the term 'new science' (Doll 2012).

Doing autobiographical research grounded in CT enables us to go beyond the study of discursive elements by studying an experiential self that creates dynamic interactions with others (human and non-humans) within an environment. With this in mind, complexities studies in autobiography focus on an experiential self as context-dependent (e.g. networked) narrator who deals with internal and external fluctuations, order and disorder, and random situations that challenge their creativity. In this manner, complexity is interested in phenomena that privilege open systems, in other words, phenomena that interact or exchange information with the environment (i.e. agents). An autobiographical practice is not only about an individual's writing of his or her memories, but also about their relationships to others through a dynamic flow of interactions and information exchange.

Both Morin and Prigogine are proponents to bridge the two cultures divide in academia by cultivating a common dialogue among disciplines such as physics, biology, psychology, anthropology, and philosophy in order to enable a holistic view of the human being as a complex entity that is in dynamic relation with their environment. Edgar Morin, a social science scholar, criticizes the status of the humanities for favoring a fragmented self that is compartmentalised in structures in his book *On Complexity* (2008, 41).[54] According to him, we need to mobilize both the humanities and natural sciences in order to converge towards a 'holographic' understanding of the human being. This convergence would only be attainable when reductionism and dualistic

[54] Morin's translated work in English is very scarce. His book *On Complexity* aims to summarise his main concepts developed along his scholarship on the study of complexity thought which he has written mostly in French.

thoughts are substituted by a holistic and planetary thinking that could bring back the "knower from the process of knowing" (Morin xxxix). Morin's notion of the knower coming to the center as a "subject of inquiry, self-reflection and self-analysis" (xxxix) goes hand in hand with the notion of an autobiographical self proposed in this dissertation. The autobiographical self is seen as the 'knower' in the process of 'knowing', embodied in their experiences and sustained by networks, which enable the autobiographical self to improvise and self-organise. In this sense, I argue that autobiography can be a convergent point in the field of humanities to study the 'self' in network with other beings. I consider autobiography as an embodied memory that enables us to recognize the uncertainties, fluctuations, order and disorder in one's life. To write or read autobiography is more than authenticating one's memories; it is, instead, a "dialogue with the uncertainties" as Morin remarks (59). The uncertainties may occur as autobiographical practices, which involve at least writing and reading, consist of an open system with its self-organization properties and interactions that 'flow from within and beyond', making it a complex communication system. In this sense, Morin (82) reminds us that the word complex originates from the Latin *complexus*, which refers "to what is seen as interwoven" (Morin 82) or interlaced together. Morin defines complexity as:

> a fabric of heterogeneous constituents that are inseparably associated: complexity poses the paradox of the one and the many. Next, complexity is in fact the fabric of events, actions, interactions, retroactions, determinations, and chance that constitute our phenomenal world. But complexity presents itself with the disturbing traits of a mess, of the inextricable, of disorder, of ambiguity, of uncertainty. (5)

He draws our attention to the fact that the attempt to repress disorder, to eliminate ambiguity in order to restore 'order' is in fact risky, 'leading us to blindness', because those elements are part of the *complexus*. In his planetary view, it is necessary to keep "a process of simultaneously organization and disorganization" (2008, 6), which is dynamic. He asserts that life is a "complex self-eco-organization that produces autonomy" (6).

The idea of the complex in life narratives has also been present in Jerome Bruner's work. In his article "Life as Narrative", Bruner discusses Sartre's reflections on the act of telling one's autobiography, "His point is a telling one: life stories must mesh, so to speak, within a community of life stories; tellers and listeners must share some "deep structure" about the nature of a "life"" (2004, 699).[55] In other words, life stories are meshed, interwoven with life stories of others, creating a net of stories, with different voices. The notion of being 'interwoven' implies a complex pattern, with dynamic interactions that bring up different voices, that is, an intertextual feature that allows collaboration and dialogue. Moreover, life narratives are not written or told in isolation; they interconnect with life stories of others, by creating a network of life writings. Thus, one's personal story is also about the story of the other, which brings us close to the notion of ecological relations not only through a 'net of stories' but also through a 'net of mediatised rhetoric'. In other words, an ecology of composition consists of stories being written, read, and performed through an interweave of rhetorical elements (e.g. metaphor, humor, etc.) at a micro level; of stories being connected through an interweave of different mediatised platforms (e.g. verbal, visual, audio, and moving) at a meso-level; and of stories being communicated through an

[55] "Jean-Paul Sartre remarks in his autobiography, "a man is always a teller of stories, he lives surrounded by his own stories and those of other people, he sees everything that happens to him in terms of these stories and he tries to live his life as if he were recounting it" (Sartre 1964, citated in Bruner 699).

interweave of other voices at a macro one. The three layers make a multi-leveled network in which autobiography/life stories are seen as a "complex self-eco-organization" (Morin 2008).

Therefore, considering Morin's 'self-eco-organization', I defend that that the practice of writing an autobiography runs freely, without repressing 'mess', 'disorder', or 'ambiguity, which enables an autobiographer to explore their self-reflection, self-inquiry, and creativity while engaged in their writing practice. Furthermore, life narratives show marks of complexity not only at a discursive level, but also at an experiential level lived by an autobiographical self. It is not a surprise to read an autobiography and discover that the narrator is dealing with deep self-reflections upon their misfortunes, dilemmas, traumas, and losses. What we want to read is not how the narrator has 'eliminated' those 'messy' experiences, but how the narrator has created coping mechanisms to face the 'disorder, chaos, and ambiguities' in their life; or even so, which 'lessons' the narrator has taken out of it. The autobiographies examined in this dissertation exemplify this push-and-pull force between order-disorder (i.e. chaos) in one's life discursively and experientially. The push-and-pull effect is necessary to 'keep life going' (i.e. flow) through an ongoing process of self-organization to reach dynamic equilibrium.

3.4 Neuro-Autobiography and Complexity

By framing an autobiographical practice as dynamic communication systems, I identify various nodes of writing practice that brings first personal-pronoun narrators together to share their life experiences. In the case of the neuro-autobiographies, the narrators share with their readership their experiences of living with certain neurological conditions by creating a complex rhetorical mosaic in which their voices get entangled with other voices that hold scientific power. Thus, the complexity in neuro-autobiography is characterized by its interconnectivity and

intertextuality with resources that are scientific and non-scientific which creates a dynamic interaction while a personal story is being told. Once facilitated by the vernacularisation of neurosciences, the neuro-autobiographical practice emerges from a bottom-up view that includes personal narratives of individuals' experiences with brain conditions, which are usually omitted in scientific discourses, spaces, and practices. The neuro-autobiographical practice takes advantage of diverse resources through multimodality, literary devices, rhetorical and performative elements, among others, by reinforcing vernacular features which are usually repressed in scientific texts in order to avoid "carnivalesque" forms (Bakhtin 1984). Morin states that scientific discourses reject metaphors because they can blur the objectivity in the text by compromising the truth that orthodox sciences claim. Supporting complexity in discourse, Knyazeva and Kurdyumov stress that metaphor "marks non-linearity in the text or in the thought, an openness to multiple interpretations" (in Morin 91). Hence, distinct from neuroscientific texts, neuro-autobiography creates space for circularities, multi-references, ambiguities, synergy, and creativity in narratives. It communicates (neuro)-sciences based on "empathy" (Morin 93) as personal accounts enable feelings and emotions to emerge, with which the reader/audience can identify.

The transdisciplinary feature in complexity thought allows intersections with natural sciences such as physics, and in particular quantum theory, that enable us to consider neuro-autobiographies metaphorically as 'matter' and 'energy', that is, 'particle' and 'wave', which we can also associate it to 'word' and 'meaning'. Therefore, neuro-autobiography as a vernacular form of communicating neuroscience can be regarded as both matter and wave; the materiality of the neuro-autobiography enables individuals to manipulate it with some degree of plasticity (i.e. malleability) based on narrator's and reader's interpretations and creativity. The interaction

established between narrator and reader mediated by neuro-autobiographical material promotes information and knowledge to flow dynamically as energy and wave; in other words, it is a meaning-making activity that emerges out of a synergetic process among agents. Interestingly, as a correlation, matter-energy duality has also important current implications to neurosciences to explain the classical, unresolved, and contested mind-brain problem since Descartes.

Approaching autobiographical studies from a complexity framework shifts the concept of autobiography from a literary genre to a concept of open systems with distinct nodes of network such as neuro-autobiography, autoethnography, and autopathography among others. By adopting such a view, the focus shifts from the text, which is reductionist per se, to the interactions, relationality, and interconnectivity among discursive and experiential elements, between writer-text-reader, and publishers-consumers. As an open system, autobiographical inter-actants (i.e. agents such as narrator, text, reader, audience) "literally enact a meaningful world as we elicit and interact with what is relevant in our environment, primarily through the generative circularity between movement and cognition and perception" (162) as Mugerauer remarks, based on Maturana and Varela's concept of 'enactivism'.[56] In this view, the autobiographers studied here are themselves in relationality with their worlds (i.e. internally and externally) by acting upon them in a meaning-making process. Their narratives establish nodes of interaction and connectivism necessary for information to be exchanged among various agents, who can either facilitate or not the autobiographer's actions upon the world. Moreover, once neuro-narratives are written, told, read, or performed on different media platforms, they can also create mediatised

[56] Stewart clarifies that "Without action, there is no "world" and no perception. This is the heart of the concept of enaction: ever living organism *enacts*, or as Maturana (1987) liked to say *brings forth* the world in which it exists. This has important ontological consequences, as it means that "reality" is not pre-given but co-constructed by the organism." (2010, p.3).

nodes of interaction that attract external agents (i.e. reader/audience), members of other systems (i.e. literary system, medical system), who may empathize with those life stories by retelling, transferring, and translating them to external nodes that will form a network of stories.[57]

To conclude, autobiography and its variations such as neuro-autobiographies are far from being flat; they can facilitate the formation of network in a multi-layered dimension, allowing narratives to evolve, self-organize, and interconnect through the work of dynamic agents that transcend the materiality of textual elements. This is an ecological view that transcend genre studies.

The human brain, seen as a complex organ, can no longer be understood under a Newtonian paradigm with its mechanistic approach (i.e. simple effect and direct cause) that reduces the organ to a simple clock, for example. The brain can neither work in isolation, nor can it be measured and externally controlled. Similarly, contemporary autobiographical and narrative studies recognize that life stories are not about an individual/self in isolation and autonomous, but in relational networks part of an environment; for example, Harré remarks that "The properties of a person's flow of action are also relational, since that action involves other material things or other people or both" (66). In life narratives, one's relational identity cannot be understood as simple, but as complex since it involves a self-organized and open system that interacts with other systems. In the case of neuro-autobiography, it consists of narratives that record life which is 'self-regulated', capable of changes since it interacts with other systems (Doll 12). A simple

[57] The nodes of interaction are available for both analogue (e.g. old media format like a book) and digital (e.g. the Internet) autobiographies; yet, the difference lies in the immediacy of responses and actions. In the case of a hard-copy, a reader might contact the writer via mail or email to send their comments, or circulate the book among their acquaintances, once they have read it. In the case of digital platform such as a recorded autobiography, the publisher can upload it on *YouTube* to allow viewers to post comments, which may create internal dialogues with other viewers who are likely to share other links or not; thus, the internet allows complex relations to emerge through the principle of 'spreadability' (Jenkins 2012), with the potential to create a virtual community.

approach would not be able to consider the randomness, chance, and indeterminacy that feature life as an object of study in neuro-autobiography. Moreover, neuro-autobiographies offers a development of 'experience into experience' in Dewey's sense as it breaks apart from the scientific texts, which are known for their 'objectivity' and determinism. In sum, the neuro-autobiographical node, as seen part of dynamic communication systems that integrate life writing practices, welcomes a type of narrative that fluctuates within order and disorder (i.e. chaos) depicting an autobiographer's life with a neurological disorder.

In life narrative, a 'turning-point' is a key shift from one point to another, with some degree of irreversibility. In complexity theory, the 'turning-point' may be seen through the process of entropy.[58] The humanities and educator scholar, William E. Doll Jr., takes complexity theory as the basis of his work in curriculum education. He borrows some concepts from physics such as entropy to explain a transformation approach in curriculum design. For example, Doll explains that the power in a steam engine is not reversible, having some loss in the 'conversion process' where energy is 'not totally conserved'. He continues that "This wasted or dissipated energy is called entropy, after the Greek meaning of a change or a turning" (13). Translating such concept to (neuro)-autobiography studies, a turning point in one's life reveals instability, fluctuations, and changes, which would not be understood substantially if framed within a Newtonian view that privileges closed systems. Hence, complexity theory, also called 'New Science', is a current perspective to understand open systems, with its focus on the process that is in constant transformation as endorsed in Doll remarks: "Prigogine presents a new paradigm and with it a new sense of order which intrinsically transforms. […] Order emerges internally, through

[58] The term entropy is taken from physics (i.e. second law of thermodynamics) to express measure of increasing disorder in closed systems; to keep a machine running, some energy needs to dissipate into heat, which eventually will come to a halt. Yet, living organisms are open systems, as Capra explains: "need to feed on a continual flux of matter and energy" (48) to keep alive, and therefore, cannot be described by the second law of thermodynamics.

interaction" (14). Doll relies on Prigogine's work to develop his ideas on curriculum based on the complexity paradigm. Prigogine's own understanding of chaos is based on the assumption of "a transition from disorder to order" (1984).[59] Hence, I state that the disorder increases at a turning-point in an individual's life, which can lead to chaos (i.e. entropy increases), however, living beings can self-organize (i.e. self -regulate) at higher levels in other to balance their energy (in the case of the neuro-autobiographies the narrators' level of stress and anxiety due to their neuro-disorder can correspond to the idea of unbalanced energy). The example of a turning point in autobiography shows that "development is not continual and gradual; it is punctuated with plateaus, spurts, and bifurcation points" (Doll 15). In this view, writing and reading a neuro-autobiography is a "process of doing, undoing and redoing" (15); Doll exemplifies that by comparing teachers with writers, as he says that "The teacher must intentionally cause enough chaos to motivate the student to reorganize" (15). Comparing Doll's ideas to narratives, I state that a writer should intentionally create 'chaos' in a text to motivate readers to self-organize (i.e. making meanings) and react to the story (cognitively and emotionally). In the neuro-autobiographies explored here, the autobiographical self may find itself at the edge of chaos but being able to adapt (Doll combines Piaget's ideas in his work) and to maintain a pattern of 'equilibrium, disequilibrium-reequilibrium' (i.e. internality-disequilibrium-autoregulation) in order to recover equilibrium which is ephemeral, and so is life. This leads to at least a cyclical movement, since to keep a healthy mind a person needs to have their body in constant auto-regulation or reequilibrium. A disruption in such a pattern can lead to mental instabilities such as anxiety and meltdowns as observed in the passages from those neuro-narratives analyzed in this dissertation.

[59] cf. Prigogine, Ilya, and Robert B. Tucker. "Wizard of Time." *interview by Robert B. Tucker, May* (1983).

By adopting a systemic approach to the studies of personal narratives, in this case the neuro-autobiography, I identify two overlapping layers: one is a macro layer that refers to the autobiographical self's memory of their life events in interconnectivity with other agents; the other is a micro layer that refers to the sign system (i.e. writing, oral, and visual elements). As Porush mentions, the microcosm is "an idealized space where simple particles interact in well-behaved ways according to the laws of dynamic" (368). In this sense, I take the example of linguistic structures that are deterministic and predictable as seen in the mechanistic model, in which moving linguistic entities/particles/structures are time-space indifferent – they can be put at the beginning, middle or end of a sentence (reversibility) as seen in many languages. Hence, the grammatical world can be considered a "naïve realism", an expression used by Prigogine to refer to a microscopic world that is deterministic and reversible under the science of being. Yet, the macroscopic world of life writing that consists of interpretations of life events is distant from the organized world of structures and grammatical elements, but it is close to disorder and chaotic dynamics. As Porush mentions, "macroscopic interactions are more vulnerable to entropy" (369). In this regard, life writing carries with it the arrow of time in the sense that we grow old and die. However, this does not mean that we cannot bring a past event into the present through our memories. But we cannot live that moment again, except by recalling and writing or representing it.

The complexity of life as experienced and narrated in autobiography is marked by a network of individuals, things, and agents that the autobiographical self has interacted with throughout their different trajectories. Life writing allows an opportunity for reflections, as it evolves through a feedback process, as a system that can alter itself, through self-organization and autopoiesis. In this regard, it is always in a state of becoming as Prigogine puts it (1980); the macroscopic world,

or better, the everyday, is a science of becoming (Porush 369). Furthermore, Porush mentions that "Reality is bumpy, grainy, noisy unpredictable" (370), which we can expand it to life, as being also bumpy, grainy, noisy, and unpredictable. He also confirms our difficulties in describing 'reality' as something 'simple' and logical as the "scientific discourse demands" (370). In this manner, vernacular life narrative emerges as an alternative to scientific writing, with its capacity to deal with complexities and the 'not so logical stuff' in the everyday, by comprising the controversies, paradoxes, and ambivalences that are manifested in life. In those neuro-autobiographies, the narrators question the scientific knowledge against its objectivities, abstractions, formulations, hypothesis, findings, and conclusions. They create a space in their narratives to deal with the inter/subjectivities that lead to unfolding questions, with no absolute answers, but with reflections to self-development.

Although Prigogine as a scientist and an intellectual was interested in narrowing the two cultures gap, his 'language' still privileges mathematics with models to explain his theories, such as "dissipative structures", which he uses to show how order can emerge spontaneously out of chaos. This may leave him outside the humanities community, as it needs extra effort to translate his key concepts outside his natural sciences niche. As Porush explains, Prigogine's key concept, dissipative structures, "survive in an open exchange of energy with the generally entropic universe in order to dissipate or work off the products of their instabilities" (370). I attempt to apply Prigogine's concept of dissipative structures in the case of neuro-autobiography: the life narrative interacts with other discourses (i.e. scientific, journalistic, medical, and popular culture) by exchanging information, which increases its level of entropy, that is, the meaning created through the interweave of intertextual and experiential elements in a vernacular context; any flow or exchange of information (e.g. intertextuality and extratextuality) from vernacular and non-

vernacular sources (e.g. neuro-autobiography and neurobiology curriculum) may create points of instability in the narrative that ends up dissipating in order keep balance and flow.

Prigogine's theory of dissipative structures are in a way a rework of Ludwig von Bertalanffy's term *Fliessgleichgewicht* ("flowing balance") that deals with living structures' "dependence on continual flows of energy and resources" in open systems (Capra 177). In ecology, Bertalanffy's notion of "flowing balance" is illustrated in "recycling", "photosynthesis", and "food web" as explained in Capra's popular book *The Web of Life*. [60] In conclusion, Prigogine's theory of dissipative structures deal with the contradictory "coexistence of structure and change, of order and dissipation [disorder]" (180) observed in all living systems.

Thus, I am proposing here a revision of 'information studies', or even better, of 'communication studies' that would distance itself from the original model developed by Claude Shannon – transmission model (see Shannon and Weaver 1949) – which is limited to quantitative or mathematical framework that excludes socio-cognitive variables and multi-linearity: "The larger the set of possible messages, the higher the sender's freedom of choice in selecting one specific message, the higher the amount of information communicated" (Schweighauser 22). Although Shannon considered that "chaotic, disordered, entropic messages have greater information value than ordered, negentropic ones" (Schweighauser 22), his information model was based on an encoded and decoded framework that secured a "successful transmission of self-identified information" (Schweighauser 26). Shannon's information model has been criticized by humanities scholars for being detached from hermeneutics and contextualization, and has been replaced by recent models that enable interactive or transactional

[60] Capra further explains that "energy is dissipated as heat through respiration and as waste through excretion" (178). His example is based on Eugene Odum's saying: "Matter circulates, energy dissipates". (178)

information flow[61] Shannon's colleague, Warren Weaver, complemented the mathematical oriented Information Theory by developing a notion of "noise", which I identify as a subverted element to distort information. Weaver's contribution in general (e.g. Machine Translation) was somewhat better received among literary and cultural scholars during the 1980s (Schweighauser 28), although his model of communication was still not popular because it was "too restricted to its technical context" (28). Yet, Norbert Wiener's work on "processes of information exchange, feedback, and self-organization" (Schweighauser 30) in complex systems such as computers and brains has gained attention from communication scholars. Wiener's work distances itself from a linear approach as seen in the sender-receiver model; instead, his work is similar to Gregory Bateson's, which favours a "holistic exploration of open, homeostatic system" (30) with emphasis on autopoiesis and emergence.

While Shannon's model does not offer an anthropological view and it seems an "imperfect precursor to more sophisticated models of communication" (31), Schweighauser remarks that information theory is still significant in German media scholarship, as it offers resources to develop "a technology-centered, postanthropocentric theory of culture" (31) by focusing on material over meaning. Following this train of thought, digital communication (e.g. internet) would still benefit from Shannon's model on 'programming' in addition to Weiner's cybernetics studies; however, the actualization of communication (i.e. the competence-performance of communication) is done by 'real-world agents' (e.g. speakers/listeners), which can be technologically mediated, but the actual activity is based on interactional contexts that allow networks to grow within an ecological environment. Thus, I propose an ecological understanding of communication model that is based on how agents (e.g. speakers, listeners, viewers, etc.) use

[61] For current communication models that are approached from the humanities perspectives, see: Cobley, Paul, and Peter J. Schulz, eds. *Theories and models of communication*. Vol. 1. Walter de Gruyter, 2013.

communication technology as mediatised spaces where interaction and network can emerge organically, out of noise, disturbances, interruptions, and fluctuations that challenge the order-disorder in communication.[62] Therefore, an ecological model of communication is non-linear, uncertain, and dynamic, going hand in hand with complexity thought. As demonstrated in this dissertation, the process of vernacularisation is prone to 'noises' in communication by 'disordering' the scientific language and knowledge of (neuro)-sciences.

Within an ecological model of communication, information is not concentrated on a single individual agent but distributed throughout their connections (Osberg and Biesta 2003). Transferring this idea to the case of the neuro-autobiographies, one's life story is distributed among different media platforms (i.e. published autobiographies, recorded video, YouTube, TED Talk website) to be received by distinct types of audience that will redistribute those stories throughout other connections or points of encounter (i.e. nodes). The complexity nature of autobiographies in terms of production, circulation, distribution, reception, and consumption challenges Shannon's 20th century information model that does not take an ecological approach into account. To show that an ecological approach is necessary in the field of communication (i.e. rhetorical studies), Margaret Syverson adopts complexity theory as a framework to explore writing/composition (i.e. rhetoric studies) as an open system that is marked by a network among writers, readers, text, and the environment. [63] In this vein, she defines ecology as a "set of

[62] Davis Foulger has developed a model of ecological communication process (2004) which I have revised it in my work on internet communication and audience engagement, see footnote 31. For Davis Foulger's paper see: http://davis.foulger.info/papers/ecologicalModelOfCommunication.htm

[63] Syverson cites William Paulson's text on "The Noise of Culture", where he explains the difference between simple, complicated, and complex systems: "It is not hard to conceive of simple systems: a pendulum, a piston, a single logical operator at the level of bits in a microprocessor. We can understand fully the operation of such systems. Complicated systems, such as a clock, a car engine, or a home computer, can be fully understood as the interaction of their component parts, so that whereas knowing them requires much more of one's time and patience, in principle nothing prevents us from explaining their operation just as fully as we can explain that of the simple systems of which they are made up. What distinguishes the complex system, on the other hand, is a discontinuity in knowledge between the parts and the whole" (Paulson 108 in Syverson 4).

interrelated and interdependent complex systems" (1999, 3) and identifies complex systems as a "network of independent agents – people, atoms, neurons, or molecules, for instance – act and interact in parallel with each other, simultaneously reacting to and co-constructing their own environment" (3). Her understanding of (written) communication as part of an ecological complex system helps us understand neuro-autobiography as part of a system that consists of a network of independent agents (writer, narrator, autobiographical self, reader, publisher, media platform, etc.) with each contributing to the meaning-making of those life stories about individuals with neuro-conditions. Moreover, Syverson argues that "an ecology is a kind of meta-complex system composed of interrelated and interdependent complex systems and their environmental structures and processes" (5).

Syverson' work is inspired by John Holland's exploration on Complex Adaptive Systems (CAS), who remarks that "coherence and persistence of each system depend on extensive interactions, the aggregation of diverse elements, and adaptation or learning" (Holland 4). The dynamic element is important to the studies of (digital) life narratives, as the medium allows "complex interrelationships in which the writing is embedded: the people and texts that form a larger conversation in which the writer, text, and reader participate and from which the "ideas" emerge to take written shape" (Syverson 6). Syverson does not explicitly mention the digital environment; however, what she has in mind is 'the technologies of writing' as part of an environment in which a writer interacts with tools to support the activity. She further remarks that:

> We would consider how the text takes shape as it emerges, how the writer interacts dialogically with the text not only through acting upon it but by responding to it and to its

potential readers. We would situate the composing of the text in a nexus of complex social structures, ranging from the personal to the institutional and even global. (7)[64]

Syverson is also aware that an ecological approach should be situated "in a historical complex", or in a "larger discourse that is historically situated, and involving historically situated technologies, social relations, cultural influences, and disciplinary practices" (7). Moreover, Syverson considers the audience as part of an ecology of composition as they are "active constituents", "situated in a physical, psychological, social, temporal, and spatial network of relations" (7). In a way, she regards an ecology of composition as a complex system with four key elements interacting with each other: distribution, emergence, embodiment, and enaction. [65]

Her approach departs from a cognitive process that goes beyond understanding human beings as the sole agents in an interactional process; she considers technological instruments and physical landscapes as important as human beings during the composition process. She wants to disclaim that the writing process is usually atomist, reductionist, with a single focus on individual writers, texts, and reader in isolation. The work on 'distribution' and 'situated cognition' (cf. Hutchins 2010 and Latour 2005) shows that "cognitive processes are not only dependent on social interactions but also determined by activities situated in specific environments" (Syverson 8), which should not be reduced to an individual mind.

[64] Syverson wrote her book at the turn of the 21st century (1999), when the World Wide Web was booming as a global computer network.

[65] Syverson states that "distributed cognition refers to the way cognitive processes are shared, that is, both divided and coordinated among people and structures in the environment", whereas "situated cognition refers to the fact that cognitive processes are always embedded in specific social, cultural, and physical material situations, which determine not only how cognitive processes unfold but also the meanings they have for participants" (9). Syverson explains that emergence is part of a constant evolvement as result of responses to the environment. Syverson states that "embodiment does not only refer to our conceptual structures and cognitive activities" (12), but also to physical interactions with humans and nonhumans, that is, agents. Moreover, "Embodiment grounds our conceptual structures, our interactions with each other and with the environment, our perceptions, and our actions" (13). She defines enation based on Maturana's concept of enactivism: "the principle that knowledge is the result of an ongoing interpretation that emerges through *activities* and *experiences* situated in specific environments" (13).

In addition to situate the neuro-autobiographies within an ecological model of communication based on complexity studies, this dissertation recognizes the existence of a pedagogical pragmatism in which the autobiographical narrator 'does something' with their life narratives. Similarly, the reader or viewer also 'does something' with the content. For example, an autobiographical narrator might write it as a self-reflective, self-inquiry practice, or as a self-healing practice; whereas a reader might search for information regarding specific neurological disorder and how to apply that knowledge to themselves or their dearest ones. In this sense, writer and reader can engage with a story by having a mindset or attitude to learn and share something, be it at a cognitive, emotional, or behavioural level. To the autobiographical narrator it might mean acquiring knowledge or even developing wisdom out of the story they went through; to the reader, it might mean how to make meaningful use of that piece of information and how to transform that into knowledge. The learning opportunities one can take either as a writer or reader from neuro-autobiographies are only possible because 'experience' lies in the heart of it, or better saying, in the brain of the autobiographical self.

3.5 Complexities in Neuro-Autobiography

Neuro-autobiography is ultimately a writing about one's human life under certain brain conditions. Prigogine states that life is an "an example of open system as it exchanges "matter, energy and information with the outside world" (895). In this statement, Prigogine sees life as a biological element, dynamic and self-organized; however, he also offers a sociological view of life as inherent of our society, considered a 'non-linear system', in which "what one person does influence[s] the actions of others" (895). His statement can be translated into some analogies known as a 'domino effect', 'chain reaction', and 'butterfly effect,' which are evidence of

interrelations and ecological views that emphasise collectivism over individualism. Moreover, the choice individuals make is always in relation to other possibilities or agents. The options individuals have before them are part of the bifurcation life offers. The notion of "bifurcation" is central in Prigogine's work as well, in which he explains that a trivial bifurcation would not have any social effect, whereas a non-trivial one would "indeed lead to new historical systems" (896). Bifurcation is important for autobiography studies because it offers choices that can impact on one's life or not, to the extent of leading to a turning-point that becomes pivotal in one's life course. In this sense, bifurcation is a relevant concept to be explored in life narrative as it allows a reader to identify choices the autobiographical self makes based on certain conditions that can lead to positive or negative outcomes. In the case of neuro-autobiographies, bifurcation becomes a key element to understand the conditions and choices the autobiographical self makes which can stress or not their neurological conditions and disabilities. For example, in Maysoon's case, a bifurcation thinking has led Maysoon to identify and choose stand-up comedy and disability activism as options of empowerment and self-advocacy of her neurological condition.

In his book *Exploring Complexity* with his co-author Nicolis, Prigogine defines complexity as "an idea that is part of our everyday experience" (6) and "related to the various manifestations of life" (6), which sides with my neuro-autobiography study in which the vernacular allows order-disorder to keep life dynamic, at the edge of chaos. For both authors, complex open systems are in constant exchange of information internally and externally, and "one of the essential features of complex behaviour is the ability to perform *transitions* between different states, evolution and history" (36). The 'transitions' in neuro-autobiographies can be seen as discursive markers in the narrative that indicate shifts and turning-points in one's life as a result of the bifurcations and the choices available. Moreover, transitions can also be attributed to emotional and experiential

markers lived by an autobiographical self while in interaction with other agents in the environment. In neuro-autobiographies, emotional and experiential markers such as anxiety, depression, seizures, and stroke create transitions that can lead to an internal order-disorder within the borders of an individual's body-mind, and subsequently, to an external order-disorder between the individual and their environment.

A humanities scholar Robert Pepperell in his book, *The Posthuman Condition*: *Consciousness beyond the Brain* discusses the notion of a non-linear system, which resonates with the complexity studies presented here. Pepperell states that "Linear equations are seen to be useful in describing 'ideal' situations with few variables, whereas no-linear equations are often used to try and describe 'real' situations – things that are messy and complex" (24), which can be related to the everyday life that is usually messy and complex as well as the brain and consciousness. He states that "One of the major features of non-linear systems is that their behaviour is seen to be sensitive to many simultaneous influences" (24), which can be attributed to the notions of interconnectivity and network in open systems. For instance, our membership in various socio-cultural groups and communities over the course of our lives creates an ecological system, which is open, as we exchange information and make meanings out of the interactions we establish in the environment. Those interactions might eventually influence our mind-body, since our brain is sensitive and susceptible to changes in the environment. Current studies in genetics and biology have shown that the environment can modify the expressions of some of our genes, but not the DNA, which is called "epigenetics" (Wilson 1998). Pepperell also affirms that "A non-linear model of the mind and body might be easier to reconcile with our own experience, in which we understand ourselves to be constituted of dynamic interrelated events involving multiple stimuli and responses occurring simultaneously throughout our being" (25). In this regard, our

information process is not only simply a matter of following an input-output model, but also a matter of reacting to external stimuli by an integration of mind-brain-body. If we face a situation of fear, we can feel our legs shaking, or heart pounding fast, as our eyes are dilated; simultaneously, our brain is releasing neurochemistry – which we cannot feel or be aware of – while we make decisions about the event that provokes fear.

Pepperell situates his ideas within a 'posthuman' framework instead of complex systems, although he explores concepts such as network, context, and interconnectivity. It seems to me that his post-human approach would fit better in complexity thought as he states: "In posthuman terms, both consciousness and human existence can be considered as emergent properties arising from the coincidence of a number of complex events" (30). Not only does he use the word complex, but he also defines posthuman within a framework of complexity thought. His statement implies a holistic view that is situated in the brain as well as it is dispersed throughout the body and environment. He mentions that "it is less useful (or realistic) to treat thought processes as 'brain determined' than to consider them as determined to differing degrees by the brain, the body and the world" (30). In this sense, Pepperell calls it "embedded", "enworlded" or "embodied" for human experiences, implying a monist attitude without a separation between the agents, "one continuous whole" (48), in other words, without borders to divide agents in an environment. Moreover, he understands agents as self-organised organisms that are interconnected by networks; for example, brain cells (i.e. neurons) are individual self-organised units, but they create interconnectivity through transmission of information locally and integrally across the brain. In the case of the neuro-autobiographies, each story may seem isolated from each other, but they are in congruence with each other as they are connected by commonalities

such as neurological disorders and disabilities. In a way, each story talks to one another, contributing to (neuro)-autobiography as open systems.

Pepperell's post-human approach gets closer to complexity thought, as seen in the following statement: "words and the meanings they embody have a rich ecology of interconnections and evolutionary history that defies linear interpretation – what is sometimes called 'intertextuality'" (86). The author links ecological and non-linear perspectives to the notion of language, and more so, to complexity studies, as Pepperell remarks:

> all non-linear, complex systems (and the operation of human language is certainly a complex system) are highly sensitive to small perturbations and external influences, i.e. they are context sensitive and their boundaries cannot be fixed with precision. With language, as with other systems, total predictability and stability is ruled out. (87)

In his remark, Pepperell refers to language in use, or better, a vernacular form that is far from an idealized lab language that linguists can create to examine it. The vernacular language is real, embodied, and for this reason, unstable, and unpredictable. The language of the everyday is the 'real language' as he states: "a turbulent fluid, the catastrophic ruptures between continuous flows of words, the flips and reversals of meaning, are instantaneous and unpredictable" (88). A vernacular language with its non-linearity imposes challenges for the development of computational brain, that is, Artificial Intelligence, in terms of programming everyday language based on experiences, limiting the codification of human intelligence, because "real, active language should be regarded instead as a matrix of infinite-dimensional events" (Pepperell 88). It becomes evident that Pepperell's understanding of the posthuman is derived from the complex interactions between human-technology/computer.

Reading Pepperell's work may lead us to think that posthuman theory overlaps with complexity thought and postmodern. The latter is an alternate paradigm for complexity studies, which in some instances can be divergent (Morçöl 2001), despite some scholars having attempted to draw some similarities (Cilliers 1998). In this section, I claim that one of its divergent points is the notion of fragmentation, which has been widely explored in postmodern studies, and has strongly influenced the understanding of the self in autobiographical narratives. Moreover, gender, social class, and ethnic differences contribute to the fragmentation of the self represented in life narratives; such a view can emphasise reductionism and disconnectivity by framing a particular moment, event, or condition that the autobiographical self faces. Yet, in complexity thought the self is not understood as being fragmented and isolated all the time, but self-organised and interconnected, or better, as an agent that is in dynamic interactions within a network throughout an arrow of time. For this reason, the autobiographical self in complexity thought is seen as a 'fractal agent' that behaves in irregular patterns, but it is not 'broken' or 'in pieces' apart from the whole. Yet, a fragmented autobiographical self is usually isolated from other agents and disconnected from its roots, family, society, and country, according to postmodern approaches. For this reason, life narratives of survivors, immigrants, or refugees usually explore the autobiographical self as a fragmented being focused on its own suffering, not acknowledging the new relationalities that are recreated, reinvented, and reconfigured as means of adaptation to a new environment. The autobiographical self cannot live in a constant shattered world, otherwise, it may lead to an erosion of one's life story. It is not a surprise that the fragmented self has been part of a paradigm prevalent during the 20th century due to historical events such as World War I and Wold War II, followed by an existential crisis in the western society.

To understand the correlation of wholes and parts, I consider David Bohm's (1996) metaphor of the "holographic", in which the parts are independent units, but they are still integrated into a whole. In other words, the parts are self-organized, with autonomy, but "what they are and what they can do can be understood only in the light of the whole" (22). The mechanistic view, however, demands that elements are fragments not related to the whole. In this sense, Bohm distinguishes the concept of part from fragment. For him, "part" is "intrinsic to a whole", which does not occur with a fragment (23). He offers an example of a watch, explaining that "to hit a watch with a hammer would not produce parts, but fragments that are separated in ways that are not significantly related to the structure of the watch" (23). His example shows that fragments do not have a function and become useless, while parts have a role or function. Moreover, Bohm remarks that fragmentation can become a mindset that can lead to negative, dangerous, or undesirable 'reality'. He explains:

> Fragmentation is therefore an attitude of mind which disposes the mind to regard divisions between things as absolute and final, rather than as ways of thinking that have only a relative and limited range of usefulness and validity. It leads therefore to a general tendency to break up things in an irrelevant and inappropriate way according to how we think. (24)

The fragmentary perspective tends to lead to an egocentric thinking, in dualities, and superiorities as he concludes: "to sum up, fragmentary thinking is giving rise to a reality that is constantly breaking up into disorderly, disharmonious and destructive partial activities" (25). In this manner, fragments are irrelevant parts that cannot be put together to function again. In this way, we are unable to see fragments as proper pieces in relation to the whole. To put it briefly, complexity may differ from postmodern in the sense that in the former the agent keeps its parts

intact, interacting and exchanging information with other parts or even other agents, creating new combinations, interconnectivity, and innovations without losing its individuality, despite being in a constant process of becoming; whereas in the latter, the agent loses the original parts to form new ones in a process of hybridity, making the original identity to be erased. Despite their differences, both schools of thought share the notion of intertextuality. Based on complexity thought, I argue that intertextuality is considered the encounter of other voices forming nodes along the text, becoming visible by not merging with each other, but interacting so that a creation of a network topology is possible. Yet, in postmodern thinking the voices merge in a text and become hybrid by the likelihood of losing the 'author', once embedded in a narrative. This can be observed in women's life narratives that follow a "disjunctive form" or narrative as Jelinek (1986) identifies in her pioneering study on women's autobiography. Jelinek gives examples of life narratives in which the autobiographers use stylistic devices to "distract the reader with anecdotes", "[rely] on drama for [their] portraits" in order to "sever – unconsciously – a protective function, a way of obscuring the lack of a retrospective, coherent, and holistic sense of self" (188). [66]

Complexity thought has one of its roots in quantum theory, which has inspired me to understand autobiography as a relation of matter/particle, which is embodied in signs and words, and energy/wave, which is emergent in the meaning created out of interconnections. As Bohm states: "The fact that everything can show either a wave-like or a particle-like character according to the context of the environment which is, in this case, the observing apparatus, is clearly not

[66] More recently, Smith and Watson draw attention to the construction of a "hybrid self" in women's autobiography that intersects with visual image, text, and performance. They theorize the self-representation in artists' life narratives such as Frida Kahlo and Charlotte Solomon by considering the body which is portrayed or performed. They state that "these self-referential displays at the visual/textual interface in hybrid or pastiche modes materialize self-inquiry and self-knowledge" (2002, 7).

compatible with mechanism, because in mechanism the nature of each thing should be quite independent of its context" (6). Based on this view, an ambivalent feature enables something to hold two valences which is dependent on a context. The notion of ambivalence has also been a common characteristic in postmodern approaches, which is not exclusive to complexity studies; however, in postmodern studies, the context of the environment seems to be overlooked, whereas in complexity thought the environment plays a key role in the interaction of the agents. Thus, examining ambivalence in neuro-autobiography means that we should consider discursive elements and emergent meanings which are both context-dependent.

Bohm also emphasises the notion of "non-locality of connection", an important feature in complexity studies, but undermined in postmodern studies. Interaction does not necessarily happen only when agents are in face-to -face events, or in short distance apart, but also afar, in virtual and mediated environments. According to Bohm, "the connection can be between particles at considerable distances in some cases. This violates the classical requirement of locality – that only things "very close to each other can influence one another" (7). The internet has been a model for a non-locality of connection; we can connect with others from distances never imagined before. Thus, digital neuro-autobiography takes advantage of this feature by connecting with an audience that lies outside any border, geographically and metaphorically. For example, any viewer with access to internet connection can watch Maysoon's TED Talk video independent of their locality; moreover, a viewer can connect with other viewers by posting comments that violate the traditional concept of time-space, that is, a viewer may still post a comment on a presentation that took place five years ago, and may still receive a reply from another viewer sometime in future.

Another important concept in Bohm's scholarship is "enfoldment", in which "everything is folded into everything" (12). We can extent its meaning to autobiography studies, in which life stories can enfold and unfold in a dynamic move like the waves. In other words, life unfolds and turns inside out once 'written'. A person's life narrative enfolds and unfolds in a continuous flow so that their life events can be considered integral and "in constant recreation through enfoldment and unfoldment" (Bohm 15).[67] Hence, autobiographical writing is a dynamic exercise that involves self-reflectivity, metacognition, and self-organisation, triggered by physical and emotional experiences with oneself and with other agents in an environment. In sum, autobiographical writing is a process of enfoldment and unfoldment that leads to one's self-discovery.

To conclude, this chapter offered an overview of the main concepts in the field of autobiography, more specifically with women's life writing since it has been initially influenced by postmodern thought, which stresses issues of subjectivity, agency, and fragmentation. In this view, women's life writing has largely served as a space for feminist epistemologies to emerge in opposition to standard knowledge (to some extent represented by the scientific discourse). Despite postmodern ideas having supported the evolution of women's autobiographical practice over the past decades, they offer a reductionist view by emphasizing a relativity with the notion of difference that can lead to identity politics. For this reason, this chapter explored complexity thought as an alternative approach for autobiography studies as it can provide holistic and transdisciplinary perspectives that are likely to be a hallmark in the 21st century. Hence, I drew

[67] Deleuze develops a philosophical theory of the self in his article "The Fold" (1991) based on Leibniz's concept of monad; briefly speaking, Deleuze's article is about matter and soul from a monistic perspective, in which "enfolded and "unfolded" are part of the same ongoing process, with no distinction between inside and outside. Deleuze's "The Fold" is likely to be congruent with David Bohm's ideas of the "implicate order" as seen in his work *Wholeness and The Implicate Order* published in 1980.

upon complexity theory to revisit autobiography studies so that they can be understood as part of open systems with an emphasis on an ecology of composition that enables various agents to interact. In this view, an autobiographical self is neither isolated nor fragmented, but it is in constant flow, a becoming process, marked by interactions, networks, interconnectivities that emerge out of lived experiences and narratives.

CHAPTER FOUR: Exploratory Mapping of Five Neuro-Autobiographies

4.1 Context and Participants

In this chapter, I explore five published autobiographies written by professional women who live with some neurological conditions that affect their everyday; despite being public figures, they are active citizens in the public sphere and media. They were selected because their stories have been narrated and performed in different media platforms, such as published autobiographies, websites, social media, and uploaded videos on YouTube. I concentrate the analysis on the published autobiographies, although I may rely on a few references to their online resources, whenever necessary.

The autobiographers are Temple Grandin, Siri Hustvedt, Jill Bolte Taylor, Barbara Arrowsmith, and Francesca Martinez. They are all from English-speaking countries, and all have distinct professions despite their neurological conditions. Temple Grandin is an animal scientist diagnosed with Autism Spectrum Disorder (ASD). Her neuro-autobiography *Thinking in Pictures: My Life with Autism* (1995, 2006) serves to translate (neuro-)scientific information to a vernacular language and discourse; in other words, her life story communicates autism research and her own experiences as a high functioning autist to a lay reader.

Siri Hustvedt is a professor of English and a well-known novelist who suffers from migraine and convulsion. In Siri's neuro-autobiography *The Shaking Woman or A History of My Nerves* (2010), scientific and vernacular knowledge flow like a stream of consciousness in her story. Siri provides a brief review of the history of (neuro)-sciences and psychology along with personal and experiential accounts of her neurological condition.

Jill Bolte Taylor is a neuroscientist who had a stroke as a result of an aneurysm while she was in her early 30s, marking her body with sequelae and trauma; Jill's neuro-autobiography, *My Stroke of Insight: A Brain Scientist's Personal Journey* (2009) mixes scientific language with vernacular in a didactic writing style to make her readers aware of the risks of a stroke and its aftermath.

Barbara Arrowsmith is a special education teacher and entrepreneur who was diagnosed with learning disabilities as a young adult. Barbara's neuro-autobiography *The Woman Who Changed her Brain* (2012) deals with personal and scientific views of living with learning disabilities and how it has affected herself during her school years.

Francesca Martinez is a stand-up comedian and former BBC actor who was born with cerebral palsy (CP). Francesca's neuro-autobiography, *What The **** Is Normal?* (2014) deals with her experience of living with a visible disability that has impacted her interactions with both people and physical environments since a very early age, leading her to build a worldview that is in constant tension of what normal and abnormal in life may look like.

In the analysis, the autobiographers are addressed by their first name to keep it free from professional titles and formalities that their professions might insinuate. By following an ethnographical style, I identity them as participant-narrators whose personal stories have been published and circulated across media. For a holistic view of the neuro-autobiographies, I synthesize them under the complexity thought. Afterwards, I examine the parts, that is, the narratives individually, which are coded into categories supported by the literature review in this dissertation to map and analyze the neuro-autobiographies.

4.2 A Model of Synthesis through Complexity Thought

This section offers a general model of analysis of the neuro-autobiographies through complexity thought, mostly influenced by Prigogine's concepts. I start with Jill Bolte Taylor's autobiography *My Stroke of Insight* to offer a reading model under the lens of complexity thought since her story deals directly with the brain as a co-protagonist. Moreover, reading it through complexity thought helps me synthesize her life story in a holistic manner.

When Jill had a stroke, a section of her affected brain 'died', that is, the neurons died, which is seen as an *irreversible process*. Jill was able to rehabilitate some lost functions and compensate others since the human brain has the ability to find new pathways to resume neuronal communication through synapses so that 'neurons can fire and wire together'. The organic process that lies at a micro level can be metaphorically translated and magnified to a macro view, with reference to Jill's everyday life which was forced to take a different route due to the stroke. In other words, some of her everyday functional activities could not be restored, which became irreversible. However, due to her *internal feedback* (i.e. input/output) and social network with external agents (e.g. family members, friends, and medical staff), Jill was able to create new paths, or better, 'realities', by rehabilitating what was affected. In this sense, she could cope with an aftermath of the stroke because her personality and brain/mind could adapt to a new environment (e.g. internal and external), due to its plasticity in her way of thinking (growth mindset), by recreating, reshaping, and readapting to her new 'body' and to external agents with whom she interacts. Thus, it is important to understand the complexity of a post-stroke recovery and its aftermath not only on a neurological level (i.e. micro) but also on an everyday one (i.e. macro). Jill has shown resilience by 'writing' her life with a different ink; in other words, she is capable to activate her self-organizational and self-regulatory functions (i.e. *autopoiesis*) to

interact with the environment with agency and self-determination. The mechanisms of her internal *feedback system* enable her to perceive, act, respond, and perform in relation to other agents; in other words, to exchange information through a network of agents that can offer and support her recovery.

Before the stroke, Jill could manage her life to sustain balance, that is, *homeostasis*. The rupture of cerebral arteries in a fraction of time brought *chaos* to her body, and eventually, to her everyday life. The need to restore order took her through a lengthy process that demanded determination, resilience, and mind shift towards a new fragile life. She needed to regain strength and energy to continue writing her life story. The loss of energy, or better, the energy she stored in her pre-stroke life was dissipated (i.e. *entropy*). In a post-stroke period, the dissipated energy reattached to parts, to agents, to fragments of herself, which lost strength. As a being, she could bring this energy back to restore the fragmented pieces and to transform them into new complex forms, *fractals*, in an attempt to bring back similar patterns from her pre-stroke life.

Once a neuroscientist and mental health activist, now Jill sees herself as a brain health self-advocate who aims to raise stroke awareness in society through prevention and education. She uses the internet, that is, the cyberspace to disseminate her activism through a personal website and recorded talks (e.g. TED Talk) on *YouTube*. Although she might have lost some of her professional functions, she can keep a pattern in her life that includes citizen action (cf. Arendt). Thus, Jill regains agency, as she can navigate though different institutions and access resources that help her speak up. By being a stroke survivor and brain health activist, she is able to vernacularize neurosciences through her own life story which is supported by her scientific knowledge permeated into her published autobiography, public talks, and website in an everyday language style.

I apply further concepts from complexity thought to analyze the four other neuro-autobiographies. In the case of Siri Hustvedt's neuro-narrative, I identify complexity as part of her life essence. Her neurological condition, i.e. the migraine epileptic seizures, works unexpectedly, and whenever she feels them, the disconnection between her mind and body leads to chaos. Different from Jill, Siri lives on the edge of chaos since tension between order and disorder (i.e. chaos) is a constant mark in her everyday life. She is always prone to an unexpected seizure attack which raises her levels of anxiety whenever she has public interactions. To keep her internal balance (i.e. homeostasis) she must learn how to adapt herself to the *uncertainties* that destabilize her agency and decision-making functions. In this sense, her self-organizational function becomes fragile and vulnerable, easily betrayed by her neurological condition. To compensate it, she builds a strong network with agents that can give her emotional support (e.g. family, friends, medical staff, biofeedback therapy, and neuroscientific knowledge). Her neuro-autobiography emphasizes the confluence of those agents by giving them 'voice' – through a discursive marker of intertextuality and socio-intellectual network (*interconnectivity*).

Her reliance on neuroscientific knowledge is hybrid as she privileges psychoanalysis and metaphysics. She does not take stock in scientific knowledge (i.e. neurosciences) in her narrative while a spiritual tone lies underneath her writing; better saying, she tries to integrate materialism and idealism as part of her reflections and narrative so that an interaction between the two views is in constant movement. Hence, she needs the back-up of psychology (i.e. mind and soul) to offer explanations that transcend atomistic functions of the cells and organs. The physical and metaphysical may get entangled in her agreement with a 'quantum self' to understand her condition in order to figure out the mystery that she holds inside her body. Interconnectivity is important for her because it is a way of producing knowledge (vernacular and scientific) through

the interactions with human and non-human agents, which create energy. Metaphorically, her writing concentrates ‘quanta of energy’ that dissipates from each page of her neuro-autobiography as result of entropy.

Temple Grandin’s life story may offer us a distinct reading under the lens of complexity theory. Temple was born with a different wired brain (autism); therefore, the normal state of her life has been always in a state of chaos. However, Temple can keep some order within chaos as she has received ongoing support from her social network which allows her to keep a level of balance between order-disorder in her everyday. Her life writing emphasizes a social network (e.g. family, education, economic, and religious) that has been constructed on her behalf, with interconnectivity to support homeostasis in her life. If she had not received such support, her world might have collapsed, making her feel fragmented and secluded; yet, strong interconnectivity contributes to build a resilience model at individual and collective levels. Nevertheless, Temple’s public life story, told by others (e.g. biofilm, website, social media) is, however, trimmed and filtered to portray her as an independent woman with autism who has succeeded by her own devices. She capitalizes on her image as a self-advocate autist who is for drug therapy since she holds a strong belief in life sciences and pharmacology.

In a similar vein, learning disabilities have forced Barbara Arrowsmith to live in a world between order and disorder since an early age; however, once she had received a clinical diagnosis for her neurological condition, she decided to reverse the situation. Despite the fact that brain damage can be irreversible, the human brain can create new paths (new nerve cells) to adapt to internal and external environments through the process of plasticity. For this reason, Barbara is capable of retraining her brain, recovering some cognitive skills, and reconfiguring her life. Different from Temple, Barbara does not want to incorporate her learning disabilities into her

personality, since the neurological disorder offers her neither cognitive nor emotional advantages, except for her traumatic memories (*backpropagation*).

Overall, each neuro-autobiography becomes a node of self-reflective practice, in which the five autobiographers can be an observer of their neuro-conditions and their 'selves', leading to an ambivalent position of being simultaneously object and subject. The self-reflective practice is emphasized in the published autobiographies rather than in the performances (e.g. interviews and talks) since the latter is based on a script that limits the storyteller to contemplate their experiences. The talks and interviews posted on websites and You Tube, on the other hand, invite participatory interactions and fast dissemination of those women's stories. In a different note, the case of Maysoon is grounded in performance as she does not have a published autobiography. Although her jokes offer some reflective moments for the audience, they are scripted and framed to avoid chaos. Her neurological condition, cerebral palsy, is itself a chaotic condition similar to Francesca's. Both women share CP, in which body and brain interact with a deficit in the *feedback system*. The neuronal communication or command in their brain to the body fails or is disrupted, 'trapping' both women in a "wobbly" body. This malfunction in the brain leads to ataxia, which resembles an apparent 'drunkenness' behaviour, affecting muscle tone, motor coordination and balance, accompanied with a slurred speech. However, the 'wobbly' movement does not correlate with the individual's internal thoughts and feelings. In Francesca's autobiographical narrative her thoughts are coherent betraying the body that moves 'incoherently'.

All the autobiographers studied here are in a privileged position of being embedded in supportive environments, which facilitate their participation and engagement in social networks that can maintain their lives in 'balance'. For example, they have achieved some of their life goals

despite their struggles to fit in a 'normal' world. Their family and friends can offer them material and emotional support to pursue their ambitions, and for this reason, they can better integrate into society despite their disabilities.

Nevertheless, the autobiographers are aware of small disruptions in their everyday that may lead to chaos as their lives are fragile and vulnerable. This can be observed in the neuro-autobiographies but not in the digital ones. On the uploaded interviews and talks, there is a sense of illusion that show those women with full agency and control of over their bodies as they perform. The jokes and humor they use as rhetorical devices may masquerade their anxieties, fears, and self-doubts. For example, in Francesca's and Maysoon's talks, their own laughs, although with energy, are unsustainable. The sense of humor is part of a rehearsal script that concentrates energy, but it is dissipated once the jokes are heard, losing enthalpy.[68] Thus, this process is irreversible; the performers cannot take their jokes back; the audience's laugh is a mark of this dissipation. For example, you can repeatedly tell the same joke, that is, sentence by sentence, through the articulation of the words, but the energy that involves the joke when it was first created, spoken, or heard cannot be regained. The unexpectedness of the humor is what makes it laughable, which is highly dependent on the context and environmental conditions. It is likely that Francesca's or Maysoon's jokes would not carry the same energy when told by someone else, in a different time and space. Therefore, humor is highly dependent on the context in which it is created, spoken, and heard; in other words, it deeply relies on local interactions as

[68] The term enthalpy borrowed from Thermodynamics refers to measurement of heat energy. Here, I use it metaphorically to illustrate that after a joke is being told it releases energy that is accompanied by the audience's laughter, which is considered an excess energy. This communicative action-reaction (dissipation of heat) leads to a loss of enthalpy, as its parts (i.e. linguistic structures) are dissipated once uttered, increasing entropy. For a detailed understanding of energy flow, see: Kovác, Ladislav. "Bioenergetics: A key to brain and mind." *Communicative & integrative biology* vol. 1,1 (2008): 114-22. doi:10.4161/cib.1.1.6670

part of a system that constitutes a certain language. Similarly, it is hard to find a certain joke funny when it is translated into another language, culture, or context. The inherent locality of the humor impedes that it travels to other networks, limiting interconnectivity, translation, and communication.

Prigogine once stated that "The classical view […] focused its interest on the transition from order to disorder. Now we find everywhere transitions from disorder to order, processes involving self-organization of matter" (1982, 47). His statement is fundamental for the understanding of these neuro-autobiographies since both processes (i.e. order-disorder and disorder-order) are represented in their narratives. In Jill's case, it is her life shifting from order to disorder. During her pre-stroke event, linearity, reversibility, and determinism mark her everyday life. With the stroke, her life shifts, becomes chaotic and disordered, as part of her brain and life becoming irreversible. Her brain relies on neuroplasticity to remap and relearn new paths to readapt to a new environment (her own body, mind, and culture). As a stroke survivor, Jill faces an unstable life, with fluctuations because of the disruptions in the organic system. Once her capacity of self-organization is regained, Jill is able to redeem her 'agency' and remap new paths and alternatives to her life. Similarly, Siri has her world fluctuating between order and disorder every time she has a seizure. Her life becomes unstable, random, and non-deterministic. Yet, both Francesca and Maysoon were born in a state of disorder with constant fluctuations and irreversibility due to CP; however, they learn how to live under uncertainties and are able to find order within their 'disorder', since their self-organization function has not been damaged.

The neuroautobiographies illustrate neurological disorders that play with the notion of non-equilibrium which aligns with Prigogine's statement: "An equilibrium world would be chaotic; the non-equilibrium world achieves a degree of coherence which, at least for me, is a source of

surprise" (1982, 57). It means that the stories of lived experiences with autism, CP, learning disabilities, and seizures show that these protagonists live in a non-equilibrium world with 'a degree of coherence' since they can extract meanings out of their lives, set goals, and interact with agents in a supportive network. If they had been institutionalised under the expectations of setting them into 'an equilibrium world', their lives would have been chaotic instead, as they would have been deprived of agency, and consequently, of resilience to adapt into an environment. By allowing those women to have their lives grown in natural environments rather than being stuck in institutions, where freedom and creativity would be curtailed, their physical and mental health could naturally develop along with their resilience mechanisms. The autobiographers have shown in their narratives that their Self is in constant 'process of becoming', which is dynamic, non-linear, and non-deterministic. Instead of understanding life as something static, deterministic, and certain, we are dealing with it as something uncertain and open, which is in the process of becoming, rather than as a finished entity or another 'business'. Led by Prigogine's words, matter is dynamic, in process, and so is life:

> This description of nature, in which order is generated out of chaos through non-equilibrium conditions provided by our cosmological environment, leads to a physics which is quite similar in its spirit to the world of "processes" imagined by Whitehead. It leads to a conception of matter as active, as in a continuous state of becoming (55)

In one of Prigogine's interviews, he remarks that "With the paradigm of self-organization we see a transition from disorder to order. In the field of psychological activity this is perhaps the main experience we have – every artistic or scientific creation implies a transition from disorder to order" (1983). In this view, I include the neuro-autobiographies in a continuum that ranges from artistic to scientific creations, in which discursive interactions between vernacular and

scientific content are non-linear and non-hierarchical. By examining the neuro-autobiographies through complexity thought, I recognize those life narratives as part of a whole, in which experiential and discursive practices are entangled, creating a mesh, with the internal and external worlds being interwoven. Moreover, the complex framework offers resources that are transdisciplinary, which enables us to examine the narratives as integral since the main object is human life, both lived and represented symbolically and discursively.

Hence, the analysis of the neuro-autobiographies as a case study of the vernacularisation of the modern neurosciences have showed how complex relations between agents (human and non-human) are based on an ecology of communication that can facilitate dialogic relations, in which action and reaction are in constant fluctuations. To conclude, this section has offered a model of synthesis of the published neuro-autobiographies through complexity thought in order to identify how concepts in the New Science can be articulated in those stories from a holistic view in which micro and macro layers can link one's narrated life to another's.

4.3 Ecology of Writing: Vernacular and Scientific

This section examines each published autobiography in order to identify how the five autobiographers deal with their everyday lived experience of their neurological conditions and how they unpack the neuro-scientific knowledge that stem from medical and neuroscientific institutions and how such content is embedded in those personal accounts. I am particularly interested in identifying how an ecology of writing/rhetoric and style can play a role in the mapping of vernacular knowledge to the mainstream scientific knowledge. Furthermore, I examine discursive strategies the narrators use to engage with their readers in terms of empathy while describing their struggles in the everyday. Such analysis focuses on an emic perspective

which brings to light the five autobiographers' voices and their attitudes towards their neurological conditions.

Since the five autobiographers have post-secondary education and some of them in biological sciences they alternate between vernacular and scientific words at some instances. However, they voice their narratives in a vernacular rhetoric and style that shapes their identities and attitudes towards their neurological conditions. In the majority of the examples explored in those narratives, the vernacular becomes the preferred marker with its rhetoric and writing style so that readers can empathize with the autobiographers' neurological conditions and become aware of possible stereotypes and stigma that the narrators may have faced. Nonetheless, there are a few cases in which the vernacular is a less preferred marker since it may reinforce biased attitudes or stereotypes as it shall be seen in examples further on. In this sense the vernacular marker is dynamic, oscillating, and ambiguous.

In this section, I explore the neuro-autobiographies through three categories: vernacular rhetoric and style, rhetorical tools, and pragmatic functions. The vernacular rhetoric and style refer to a holistic view of the neuro-autobiographies from a writing perspective that follows some stylistic patterns that resemble for example, a 'manual', a 'critique', and a 'manifesto'. '. Moreover, the autobiographers are considered rhetors who fulfill pragmatic functions (i.e. performative approach) while they write their autobiography to communicate and educate their readership about the brain and neurological conditions. They use some rhetorical tools (e.g. analogies, metaphor, humor) throughout their personal stories to engage the reader so that responses of empathy, trust, and fascination can be evoked.

Furthermore, I use the term 'ecology of writing' to refer to a collaborative approach (e.g. intertextuality) used in the neuro-autobiographies. This collaborative feature enables the five

autobiographers to interact with scientists, scholars, experts from neurosciences and medical sciences so that they can unpack the scientific knowledge while it gets entangled with their own personal stories which vernacularize the neurosciences.

The following table summarizes the narrative patterns and styles observed in the five neuro-autobiographies as part of the ecology of writing. I will analyze each neuro-autobiography in relation to rhetoric and writing style as it follows next.

Autobiographer/ Rhetor	**Vernacular Rhetoric and Style**	**Rhetorical/ Discursive Tools**	**Pragmatic Functions**
Temple Grandin	Instructional manual (survival guide)	Analogies Humor Metaphor Didactic	Educate Self-advocate
Siri Hustvedt	Storytelling (confabulation) Quest Narrative Critique	Humor Irony Rhetorical question Wit	Educate Debate
Jill Bolte Taylor	Instructional manual (survival guide)	Humor Hyperbole Visuals Didactic	Educate Spiritualize
Barbara Arrowsmith	Instructional manual Marketing (i.e. promotional material)	Humor Argumentation Persuasion	Educate Advertise
Francesca Martinez	Manifesto (i.e. resistance writing) Critique	Humor Irony Sarcasm	Educate Politicize

Table 1: Ecology of Writing

4.3.1 Temple's Collaborative Rhetoric

Temple's autobiographical narrative features a collaborative rhetorical approach by establishing a dialogue with other authors such as the late neurologist Oliver Sacks, a neuroscientist Antonio Damasio, and a late autistic writer Donna Williams.[69] A collaborative rhetoric enables her to interact with other agents and ideas by engaging her own story with theirs. For example, Temple uses Donna Williams' case of sensory processing disorder to interact with her own story: "Williams describes herself as mono channel; in order words, she cannot see and hear at the same time" (72). She introduces the sensory processing issue through Williams' case to link it to her invention of the "squeeze machine" to cope with her own processing disorder which usually affects autists' daily lives and social interactions. The entangled story is to show that sensory processing disorder is not caused by one's personality disturbance but by neurological conditions that may need medical interventions.

In terms of style and rhetorical strategies, Temple's neuro-autobiography resembles a 'self-help manual' as she gives recommendations, suggestions, and strategies for how to deal with ASD individuals. This type of rhetoric and writing style has been categorized as a 'Survival Guide' to target an audience that consists of caregivers and high-functioning autistics. There is some degree of authority in Temple's narrative when she directly addresses her readers through a second-person pronoun, "You", while setting instructions on how to deal with autists. For example: "When working with nonverbal people with autism you have to be a good detective to figure out the cause behind a challenging behaviour like throwing things or biting people. The first thing that must be ruled out is a hidden medical problem that the person cannot tell you about" (181). This example is under the subtitle "Troubleshooting Challenging Behaviour"; the

[69] Donna Williams passed away in 2017 while I was drafting this dissertation.

word ‘troubleshooting’ is usually seen in instructional guides for technology (e.g. electronics), which marks Temple’s recurrent association with ‘machines’. The next subtitle “Troubleshooting Guide for Challenging Behaviour in Non-Verbal Individuals” reinforces her technical report writing style in which she uses ‘step-number’, as illustrated below:

> Step 1. Look for a painful, hidden medical problem.
>
> Step 2. Look for a sensory reason.
>
> Step 3. If 1 and 2 can be ruled out, look for the behavioral reasons for the challenging behaviour. (181-182)

In general, a rhetoric of ‘survival guide’ has become a common genre for a growing audience of caregivers who must deal with individuals with ASD. The writing style is usually concise, objective, and hypothetical, seen through sentences that use ‘if-clauses’. The hypothetical clause offers readers (e.g. caregivers) some scenarios they might face during their interactions with ASD individuals with viable solutions as in Temple’s narrative: “If communication is a problem, then the individual may need a communication system such as “Picture Exchange” or a picture board. If a desire for attention is the cause, then ignoring the behaviour sometimes works. If the individual is attempting to escape from a task, you must make sure that a sensory sensitivity issue is not the true cause” (182).

Temple’s autobiography does not follow a usual pattern of life narratives that are based on reflective practices. Instead, Temple chooses a more detached style, in which she constantly shifts from a first-person pronoun to a third-person as seen in the fragment: “The really big challenge for me was making the transition from high school to college. People with autism have tremendous difficulty with change” (18). The shift from the first-person pronoun ‘I’ to ‘they’ (i.e. “people with autism”) is a stylistic strategy that enables Temple to avoid a challenging practice of

self-inquiry in her narrative, in which she would have to confront her emotions and feelings; such practice can be overwhelming to ASD individuals who usually have difficulties in dealing with their emotional reactions.

Hence, a 'survival guide' style to communicate and educate her readership is emphasized in her autobiography by fulfilling a pragmatic function of "doing things with words". The next sub-section identifies and analyzes some further rhetorical and stylistic devices as markers of vernacularity that Temple uses in order to unpack the neuroscientific knowledge and discourse.

4.3.1.1Temple: "Since my CEO's office has poor "computer" connections…"

Temple plays the role of a translator for communicating and explaining neuroscientific knowledge in relation to the difference between normal and autistic brains. She does this through lexical and concept associations, and analogies as part of her pedagogical writing style. For example, she uses an image of an 'office building' to explain the notion of neural connectivity, as she states:

> Think of the normal brain as a big corporate office building. All the different departments such as legal, accounting, advertising, sales and the CEO's office are connected together by many communication systems such as e-mail, telephones, fax machines, and electronic messaging. The autistic/Asperger brain is like an office building where some of the interdepartmental communication systems are not hooked up. (27)

Temple explains how a normal brain and an autistic brain work by comparing the human organ with a corporation in order to show how departments are organized and interconnected; such illustration marks a vernacular rhetoric and knowledge through comparisons. The use of analogies as a pedagogical tool is recurrent in her narrative to teach her readership about an

autistic brain, as seen in the next example, in which Temple explains the function of the frontal cortex in the brain by comparing it with a CEO's office:

> The frontal cortex is analogous to the CEO's office in a corporation. Researchers refer to frontal cortex deficits as problems with execution function. In normal brains, "computer cables" from all parts of the brain converge on the frontal cortex. The frontal cortex integrates information from thinking, emotional, and sensory parts of the brain. The degree of difficulty in forming concepts is probably related to the number and type of "computer cables" that are not hooked up. (30)

The analogy shifts from an idea of corporation to computer hardware by implying that the frontal cortex centralizes power such as a CEO of a company, and the information converges through neuronal cells that are interconnected by synapses, which Temple calls them, in a vernacular style, "computer cables". The analogies reflect two mainstream cultural artefacts strongly represented in the everyday of North American economic system – the computer and the business organization. Thus, she takes for granted that her readership is well-experienced in these two matters, which lie at the core of American culture – technology and capitalism. Moreover, by comparing the human brain connectivity to computer cables, Temple reinforces a Newtonian tradition of understanding human beings as machines.

The analogies derive from concrete illustrations which the reader can visualize along the narrative; her pedagogical writing style may cater for a reader who may be in the spectrum themselves. In this regard, Temple explains how 'concept formation' is likely to be a problem for ASD individuals, "Since my CEO's office has poor "computer" connections, I had to use the "graphic designers" in my "advertising department" to form concepts by associating visual details into categories. Scientific research supports my idea" (30). She uses analogies such as

"graphic designers" and "advertising department" to represent the problem of connectivity found in autistic brains, whose neuronal cells responsible for imagery are activated to compensate poor connections with the ones in charge of verbal functions. She mentions that her hypothesis has been accredited by a scientific community that authorizes her vernacular translation. Temple also uses simile as a rhetorical device to make analogies, as observed here: "My mind works just like an internet search engine that has been set to access only images. The more pictures I have stored in the Internet inside my brain the more templates I have of how to act in a new situation" (31). Temple compares the function of her mind to an internet search engine, implying that her brain can scan for the best images stored in her memory.

Temple does not differentiate brain from mind as she alternates between the two words along her narrative; however, she sometimes uses the word mind to refer to cognitive functions situated in the brain which is illustrated as an anatomical organ. In this instance, she describes the brain as a box that stores our mental functions; or better still, she metaphorically refers to the brain as a hardware in contrast to the mind which she compared it to a software. She relies on a type of analogy which has been criticized by some neuroscientists and philosophy scholars such as Joseph Ledoux and Paul Churchland, respectively, who have disregarded the mind-brain problem by reducing the mind to brain functions. Yet, the brain as a computer model has its origins in the work by a cognitive psychologist, George A. Miller, who was inspired by cybernetics researchers and by Shannon's Information Theory. As an animal engineer, Temple privileges the analogy of the computer model to explain categorization as a cognitive function that we use to sort out and store information from our everyday experiences: "The hippocampus is like the brain's file finder for locating information in stored memory" (31). Her arguments are also based on recent neuroscience research, as she states that "Studies of the brain show that sensory problems have a

neurological basis. Abnormalities of the cerebellum and the limbic system may cause sense problems and abnormal emotional responses" (87). Moreover, Temple alludes to research done through brain imaging technology (e.g. MRI scanner) in order to strengthen her arguments with scientific evidence in her narrative.

Interestingly, Temple uses class struggle conflict as an analogy to explain lack of empathy in individuals with autism. She may assume that her readership would be familiar with this type of class struggle, and they would probably identify themselves with it. Temple's social class analogy makes a compelling case for the construction of vernacular knowledge as she attempts to translate empathy from neuroscientific grounds into an everyday condition familiar to millions of working-class people. Instead of relying on case studies or life stories of autistic individuals with empathy issues, Temple opts for an analogy that 'empathizes' with a very current worldwide socio-economic problem. She deals with this issue through a recurrent analogy that includes corporate culture, as she explains:

> Time after time I read in the paper about a company that is in financial trouble and they need to ask the workers to take a cut in pay. The workers agree to a pay cut, but the chairman of the board gives himself a bonus. This often makes the workers really angry. This is a situation where ego and emotion blind empathy. Why does this blindness occur? Power and ego circuits that I do not have cause this blindness. These managers seem to be incapable of learning from the same mistake made by other companies. Possibly these managers do not have empathy because they do not directly see how the workers react. […] New research is revealing how empathy works. Brain circuits called mirror areas are activated when a person sees another person hurt. These circuits enable a person to

> experience the other person's pain. […] People have empathy when they directly experience suffering. (98)

Associating the human body with a machine (e.g. computer) or technology (e.g. video camera) turns out to be Temple's rhetorical and stylistic strategies throughout her neuro-autobiography. The comparison between the human brain and a computer is a recurrent rhetorical strategy in her narrative to translate the scientific knowledge into the vernacular: "A person or animal can learn to overcome a fear. The brain does this by sending a signal down to the amygdale (emotion center) to close the "computer" file of the memory. The file can be closed but it cannot be deleted" (183). Similarly, in Chapter 9 ("Artists and Accountants: An Understanding of Animal Thought") Temple explains how a savant's mind/brain works by comparing it with a video camera: "I would speculate that the true card-counting savant mind works like a video camera that is fixed to a tripod and continuously records the same scene" (185). More than a discursive device, the use of technology in her narrative becomes a pedagogical strategy to teach her readership about brain functioning.

4.3.2 Siri's Confabulation as a Rhetorical Strategy

As a novelist, Siri differs from the other neuro-autobiographers. Her narrative is literary, poetic, and more subjective. It is non-linear and oscillatory, which marks a dense and complicated autobiography, not clearly organized to orient a reader; in other words, there are no chapters or sections to separate main ideas or topics. The only cues she leaves to signal shifts in her thoughts and writing are the capitalization of the first four or five words in a sentence of a new paragraph, which some readers might overlook, as seen in the following example, "ABOUT

SIX MONTHS AFTER" (27), and "HYSTERICS SUFFER MAINLY FROM REMINISCENCES" (74).

Siri places creativity at the heart of her autobiography; for this reason, Siri does not craft a narrative that could be easily identified as a manual or a survival guide. Instead, Siri entangles reality and fiction, in which she explores its complexity under the term 'confabulation', seen here as a rhetorical device to deal with the mysteries of the 'shaking woman'. In this sense, Siri points out that her narrative is neither based on lies nor on pure fiction, but on a creative process of confabulation, stemmed from her neurological condition, which neurosciences are yet to offer precise explanations to the condition of the shaking woman. She states that "Confabulation isn't lying; the neurological term refers to the explanations brain-damaged people come up with to explain the mysteries that confront them" (54).[70] Siri illustrates the meaning of confabulation by referring it to the condition of the "shaking woman": "The shaking woman is not the narrating woman. The narrating, interpreting woman continued while the other was in convulsion. The narrator was a fluent generator of sentences and explanations. It is she who is writing now" (54). The double or 'split identity' is about the body and the brain; while the body 'shakes', the brain 'works', as if there were no interaction between the two parts.

Neurologically speaking, confabulation is a problem of communication between the two hemispheres through an issue in the corpus callosum, which Siri metaphorically hypothesizes whether "a whole host of intellectual theories don't fall into the category of grand confabulations" (54). Her readership may wonder whether her life story is based on her lived experience or on fictionalization since she entangles fantasy and reality in the construction of her life story. To deal with this problem, her readership should search for information outside her published

[70] Siri explains how confabulation works at the brain level by relying on Gazzaniga's neuroscientific studies about the "the left-brain interpreter" (54).

autobiography so that they can confirm it against recorded online interviews and talks between Siri and scientists or journalists.

As a professional writer, she has the resources to play with fictionalization in her autobiography, since the imaginary is part of her creative writing process. For the reader, it may become difficult to separate fiction from reality, creativity from fact, and storytelling from reasoning, mainly when there are instances in which fictional and experiential dialogues with a medical staff are present in her narrative. Moreover, her narrated encounters are entangled with references and reflections, creating a complex dialogue. In one of Siri's supposed experiential interaction with a real-world doctor, who requested an exam necessary for a more precise diagnosis to evaluate her condition, the event is remembered and filtered through Siri's perspectives as a humanities scholar who understands that science is part of a semantic construction.[71] Siri concludes that confabulation can lead to 'fuzzy' or 'uncertainties in the narrative as "Blurring borders creates abiding conundrums" (157). Hence, within a confabulation rhetoric Siri tells the story of the shaking woman by exploring concepts from psychoanalysis, neurology, and neurosciences. In the following sub-section, I explore further language devices she uses that not only enrich her narrative style but also signal a relation between scientific knowledge and vernacular.

[71] Siri illustrates it with an example from *Migraine*, one of Oliver Sacks' books, in order to support her argument about the pitfalls of relying purely on objectivity and categorisation of a symptom in certain illnesses. Oliver Sacks talks about how sometimes symptoms can blur certain illnesses, as he cites an example from another doctor who coined the term 'migralepsy' to illustrate humorously that a clear-cut definition might not always be possible. Siri comments that Oliver Sacks "acknowledges not only the twists and turns of medical history but the genuine ambiguities that arise when we try to attach names to phenomena that resist clarity" (157). This requires an open-minded attitude and flexibility to embrace medical science (or better *ars medica*) as each individual has their own specificities, and therefore, a semantic plasticity is necessary to accommodate personalised medicine.

4.3.2.1 Siri: “The question has always been, A woman is shaking. Why?”

Siri recounts a history of hysteria through neurosciences, psychoanalysis, and her own philosophical outlook as a humanities scholar who tries to clarify the fuzzy notion of conversion disorder which is rarely understood among the medical and scientific community. Thus, her writing style to unpack the scientific knowledge is not through comparisons, analogies, or metaphors, but through storytelling, in which she centers her case on the history of hysteria by adopting a quest narrative style.

Siri’s quest starts with a curiosity to learn more about her neurological symptoms as well as her ‘self’, as she states: “If I couldn't cure myself, perhaps I could at least begin to understand myself” (6). To address her neurological condition, i.e. seizures, she opts for a vernacular word such as “shaking” and its variations to describe her symptoms: “By the time I shook in front of my father's tree, I had been steeped in the world of the brain/mind for years” (6). Siri speculates that an emotional component must be a trigger in her ‘shaking’, as she cites the case of her talk in honor of her father: “Whatever had happened to me, whatever name would be assigned to my affliction, my strange seizure must have had an emotional component that was somehow connected to my father. The problem was that I hadn't *felt* emotional. I had felt entirely calm and reasonable” (7). She is intrigued by emotions tricking her when she had a seizure; despite feeling “calm and reasonable”, the shaking happened out of her control and consciousness while she is delivering a eulogy to her father. She refers it as a “strange” situation, once she feels her brain disconnected to her body, or better, losing control of ‘her’ self. Such uncanny condition leads her to invest her time in searching for an explanation, or rather, a ‘raison d’être’ that becomes her autobiography: “I decided to go in search of the shaking woman” (7). Instead of stating 'to go in search of myself or me’ she opts for a third party, “the shaking woman”, as if it were another

person she is searching for, outside the boundaries of her body. She is unable to identify with the 'shaking woman' whom she sees as an alien to herself. In other words, 'the shaking woman' becomes the 'other' that causes Siri to shake or have a convulsion.

To understand the "shaking woman" phenomenon, she goes on a 'quest' that includes a revision of the history of the neurosciences. Siri adopts a vernacular style to revise the disciplines (e.g. psychology, psychoanalysis, neurology) that deal with the "nerve disease" in order to understand her 'convulsion'. [72] Siri briefly touches on the history of ancient Greek medicine in terms of how they understood convulsion and epilepsy as two separate neurological conditions that do not have to be correlated to each other. Skipping in time, she briefly discusses the witch hunts that took place during the Middle Ages, when women with neurological disorders such as epilepsy were targeted as being 'possessed'. Siri shifts her focus to Freud's psychoanalysis, which becomes a recurrent topic in her neuro-autobiography. Nevertheless, she also discusses approaches in pharmacology and technology (e.g. brain imaging techniques) as current line of treatment for seizures. Her intention is to develop a dialogue between Freud's work and current neuroscientific discoveries that cover the mind/body problem from a philosophical view. Thus, Siri's neuro-autobiography is less about her life story, which she keeps it superficially, but more about a discussion of scientific knowledge of the human brain. As she states in a recorded interview uploaded onto the website bigthink.com, her narrative is 10% about herself and 90% about neurosciences.

Hence, her neuro-autobiography is a brief history of convulsion and epilepsy studies permeated with experiential accounts in a vernacular style, in which she selects words from the everyday to translate scientific ideas. Siri mentions that convulsions have been a puzzle for

[72] Nerve disease is a vernacular expression used during the Victorian period in reference to women's mental health, famously linked to hysteria, which Siri uses instead of neurological disease.

physicians over centuries, and they have gained popularity in medical history as "Epilepsy is the most famous of all the shaking illnesses" (7), an affirmative sentence she uses to justify its importance in her neuro-autobiography to her readership; moreover, epilepsy cannot be reduced to convulsions, as the fit can also be a symptom of other neurological conditions. For this reason, Siri considers epilepsy a neurological illness with its own specificities. She also observes that a person to be diagnosed with epilepsy has to have at least two seizures, as she explains: "I needed to have had at least *two* seizures. I believed I had had one genuine seizure before my intractable migraine" (9). With this assertion, she is ineligible for being diagnosed with epilepsy, as she states that "The second one looked suspicious to me" (9). For this reason, she continues her quest. She decides to examine convulsion and epilepsy through historical and evolutionary perspectives that allow her to understand the disorder from both a mystical/religious explanation and natural/medical sciences. For example, Siri mentions an ancient Greek physician named Galen who "would have diagnosed me with a convulsive illness, but he would have ruled out epilepsy" (7). [73] Yet, during the medieval period, her shaking or tremor would have been diagnosed as supernatural phenomena in which "nature, God, and the devil could wrack your body, and medical experts struggled to distinguish among causes" (8). It was a time when the unknown was explained as being caused by supernatural phenomena, and alchemy was a vernacular practice of medicine and chemistry. To illustrate the medieval culture, she cites examples of saints who suffered from migraines accompanied by auras and visions, whose symptoms were considered "mystical flights towards God" (8). Siri conjectures that if she were having her "tremulous episodes" during Salem's witch hunting wave, "the consequences might have been dire" (8), with

[73] Siri explains that epilepsy is caused by convulsions which interrupt cognitive functions such as awareness and speech, which is not her case, since they are not affected, making her wonder what her diagnosis would have turned out to be during Galen's time.

life-threatening consequences, as she could have been denounced as "a woman possessed" (8) since "some external power had entered my body to cause the shudder" (8). What Siri implies is that depending on the historical period, her shaking would carry different interpretations and meanings, as neurological diseases have been vulnerable to religious and mystical beliefs, since altered self/consciousness used to be considered an issue of the soul, and not of the brain.

Siri searches for a precise diagnosis of her neurological condition which leads her to delve into neurosciences. Learning from a third party about a medical term called 'conversion' to refer to "patients neurologists don't know what to do with them" (10), she ends up having an epiphany as she reveals it in italics: "*That could be it!*" Her insight explains about conversion as a current term to replace the 19th century hysteria: "My fit had been hysterical" (10). This incident becomes a hook for her to shift to the next theme in her neuro-narrative that is "hysteria". She gives a comprehensive explanation of the word hysteria by commenting on its Greek root that means 'womb', which is related to the female reproductive organ.[74] She explains that such a view removes hysteria from the realm of mental disorder and places it in a woman's body and female sexuality mainly of the young (i.e. virgin) or old (i.e. widow), hindering women's agency in the western society. It was only after the 18th century that hysteria shifted from the womb or somewhere else in woman's body to the brain. Siri inserts herself into the historical narrative of hysteria with a tone of humor as she declares, "and of course, I was a woman with a potentially vaporous or disturbed uterus" (11). The use of humor implies her critical view of the history of medical science, which has been usually male-oriented. Her writing is subtly permeated with

[74] Her narrative implies that hysteria has a biased history with a misogynistic tone that pervaded Greek culture as she comments: "Galen believed that hysteria was an illness that beset unmarried and widowed women who were deprived of sexual intercourse but that it wasn't madness" (10).

feminist criticisms in relation to how scientific and medical knowledge have been constructed in the western society.

Since neuroscience focuses on the brain as the supreme organ over our body, Siri tries to counter argue by stating that conversion has been situated in the row of psychiatric disorders as "somatoform disorders", which means "disturbances of the body and physical sensations" (11) that allows a connection between the body, the brain and the peripheral nervous system. Moreover, Siri extends her critique to medical knowledge construction by implying that neurological diagnoses are vulnerable to interpretations that vary according to dominant paradigms in the history of science. Thus, psychiatric knowledge is based on interpretations and meaning making, which create ambiguities and challenges to define some neurological disorders, as she states: "There it's called dissociative (conversion) disorder. If this sounds confusing, it is. The authors of psychiatric diagnostic texts have obviously been uncertain what to do with hysteria" (12). Siri remarks that "this contemporary dilemma of identification sounds a lot like the difficulties physicians have had throughout the ages separating epilepsy from hysteria. The question has always been, A woman is shaking. Why?" (13) This is a rhetorical question which centers on the person and not on the disorder. Her search for a definite diagnosis becomes a quest to be taken across her narrative, as if she were searching for the Holy Grail.

Like Temple's neurological disorder, Siri's condition is accompanied by symptoms of anxiety which she ends up relying on medical treatment while getting "a referral to an epilepsy specialist". But differently from Temple, Siri does not react positively to pharmacology, becoming frustrated and losing trust in the western medicine, as she complains: "a placebo might have worked just as well" (32). She implies that concepts, beliefs, and autosuggestion might work as much as the medication, as she remarks that "Ideas, it seems, are powerful and can alter us"

(32). Siri's storytelling shows elements of her political viewpoints, which she crafts in a critique style to point out some neuroscientific practices she is skeptical about. For example, Siri briefly discusses the use of brain imaging technologies such as PET, SPECT, and fMRI to clarify to her readership that we cannot equate brain imaging with a simple, objective, and transparent photograph of the brain as scientific journalism tends to do for the sake of sensationalism and simplifications in neuroscience for a lay audience. For this reason, her critique is blunt to her readership: "What the pictures actually show and how to read them remains controversial, however" (33).

Siri sounds uneasy with the fact of having her condition being reduced to neuroscientific explanations. She cites a well-known Canadian neuroscientist, Donald Hebb, for having proposed a principle to explain learning and memory through neurophysiology in 1949.[75] Many years later, a neurobiologist named Carla Shatz has paraphrased Hebb's principle through a rhymed statement: "Neurons that fire together wire together". Such statement has become popularly attributed to Hebb's authorship, including Siri who cites Hebb as the reference for it in order to explain that her seizures are likely a problem of brain waves while her neurons fire and wire together. She raises the following question to link it to her case: "Can I say that the shaking woman is a repeatedly activated pattern of firing neurons and stress hormones released in an involuntary response [...] Is that all there is to be the story?" (116). She is not convinced by the reductionist approach in neuroscience; thus, she searches beyond neuronal patterns as she self-inquiries: "Am I wrong in feeling that "a vast assembly of nerve cells" is an inadequate

[75] Hebb's principle is: "When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased" (p. 62 in Kyersers and Gazzola, 2014, 1). For further explanations see: Keysers, Christian, and Valeria Gazzola. "Hebbian learning and predictive mirror neurons for actions, sensations and emotions." *Philosophical Transactions of the Royal Society B: Biological Sciences* 369.1644 (2014): 20130175

description of *me* or that those words fail to answer the question. What happened to me? Am I looking for a narrative, a confabulation, to interpret a debility that is no more and no less than synaptic wiring and firing?" (117). The anguish to have an answer that can comfort and assure herself that human beings are more than neurons in synapsis remains in suspension. Siri involves Joseph Ledoux into her conversation, as a neuroscientist who published *The Synaptic Self: How our Brains Become who We are* (2002); despite Ledoux's reductionist approach to the 'self', Siri argues that Ledoux acknowledges "there are levels of human reality" (117), although she remarks that "it is not clear how the changes at the neural level relate to those at the psychological level" (117). The mind-brain problem becomes transparent in her narrative as she tries to deal with the uncertainties about her jittering, or better, about her 'self' or brain.

Siri explains certain concepts from psychiatry and psychoanalysis such as "transitivism" and "transitional object" by linking these terms to her own neurological condition and life story. [76] For example, Siri recalls an event in her life just before her father passed away. She used to visit him at a nursing home and followed a routine to sleep over at her mother's home. One day as she was lying on the bed and thinking of her father, she narrates that she felt uncomfortable with her body feeling heavy and in a "panicked helplessness" mood. She describes the feeling: "For however long it lasted, only minutes, I was my father. The sensation was both overwhelming and awful. I felt the proximity of death, its inexorable pull, and I had to struggle to leap back into my own body, to find myself again" (125). This passage is a vernacular account of the notions of transitivism and transitional subject through a storytelling model. She describes an embodied experience focusing on corporeal sensations rather than on rationalization or cognitive

[76] Siri defines transitivism as "a projection of one's own symptoms on a double to save the self" (121).

functions.[77] She digresses from her story to comment on Freud's work on melancholia and dreams, which she implies that being connected to her father's body is a result of depression and repressed feelings. The storytelling format is to point out that neither a neurological treatment nor a psychiatric therapy would serve her well, but psychotherapy.

Although Siri's account relies on a neuro-psychoanalysis framework, with a focus on the brain and mind, she highlights the importance of the body in connection or disconnection (in her case) with the brain, as she states: "But the neck is also where the shaking woman begins. A sick neck served as the perfect dream image of my symptom: *From the chin up, I was my familiar self. From the neck down, I was a shuddering stranger*" (129). This is an important passage because it shows the dis-connectivity between body and brain as separate entities; or better, Siri's body is fragmented, as if her neck served as the bridge between these two alien territories. Her brain, where her 'self' is located, inhabits a familiar space, of which she is in control, and from the neck down lies *terra incognita* (i.e. convulsion), where she cannot recognize as part of being her 'self'. Her narrative shows that the disconnection is a metaphor for the body-mind conundrum that she refers to "ambiguous". To indirectly address this issue, with a tone of mockery, she raises the question: "Isn't the neck the place where the head ends and the body begins?" (129). Briefly, the shuddering woman does not think, neither has cognitive skills, nor does she have consciousness; therefore, it cannot read or write, which it is the reason she cannot recognize the shuddering stranger as an integrated part of her 'self'.

[77] The focus is on corporeal sensations and experiences as she notices, "I felt the oxygen line in my nostrils and its discomfort, the heaviness of my lame leg [...] the pressure in my tightened lungs" (124). She also cites another example when she was working on her father's memoir years before he died. She could also feel her and his body merging as she typed his dad's letters into the memoir: "Typing allowed his words to take on a physical reality beyond what I would have experienced by just reading them. My fingers can listen, too" (125).

When Siri was young, she equated her unexplained lived experiences as “supernatural”. Her unexplained migraines were related to supernatural force, as she describes: “Since childhood I have experienced lifting sensations and euphoria, floods of deep feeling that arrive in my body as a lightness in my head and seem to pull me upward. An unearthly clarity of vision and a feeling of high, perfect joy have preceded my most brutal and durable headaches” (157). Siri's narrative of the supernatural in her everyday life which emerged from physical pain and uncanny experiences are seen under two lenses: one vernacular and the other scientific. The vernacular is expressed as if it were a literary text in the shape of magical realism, whereas the scientific knowledge is based on a literature review of scholars across the field of neurosciences, philosophy and psychology, such as a Canadian scholar, Iman Baruss whose work transcends mind. Siri continues her story: “And once, well into my adulthood, I saw my small pink man and his pink ox on the floor of my bedroom” (157). Her hallucinations were part of an altered mind or aura phenomena due to strong migraines, making her think that she was “different” from other kids. Feeling different might have defined her personality or identity, while dealing with those migraines as a child. However, Siri affirms that nowadays she no longer attributes those experiences to the “presence of the supernatural”, but instead, to her “nerves”. Her point in the narrative is to discuss how mental illness has been associated with personality and spirituality throughout medical history, which leads her to raise an existential question that is recurrent in her narrative: “The association of pathology with personality brings us yet again to a larger question: What are we? To what degree can beliefs, including religious ones, be linked to a person's neurobiology?” (158).

Siri resumes the discussion of what scientific and mystical evidences might be (e.g. hallucination) by recalling when she received her official diagnosis of a classical migraine with

characteristics of ‘temporal lobe epilepsy’. The diagnosis makes her accept the shaking woman inside herself, as she remarks: “The headache is me, and understanding this has been my salvation. Perhaps the trick will now be to integrate the shaking woman as well, to acknowledge that she, too, is part of myself” (174). This leads to final conclusions in her neuro-autobiography. The diagnosis comes up as a resolution to a climax, or an epiphany to her conflict. As seen, Siri unpacks neuroscience and medical terminology through a storytelling style in order to construct vernacular knowledge of her neurological condition to a lay readership.

4.3.3. Jill’s Rhetoric of Spirituality

Like Temple’s neuro-autobiography, Jill’s narrative is marked by a pedagogical rhetoric and style with the aim to instruct her readership about the brain and stroke. Her narrative shows evidence of her professional and personal achievements until the day she had the stroke, which completely changed her life as she recollects: “I woke up on December 10, 1996, to discover that I had a brain disorder of my own. I was having a stroke” (7).[78] Jill has her readers in mind when she advises them about the content of some chapters that deal with anatomy of the brain and stroke information: “Please don't let this section scare you away. I have done my best to keep it user-friendly with lots of simple pictures of the brain so you can understand the anatomy underlying my cognitive, physical, and spiritual experiences” (8).

Besides holding a pedagogical writing style, Jill’s narrative shows reflexivity and dialogical features, which are shown in how she constructs the grammar such as verb tenses, from present to

[78] Chapter One in Jill’s neuro-autobiography aims to profile Dr. Jill Bolte Taylor as an award-winning neuroscientist, engaged in advocacy for individuals with schizophrenia, and active scientist at a medical school before suffering a stroke.

past and vice versa. This style reinforces an internal dialogue, while she experiences a spiritual moment, stressing a near 'supernatural' phenomenon she went through:

> On silent prayer, I reflected, *I am not supposed to be here anymore! I let go! My energy shifted and the essence of my being escaped. This is not right. I don't belong here anymore! Great Spirit, I mused, I am now at one with the universe. [...] The fragile mind of this organic container has shut down and is no longer amenable for intelligent occupancy! I don't belong here anymore*. (68)

Jill's identity of a stroke survivor is 'officially expressed' in Chapter 12, in which she states that "I celebrated the joy I felt and the lessons I had learned. I was touched by the daunting reality: I was a stroke survivor" (114). She sees herself as a stroke survivor with some tone of irony since she was once a neuroscientist who is now a survival of brain damage. Not only is she a survivor of a brain stroke, but also of a brain surgery, on the path to a life-long rehabilitation. In this vein, she focuses on the notion of recovering, with a preference to the word 'wounded' to describe herself, distinct from Francesca who focuses on the word 'damaged' (brain). By using the lexical choice 'wounded' as a key concept, Jill implies the possibilities of a complete recovery; or better, the word 'wounded' suggests recovering, whereas 'damaged' does not open possibilities for healing.

Like Temple's, Jill's neuro-autobiography shows elements of a 'manual' or survival guide. Thus, based on her lived experience, Jill provides her readership (e.g. stroke survivors and caregivers) with practical recommendations to improve the healing process as part of her narrative in addition to references that she points out in the appendix. Jill's list of recommendations is stressed in her narrative in bold throughout Chapter 13. She explains her decision to recover from a stroke by pointing out the difficulties she faced during the process. She

indicates that to obtain a successful recovery it is necessary that an individual should have strong will and resilience, as well as caregivers' understanding of trust in the healing process. Jill expects a recovery that is not only based on her body but also on her mind.

It may surprise her readers' that Jill's life narrative favours vernacular knowledge (intuition) over a medical discourse. This is seen in the description of her healing process. She focuses not only on her own efforts to keep a recovery path, but also on her need to have others helping her. This is the first principle or recommendation seen in bold in her narrative on Chapter 13, "**I desperately needed people to treat me as though I would recover completely**" (116). She clearly states that she needed caregivers who believed in her recovery although the medical staff seemed not to believe in her full recovery, as she rebuts them, "I have heard doctors say, 'If you don't have your abilities back by six months after your stroke, then you won't get them back!' Believe me this is not true". She resists medical scientific knowledge, or better, the 'truth', while she insists on her own experiential knowledge and intuition that lie in the vernacular from a patient's perspective. At the same time, her background in science seeks evidence and empirical knowledge, which she considers her 'experience' as such, by trying to counter-argue and falsify the clinical judgement doctors follow.

Moreover, Jill's neuro-autobiography takes an essay on the notion of recovery and the sense of being her 'self' as seen in the last chapters from Chapter 15 on. The narrative is no longer about facts that happened to her, but about how she sees herself during the recovery period. Her thoughts indirectly touch the classical body-mind problem through a discussion of how to find balance between the two hemispheres: "Creating a healthy balance between our two characters enables us the ability to remain cognitively flexible enough to welcome change (right hemisphere), and yet remain concrete enough to stay a path (left hemisphere)" (145). Her goal is

to achieve a healthy balance by reprograming her brain circuitry and being aware of patterns that take over the behaviour we disapprove of. Her stroke has a self-awareness effect, revealing a new type of life for Jill, so that she can reconstruct her identity: "One of the greatest blessings I received because of this hemorrhage is that I had the chance to rejuvenate and strengthen my neuro-circuits of innocence and inner joy. Thanks to this stroke, I have become free to explore the world with childlike curiosity" (147). She is not shy to attribute these qualities to her right mind by stressing its supernatural power, with divine knowledge, omniscience, and female wisdom: the right mind is "the seat of my divine mind, the knower, the wise woman, and the observer" (147). Here, Jill's narrative shifts to spirituality; the word choices are marked by vernacularity, as she remarks that "my right mind is ever present and gets lost in time" (147). She attributes a cosmic dimension to her right mind as it becomes a representation of a 'collective brain' that not only cares about her own body, but also "the fitness of your body, our mental health as a society, and our relationship with Mother Earth" (148). Her neuro-autobiography takes a step towards a *New Age rhetoric* as she states: "we are brothers and sisters on this planet. We are here to help make this world a more peaceful and kinder place" (149).

A rhetoric of spirituality breaks away from scientific knowledge in her neuro-autobiography and it is seen as a mark of vernacularisation in her narrative. Likewise, a rhetoric of New Age aligns with an ecological view of herself in relation to other agents, humans, and non-humans. For her, the right mind is the spiritual, open-minded side, that is, the divine force that resides in one's body, which is usually repressed by the left hemisphere. Nevertheless, she acknowledges that the left mind is "the tool I use to communicate with the external world" (149). The left is the one that communicates with her since she recognizes that the left hemisphere is the rational side that performs the doings of categorizing, organizing, describing, judging, and analyzing

everything (149). Because the left hemisphere sides with the material world and the right hemisphere with the spiritual one, Jill looks for a balance between the two hemispheres so that they can complement each other.[79]

Jill's narrative becomes self-reflective and philosophical in some instances. For example, in the chapter titled "Finding your Deep Inner Peace", she shifts from the first-person pronoun I to the second person You. Her writing style resembles a guided meditation with Jill directly addressing her readership in that mindful practice:

> If you will, think about your breathing. Since you are reading this book, then you are probably sitting in a relaxed state. Draw in a big deep breath. Go ahead, it's okay. Pull air deep into your chest and watch your belly swell. What's going on inside your body? Is it in a comfortable position? Is your stomach feeling calm or queasy? Are you hungry? How full is your bladder? (171)

In the next sub-section, I explore further rhetorical and stylistic devices Jill uses in her neuro-autobiography in order to identity how she constructs a vernacular account of her stroke and how she addresses it to her readership.

4.3.3.1 Jill: "Oh my gosh, I'm having a stroke!...Wow this is so cool!"

As a trained neuroanatomist, Jill tells her story in a pedagogical style to explain to her readership how the brain works. She uses a vernacular rhetoric and style through visuals to accompany some explanations. For instance, in Chapter 2 Jill covers the anatomy and physiology

[79] Jill acknowledges the importance of the left brain as a center of the language and thought that gives us power of creating stories that we tell about ourselves; however, she is concerned about the possibility of the left hemisphere betraying us through make-up stories to ourselves, as she states humorously, "At least until I realized that my left mind full-heartedly expected the rest of my brain to believe the stories it was making up!" (151).

of the brain as if she were a classroom instructor (e.g. brain processing information, sensory stimulation, and brain anatomy - e.g. cortex, corpus callosum, hemisphere, middle artery, limbic system) so that her readership can understand what type of stroke she suffered when she was a young adult (arteriovenous malformation, that is, aneurysm). She ends the chapter by showing a poster of the warning signs of stroke. For this reason, her neuro-autobiography has an educative function in which Jill uses pedagogical rhetorical devices such as illustrations, translation of jargon, and footnotes. Her pedagogical writing is present along her narrative with some recurrent information about the anatomy of the brain hemispheres and their functions to emphasise how such knowledge is important to understand what happened to her brain (i.e. a hemorrhage she suffered in her left hemisphere which put her personal and professional life on hold). Thus, her life writing is loaded with learning resources on how to cope with the aftermath of a stroke and brain surgery. She believes that her complete recovery was due to her neuroscientific knowledge, or better, her belief in neuro plasticity, as she states: "I believed in the plasticity of my brain -- its ability to repair, replace, and retrain its neural circuitry" (35).

Jill focuses on her life story to recount the morning when she had the stroke. She provides her readership with details by narrating her experience of having a stroke in terms of how her brain is reacting, what cognitive faculties she is losing (e.g. sensorial, motor, and speech), and how she struggles to call for help. Simultaneously, she describes the spiritual comfort she is experiencing similar to a state of nirvana, while the right hemisphere is taking control, her left hemisphere is losing track of the world due to the hemorrhage. It is only when she notices her right arm dropping completely that she realizes she is having a stroke. She uses italics in her writing style to differentiate her narrative from her running thoughts of her experience under the stroke process, for example, "*Oh my gosh, I'm having a stroke! I'm having a stroke!* And in the next

instant, the thought flashed through my mind, Wow this is so cool!" (44). By examining these sentences in the narrative, I recognize an internal dialogue marked by 'style-switching', in which scientific and vernacular voices alternate while she describes her stroke in process. Furthermore, she uses illustrations as rhetorical device to refer to the traumatic moment with a drawing of her hemorrhaged brain with the affected areas; she expresses her thoughts through this internal dialogue: "Remember, please remember everything you are experiencing! Let this be my stroke of insight into the disintegration of my own cognitive mind" (47). Her narrative of having a stroke is a reconstruction of the moment she loses her cognitive abilities, her trauma, and her struggle to call for help. She narrates the process and not the result of having a stroke; she writes her perceptions of the drastic changes happening to her body as she loses control over it. Jill recollects the gradual lost of her cognitive functions such as memory, speech, and vision while she was trying to orchestrate her rescue. In sum, she narrates a process of becoming a disabled woman.

In her narrative she gives details of the process of becoming disabled. For example, she describes how she loses the sense of body schema, loses her limb boundaries that become fluid. Moreover, she narrates experiencing bizarre feelings such as the right hemisphere taking over the left while she loses her cognitive functions. She describes the struggle and affliction to remember her doctor's telephone number: "It took more than thirty-five minutes for me to navigate my way a mere inch down into that stack where I finally recognized the Harvard crest" (60). If she was losing the spatial awareness of her body, we may wonder if she was also losing time awareness of the events. If space was lost, time perception was likely to be lost as it depends on memory, thus the reader may ponder how she could have a precise duration of the event, that is, the "thirty-five minutes". To answer this, I speculate that there might be some memory gaps

while she tries to remember the traumatic event; therefore, her strategy is to fill it in by following her creative mind as she writes her autobiography.

Jill's pre-surgery narrative describes how she physically and emotionally has prepared herself for the brain surgery. She wants to show that there is a link between body-brain-mind-spirit, as she comments: “No matter what the next day's surgery held, this body of mine was the life force power of trillions of healthy cells. For the first time since the stroke, I felt my body was strong enough to endure the upcoming craniotomy” (111). The adjectives she uses to describe her body, “healthy” and “strong” are positive, which refer to her attitude and growth mindset. Jill keeps the chapter on the surgery short, with highlights of her sense of humor to alleviate her anxiety before the surgery, as she describes, “The last thing I remember saying to Dr. Ogilvy before he injected me with some meds was, ‘Hey doc, I'm thirty-seven and single; please don't leave me totally bald!’ On that note, he knocked me out” (112). Her sense of humor marks incongruence in order to relieve her tension and anxiety. Moreover, Jill illustrates her story with a photograph of her nine-inch scar, with a third of her hair shaved as an evidence for her readers.

Jill's narrative sometimes flows from a scientist’s perspective to a lay person’s intuition, with the latter being located in the field of the vernacular. For example, she explains that her need to recover through sleep is very intuitive: “As I mentioned earlier, from my brain, sleep was ‘filing time’” (117). Her agency to decide on how she needs to recover is in part due to her caregivers, who have listened to her. She criticizes institutional rehabilitation programs as top-down approaches in which patients are usually at the mercy of medical staff agenda, schedules, and objectives: “I firmly believe that if I had been placed in a conventional rehabilitation center where I was forced to stay awake with a TV in my face, alert on Ritalin, and subjected to rehab on someone else's schedule, I would have chosen to zone out more and *try* less” (118). Jill retains

agency over her own recovery by choosing to stay at home: "For my recovery, it was critical that we **honor the healing power of sleep**" (118). In her narrative, she emphasizes her ideas in bold as if they were tenets. Her recommendation to her readership is to take responsibility for their own recovery process, listening to the needs of their body and having company of caregivers who ascribe to natural healing processes. For this reason, she opts for a vernacular healing rather than a clinical treatment that involves pharmaceutical procedures and institutionalization. She emphasises that "yet I remain a very loud advocate for the benefits of sleep, sleep, and more sleep interspersed with periods of learning and cognitive challenge" (118). Hence, she believes in natural healing in which the body has the power to cure itself.

Jill's sense of humor is also an important indicator of her wellness to build resilience and to cope with the tension, trauma, and loss in her life. Thus, resilience, positive psychology, and creativity helped her with the healing process as well as her engagement with arts.[80] As a stroke survivor, she sees herself in a privileged position because she has the means to reprogram her mind so that negative traces in her psychology, such as egoism, stubbornness, and arrogance are kept at bay. For this reason, she offers a vernacular understanding of recovery that goes beyond a clinical setting; for her, a vernacular recovery is to overcome the negative habits one holds before a traumatic event or accident. Recovery in this sense means changing one's mindset and psychology: "I have consciously chosen to recover my left mind's ego center without giving renewed life to some of those old circuits" (152).

Jill deals with 'brain power' under a vernacular approach rather than a neuroscientific knowledge to explain her 'resilience'. Her statements are grounded in pop psychology (e.g. law

[80] Jill optimized the healing process by feeling motivated and determined to set goals to relearn brain anatomy and to exercise the motor and cognitive skills affected. However, she does not explain in her narrative how hard the process might have been; instead, she focuses on the product that is the stained glass which "hangs at the Harvard Brain Bank" (120).

of attraction) as seen here: “I own my power and make more choices consciously” (154) and “In the long run, I take responsibility for what I attract into my life” (154). Her narrative is crafted in a New Age rhetoric, with a focus on mind-power that marks a vernacular spirituality that emphasises the individual as a being: “I have learned that I can own my power and stop thinking about events that have occurred in the past by consciously realigning myself with the present” (155). Hence, her writing style entangles a New Age rhetoric with brain sciences, that is, it combines the vernacular with the sciences which may surprise some of her readers who expect explanations solely based on brain science since Jill is a former neuroanatomist.

4.3.4 Barbara’s Rhetoric of ‘Before-After’

Barbara Arrowsmith’s neuro-autobiography rhetoric can be read in some instances as an advertisement for neuro-plasticity as being the ultimate paradigm for changing one’s brain, and eventually personality. She counter-argues traditional psychology beliefs that the human brain cannot change itself, such as a ‘compensatory mode’ that suggests individuals with learning disabilities should work on their strengths. Barbara criticizes such approach: “Find each child’s unique gifts, we were told, and work on developing them because children could deploy them to compensate for things they could not do” (9). Barbara rejects the compensatory mode, which lies in “old brain-is-fixed paradigm” with the notion of “hardwired brains and lifelong disabilities” (10); instead, she turns to Norman Doidge’s work on brain plasticity to validate her assertions.

Barbara acknowledges the importance of neuroscience in explaining neurodiversity in our society. She mentions that “Neuroscience holds great promise in that it offers insight into the differences between us and the different ways that each of us thinks, learns, processes information, and responds emotionally – all of which are determined in no small part by the

singular makeup of our brains" (36). It is on these grounds that she announces her neuro-autobiography as a collection of "stories of people with brain deficits. Most of these people enrolled in Arrowsmith and overcame their learning disabilities by hard work. Brain work" (36). Influenced by an ethnographic methodology, Barbara briefly describes the context and participants who have been interviewed so that she can bring their stories together in a 'before-after' rhetorical framework, in which the stories "marked contrast between what was impossible before the deficit was addressed and what is possible now. These are stories of transformation" (36). The rhetoric of 'before-after' in those stories focuses on changes, transformations, and accomplishments that set them as 'successful' narratives in order to promote her learning disabilities program and school. Hence, her writing style is modelled by a common marketing strategy that uses 'before-after' in advertisements of a product.

In her narrative, Barbara uses rhetorical and stylistic devices to frame vernacular and scientific knowledge side by side. For example, she creates an everyday anecdote to illustrate either one of her cognitive deficits or one of her students', which lies in the vernacular with a storytelling component; next, she states the 'scientific concept' that encapsulates the case, as seen in the following extract: "In 1978, I looked back, for example, at my lifetime of clumsiness and klutziness. I collected incidents and catalogued and analyzed then, while becoming more convinced that they were all linked. Eventually I would give my problem a name: *kinesthetic perception*" (145). The concept of kinesthetic perception has not been exclusively coined by Barbara as it may seem; the term has been used by researchers in educational psychology as an alternative for the established scientific term 'proprioception'.[81] The problem she describes

[81] Proprioception was previously referred as "muscular sense" and associated with the physician Charles Bell's "the sixth sense" (1833). Years later, the neurologist H.C. Bastian introduced the term 'kinesthesia' to refer to 'sense of movement' (in Smith 2011, 219-221).

relates to corporeal perception when an individual is moving (kinesthesia) through a certain space-time dimension.

Following the rhetorical pattern 'before-after' Barbara gives further examples from her everyday life or from other individuals' to illustrate when she or they used to fail because of cognitive deficits. Sometimes she permeates scientific information in-between to provide her readership with resources and contexts. She usually concludes with assertions that either her or one of her students no longer suffer from a certain disorder/deficit. For example, she states that "I don't slur my words anymore" and "Kirstin was able to join her family skiing and became very proud of her skiing prowess. There would be no more sitting in the chalet at the bottom of the hill" (159). Barbara insistently offers examples that follow the 'before-after' style to her readership in order to convince them of her successful method: "For half my life, there were no maps, only the panic, anxiety, and embarrassment that went with constantly getting lost. What a joy it is to have maps in my head and to be able to rely on them" (176). The rhetoric of 'before-after' is used not only to provide 'evidence' of how efficient her program is, but also to convince and persuade her readership about the outcomes of brain exercises based on neuroplasticity science.

4.3.4.1 Barbara: "Barbara… has a mental block."

Barbara narrates less about herself and more about her work within the discipline of brain science in a vernacular style, in a similar manner as seen in Siri's autobiography. This can be observed in the opening of her narrative, where she describes a neurological case she is impressed by, rather than starting with her own life story. In the first chapter she tells a story about a man called Zazetsky who suffered brain damage. Her own story comes afterwards, in a

chronological order, where each chapter is marked by a certain year that serves as an index of a meaningful event that happened to her life. At the beginning of her neuro-autobiography, Barbara makes it clear that her story is entangled with brain studies and the researchers that have had an impact on her life. For this, she dedicates her book to a Russian neurologist called Alexander Luria while she addresses the importance of his work to her readership in the Introduction: "The book you are now reading would never have been written had I not chanced across The Man with a Shattered World in 1977, the year Luria died. I shared Luria's intellectual curiosity and Zazetsky's reasoning deficit, as well as his determination" (4). In Barbara's view, her life is entangled with Zazetsky's, a man who despite became cognitively disabled from a severe brain injury during the Second World War never gave up trying to understand his neurological deficit. Both share a degree of self-determination which in this dissertation is understood as a feature necessary for building resilience, as Barbara states:

> Zazetsky's drive led him to labor all that time writing a journal as he strove to understand the "strange illness" that had suddenly and catastrophically befallen him with a loss of meaning in his world. My own drive compelled me to search for a solution to the same neurological deficit that had robbed me of meaning since birth. (4)

Her neuro-autobiography serves as a vernacular sample of neurosciences that deals with brain plasticity to overcome learning disorders. Inspired by Luria's research, Barbara's neuro-autobiography is a vernacular version of his neurological findings such as his research on memory. Luria's work sets the tone for Barbara's autobiography about her learning disability. She uses a vernacular term 'mental block', once used by a school teacher while addressing Barbara's condition to her mother. She recounts the event in a dialogue format, as seen here:

> "Barbara," the teacher is explaining to my mother, "has a mental block". As children do, I understood this truth quite literally. Evidently there was a chunk of wood lodged in my brain, and it would have to be removed. […] For the first twenty-six years of my life, and I am fifty-nine years old as I write this. I lived in a dense fog not unlike Zazetksy's. (4)

Barbara's recollections of her learning disabilities are marked by traumatic experiences during her school years. Her neuro-autobiography shows evidence of how deeply her neurological condition has affected her cognitively, emotionally, and socially. For example, she lists her learning deficits and remarks that "The logic of basic math, the concept of telling time, the ability to truly comprehend what I was hearing or reading: all eluded me. On the playground, I couldn't follow conversations or the rules of simple games" (4). To cope with the deficits in her life, she builds resilience and strategies to overcome them. Yet, the environment (e.g. family and school systems) does not offer the support she needs while growing up. Because her learning behaviour is unstable, fluctuating, her teachers label her inconsistently "gifted", "slow", and "difficult", all in a vernacular realm, but with some biases. She explains that since her learning was not coherent, as "There was no language then to describe my condition", the vernacular language becomes the mainstream, which does her more harm than good. She explains that the term 'learning disability' was not available as a neuropsychologic term when she was a school girl: "The phrase learning disability was coined only in 1962 by a Chicago psychologist named Samuel Kirk, and it did not come intro common parlance until the late 1970s" (5). Because the term 'learning disability' was not coined at the time, the use of vernacular terms such as 'smart', 'slow', 'difficult', and 'somewhere in between' were usually used instead, which reinforced stereotypes. The use of a vernacular 'squirrels' and 'turtles' to metaphorically translate into 'fast'

and ‘slow’ school-readers make students with learning disabilities vulnerable to bullying, that is, “mocked and teased by the other children” (5).

Barbara is also labeled as clumsy, a vernacular reference to an issue with her kinesthetic perception. She recalls her clumsiness by stating that “I would frequently trip over my left foot when walking. My classmates called me a klutz, and I was always picked last for any team sport” (147). The slang term for clumsiness is klutz, which holds stigma for behaving different from other ‘normal’ kids. She later returns to the term by saying that “People with this deficit are often called ‘klutzy’ and ‘clumsy’, but those words fail to capture the depths of the disorder or the way it puts you at odds with your own body” (149). Barbara recounts some other examples in which her clumsiness is targeted and labeled. For instance, once her father compared her steps to an elephant’s stomp because she lacked some grace whenever walking around. The kinesthetic problem makes her feel humiliated, lowering her self-esteem. Scientific resources (e.g. Luria’s research) has granted her emotional comfort to understand her condition since the vernacular language used to address her learning disabilities is shameful and judgmental: “I became my own guinea pig. Thanks to Luria. I was able to understand which part of my brain governed my kinesthetic awareness and I developed an exercise that I hoped would stimulate that area of my brain” (148). In conclusion, in Barbara’s narrative, the vernacular has a detrimental pragmatic force (i.e. perlocutionary force) that reinforces biases, judgements, and prejudice against individuals with learning disabilities, and in this case, more specifically, school children.

Similar to the other neuro-autobiographies explored here, Barbara’s narrative also meets a rhetorical purpose of an instructional manual; in this case, it resembles a brief course book on neuroplasticity through a vernacular rhetoric as mostly seen in Chapter 5, “Brain Work: Arrowsmith Core Principles”. She reviews the main research studies in the field of brain

plasticity, and she briefly explains neuroanatomy through the illustration of a neuron and its parts (31). The narrative is a simplified version of a neuroanatomy book for a lay audience, which includes summaries of studies that deal mostly with plasticity conducted in labs with rodents. Her intention is to convince her readership that her own method is based on scientific knowledge; however, Barbara's method lacks evidence to prove positive outcomes from the cognitive exercises she has designed and claimed. Since she is aware of the criticisms she has received, she indirectly approaches them by emphasising the use of intuition and imagination (falling into a vernacular domain), as she states: "On my long journey to create those many brain exercises, I tested hypotheses and my intuition and my imagination" (34). She supports her assertion by citing a case of a scientist, Jonas Salk, who developed the first polio vaccine, although he considered his intuitive insights based on his scientific knowledge having equal values to his reasoning.[82] The emphasis on experience is also hallmarked in Barbara's narrative: "I lived in a world of felt sense rather than one of logic and reason. For me, metaphors were rooted not in language but in my experience of the physical world" (35). Embodied experiences require senses and imagination, for which the right hemisphere of the brain is responsible. She acknowledges that her cognitive exercises are in part developed through embodied experiences: "Creating exercises for various parts of the brain, I would put myself inside that area and try to devise an exercise that would get it working" (35).

In one of her chapters, "The Fog is Dispelled", Barbara discusses cognitive exercises she has designed for herself and how they have helped her overcome her learning disabilities. Her

[82] Salk in his book *Anatomy of Reality: Merging of Intuition and Reason* tells his personal story about how he became a scientist, and privileged experience as a starting point (in Arrowsmith). His 'humanities' approach to science was not always well received: "Salk contributed to his own rejection with his unconventional approach to science—his emphasis on intuition and sometimes abstract principles—matched by a convoluted manner of writing and a love of metaphor. In other words, he didn't behave like an academic scientist." Jacobs, Charlotte DeCroes, and Charlotte Jacobs. *Jonas Salk: a life*. Oxford University Press, 2015, p. 457.

persistence through "clock exercises" has liberated her from the fog of her brain: "The big and little hands of a clock finally began to make sense to me. Then came the defining moment of my life" (41). She recalls the day she became able to understand what she was reading, which came to her as a turning-point in her life, enabling her to regain agency and strengthening her decision-making.

> I remember in June 1978 excitedly pulling philosophy books from a shelf. I would open one book, read a page, and immediately understand what I was reading, then pull another book from the shelf and repeat, until I was surrounded by a pile of more than one hundred books. Why so many? I wanted to make sure that this was not just some random happen-stance, so I continued until I had enough evidence that I could read and understand this complex material (41).

Most of the chapters in her autobiography feature life stories of students with learning disabilities that have successfully changed their brains with the cognitive exercises developed in her school. Barbara recounts their stories of learning disabilities and explains them based on Luria's neurological science and neuroplasticity, creating a hybrid text in which scientific knowledge merges with vernacular stories, as seen in one of her accounts: "In the Arrowsmith classroom, Karen immersed herself in the 'wheat-from-chaff' narrative exercise meant to combat the symbolic thinking weakness. Luria had suggested that the preliminary and most complex part of the thinking process involved picking out the essential elements of the problem at hand" (71). This example also shows a marketing rhetoric, "In the Arrowsmith classroom", in which Barbara tries to combine a teaching rationale by describing a student's learning experience in her school with Luria's neuroscientific research in relation to cognitive abilities.

4.3.5 Francesca's Humor as Rhetorical Strategy

Francesca's neuro-autobiography is divided into four sections, although the division is not clearly mentioned in the book content. Except for the "Disclaimer and Prologue", the remaining consists of fourteen chapters. In the first section, under the title "Disclaimer", Francesca openly acknowledges her condition of being a disabled woman in a tone of sarcasm and humor, by stating that she should neither be seen as a source of inspiration nor as a role model. She bluntly reveals her weaknesses, her fears, and her tendency towards laziness in case a reader is expecting an autobiography written by a 'great woman' with virtues to be admired. She confesses that "Because, the truth is, I'm small potatoes" (10) and "So I am actually de-motivational. Sorry" (12). The disclaimer can be understood as a critique of a culture of exhibitionism and narcissism that are pervaded across the Anglo society for the past few decades. The second section, that is the "Prologue", is a preview of Chapter Nine, scripting a dialogue between her and a man she falls in love with while attending a stand-up comedy training. The man named Dylan (perhaps allusion to the singer Bob Dylan, an icon of the American counterculture) plays a key role in Francesca's life as he has helped her find out her inner self. This is clearly seen in the following dialogue that unfolds on page 15:

> F: 'You mean, I can just ... choose how to see myself? I don't have to be
> 'disabled' or 'brain damaged'? I can choose to be … me?'
> Dylan drank more beer.
> D: 'If you want. The only power we have in life is the power to choose what to
> think'.
> I laughed without wanting to, a bubble of joy escaping from me.

F: ‘So, I’m just…me.’ I felt invigorated, as if I could see everything all at once.

(15)

The third section consists of ten chapters in which Francesca describes her life events in a chronological order. She narrates stories from her early childhood memories until her adult life when she becomes a successful and award-winning stand-up comedian – all of it embedded with humor. Yet, the fourth section consists of the three last chapters in which Francesca focuses on social justice themes instead of her own life story. The fourth section takes a different discursive format resembling an essay-manifesto in which she reveals her political views on disability, on issues of stigma, on normality, and on society’s obsession with women’s bodies (mostly of celebrities).

Those sections in her neuro-autobiography help with organizing her writing, but above all they set borders between ‘her life events’ and ‘her ideological views’, which the reader may question the underneath goals of her life writing. The title of her neuro-autobiography *What the **** is Normal?* pre-sets a rebellious tone towards society’s understanding of normality versus disability. The rhetorical question in the book title may hook and instigate the reader to reflect on the concept of normality, which Francesca will only directly address at the end of her narrative.

Humor is a rhetorical device in Francesca’s writing style, and it is usually used as an indirect form of criticism as seen in her descriptions about the medical community she has dealt with along her life. Her writing style also carries some tone of disdain, skepticism, and scorn in relation to the medical staff as they are associated with an institutionalized discourse that holds power. One example that illustrates her contempt towards health professionals is when her parents are given Francesca’s CP diagnosis at the age of two: “Apparently, my brain had been starved of oxygen at birth and part of it died. The consultant not only walloped them with the

Doctor Who moniker but also declared, with unshakeable certainty, that I was mentally retarded" (21). Her parents' reaction is of skepticism towards the doctor's words regarding her mental disability. Francesca continues her tale by describing the event: "That evening my parents and grandparents decided that the doctor didn't know what he was talking about and that I was perfectly responsive and intelligent" (21). There is a clear clash of polarized ideologies represented in her narrative: one side lies Francesca's family (vernacular), and the other the medical staff (medical science). Francesca narrates the polarized clashes along her story with humor, sarcasm, and irony. Moreover, she uses humor as an organic rhetoric strategy throughout her story to alleviate tensions and anxieties she (or her family) faces that come out of difficult, opposing and controlling interactions with the medical professionals that are in charge of treating her neurological condition.

4.3.5.1 Francesca: "I'm wobbly. That's how I describe myself."

Similar to the four autobiographies studied here, Francesca's life narrative is also illustrated with metaphors to describe the narrator's neurological condition. The use of metaphors in those narratives are usually the preferable forms as they tend to sympathize, soothe, or attenuate the gravity of her neurological conditions; except for Barbara's narrative, in which the vernacular reinforces stereotypes and stigma. Yet, for Francesca, the vernacular works in her favor, minimizing the stereotypes imposed by the cerebral palsy and the gravity of her disability.

Another common function shared in those neuro-autobiographies is their pedagogical element. In Francesca's case, she uses her neuro-autobiography as a pedagogical resource and political tool to express the constant tensions and struggles between her lived experiences with brain damage (CP) and the 'normal' life people have without CP. To minimize this tension, Francesca

uses humor as a stylistic strategy that sides with vernacularity against the medical classification of Latinized terms (top-down) imposed on patients to shape their identity; in her case, it is as a woman with cerebral palsy (CP). Francesca recognizes the Latinization of medical terminology as an exercise of control and authority over patients and caregivers. To resist it, she uses her neuro-autobiography as a space for speaking out against language power and scientific control through a process of self-translation. In other words, Francesca uses stylistic choices to construct a puerile, naïve, and feminine identity in contrast to the scientific medical discourse that tends to erase cultural representations (e.g. gender, class, ethnicity, etc.) in the sake of objectivity and universality. Her approach can be noticed at the beginning of Chapter 1 when Francesca introduces herself:

> I'm wobbly. That's how I describe myself. Because the words 'cerebral' and 'palsy' are attractive as an ingrowing toenail. With a fungal infection. The former evokes something cold, clinical, distant; the latter sound like Shakespeare: God's mercy! I have a palsy! The devil feasteth upon my face! Or something like that. In short, 'cerebral palsy' is as far away from sexy as Rupert Murdoch is from a social conscience. (18)

Her resistance is political, as she sets thick borders between the vernacular and the scientific worlds with a small chance of creating a dialogue. The clear demarcation reflects her activism, which is mentioned on the back cover of her book with the heading, "The Wobbly Revolution Starts Here". Francesca's lexical choice of using 'wobbly' as a marching flag offers a broader semantic scope than the Latinized expression 'cerebral palsy', which narrows and reduces the individual to a neurological condition. The vernacular term, 'wobbly', offers a three-dimensional perspective on one's identity in terms of cognition, emotion, and action. For example, one can

think wobbly about a situation, by being not certain of its outcome, that is, doubting it, which refers to one's cognitive ability. Or one can *feel wobbly* when experiencing a negative event, that is, feeling shaken or anxious, which relates to one's emotional state. Furthermore, one can *walk* wobbly when their legs are tired, or stepping on a surface that is uneven and makes the person lose balance and move funny. In this view, wobbly as an adjective can describe three functions, in contrast to the adjective noun pair 'cerebral palsy' which nominalizes a certain type of brain damage. In Francesca's neuro-autobiography, she relates to the term cerebral palsy as something ugly, repulsive, cold, and clinical, which implies that she does not identify herself with the neurological condition. She denounces the medical term as a label that marks stereotypes:

> So I'm not best pleased to have had this charming label stamped on me when I was just two years old. Athetoid Cerebral Palsy with Myotonia and Ataxia. I was a cute little girl with golden ringlets who had been branded a Doctor Who monster. Or a yoghurt drink…NOW with added Myotonia And Ataxia! (18).

Francesca strongly confronts the heavy jargon imposed by the medical community to diagnose patients with congenital brain damage, which creates a cultural gap between the medical science and the vernacular, and consequently, establishes an asymmetrical relation between physicians and patients. Francesca's humor to critically deal with issues of hierarchy and power relations that characterize scientists and medical professionals is also expressed in the following lines: "It's as if a party of highfalutin consultants take turns to pick words out of tombola brimful of polysyllabic sibilants designed to induced pant-wetting dread at the very sound or sight of them. Disease, disorder, syndrome, dystrophy, sclerosis. (Not just one sclerosis: multiple sclerosis)" (18). Francesca's choices for words such as 'floppy' when referring to herself as a baby and 'wobbly' when she is older may reflect not only attributes that relate to her neurological

condition but also to her personality: a relaxed, sensitive, and delicate person. In her neuro-autobiography, she reveals her need to hang on to those positive predicates in order to resist the branded labels tagged by the medical community, which would drag her down. Her reflections on this tension and contesting words emerge in her narrative as seen in the following extract:

> Words that take seconds to utter and decades to cast off. Unknown to me then, they disappeared into the ground around me and, over time, would emerge as the bars of a cage, hemming me in from the outside world. I would no longer be Francesca. I would be…different, faulty, an error, wrong, abnormal. A chain of negatives that would drag me down and make me flinch internally when I spoke them or even thought of them. I was also…wait for it, brain damaged! Yes, my brain, the most important part of me, is cock-arsed, crappy, mangled, blemished. If you'd received it from Amazon, you'd ask for a refund. (22)

Despite advancements in medical sciences, individuals' skepticism of medical knowledge is still a common attitude. Not only is the doctor's knowledge put on the spot, but also the medical terminology to describe patients' illnesses, as both rely on heavy jargon that is de-contextualized and meaningless to patients. The use of technical words to explain a certain health condition to a patient is approached in Francesca's narrative through sarcasm: "The cloud that had loomed now lifted and my family were convinced that, while I might have the new name of a sci-fi monster, my intellect was intact" (21). Dissatisfied with the diagnosis, Francesca's parents look for a second opinion, in which the new doctor confirms she is not mentally disabled, but she will probably "never lead a normal life" (22). Since this event happened when Francesca was at a very tender age, her autobiographical memory of those incidents is likely to be a construction from stories her caregivers told her. In sum, Francesca's lexical choice 'wobbly' over the scientific

term ‘cerebral palsy’ reveals complexity as the vernacular choice is more fluid, dynamic, and bound to a contextual environment. Thus, the vernacular word ‘wobbly’ resists the medical term ‘cerebral palsy’ by minimizing a semantic meaning of her disability and by increasing a pragmatic force (illocutionary/perlocutionary force) that is more open to inclusion.

Despite using the vernacular ‘wobbly’ as an act of resistance, Francesca reveals an unconscious fear of language use and lexical choices that are imposed on individuals with the intention of tagging labels that can limit their functions in life. In this manner, we can bring Prigogine into the discussion here as he is also concerned with the issue of labels in our society that are used to categorise, constrain, and limit individual’s creative process in their natural manifestations in life, as he mentions in one of his interviews, *Wizard of Time*, recorded in 1983:

> However, I think what we need in society is amplification, spontaneity, and fluctuation. And that is exactly what is missing in forms of society where one tries to categorize people, to pattern their activities into well-defined channels. Nature gives us a different model. Nature is trying experiments all the time; some of them are amplified, others are not. This spontaneity of nature is a model we must keep in mind. (n/p)

In Prigogine’s view, nature should be the model to be followed because, among many other reasons, it lacks discursive properties such as categories, labels, and codes that can be restrictive. Yet, human beings are also discursive entities who depend on linguistic functions to organize themselves in society. Despite facing discursive impositions, we can still avoid the pitfalls of categories when we liberate language from a controlling system within ourselves and society, enabling individuals to express themselves without internal and external fears of being labeled. In this manner, individuals can manifest themselves organically and creatively, by experimenting with different forms of communication, interactions and actions without worrying about categories.

4.4 Complexities of the Self

This section explores how the Self represented in the neuro-narratives struggles with labels of disability and normality. I identify some dichotomies in the narratives which polarize the autobiographers' identities, as they are expressed under feelings of alienation, difference, and inferiority that are tied to stigma. In this sense, I examine the strategies the autobiographers use to deal with labels and how the context and environment may influence their conditions of being and feeling disabled, or less abled. The figure below illustrates the labels attached to the autobiographers as observed in their narratives; the matching colours show categories that the five women share with each other. Jill is the only one who does not have a match since her neuro-condition is acquired in her adulthood, whereas the other four women have had their brain 'wired differently' since they were born.

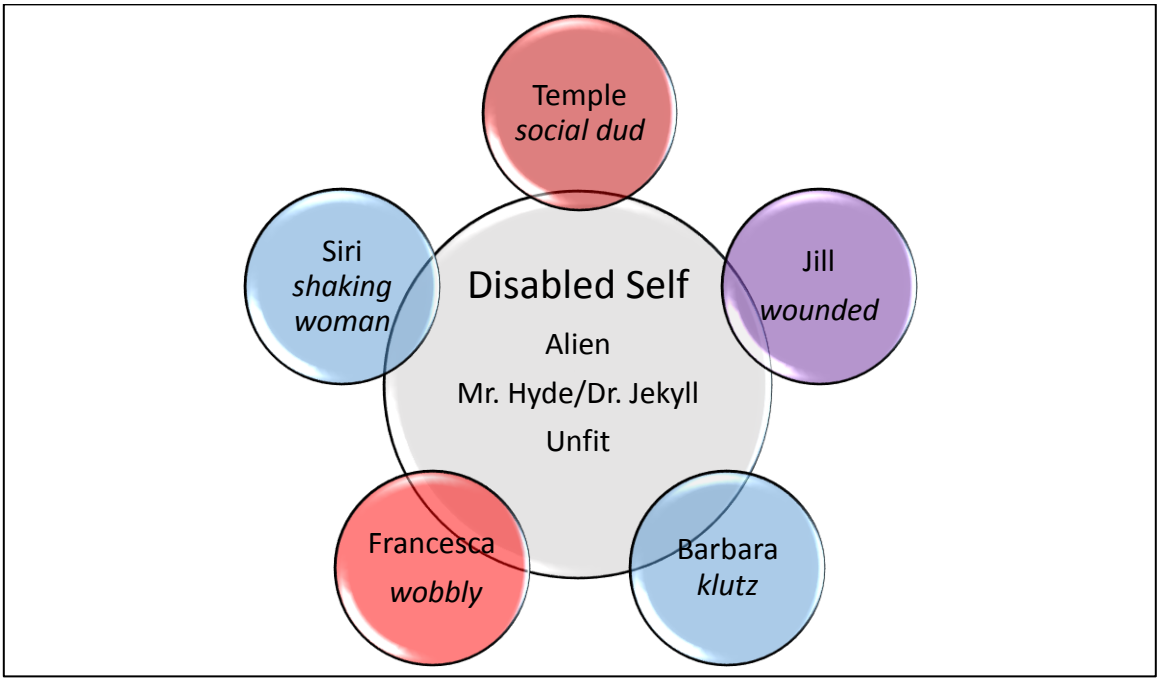

Figure 3: Complexities of the Self

4.4.1 Temple: "Social Dud"

Temple faces the 'fit-in challenges' when she is a high-school girl by revealing that "I did not fit in with my high school peers, and was unable to figure out what I was doing wrong […]. But back then I could not figure out why I was such a social dud" (17). She admits her strangeness and oddity by believing she is the one to be blamed for her awkward behaviour that has prevented her from 'fitting-in' at school. She describes her lack of social skills by considering herself a "social dud" unable to establish classmate relationships during her school years. Her description is rational, without expressing emotions she might have felt, leaving it to her readers to infer it from her story. Temple's awareness of being different from her peers can be an indication that some autistic individuals are aware of their surroundings, despite finding it difficult to express their emotions and thoughts in a social context (c.f. Theory of Mind). Thus, the belief that individuals in the autism spectrum disorder live in their own world by showing no interest in the surroundings should not be generalized. Being too sensitive to the environment may lead them to behave in a certain way that looks like they are cold, distant, and secluded in their own private world. The adaptation issues (e.g. school and workplace) usually misjudged by the neurotypicals are clarified in Temple's narrative in order to raise empathy to autists' social behaviour: "When I was a teenager, I was aware that I did not fit in socially, but I was not aware that my method of visual thinking and my overly sensitive senses were the cause of my difficulties in relating to and interacting with other people. Many autistic people know that there is something about them that is different, but they don't know what it is" (74).

Yet, Temple seems hesitant to delve into her memories in her neuro-autobiography. It is only in Chapter 3 that she decides to talk about her childhood memories and her autism diagnosis when she was two years old. Similar to Francesca's narrative, we can assume that those

memories are constructed by family conversations that the narrators have been exposed to since the stories were told when both were toddlers. The following fragment illustrates it:

> At the time, I showed the symptoms of classic autism: no speech, poor eye contact, tantrums, appearance of deafness, no interest in people, and constant staring off into space. I was taken to a neurologist, and when a hearing test revealed that I was not deaf, I was given the label 'brain damaged'. Most doctors over forty years ago had never heard of autism. A few years later, when more doctors learned about it, that label was applied. (33)

Temple uses the word "label" in two instances: one to refer to "brain damaged" as a general term to identify her neurological disorder, the other to refer to autism as a 'specific' neurological condition. Although autism has a controversial and uncertain etiology, that is, what can cause it is still under investigation (e.g. virus, genetic disorder, neuronal disorder, environmental), the label (e.g. autism) gets attached to a person's identity, with the possibility of even taking over one's personality.[83] However, autism is not a fixed neurological disorder, with deterministic symptoms that apply to every case and imply the same outcomes. Instead, its diagnosis fluctuates within a spectrum, that is, a continuum that can range from an individual completely dependent and 'disabled' to 'high-functioning' and 'savant'. In 2013, the DSM-5 reviewed the criteria for diagnosing autism and included Asperger's syndrome into the Autism Spectrum Disorder (ASD).[84] Individuals like Temple Grandin who once would be diagnosed as having Asperger's because they can live a regular social and professional life, now they fall into the diagnosis for

[83] For a discussion on autism etiology see: Baker, Jeffrey P. "Mercury, vaccines, and autism: one controversy, three histories." *American journal of public health* vol. 98,2 (2008): 244-53. doi:10.2105/AJPH.2007.113159

[84] DMS -5 stands for Diagnostic and Statistical Manual for Mental Disorders. https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/dsm-5-fact-sheets

ASD. Moreover, the inconsistency due to contestable and unreliable neurobiological evidences limit autism to an interpretative diagnosis through clinical observations which makes it "complicated by the fact that the behavioral criteria are constantly being changed" (35). Moreover, Temple states that "Unfortunately, diagnosing autism is not like diagnosing measles or a specific chromosomal defect such as Down syndrome. Even though autism is a neurological disorder, it is still diagnosed by observing a child's behavior. There is no blood test or brain scan that can give an absolute diagnosis, though brain scans may partially replace observation in future" (35). For Temple, interpretivism and subjectivity can hinder a precise diagnosis; for this reason, she defends the use of brain imaging scanners for individuals with autism as they can provide an objective and detailed diagnosis. As a scientist, Temple privileges scientific objectivity and technological resources to detect autism etiology instead of a clinician's judgment and interpretation, as she mentions: "In the future, brain scans will be sophisticated enough to provide an accurate diagnosis. Thus far, brain research has shown that these conditions have different patterns of abnormalities" (39). Her trust in scientific methods to provide "accurate diagnosis" reinforces a positivistic thinking to discover the truth. This is important for her because an accurate diagnosis through technology would completely differentiate and separate autism from schizophrenia, for example, as she states: "Confusion of the two conditions is the reason that some doctors attempt to treat autism with neuroleptic drugs" (39). Temple is concerned about physician's misdiagnosis and prescriptions of neuroleptic drugs for autistics who are not schizophrenic, as she remarks that "Neuroleptic drugs have very severe side effects and can damage the nervous system" (39). In her view, brain imaging techniques can avoid clinicians' misdiagnosis; a position that may side with the ongoing debate about technology and automation substituting professionals in their workplace.

Although autism is recognized as a disability, it seems that for Temple, it is part of her personality; for this reason, she needs to assure herself about her unique form of autism while comparing herself with other autistics: "Though most autistics will not function at my level" (49). Her recursive reaffirmations as a high-functioning autist is likely to be a trace of her self-doubt and anxieties in relation to non-autistic individuals, as she describes: "Many parents and teachers have asked me where I fit on the autistic continuum" (49). Her reply to her readership is through examples of situations when she still struggles to fit in socially such as handling new situations, unexpected problems, and traveling to countries that she cannot speak the native local language: "I feel very helpless when I can't speak the language. Often I withdraw" (49). Yet, her comments do not seem exclusive to autists; a shy, introspective, and anxious person may also express similar concerns. Because high-functioning autism may be non-linear, ambiguous, and uncertain Temple needs to convince her lay readership of her disorder as she ponders:

> If I were two years old today, I would be diagnosed with classic Kanner's syndrome, because I had delayed abnormal speech development. However, as an adult I would probably be diagnosed as having Asperger's syndrome, because I can pass a simple theory-of-mind test and I have greater cognitive flexibility than a classic Kanner autistic […] Like most autistics, I don't experience the feelings attached to personal relationships. (50)

Her diagnosis fluctuates, but she shares a common feature among individuals with ASD which consists of poor social interactional skills. As a high-functioning autist, falling within the liminality between normality and non-normality, Temple feels uneasy about fitting in both worlds: the autistic and non-autistic one. She sees autism as part of her identity, of her skin and body, a disorder that "controls who I am" (50), for this reason, Temple fears losing the

advantages of being a visual thinker, which has helped her become a successful animal scientist. Thus, she wants to preserve her identity as a high-functioning autist.

The notions of normality and non-normality permeate Temple's narrative. One example is through visual rhetoric such as personal photographs that she shares with her readership in her autobiography. They relate to her visual memories that are expressed through pictures, such as her family album from her childhood and her professional profile which both show different stages of herself in life. For example, her picture as a toddler shows a smiling girl posing for a camera with the caption, "I had no speech and no interest in people […]. Like many autistic children, I looked normal" (n. pag.). The caption reflects the paradox of autism, an apparently 'normal' toddler's picture followed by an emotionless description. In this sense, autism is an invisible disability that splits the body and brain/mind, that is, an individual can have a healthy, 'abled' body with a brain/mind that processes in a different circuit. Nevertheless, Temple makes her invisible disability visible by delivering talks about her condition in educational settings. Moreover, she dresses in a cowboy style, an attempt to neutralise her gender, so that she does not look and act feminine according to mainstream cultural norms and expectations. In this way, she brands herself as an animal scientist who deals with livestock and as an educational consultant for ASD by delivering public talks in schools, hospitals, and companies.

4.4.2 Siri: "…the shaking woman as an untamed other self…"

In her neuro-autobiography, Siri creates a shaking woman as if it were a fictional character that lives inside her body and with whom she does not feel any identification. Perceiving oneself as the 'other' can reflect a split personality disorder, as Siri comments: "The strangeness of a duality in myself remains, a powerful sense of an 'I' and an uncontrollable other. The shaking

woman is certainly not anyone with a *name.* She is a speechless alien who appears only during my speeches" (47). She reconfigures the shaking woman as an alien that possesses Siri's body while she questions who owns her body when she suffers convulsions, considering it a dilemma for her: is Siri talking about the 'I' or the 'shaking body'? A bipolar characteristic that stirs internal competitiveness as Siri must decide for whom to cheer up or choose. The question of the 'other' that takes control of her body becomes a writing strategy that Siri uses to explore the topic of subjectivity in her neuro-autobiography, as she remarks: "Hysteria, from this point of view, is a derangement of subjectivity, of ownership of the self" (47). Siri raises a question of who is in charge of her body: "But who owns the self? Is it the 'I'? What does it mean to be integrated and not in pieces? What is subjectivity? Is it a singular property or a plural one?" (47). These questions are part of a self-inquiry into her neuro-narrative, while she tries to come to terms with the shaking woman living inside her body but not in her mind. This split between body and mind is present in Siri's narrative while she compares herself to well-known literary characters, Mr. Hyde and Dr. Jekyll. The comparison is expressed with humor to alleviate her anxiety: "I have come to think of the shaking woman as an untamed other self, a Mr. Hyde to my Dr. Jekyll, a kind of double" (47). The 'shaking' body seems to be untamed, whereas the mind seems to hold the consciousness to keep her integrity. She relies on further examples from literature to reflect upon the doubles in order to connect them to her story. She has developed a pattern in her neuro-autobiography in which she uses small fragments taken from her life story as a bait to hook the readership into something bigger (i.e. neuroscience, psychoanalysis, philosophy, and literature). She bridges her discussion about doubles in literature with neurosciences, giving a more vernacular tone to the issue of the split brain: "Versions of this right/left brain division have led to popular but simplistic notions of right - and left-brain personalities and other reductive

speculations, such as attributing consciousness to the left hemisphere and unconsciousness to the right" (53).

Siri plays with the idea of 'double' by seeing herself as 'another being', losing the sense of her own identity, as if someone else possessed her body, as she remarks: "The search for the shaking woman takes me round and round because in the end it is also a search for perspectives that may illuminate who and what she is. My only certainty is that I cannot be satisfied with looking at her through a single window. I have to see her from every angle" (73). The vulnerability of the self leads her to confabulations, as if she were a mystical woman, when she states: "Were I prone to mystical explanations, I might imagine that an angel (or devil) had played with my typing fingers" (72). Her point is to question why the scientific community has ignored supernatural phenomena and turned them into a taboo that lies outside the scientific research, as she continues her questioning: "What is at work in automatic writing? Unconscious self-suggestion? An incubated text that suddenly appears in words? Subliminal memories reconfigured and made conscious?" (72). She wonders whether "automatic writing" can be explained by brain science as writers seem to behave as possessed poets channeling voices from another world.

Siri's comparison is similar to Jill's discussion on her right and left hemispheres, i.e. the right is in charge of the cosmic, and the left is of the material. Thus, the aura migraine is to the right hemisphere what the shaking woman is to the left hemisphere. Siri accepts the ownership of the migraine, but she rejects the shaking woman because she cuts Siri into two. Moreover, there is a split between verbal and corporeal languages and communication: "When the shaking happens, my narrating first-person subject seems to go in one direction and my recalcitrant body in another" (165). She reinforces language as dominant once it takes ownership: "Language is intimate to my sense of self" (165). In this vein, her 'self' is constructed in the language but not

in the voice, which lacks agency. Moreover, she does not identify with the language of the 'shaking body', as it is not her 'self'. Her identity is expressed through verbal language. But then, she also recognizes that she may hear other invisible voices, as she states that "People hear voices" (166), while she digresses from her life story to explore mysticism and spirituality. The digressions can be explained as a stylistic pattern to avoid a deeper look into her own life.

At the end of her autobiography, there is a final remark on the result of her MRI with its diagnosis of a normal brain, triggering her to humorously raise a rhetorical question: "Am I back to the beginning again?" (186). Her personal quest for a Holy Grail runs in a circle, without an outcome; to find it, Siri needs to understand that the searching is not external but internal, that is, she has to accept the shaking woman as part of her 'self', in a form of self-acceptance. It seems that she is aware of it as she finally remarks: "I cannot really see where the illness ends and I begin; or, rather, the headaches are me, and rejecting them would mean expelling myself from myself" (189). She comes to terms with her chronic neurological condition, despite confessing that it has been difficult for her to accept the shaking woman because the 'alien woman' has manifested only after the onset of Siri's migraine: "I have had a much harder time integrating the shaking woman into my story, but as she becomes familiar, she is moving out of the third person and into the first, no longer a detested double but an admittedly handicapped part of my self" (190). She concludes that neither a specialist (e.g. psychiatrist or psychotherapist), nor brain imaging technology (e.g. MRI) can tell who we are, only the person themselves can find their 'self'. The 'self' is a term or concept that continues to be controversial in her narrative; is she talking about the core self? The autobiographical self? Does the 'self' really exist? Siri plays with those ideas as well, since the 'self' is merely a construction of our brain as she states: "the self is an illusion" (192); a popular belief attributed to Buddhism philosophy. Siri decides to

accept her 'self', whatever that means (be it dynamic and complex as in Freud or be it plural as in Winnicott). She finally answers it with the following questions: "I feel I have one – a self – but why? Is it everything that lies within the borders of my body? Not really. When I shook, it didn't feel like *me*. That was the problem. When did it arrive, that selfness? I don't remember" (193). These questions cannot be fully answered; it remains open for ongoing reflections to her readership. Comparing Siri's with Francesca's neuro-autobiography, Francesca's readership can recognize that she accepts her disability at the beginning of the narrative (Prologue), with blunt affirmations that she is a wobbly woman. Whereas Siri only accepts the shaking woman to live inside her body at the end of her narrative; in this case, it seems difficult for Siri to accept her identity as a 'shaking' woman, which reflects a long and complex process of her internal struggle and life journey.

Besides examining the self through the shaking woman – which is an embodied experience – Siri also recognizes the self as a discursive phenomenon by highlighting language as essential in the formation of the 'self', while she states: "We organize the past as explicit autobiographical memory, what Antonio Damasio has called 'the autobiographical self'[...] There can be no autobiographical self without language" (58). In other words, she lives in language as being a writer herself, which makes her statement somehow biased in placing language at the core of the thoughts and mind. Contrary to Siri Hustvedt, Temple Grandin and Jill Bolte Taylor, who are not professional writers but scientists themselves, undermine the power of language (e.g. verbal). Temple centers on visual thinking and Jill on experiential thinking (e.g. corporeal language). Yet, Siri relies on Freud's work to support her argument about written language being more refined than visual language in the construction of the self and memory. To illustrate it, she cites Freud:

"Thinking in pictures is, therefore, only a very incomplete form of becoming conscious. In some way, too, it stands nearer to unconscious processes than does thinking in words" (60).

4.4.3 Jill: "I was no longer a normal human being."

In Jill Bolte Taylor's neuro-autobiography, the condition of being permanently disabled is raised as a red flag. While suffering a stroke, she recognizes she is also becoming disabled while losing her cognitive functions: "I feared that my cognitive mind was becoming so disabled, so detached from its normal ability to function, that I would be permanently disabled" (60). Moreover, she realizes that the disabling process is not only about her mind/brain but also about her body: "By now, I understood that clearly I was no longer a normal human being" (63). She understands her brain has gotten damaged which affects her body. The process of having a stroke is mixed with spiritual feelings, as she fears for her life: "So I held my head in my hands and wept. [...] I prayed for peace in my mind and I prayed, *Please, Great Spirit, don't shut down my life*" (64). She recognizes her disability and sense of losing her agency in the aftermath of the stroke when she is transferred from one hospital to another. At that time, she understands that she is no longer a "choreographer" of her life, as she has lost her 'self', agency, and consciousness: "My body fell limp, and my consciousness rose to a slower vibration. I clearly understood that I was no longer the choreographer of this life. In the absence of sight, sound, touch, smell, and fear, I felt my spirit surrender its attachment to this body and I was released from the pain" (65).

Jill, the stroke victim now, recognizes that former Dr. Jill Bolte Taylor can no longer play the role of a neuroscientist with a successful career. For this reason, she mentions that she is dead and the *I* (whoever is left in the right hemisphere) is unknown to her. This *I* is the one suffering the aftermath of this brain damage: "I was no longer bound to her decisions or self-induced

limitations" (70). It becomes an alien form as in the 'shaking woman'. According to her, the left hemisphere, which corresponds to the brain region responsible for her success as a professional scientist in the form of her 'thinking self', once damaged, loses its functions, while the right hemisphere takes over. She believes that her right hemisphere has not been activated as much as her left before the stroke, as her left used to be responsible for her high functioning cognitive abilities that could guarantee her a successful career as a neuroscientist; for this reason, as a result of a brain damage, the autobiographer chooses to affirm that Dr. Jill has died, implying here that the successful neuroscientist and activist are 'dead', but not the ordinary woman called Jill. For this reason, she grieves the death of Dr. Jill: "Although I experienced enormous grief for the death of my left hemisphere consciousness – and the woman I had been, I concurrently felt tremendous relief" (70). She refers to Dr. Jill not as the *I* but the *she* in the following sentence: "That Dr. Jill Bolte Taylor had grown up with lots of anger and a lifetime of emotional baggage that must have required a lot of energy to sustain. She was passionate about her work and her advocacy" (70). The pronouns *she* and *I* represent separate entities, in which the *she* refers to the left side, whereas the *I* to the right hemisphere, or even the soul as she equates it. In other words, the right hemisphere resuscitates, whereas the left gets wounded and it is about to die. The tone of this tragedy is strong with the repetition of words related to death. The shift of pronouns from *I* to *she* and *she* to *I* is particularly important in the narrative, and it becomes recurrent in the following sentences: "But despite her likable and perhaps even admirable characteristics, in my present form I had not inherited her fundamental hostility. I had forgotten about my brother and his illness" (70). Nevertheless, she recognizes that the right hemisphere shows more empathy and compassion to Jill's problems than the left side, which rationalizes and resents it: "I had not inherited her fundamental hostility". Hence, the right hemisphere accepts and embraces life as it

comes, living the present moment without anxiety. Yet, the left is represented by material life, individualization, and successful values most cherished in the western capitalist cultures. For Jill, the right is all about acceptance of life as it comes. The tone of drama (perhaps as an expression of her trauma) as Jill narrates her memories can create a context for visualization and performance for her readership.

Despite the sense of awe, peace, and nirvana Jill is aware that she might not 'fit' into a normal world from then on, as she states she is no longer "a normal human being" (73). She draws attention to the fact that normal individuals (i.e. with healthy brain) perceive victims of a stroke, as people without agency, incapable, disabled, and therefore, marginalized: "I now existed in a world between worlds" (73); in order words, despite being a stroke survivor, Jill feels her agency has been disclaimed.

Jill addresses a question of memory to her readership, who may wonder how she can remember details of the event, as she stresses that "I remind you that although I was mentally disabled, I was not unconscious" (74). Moreover, she explains that she keeps a consciousness of her 'self' because the right hemisphere is not in danger to be damaged while her left is. At this point, her neuro-autobiography shifts to a writing style that includes tips on how to care for a stroke survivor. Thus, it seems she is not speaking on behalf of herself but of stroke victims, as a spokesperson in a survivor community to their caregivers: "I wanted to communicate: Yelling louder does not help me understand you any better! Don't be afraid of me. [...] Respect me. I am here. Come find me" (75). Her neuro-narrative becomes a voice for stroke survivors, specifically for the ones that have suffered aphasia. Jill herself becomes an advocate for stroke survivors in an equivalent way that she used to be for individuals suffering from schizophrenia, trying to raise awareness and to fight against a stigma that haunts the lives of the ones who suffer strokes. She

takes on a collective voice to educate her readership about the fate of aphasic individuals, who despite having lost their speech functions, still have their cognitive skills (thinking, remembering, perceiving, etc.) and human qualities preserved. She remarks that they are "not a stupid animal". She likens herself to an animal as she rebuts emotionally, "*See that I am a wounded animal, not a stupid animal*" (75).

In sum, Jill's neuro-autobiography follows a hero-narrative pattern, although with some disguises, as she omits some failures and challenges experienced during the healing process. For example, when she describes how she has been invited to give a post-stroke talk, she omits the challenges she has to go through; instead, she stresses the strategies she has developed to cope with the 'disability'. She studies one of her previous recorded talks when she was 'abled' so that she can mimic the performance of Dr. Jill B. Taylor; seeing herself on the video as if she were another person: "I studied how that woman (me) on the stage worked with the microphone" (121). The woman on the video is not her but "that woman "who is capable of thinking, speaking, moving, and performing to an audience. In this example, she clearly confesses how difficult it is for her to mimic an 'abled' self: "I worked very hard to prepare for that Fitchburg presentation" (121). She has to imitate that person who is an expert, as she remarks, "as for the content and brain expert part, I learned a lot about the brain from that presentation, but I was no expert! The videotaped presentation itself was way too much information and way over my heard" (122). By watching herself on the screen she reflects on her own performance, and she acknowledges that the level of expertise shown in the video is high for a lay audience. She criticizes herself with a sense of humor: "I had to wonder if that's what folks in my audience thought too!" (122). She realizes how difficult it may be for a lay audience to understand neuroscientific jargon, as she notes that she is not in the place of an expert any longer, but in the shoes of a lay viewer, with

much information to learn. She concludes that despite the efforts to mimic that person, the reality has changed: "I knew I would never return to the personality I had been before" (127). There is a constant mourning for Dr. J. B. Taylor permeating in the narrative, therefore, Jill's post-stroke talks and presentations can be a form of grieving and paying tribute to former Dr. J.B. Taylor.

4.4.4 Barbara: "I was different, but I had no idea why."

Barbara attributes her disability to a congenital defect: when she was born, she was detected as "asymmetrical" according to her mother, as she recalls: "The obstetrician must have yanked you out by your right leg" (15). Barbara also blames her brain disorder on a birth complication: "My tiny body was flawed from birth, as was my brain, though that wasn't immediately apparent" (15). She was born in a supportive and affectionate family that has offered her a nurturing environment as according to the culture of her time. Thus, Barbara blames her learning disabilities as a birth defect that has left her with a neurological deficit: "the entire left side of my body was like foreign territory. It was as if I had suffered a stroke at birth" (16). Not so different from the other neuro-autobiographies examined here, the notion of 'alien', 'foreign', and 'the other' can also be found in Barbara's narrative and self-perception.

Her school memories reflect the struggles to overcome her cognitive deficits that were not appropriately addressed pedagogically. Her narrative is marked by labels her teachers and peers have tagged on her due to their misjudgment of her behaviour and wrongdoings while she attempted to overcome her failures. Having a good nurturing and understanding family has made Barbara blame only on herself for her shortcomings and cognitive deficits, taking it personally. Consequently, she becomes anxious, showing low self-esteem and lack of confidence. Her cognitive deficit is metaphorically described as 'living in dense fog', as she remarks: "Living in

dense fog was one image I used to describe my confusion. Another image I used was cotton candy; I felt as if I was encased in sticky spun sugar that obscured my ability to see the world clearly, touch it, engage with it, fathom it" (25). The accumulation of failures, flaws, and painful, "grueling experiences" such as studying for exams has consumed all her energy during her teenage years. Her sense of self and consciousness is disconnected, incoherent, and vulnerable, as she mentions: "I felt alienated and out of touch with friends and classmates. My fragmented view of the world led to a fragmented sense of self. I developed a very negative self-concept and low self-esteem. I became depressed. I was enveloped in a fog that never cleared" (26). Her mental health is compromised, leading her into depressive states, with suicide thoughts, as she states: "By the age of fourteen, I was so distraught that I harbored thoughts of suicide. I wanted an end to the emotional pain and exhaustion, the constant confusion and struggle. I took a razor blade and lightly cut both wrists, thinking I would go to sleep and not wake up in the morning. Next morning, I berated myself for not getting even this right" (26). The failed suicide attempt is described with some humor to attenuate her distress and suffering. Her social life is also affected, leaving her with feelings of solitude and alienation.

She further compares herself with Zazetsky: "Like Zazetsky, I could discern that I did not fit in, but I could do nothing to change this reality" (26). As aforementioned, the feeling of not fitting-in, being different, and alien is a common feature in the narratives of the women with neuro-disorders. Barbara reinforces the idea of being different by mentioning that "I was different, but I had no idea why" (27). Feelings of being different are part of an identity crisis usually seen among adolescents, but they can become a mental health problem if not appropriately addressed, not alone when an individual faces disability. Although Barbara mentions her feelings of loneliness, difference, and poor sense of belonging, she neither explores

them with enough breadth and depth nor does she relate them to her intimate life in her story. She vaguely describes the issues in isolation, not relating them to personal encounters with her dear ones such as family members and friends.

The neuro-autobiographies studied here deal with what I call 'Dr. Jekyll and Mr. Hyde Syndrome'. In other words, the narrators usually mention a 'bipolar' element in their body, as if there were an alien dominating it or part of it. In Barbara's narrative, for example, she uses popular fictional characters to describe the 'alien' effect inside her body as part of her reflections on the issues with kinesthetic perception. She states: "My left hand was a kind of Mr. Hyde to my right hand's Dr. Jekyll. The fingers on my left hand constantly crossed paths. I could not judge how far to reach with that hand in order to hit various keys, and I invariably hit the wrong one" (145). Barbara provides examples from her teenagerhood till her mid-twenties of her issues with proprioception as she used to misjudge her body in relation to space and time, becoming herself prone to injuries. The feeling that there is an alien inside the body that does not obey the women's brains is stressed in Barbara's narrative as well:

> I had ample evidence that the relationship between my body and the world, and even parts of my body with each other, was a rocky one. The left side of my body was so alien that I could feel pain on that side and have no inkling of its source. I once put my left hand on a hot stovetop burner but was unable to react quickly. […] I learned the hard way that when I experienced pain, I'd have to visually search for its source. (146)

The two final chapters in Barbara's neuro-autobiography deal with the impact of learning disabilities. They take a stylistic form of an essay, where Barbara talks about her vision as an educator and advocate for learning disabilities from a neuroscientific perspective. Like Francesca,

she addresses the topic of stigma, and how learners feel disempowered by feeling guilty: "because they felt they were a source of disappointment to their parents or because their learning disabilities had caused their parents anguish. Virtually every student had been traumatized by failure in school, and the damage done there had carried over into home life and social life" (211). In other words, Barbara addresses the issue of mental health among individuals with learning disabilities who usually suffer from performance anxiety. Shame is another feeling that is associated with learning disabilities and because of that much is masqueraded by compensatory methods through the discourse of "You learn differently from other kids". For Barbara, different learning styles do not solve the problem. In this vein, her views do not match with the current socio-political movement of neurodiversity. For her, the solution lies in changing one's brain, by focusing on neuroplasticity so that individuals can fit better into school and society, by competing equally with each other, rather than accepting their developmental disorder as an ontological condition that is not prone to changes. However, studies in activities that stimulate neuro-plasticity to improve one's educational deficits seem to be still under discussion among neuroscientists. To counterbalance those arguments, Barbara cites a neuroscientist, Norman Doidge, as a voice of authority on the subject to validate her project, "I saw people getting better cognitively with the Arrowsmith exercises…" (213). The nomination of a neuroscientist authorises and validates her work, although Barbara does not provide evidence-based research to support her arguments. They are all based on life narratives she collected from interviews with her students and alumni, which fall in the domain of the vernacular knowledge, as previously discussed here.

4.4.5 Francesca: "By day, I was The Undesirable One, by night I was The Beloved"

Similarly, Francesca reveals her struggle with labels attached to her during childhood and teenage years in her neuro-narrative. Only when she overcomes a mental breakdown and accepts herself as who she is, her perception of life changes. A turning point in her life culminates with her discovery of becoming a stand-up comedian, a position from which she can openly joke about her cerebral palsy and perform her disability without the pretense of hiding it from her audience. It is in that pivotal moment that Francesca has gained agency and set free from medical labels that have disabled her over the years, and paradoxically, she ends up accepting her disability to able her. She describes it in the following passage:

> I had spent years accepting other people's definitions of me and doing so had filled me with shame and negativity. All my life I'd hated saying 'I've got cerebral palsy'. And now I realised that I never had to say it again. I was just Francesca and Francesca was wobbly. My neighbour's kids had called me 'wobbly' years ago and I loved it. It was accurate and non-judgemental and cool. I hadn't realised that I could choose how to view myself. (224)

Unlike the other neuro-autobiographies in which a Dr. Jekyll and Mr. Hyde Syndrome manifests as controlling characters inside the autobiographers' body or brain, in Francesca's story, the author has agency to choose which character can embody at a time to meet the needs of a context. In this way, Francesca lives a double life constrained by the environment and not by her own body or brain as seen in the following fragment:

> The difference between my home life and school was almost comical. By day, I was The Undesirable One, by night and weekends I was The Beloved. I was living two very separate lives and I made sure they were kept well away from each other.

> My family remained mostly unaware of my dejected schoolgirl alter-ego and that was the way I liked it. As long as I could keep this sorry character from them, I could pretend she didn't exist when I was at home. (111)

Francesca shows that she holds agency to choose which character to embody as a strategy to interact with agents in different contextual environment. She uses the terms "The Undesirable One" and "The Beloved" to describe the opposing characters that she not only embodies but also performs in order to meet the social context which indicates whether she fits in or not. This doubled-life reflects tensions between normality and disability in Francesca's narrative; the anxiety to fit-in is stronger in Francesca's neuro-autobiography than in the other stories studied here. For Francesca, her disability is physical, visible, and embodied. Moreover, her neuro-autobiography sounds more authentic as she digs into her deep emotions more than the other ones. Her focus in on the relationships she has established with others, that is, family, peers, lovers, and institutional authorities, who have impacted on the way she understands her disability. In her narrative, the description of her interactions with family and friends is based on her memories about growing up with cerebral palsy as a toddler, school girl, teenage, and young woman. The impact of her disability during her teenagerhood is devastating on her emotional development, as this is clearly seen when she compares herself with the 'abled' girls:

> Being around such physically beautiful people all the time just highlighted the gnawing feeling that I was ugly and inferior and faulty and abnormal. The act of keeping up the pretence that I'd no insecurities or problems or unhappiness or brain damage – along with the pressure I placed on my body by constantly demanding it to be 'normal' – was reaching breaking point. (202)

Working as a secondary actor in a BBC series for teenagers, Francesca is immersed in an environment where the body is always under scrutiny, being either judged or appreciated, putting her under stress and tension more than anybody else. The demands to keep an attractive body on the screen seems impossible for her, which creates a great deal of anxiety and somatizations, affecting her wellbeing and mental health. As a result, she becomes depressed: "I stopped going out" (202), and moreover: "The gulf between how I was seen and how I saw myself became unbearable" (203). She describes finding refuge and support in her family members who can reassure her of their love and acceptance: "My family finally convinced me that brain damage was not something to be brushed under the carpet. No matter how vigorous the sweeping" (205). The attitude of self-acceptance of one's own disability is a milestone in one's life; and for one to be accepted by others, the individual should first accept their own body, with all the visible and invisible scars, damages, and scratches.

Francesca reflects on the time she felt depressed and admits facing that situation by acknowledging how vulnerable she felt. She mentions that she used to hide or repress her emotions so that she could pretend she was always feeling and acting 'normal' – she was in constant denial. She further confesses that she recognized her prejudice against individuals suffering from mental illness, by judging people with depression as a feature of a weak personality. Only when she faced depression herself that she admitted how vulnerable she felt as a disabled person. She confesses:

> I'd always prided myself for being mentally robust so it shook me to realise just how fragile I felt. Especially as I'd dismissively judged people who had panic attacks as somewhat hysterical with a melodramatic tendency to exaggerate. […] I felt like a weary boxer after a long, hard fight who has finally accepted defeat. In

> many ways, it was a relief. I didn't have to pretend to be normal, or obsessively project strength or confidence any more. But it was also a shock. A shock to have to admit to myself that I was disabled. (205)

Accepting her neurological condition is the first step towards a turning point in her life: "It took nineteen years of kicking and screaming to admit that I was brain damaged. I was a slow learner." (206). The confidence in finding her professional passion and acceptance by others beyond her family plays an importance role in the way she guides her life from then on. Reaching a turning point in her life is a way of self-healing, by accepting herself without questions and labels. She concludes by stating that "Nobody is normal. We are all different. I had to make sure that every moment I had left on this planet counted". […] 'I liked myself', I repeated, with more conviction. I said those words every night for a long time. And I never looked back" (225). What comes next in her narrative is her assertiveness of feeling normal despite being visible disabled: "I'm still wobbly, obviously, but I don't see it as a problem anymore…" (230).

4.5 Ecology of Relations: Entanglement and Fractals

The neuro-narratives analysed here show that the autobiographers are not isolated beings living in their own world; quite the contrary, they are social beings, participants in discursive communities and networks, creating a web of relations that I call here 'ecology of relations'. The autobiographers interact with agents on a discursive level such as the scientists and authors they cite in their narratives as well as on an experiential level, such as people that are part of their 'real' world such as family members, friends, medical staff, and educational agents among others, as illustrated in figure 4. Thus, in this section, I examine how the autobiographers rhetorically

map their narratives to other voices and interactions, which are entangled in diverse environments, co-creating new stories at personal, professional, and institutional levels.

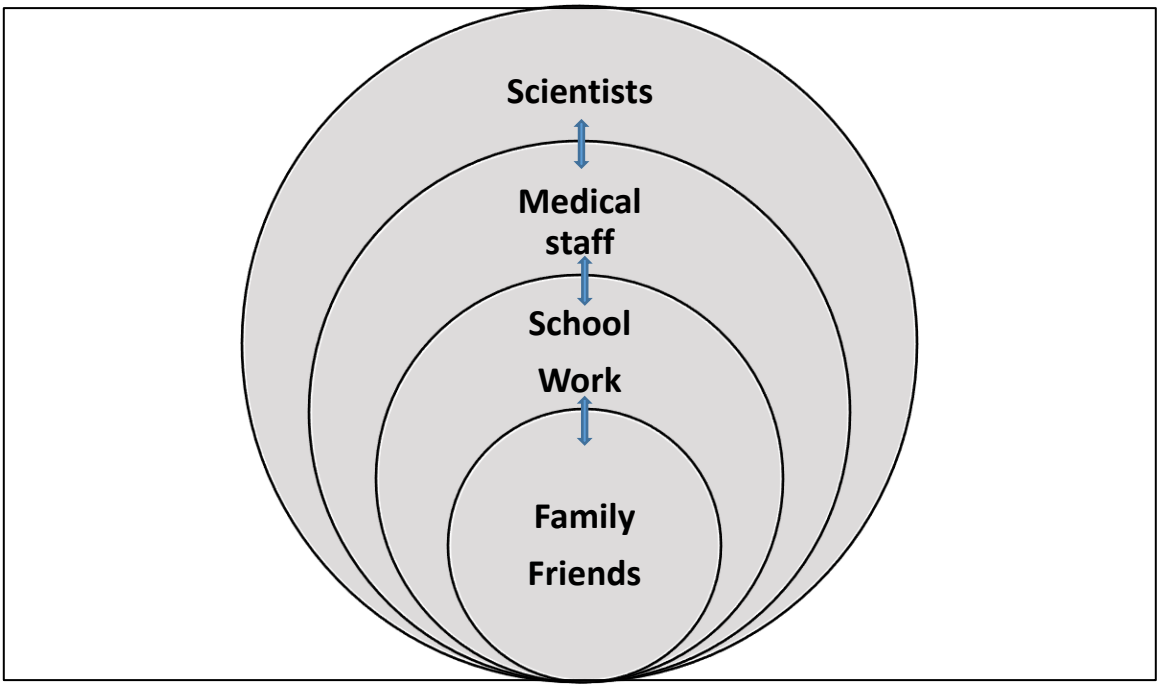

Figure 4: Ecology of Relations

4.5.1 Temple: "Psychiatrists and psychologists were of little help"

Complex social interactions are marked in those autobiographies through rhetorical tools that map the autobiographers' communication with professional and institutional agents to their view of scientific discourse hegemony in society. The five autobiographers describe their perceptions based on their interactions with medical and educational professionals in terms of how their neurological conditions are dealt with. For example, Temple describes her views of doctors and therapists with low expectations: "As I grew older, the people who were of the greatest assistance were always the more creative, unconventional types. Psychiatrists and psychologists were of little help" (103). She uses humor as a rhetorical device to criticize one of her interactions with a psychiatrist: "One psychiatrist thought if he could find my 'psychic injury', I would be cured"

(103). Moreover, as an advocate for the neurodiversity movement, she feels uncomfortable with the fact that physicians want to find a treatment that can 'cure' her autism instead of accepting her as an autistic individual. She extents the criticism to her school teachers who "wanted to discourage my weird interests and make me more normal" (104). She recounts her adaptation problems during regular high school before she was sent to a boarding school for students with emotional problems. Like Francesca's neuro-autobiography, Temple describes that she had one teacher who accepted her autism (Mr. Carlock) and who "took my interests and used them as motivators for doing schoolwork" (104). Mr. Carlock guided her to study sciences in order to understand her disorder, which eventually motivated her to become a scientist: "[he] took me to the library and taught me how to do this [searching the scientific literature] and take the first step toward becoming a scientist. These were the books the real scientists used" (104). Her relationship with Mr. Carlock is one of mentor-mentee, playing a positive role in her education and prospective career. Hence, it becomes clear that in Temple's narrative her positive interactions with medical and educational staff are depended on each professional individual who can 'think outside the box' to understand and accept her as a high-functioning autist who has the potential to develop according to her own pace and interests.

4.5.2 Siri: "The young men in white coats"

In Siri's neuro-autobiography, her interactions with the medical staff fall also under her expectations. She reveals her frustrations with the medical community that insist on treating her violent migraines with drug cocktails and psychotic drugs, not to mention, the poor interactions she faces as a woman patient. Like Temple, to mitigate her disappointments with the medical staff, she uses humor as a rhetorical strategy when she describes doctors as the "young men in

white coats" (4); most of her criticisms of the medical professionals are in relation to their lack of empathetic and compassion skills while treating their patients. She describes the chief doctor as the "Headache Czar" with a sarcastic tone when describing him as "a man who mostly ignored me and seemed irritated that I didn't cooperate and get well" (4). We can imply that Siri is uncomfortable with the asymmetrical relations between doctor-patient interactions. As a self-proclaimed feminist, Siri generalizes that most neurologists are male, which creates false-assumptions that emphasize asymmetrical relations based on power, knowledge, and gender inequality in the medical community. Her discomfort in interacting with a dominant male-oriented medical staff is equated with scientific knowledge (e.g. objective, rational, and evidenced-based), which she is skeptical about. For example, she is dissatisfied with physicians' diagnosis of her condition as it may be restricted to objective readings of exams (e.g. EGG, brain image scan, X-rays) rather than of herself as a whole human being: "Nobody really knew what was wrong with me" (5).

Moreover, Siri complains about how physicians can sound ambiguous when delivering a diagnosis of a brain disorder to their patients, which may lead to an overall distrust in the medical community. Her narrative maps her reactions of receiving doctors' diagnosis to her frustrations that are expressed in humor and metaphor as rhetorical devices. For instance, she compares herself with a popular literary character Humpty Dumpty, by paraphrasing a nursery rhyme, as she tells her readership, "My doctor gave it a name -- vascular migraine syndrome -- but why I had become a vomiting, miserable, flattened, frightened ENORMOUS headache, a Humpty Dumpty after his fall, no one could say" (5). Using humor helps her deal with negative feelings derived from asymmetrical interactions she experiences with the medical staff. Since the etiology of her migraine remains unknown and the medical community fails to give her clear explanations

about her condition, Siri decides to use her neuro-autobiography as a reflective tool to evaluate the role of the medical scientific community in our society. In other words, she shows how they may block communication with the lay population by raising imaginary walls that keep their knowledge unavailable to the everyday individual. Thus, her interactions with the medical world of neurologists and psychiatrists are characterized by tension, anxiety, and discomfort. Not satisfied with the medical reductionist approach, Siri keeps searching for counter-arguments as she describes her lived experiences not as something that is processed in her brain, but as in her body, while she states: "I seem to translate everything into bodily feelings and sensations" (117). She emphasizes that she perceives the external world with her body, reinforcing this notion when she narrates a case in which she received a letter from one of her readers (a doctor) who diagnosed her with synesthesia "she was convinced that I had it" (117). To accredit this diagnosis, Siri recalls her childhood memories when her mother used to tell her that she was "too sensitive for this world" (117). She incorporated that into her personality (e.g. hypersensitive – mirror-touch synesthesia) which she sees as a flaw later. Being hypersensitive to external stimuli (e.g. people, places, color, light) makes her vulnerable to the environment, as her "empathy is extreme" (118), becoming detrimental to her health. Siri's integral approach is, however, ignored by a medical community (e.g. neurologists) that has failed to treat her as a person (personhood), opting instead, to treat her as a disembodied brain (brainhood). This attitude illustrates medical personnel's lack of empathetic skills and their avoidance of holistic view of patients in their clinical practice; such attitude is justified by 'lack-of-time' while patients are reduced to numbers in fast paced ambulatory settings turning human relations precarious. Moreover, technological tools such as a fMRI can provide instant results for a patient's brain condition, speeding the

interactional and communication between medical staff and patient, which limits doctors' listening opportunities to a patient's account of their medical history (i.e. anamnesis).

4.5.3 Jill: "I sat and observed her absurdity and ignorance"

Like Siri, Jill is also concerned about doctor-patient interactions. Hence, in her narrative, she expresses her frustrations of dealing with the medical personnel when she was under their care in the hospital. She uses the concept of 'energy' in a vernacular mode to describe medical staff's commitment to patients' care. She considers them with low energy when interacting with her; in this vein, she feels some medical professionals can exchange or not energy with her, which may impact on their interaction. Like Temple, Jill starts 'thinking in pictures', as a consequence of the impairment of her left hemisphere. She mentions that it is not the usual form that most 'normal' people use to process information to communicate; for this reason, she feels that some of the medical staff lack the ability to interact appropriately with stroke survivors. She explains that "Communicating with the external world was out. Language with linear processing was out. But thinking in pictures was in" (78). Jill draws her readership's attention to the way lay people and professionals communicate with damaged brain individuals. They take for granted the neurological conditions and address damaged brain individuals as if they were communicating with individuals that have a 'healthy' brain. This lack of awareness leads to miscommunications and exclusions as language and thinking processes take time when someone has a brain damage. Moreover, thinking in pictures requires more processing time, but it does not mean that it is a matter of intellectual deficit. Abled people may think that the brain damaged individual is not processing anything at all, impairing the communication. The situation gets worse when the

medical staff is unable to communicate with patients who have suffered brain damage. In her narrative, Jill addresses this issue:

> I was saddened by the inability of the medical community to know how to communicate with someone in my condition. Stroke is the number one disabler in our society and four times more strokes occur in the left hemisphere, impairing language. I think it is vitally important that stroke survivors share and communicate about how each of their brains strategized recovery. (80)

Jill manifests her frustrations in relation to the medical community, which seems not to know how to communicate properly with patients with language impairment due to neurological disorders. Her complaints about the medical community's low sensitivity in communicating with stroke survivors empathetically leads her to mobilize stroke victims to share their stories in a type of "community of practice" to pool strategies that can assist medical staff to better enhance their communicative skills. Even though communication technology has enormously advanced in terms of human-computer interface for people with language impairment, the same cannot be said in relation to human-human interaction, in this case, doctor-patient.

Jill's narrative about her days warded in the hospital after her stroke surgery resembles an ethnographic log, in which she shares her experience and reflections. Since she is a neuroscientist who used to be part of a staff in a medical school, I would hypothesize that her perceptions of the everyday in an intensive care might differ from someone who is not acquainted with the medical setting. However, such a hypothesis can be refuted, since her personal account reveals that she behaves as any other lay person admitted to a hospital. For example, Jill is uneasy with doctor-patient interactions since she has experienced uncomfortable situations with medical staff, as she describes: "This young girl was an energy vampire. She wanted to take something from me

despite my fragile condition, and she had nothing to give to me in return [...] She spoke a million miles a minute and hollered at me as if I were deaf. I sat and observed her absurdity and ignorance" (83), and, "The professionals who did not connect with me sapped my energy, so I protected myself by ignoring their requests" (84). However, not all Jill's interactions with the medical staff was tense while she was hospitalized; she acknowledges that some of them have bedside manners that show knowledge, care, and compassion (e.g. person-centred), as she illustrates here: "Andrew, another medical student, came by that same morning to give me yet another neurological exam. [...] He was respectful of me as a person -- even in this condition. I was confident he would grow up to be fine doctor. I hope that he does" (85). The communication and interaction that she expects from the medical staff involves respect, empathy, and recognition of her condition, that is, basic humanistic values, behaviour, and attitudes towards patients. Jill talks about human interaction that is not only based on cognitive and emotional functions, but also on corporeal language; she moves towards a communicative practice that allows synergy to circulate. For this reason, she understands bodies not only as matter but also as energy.

As a neuroscientist, Jill had the opportunity to meet and work with famous figures in the field of neurology, with whom she shared knowledge in a symmetrical interaction. Once she has suffered brain damage, she feels that she is not at the same level as her colleagues, feeling handicapped and inferior. She recalls an encounter with a neurologist ('the famous Anne Young' in Jill's own words) who oversaw her case, which by coincidence is a professional that Jill once had met and had "already established a special rapport" (85). However, in the position of a patient with brain damage, Jill did not feel the same honor she once felt when meeting Dr. Ann Young; she confesses that she felt so apprehensive to see her "that my circuitry for embarrassment had also gone awry" (86). Her encounter with the 'Queen of Neurology' has

changed her perception: “Although I could not completely understand her words, I completely understood her intention. This woman understood that I was not stupid but that I was wounded, and it was clear that she knew that it was her job to figure out which circuits of mine were still active and which parts needed healing” (86). Despite her anxiety, she feels relieved to see that the “Queen of Neurology” has treated her with compassion and respect, “On her way out the door, she squeezed my hand and then my toe. I felt a huge sense of relief that she was my physician” (86).

Not only do these neuro-autobiographies deal with doctor-patient interactions, but also with family relations, mainly with mothers as being principal caregivers. In Jill’s narrative, the mother-daughter relationship plays a significant role in Jill’s healing; she is very thankful for having her mother as her primary caregiver since she understands that her daughter is wounded and in need of support. Having her mother by her side gives Jill confidence to face the brain surgery, despite her fear of losing her agency before, during, and after the surgery: “vulnerable and at the mercy of the people in this room” (92). Jill uses humor to describe her relationship with her mother in situations that she feels tense: “I felt physically in peril as my mother drove like a Hoosier provincial in downtown Boston traffic! We draped my face to block out the sunlight. I prayed the whole way home” (95).

Her mother is her full-time caregiver who enables Jill to rehabilitate naturally from her stroke. Jill uses humor to describe tough moments in her everyday at home to relieve tensions from the aftermath of her stroke: “I lived on the second floor of a two-family home so I had to sit on my butt and bop myself up the stairs. (No, that's not the way the physical therapist taught me to do it!)” (98). Having lost many functions due to the stroke, Jill pushes herself to retrain her body, mind, and brain in order to learn how to interact and communicate with the environment again. In

her narrative, Jill praises her mother for her milestones: “I was totally blessed to have G.G. as my caregiver” (96), “One of the keys to my successful recovery was that both G.G. and I were extremely patient with me” (97), “I have to say G.G. was really wonderful during this process” (97); and “I was wounded and she understood that” (97).

Jill’s last recommendation to stroke survivors is to be surrounded by people with positive energy and to avoid the ones that are “nervous, anxious, or angry” since they are “counterproductive to […] healing” (126). Jill’s brain narrative helps caregivers understand how their interaction and communication can affect stroke survivors’ during the healing process.

4.5.4 Barbara: “The dynamics that govern abusive relationships are complex”

Contrary to Jill, Barbara’s personal relationship with family and spouse is mentioned with some resentment in her neuro-story. This is the case of Barbara’s description of her late former husband in her autobiography. Barbara mentions him with some gratitude because he introduced her to Luria’s work, as she remarks that “bringing me to the work of the brilliant Russian scientist Aleksandr Luria, who utterly changed my life. So, thank you, Joshua.” (187) Despite paying tribute to Joshua, she briefly describes her tumultuous marriage which culminates into a traumatic separation with emotional and material losses; however, Barbara does not give enough depth to it. She simply mentions it as a life event that is also affected by her learning disability. She briefly states her vulnerability in the marriage since she was prone to manipulations that she was not aware of. She states that “During the first years with Joshua, my reasoning deficit left me particularly vulnerable to manipulation because I could never be certain what people meant. With some people, there was surface meaning and then there was the true agenda. I could not tell the difference” (188). The cognitive training she goes through also changes her interpersonal

relations, and for this reason her personality changes by the time her marriage has ended: "My marriage had endured fourteen years and when it ended, so did a seventeen-year relationship that had begun the spring of 1977. I was not the same person at the end of that period as I was at the beginning" (188). Barbara implies that she was naïve when she had the learning disability, prone to get into abusive relationships without understanding the intricacies of people's manipulations and power control, as she remarks: "The dynamics that govern abusive relationships are complex, and I do not mean to diminish all the factors that contribute. My intention here is to underline the role that learning disabilities can play in this troubled dynamic" (188). She acknowledges that the emotional part is not easily healed even after cognitive functions are enhanced. She concludes the section by stating that "It was clear to me when I fled Joshua that the blinders I wore because of my neurological deficits had gotten me into that relationship. Cognitive exercises had removed those blinders; learning to understand the world and starting to heal had gotten me out. I felt an odd mixture of sadness and relief" (189).

The end of her marriage also comes as a turning point in her life, making her move from New York to reopen her school in Toronto with support of friends, as she recalls:

> Psychologically I was numb. Physically I was in a very poor state after four miscarriages and multiple surgeries for endometriosis. The school in New York was gone and so was the Toronto school. […] But then the most remarkable thing happened. […] These angels as much as said, "There has to be an Arrowsmith school in Toronto. We need it, and others do too. (190)

The angels refer metaphorically to her friends who provide her with emotional and financial support to reopen a school. It becomes clear that a social network is important for her re-settlement and business success, which have contributed to her self-organization, resilience, and self-efficacy.

4.5.5 Francesca: "I'd always had a strange relationship with medical folk"

The web of interpersonal relations scores high in Francesca's neuro-autobiography. Part of her life story is about Francesca's reflections of her relationships with abled individuals who have affected her positively and negatively. To start with, Francesca's family plays a positive and vital role in shaping her personality and worldview. Coming from a family of artists, Francesca has embraced performing art as her interpretation of life since her tender years. However, during her school years her relationship with the educational staff is marked by resistance, a position that has endured the rest of her schooling. Her repulsion towards institutions that hold control and power such as the educational and the medical is visible in her writing, making her see them as oppressive spaces where she is forced to conform with rules, peer pressure (e.g. bullying), and discrimination. For this reason, her autobiography carries a critical standpoint that resonates with Foucault's ideas on 'disciplinary society', especially, power relations such as teacher-student and doctor-patient. It is the latter that I focus here, as she mentions:

> Clearly I wasn't cut out for the medical profession. Not that I'd harboured any ambitions to become a doctor. I'd always had a strange relationship with medical folk. They were the only people in the world who made me really nervous. … Put me in a room with a doctor, however, and I turn into a gibbering wreck. One step through the doorway and it's clear that all they see is a medical condition. Without fail, doctors ignore me and speak only to whoever has come with me. I'm as invisible as a ghost. (105)

In this passage, Francesca confesses the emotional burden from which she suffers whenever she has to visit a doctor, a traumatic encounter that triggers much worry, fear, and anxiety. Her

‘strange relationship’ with medical professionals can be attributed to the poor interaction and communication skills that doctors employ to patients in their clinic, an unfortunate situation that most of us have also faced when visiting a doctor: the lack of real care and empathy towards patients. Francesca criticizes clinical doctors for dehumanizing their patients with their view of ‘a medical condition’ that narrows the personhood to a disease, a disability, a disorder or an illness. Moreover, physicians tend to reduce their patients to tissues, cells, and molecules. Things get even more complex when patients have special communication needs as in Francesca’s case. Her speech is affected due to her neurological condition (athetoid cerebral palsy), resulting in dysarthria (i.e. a motor speech disorder) with some degree of unintelligibility. Because communication with Francesca requires more concentration and care from her interlocutors, doctors simply find it more convenient to address her caregivers without consulting Francesca directly. Consequently, Francesca feels ignored as a human being; for the doctors, she is ‘invisible as a ghost’ or an object without cognitive and emotional abilities. To illustrate it, Francesca fictionalizes a typical dialogue between a medical professional (Dr. Bennet) and a patient (Francesca) with a caregiver (mum):

> Dr. Bennet [his eyes trained steadily on my mum]: So, Mrs. Martinez, what seems to be the problem?
>
> Mum: Well, Francesca says her ankle hurts.
>
> Dr. Bennet [still looking at my mum]: Hmm…can you tell me exactly how her ankle feels?
>
> Mum [calmly]: Maybe you should ask her yourself.
>
> Dr. Bennet coughs and his eyes flicker over to me for a second, like a restless bird landing momentarily before fluttering away.

Dr. Bennet: Erm… Okay…Right, then. So…

Dr. Bennet gets up from his chair and walks cautiously around me. He kneels down on the floor in front of me.

Dr. Bennet [to my mum]: Can she take her shoes off by herself?

Mum [with just a whisper of disbelief]: I'm sure she'll tell you if you ask her.

Dr. Bennet nods before directing his eyes towards my face. He manages to keep them there this time.

Dr. Bennet [slowly and loudly as if talking to a deaf ninety-nine-year-old]: Can you take your shoes off?

Me: [with the same volume and pacing]: Yes… I … can.

Dr. Bennet looks confused for a moment, unsure whether the freak is being sarcastic or whether she is, as he suspects, intellectually deficient. I stare back at him. (106)

Apart from humor and sarcasm to relieve Francesca's tensions, the autobiographer also indirectly denounces the doctor's lack of communication training for neurodiversity patients. Not only does the doctor ignore Francesca by not even gazing at her, but also does he demonstrate his professional inability to interact with disabled patients. He feels uneasy before her presence, behaves nervously and pathetically. Although it can be argued that Francesca's representation is a hyperbole, it is common to hear patients complaining about medical staff's lack of care and empathy in the real world. [85] Unfortunately, reviews such as the ones we can read at *RateMD* are not fictional, which supports Francesca's position and fictional dialogue. These examples indicate

[85] I analyzed the discourse in some websites such as *RateMD* to identify how patients' reviews of their physicians relate to interactional skills (communication, empathy, and care); for example, some patients comment on their doctors 'attitude by describing them as "rude". For example, 'I found him rude', 'does not pay attention or listen to answer all question, bit rude', 'rude, loud, impatient, doesn't acknowledge he is working with a human being'.

that we face an urgent need to revise the medical training curriculum in order to include medical humanities disciplines such as arts, literature, and film that can enrich medical students' learning experience during their internship training (Bleakley 2015).

In Francesca's case, the domestic and outside environments can play a significant role in her personality. She always finds her family and home nurturing spaces where she feels loved; while the outside world, usually the educational setting, feels hostile to her. She has developed emotions such as fear, anger, and anxiety towards the outside world, which are usually translated into sarcasm in her writing. What matters to Francesca to feel confident is an acceptance from the outside world, which she has barely received. Instead, she focuses on her family relations, like her Spanish grandparents, who have always accepted her the way she is. Francesca recalls an event when she visited them over a summer break in Spain: "I cried my eyes out when it was time to leave Yayo and return to London. After the turbulence of school, the last three weeks had reminded me how it felt to be loved so much, to be accepted just as I was. I would miss being in such a place" (125). For Francesca, people in London, a cosmopolitan city, seem much more hostile and intolerant to her disability than people from a rural zone because metropolis are usually marked by accelerated time that constrains everyday interpersonal relations.

At school, her peers are indifference to Francesca, making her feel undesirable as she narrates: "I have to point out that, by now, my classmates were hardly ever cruel or overtly mean to me. They just didn't talk to me or have lunch with me. […] It was the frosty apathy, largely concealed, that was corrosive that peeled away the thin layer of confidence I held on to. I felt invisible" (141-2). Feeling invisible is a way of being discriminated by the 'normal' girls in her class, which affects her wellbeing and self-esteem. Even though she ends up passing an audition to act in a BBC TV series for the youth called "Grange Hill" – in which she plays a girl with a

physical disability – her school mates do not change the way they interact with her. She perceives her school mates treating her differently and ignoring her as if she were invisible, which ends up affecting her self-esteem. When she graduates from high school, she feels relieved: "I turned to look at the school buildings. I felt nothing. I'd spent five years of my life there. Five years! And, apart from Carol, not one person had said goodbye on my last day. For a moment, I felt a profound sadness pour over my body and I closed my eyes. When I opened them again, we were nearly home" (176). Similarly, the indifference she suffers from her male peers outside the school environment becomes also detrimental to her psychological health. She feels ignored by young men to whom she is attracted, as she laments: "I still believed I was unattractive and that nobody could love me […] I became increasingly obsessed with trying to hide my disability. It's not easy to hide brain damage […] (197).

To compensate for her peers' indifference, Francesca receives unconditional love from her family, which is stressed throughout her narrative. She tenderly describes her relationship with her brother and parents, respectively, when she suffers depression: "Remarkably for a fourteen-year-old, he sat and patiently listened to my shit" (206); and: "My parents, too, let me come to them day after day, to air my worries and insecurities. They listened like friends and were always there to make me feel loved when I felt lost and scared" (207). She finally concludes that "I clearly realised that my family were my rocks" (207). Thus, in Francesca's narrative there is a wall separating her private world from a public one. The private represented by the domestic world nurtures and accepts her disability, whereas, the public, the outside world, shows hostility and indifference to her neurological condition and to herself as an individual.

In conclusion, this Chapter offered a zooming in and out of the five neuro-autobiographies. First, it provided a macro perspective under complexity theory framework. Next, it examined the

‘parts’ through a discourse analysis to identify the composition, structure, and content of those life narratives. The code analysis provided emic and etic perspectives; that is, the narrators’ view of their lived experiences with their neurological conditions, and the researcher’s analysis of how the narrators unpacked the scientific knowledge, respectively. Last it discussed how the autobiographers construct their identities and map themselves to networks in order to create an ecology of relations.

CHAPTER FIVE: Mapping Complexities in Neuro-Autobiographies

5.1 Overview

In this Chapter I intend to map key concepts from the neurosciences to the five autobiographies. First, I explore two topics that are a trademark of neurosciences through a vernacular approach as identified in the neuro-autobiographies: neuroplasticity and mind-brain problem. Second, I examine how the five self-narratives can offer the resources to explore the two cultures divide as discussed in the literature review and to what extent they can bridge the gap.

5.2 Neuroplasticity: Bifurcations and Adaptations

Neuroplasticity is a key concept in the neurosciences which is dealt with in the neuro-autobiographies through scientific and vernacular examples. Plasticity as a neuroscientific concept refers to the capacity of the nerve cells to reorganize themselves and create new networks in response to fluctuations in the brain (e.g. seizures, stroke, migraines).[86] At a vernacular level, neuroplasticity is seen as a metaphor for life, personality, or habit changes as well as transformations of the self in order to adapt to an unfamiliar environment, as shown at the table below. Hence, I explore how the autobiographers approach brain plasticity in their personal narratives, be it denotative and connotative. Table 2 illustrates the vernacular and metaphorical meaning of neuroplasticity as each autobiographer deals with the term or concept.

[86] For a historical discussion of the term 'neuroplasticity' see: Demarin, Vida, and Sandra Morović. "Neuroplasticity." *Periodicum biologorum* 116.2 (2014): 209-211.

Neuroplasticity and its Metaphors

Autobiographers	Neuroplasticity
Temple Grandin	Life Transitions
Siri Hustvedt	Writing the Self
Jill Taylor Bolte	Healing
Barbara Arrowsmith	Turning-Point
Francesca Martinez	Rebirth

Table 2: Neuroplasticity: Vernacular Meanings

5.2.1 Temple: "Today, I no longer need door symbols."

In Temple's narrative I identify a vernacular use of neuroplasticity in the following example: "In order to deal with a major change such as leaving high school, I needed a way to rehearse it, acting out each phase in my life by walking through an actual door, window, or gate" (18). Temple uses brain plasticity as a metaphor for life transitions. Her experiential account of facing life changes is based on corporeal movements rather than on emotional responses or rationalization. In other words, she experiences life transitions through simulations as a result of her visual thinking ability that is unable to abstract situations. She offers her readership further examples from various stages in her life, such as "When I was in college, I found another door to symbolize getting ready for graduation…" (18). She provides examples to show how autistic individuals struggle with life transitions and how they create strategies to cope with changes. Temple concludes that the strategies (e.g. creation of symbols) are temporary until she internalizes the transitions and learning process: "This ability to modify images in my imagination helped me to learn how to generalize", and "Today, I no longer need door symbols"

(22). To abstract life concepts, Temple has to literally live them through her body by a repetitive practice that involves rehearsal movements (I note that in Temple's narrative brain plasticity is embodied). Moreover, Temple talks about changes as a learning process: "Over the years I have built up enough real experiences and information from articles and books I have read to be able to make changes and take necessary steps as new situations present themselves" (22). Temple acknowledges that changes may originate from one's experiential opportunities, which are processed in the mind (i.e. cognitive abilities) and concretized through the body. She indirectly mentions neuroplasticity without using the scientific term when she discusses how to compensate her deficits: "The nervous system has a remarkable ability to compensate when it is damaged. Another part can take over for a damaged part" (23).

Plasticity in Temple's vernacular use relates to life changes or transitions that sides with complexity theory, in which life becomes more adaptable, less rigid, non-fixed, and non-linear. Temple has shown some malleability and flexibility in facing life transitions by adopting some corporeal strategies and mental imageries to adapt to a new environment. We can understand those adaptations through the lenses of Complex Adaptive Systems (CAS). Holland explains that in CAS, "The elements, usually called agents, learn or adapt in response to interactions with other agents" (2014, 8). It is important to note that these elements are dynamic and not fixed, meaning that once adaptation to a new situation is established, other new elements may emerge, so that equilibrium is never really achieved, and agents are always in search for it. Holland mentions: "In CAS the elements are adaptive agents, so the elements themselves change as the agents adapt. The analysis of such systems becomes much more difficult" (11). In Temple's neuro-autobiography, the reader learns that Temple (i.e. agent) has adapted to some changing interactions or to some transitions, but she will not be able to know all about other adaptive

situations as she has omitted some situations or is unable to predict forthcoming ones by the time the autobiography is published. Thus, the act of choosing some situations and excluding others is also stressed in Holland's work: "For CAS, the agent-defining boundaries, determine the interactions between the agents. Indeed, the agent-defining boundaries act like semi-permeable membranes, admitting some signals and excluding others. Adaptation, and the emergence of new kinds of agents, then arises from changes in the relevant boundaries" (85). Hence, dynamic relations are necessary to promote and foster changes.

5.2.2 Siri: "Brains can reroute themselves."

In Siri's neuro-autobiography, neuroplasticity is approached from a neuroscientific perspective. She indirectly states the brain property with the following statement: "Brains can reroute themselves" (55). She acknowledges that plasticity or brain change is a property related to learning and adaptation to environment; she makes her point by citing a case study conducted by Luria (the same neuroscientist referred in Barbara's narrative) in relation to language development in twins. Siri uses Luria's research as an example to privilege verbal or language over images/visual mind, taking a distinct position from Temple. She uses Freud's theory to support her arguments: "I exist only in relation to 'you'. Language takes place between people, and it is acquired through others, even though we have the biological equipment necessary to learn it" (55). Siri takes a bio-socio approach to language as she affirms that "language is outside us and inside us" (55), which implies that our adaptations to a new environment are not only embodied but also discursive. Overall, Siri does not approach neuroplasticity with substantial depth in its scientific and vernacular modes. Yet the metaphorical use of plasticity can be extended to her explorations of 'writing the self', related

to learning and adaptations to an unfamiliar environment, not only seen as part of cognitive abilities but also as an embodied practice that writing entails.

5.2.3 Jill: "… believe in the plasticity of my brain."

Neuroplasticity is a central theme in Jill's autobiography. She acknowledges neuroplasticity as an important brain function during her healing process, as seen here: "I noticed significant improvement in my brain's ability to learn and function for eight full years post-stroke, at which point I decided my mind and body were totally recovered" (116). As a neuroscientist, she is aware of the importance of neuroplasticity as a natural, organic way of a brain recovery method, as she remarks: "Scientists understand the brain has tremendous ability to change its connections based upon its incoming stimulation. This 'plasticity' of the brain underlies its ability to recover lost function" (117). Jill adopts a vernacular approach to explain neuroplasticity despite her training as a neuroscientist; it is likely that her choice for a vernacular version may be the result of her post-stroke condition that forces her to reframe her identity as a former neuroscientist who still holds the diploma but not the professional practice. Thus, she opts for a metaphor "a playground filled with children" playing different activities and games to compare with the physiology of brain plasticity as a working set of nerve cells in the brain getting wired and fired, or an alternate circuity to promote energy. She offers a hypothetical situation: "If you remove the jungle gym, then those kids are not going to just go away, they are going to mingle with other kids and start doing whatever else is available to be done. The same is true for neurons" (117). Her comparison is toned with some sense of humor: "I think of the brain as a playground filled with lots of little children. All of these children are eager to please you and make you happy. (What? You think I'm confusing children with puppies?)" (117).

For Jill, plasticity is not only about an internal organization of the brain, but also a social organization that involves caregivers. For this reason, she gives caregivers tips and a list of recommendations on how to deal with a dearest one who is recovering from a stroke. In her recommendations, Jill draws caregivers' attention to the importance of plasticity during the patients' recovery period. They are in bold to stress its value: "**I needed the people around me to believe in the plasticity of my brain and its ability to grow, learn and recover**" (117). Thus, Jill's belief in plasticity is not only a matter of complex mechanisms of internal functions, but also of external ones (e.g. involving other agents in the environment) so that her brain can heal.

The concept of recovery and healing is important in Jill's neuro-autobiography because it illustrates her resilience, motivation, and agency.[87] Her definition of recovery involves a process that requires reframing: "If we define recovery as regaining access to old programs, then I'm only partially recovered" (128). For her, recovering is a second chance she receives in her life, with old bad habits being replaced by new good ones. For this reason, she does not want to recover part of her personality that she thinks it was not good (e.g. impatience, criticism, unkindness), but she wants to reorganize her 'self' (self-regulatory mechanism) and embrace a new identity. Thus, she sees her stroke as a gift to improve herself, as she mentions that the "gift this stroke has been in permitting me to pick and choose who and how I want to be in the world" (128). She implies that she thought she was a "product of this brain" unable to deprogram habits that she did not like, that is, unable to make changes in her personality.

Therefore, she presents a narrative of a successful recovery, rhetorically shaped in a 'hero narrative' that illustrates her redemption, despite the everyday challenges she must still face to

[87] The chapter that deals with it is titled "Milestone for Recovery", in which Jill narrates her steps to achieve full recovery, year by year, reaching her goals gradually.

readapt herself to her new brain condition. Her neuro-autobiography carries a moral lesson in the sense of showing how much discipline one must have in order to achieve their goals and get rid of flaws in one's personality.

5.2.4 Barbara: "…just as our brains shape us, we can shape our brains"

Neuroplasticity is at the core of Barbara's neuro-autobiography. She offers a brief vernacular history of brain plasticity in North American context, more specifically her home country, Canada. For example, she points out that during her school years, the notion of brain plasticity was yet to be spread among psychologists, and therefore, it was believed that "the brain you were born with was fixed and hardwired" (5). What she means is that this belief can reinforce disabilities and deficits individuals have suffered without a hope for improvement, which can lead an individual to have a low self-esteem, depression, or anxiety, as she shows in her autobiography.

Her vernacular understanding of plasticity lies in the comparative story she draws between herself and Zazetsky. Her identification with and projection to the soldier came as an epiphany, as she describes it: "This brain-damaged soldier was describing himself, but he was also describing me. *I am Zazetsky*, I thought, *Zazetsky is me*" (6). She chooses Zazetsky as her model: "If Zazetsky was the man who couldn't tell time in post-war Russian, I was his female counterpart in Canada a few decades on. But where a bullet had inflicted the damage on this soldier's brain, I entered the world with my brain already damaged. Our problem had dramatically different origins, but their outcome was precisely the same" (6). Equating her case to Zazetsky in terms of outcome, in which both have suffered from similar cognitive deficits give Barbara some emotional comfort, despite a wide cultural, historical, and spatial-temporal gap

divides both cases.[88] The epiphany, or in her words, " turning point" , comes when she realizes that they share neurological deficits due to brain damage in certain regions, as she remarks: "I finally had an explanation for what had ailed me all my life. Here was evidence that my particular learning disabilities were physical, with each one rooted in a specific part of my brain. This realization marked the turning point in my life" (6). Therefore, I affirm that metaphorically turning point can be compared with plasticity because both can function as transformative and dynamic processes that pave the path for one's adaptation to a new context.

To approach plasticity from a more current scientific view, Barbara introduces a research psychologist, Mark Rosenzweig, who "demonstrated that the brain can physically change in response to stimulation" (7). His work on neuroplasticity was conducted with rats in the 1970s, and she believes that a physical change can also take place in the human brain, "*If a rat can change his brain*, I thought, *perhaps a human can do the same*." (7). Thus, inspired by Luria's and Rosenzweig's works, Barbara designs brain exercises to promote plasticity, as she mentions: "I wondered if a clock-reading exercise might stimulate this part of my brain" (7). She tests those exercises with herself arduously: "for up to twelve hours a day, and I got better at the task" (8). Not only has she improved performing the tasks, but also she has seen results in her cognitive functions: "I cannot describe my exhilaration when I began to feel the result of all this work. […] The fog dissipated and then lifted. It was gone for good" (8). The problem with her techniques lies in the fact that there is no scientific or clinical evidence-based research to back it up; instead,

[88] She emphasises the cognitive gaps she has faced like him, "Zazetksy and I could not make meaningful connections between symbolic elements, such as ideas, mathematical concepts, or even simple words" (7). Furthermore, she mentions that "Both Zazetsky and I caught fragments of conversations, but we never grasped the whole" (7), and even more, "Logic, cause and effect, and grammar befuddled me, just as they had Zazetsky (7). Barbara reinforces the similarities and commonalities they both share, such as the regions in the brain that was damaged.

it is based on her experience and life narrative. Should her brain training activity be accredited by neuroscientists who could validate her program through robust research, Barbara's method would gain credibility. Since her method does not provide 'evidence-based' results, it can only receive merits from a vernacular perspective, such as from neuro-autobiographies, under 'experience-based' accounts.

Despite not receiving scientific recognition, Barbara has continued to develop and promote her approach in her school.[89] Barbara reinforces neuroplasticity not solely as a brain function with its own agency (brainhood), but also as a cognitive power we hold to change our brain (humanhood): "What I have learned by doing this work for some thirty-four years is this: just as our brains shape us, we can shape our brains" (8). Hence, Barbara's view of brain plasticity can be translated into a vernacular turning point in one's life, in which agency and self-regulatory (e.g. autopoiesis) schema contribute to complex adaptive mechanisms (e.g. bifurcations) to assist an individual to redirect their life story.

Her project has indirectly benefited from the American proclamation of the Decade of the Brain, as neuroscience and neuroplasticity have received more attention from the media. Along with neuroplasticity, she mentions neurogenesis, another important concept to understand brain self-regulation in adulthood, which she explains here: "how the adult brain can grow new neurons in the hippocampus, an area of the brain important for memory and learning" (12). This assertion justifies the expansion of her school program to meet adults' needs as well as those of children's, by grounding her approach in the work of neuroscientists who have acknowledged the

[89] She acknowledges her educational program as being pioneer since neuroplasticity at that time was only researched in the lab and practiced clinically, separate from its implications to education and vernacular contexts.

importance of brain plasticity.[90] Her emphasis is on brain training and exercise, based on scientists who understand the human brain as a muscle but not as a computer.[91] In sum, Barbara's neuro-autobiography is a collection of vernacular explanations of brain plasticity, supported by well-known neuroscientific work and experiential approaches taken from the everyday (e.g. family setting, school, and work).

5.2.5 Francesca: "… we've witnessed the birth of a new comedy star"

In Francesca's narrative, neuroplasticity in scientific terms is not mentioned; however, at a metaphorical level, it is compared with changes that occur in one's life. For example, when Francesca describes overcoming her depression and achieving milestones (e.g. passing the driving test, enrolling in a college course, and attending a stand-up comedy training), such changes are indirectly related to her brain malleability to adapt to new situations. Moreover, at a psychological level, the changes reveal her resilience and her openness to resume her life after certain obstacles, stress, and crisis. I identify examples of plasticity (i.e. turning points) in her narrative similar to Barbara's; for example, her instructor praises Francesca's first performance in her stand-up comedy training course, which she realizes to be her dream career: "Well, I think we've witnessed the birth of a new comedy star tonight!" said Jill, warmly. 'Well done, Francesca'" (218). Francesca gets herself astonished by the unexpectedness of her success as a future stand-up comedy artist: "I felt something totally unexpected. I felt a pull I'd never felt

[90] She mentions that it was only in 1948 that the term brain plasticity was used in a book by a Polish neuroscientist (Jerzy Konorski). She acknowledges recent studies in neuroplasticity in North America, mainly the ones conducted by Michael Merzenich, who uses cognitive exercises designed in computer programs to stimulate the brain.

[91] Barbara cites a conversation between neuroscientists that see the brain as a muscle: "We know the brain is like a muscle", says Vinongradov. "If you train it to the right way, you can increase its capacity. The brain is ever changing in relation to what's happening to it. With the correct training, we can improve cognitive processes that weren't strong to begin with by improving the processing pathways." Says her colleague, Dr. Merzenich, "The brain changes - physically, chemically, functionally" (14).

before and I knew, there and then, that this was what I was meant to do" (218). Discovering her gift for stand-up comedy is a turning point in her life, with positive outcomes as she enters adulthood. It restores her confidence, increases her self-esteem and self-efficacy. Moreover, it emerges in a time when she starts getting into relationships and discovering herself as being a woman while experiencing her first love, a free-thinker called Dylan who has convinced her to remove the labels of being brain damaged and disabled. The following extract illustrates the couple's discussion on social pressures and power of discourse that constrain people for being themselves. Dylan says: "You're not 'brain damaged'. You don't have 'cerebral palsy'. Those words are vague attempts to try and define you. Your brain is your brain and you are perfectly you" (222). Dylan's dialogue with Francesca is marked by a 'motivational' style in relation to labels: "If anyone else wants to call you another label, that's up to them. But you choose how you see yourself. And that should be all that matters to you" (223). Francesca confesses to her readership that Dylan's words have a significant effect on her, and how she feels towards him: "And that was the moment everything changed. And the moment when, for the first time in my life, I fell hopelessly, recklessly, wondrously, magically, painfully in love" (223).

Thus, in Francesca's narrative, plasticity of the brain means embracing turning points in her life; she changes her mind, or better, how she used to think (i.e. mindset) while her brain remains 'damaged'. In other words, Francesca's plasticity relates to strategies of self-regulation and self-organization so that she can better adapt herself into a new environment or a new situation. As she changes the way of perceiving her disability, she reclaims agency and gains assertiveness, which impacts on her interactions with 'normal' individuals.

The understanding of plasticity as a self-regulatory behaviour that leads to adaptions, learning, and transformation of how an individual interacts with other agents goes in tandem with Complex

Adaptive Systems. Moreover, plasticity (at the level of brain/mind) seen as a condition to adaptation requires that an individual shows some resilience. According to Masten, resilience is "The capacity of a dynamic system to adapt successfully to disturbances that threaten system function, viability, or development" (2014, 10). I hypothesize that the process of brain plasticity can correlate with an individual's degree of resilience to adapt to new conditions. In sum, plasticity and resilience are entangled (such as brain and mind) in order to support individual's biological, psychological, and social transformations necessary to interact with other agents in an environment.

5.3 Mind-Brain: Problem or an Implicate Order?

In this section I explore how the mind-brain problem is addressed in the neuro-autobiographies since it is a theme that intersects with the humanities, or better, philosophy and psychology. In this regard, I view it as a complex topic that lies in a continuum, having neurobiology on one end, and philosophy/psychology on the other end. Moreover, I recognize that the five neuro-autobiographers position themselves in relation to this debate by directly or indirectly approaching current and classical views of the relation between mind and brain. However, their approach to mind-brain relations is neither clearly defined, nor transparent in their narratives. There are instances in which their views of mind-brain problem can be fuzzy, hybrid, or ambiguous.

As a note, the mind-brain relation is complex and debatable among neuroscientists, psychiatrists, and philosophers. Cooper summarizes the ongoing views as: "dualism – mind is a different stuff"; "identity theory – mental states are identical with brain states"; "functionalism – mental states are functionally defined"; "eliminative materialism – mental states do not exist"; "anomalous monism – mental states are brain states, but psychology cannot be reduced to

neuroscience" (2007, 121). These different views of the mind-brain relation are explored in the neuro-narratives mostly as a metaphor. For example, in Temple's and Barbara's narratives, I map "identity theory" to when both narrators equate mind to brain, meaning that their psychological states can be reduced to neurological explanations. Although on some occasions Temple seems to side with functionalism by viewing the mind as software and the brain as hardware. Yet, in Siri's narrative, a monist approach is mapped to Siri's lived experiences and reflections when she recognizes her mental states in relation to her brain, although she does not negate the existence of the mind which has its place in psychology.

In Jill's narrative, the mind-brain relation is not easily well-defined since Jill recognizes even an existence of a soul, in the form of "energy beings", where sometimes she sounds to be a "dualist". [92] At the other end, Francesca neglects this classical neuro-philosophical problem, and instead, relates disabilities (even the ones caused by brain damage) to social issues, which can be seen as part of a materialist view, which in Francesca's case refers to mental states such as beliefs and desires, driven by social forces and not by the mind. In Francesca's narrative the notion of mind is non-existent.

[92] Cooper concludes that "dualism is compatible with all neuroscientific findings" (2007, 106). The neurophysiologist and Nobel Laureate John Eccles was once a well-known dualist; however, his work has been contested in current neuroscience.

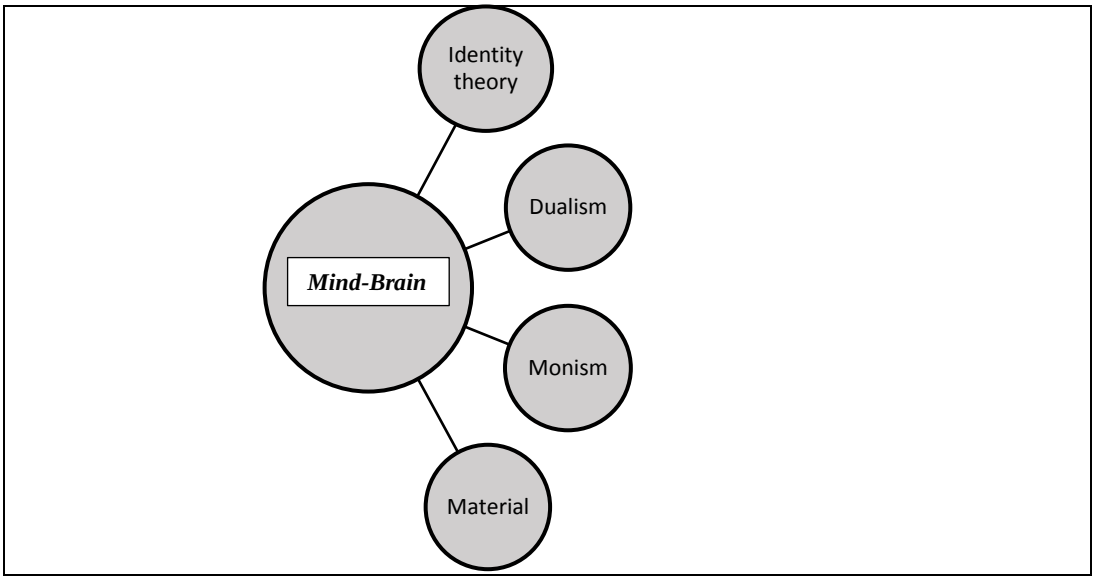

Figure 5: Mind-Brain

5.3.1 Temple: "scientific basis for belief in a soul"

Temple's neuro-autobiography lacks deep reflections on the mind-brain problem simply because she transforms any psychological issue into a biological one. In other words, she reduces mental states to the brain by ignoring emotions that can have an impact on an individual's health. Yet, there are two chapters in which Temple indirectly illustrates the mind-body problem. First, the chapter, "On Einstein's Second Cousin: The Link between Autism and Genius", Temple addresses genetics in autism by citing not only her case, but also famous genius scientists such as Einstein and Wittgenstein; she argues that both scientists would be diagnosed with autism (e.g. Asperger's) nowadays. By sharing their life stories in her neuro-autobiography Temple delineates some similarities with those geniuses such as holding rational minds, as she comments: "Like Einstein, I am motivated by the search for intellectual truth. For me, searching for the meaning of life has always been an intellectual activity driven by anxiety and fear" (212). Temple's view of

mental states (cognition and emotion) are grounded in a materialist paradigm that emphasizes the brain over the mind.

Second, in a chapter titled "Stairway to Heaven: Religion and Belief", Temple leads a spiritual conversation with her readership by discussing how autistic individuals may understand religion. She remarks that for many of them "religion is an intellectual rather than emotional activity" (223). Her assertion grounds religion in logic rather than in emotions, beliefs, or myths. The discussion becomes relevant to the mind-brain problem when she recalls an odd experience she had when her body contacted a biochemical element that altered the neurotransmitters levels in her brain, strangely affecting her feelings towards religion. This event has made Temple rethink her belief in God, which is supported by explanations from quantum theory to understand the soul and the brain. She remarks that "It was quantum physics that finally helped me believe again, as it provided a plausible scientific basis for belief in a soul and the supernatural." (233). She further discusses how she used to understand immortality, not in relation to the soul, but to the matter, that is, through intellectual work created in life: "I read an article in the newspaper about an official at the New York Public Library who said that the only place on earth where immortality is provided is in libraries" (232). She used to believe it was the material world that could provide immortality; however, through her understanding of quantum theory, she has reviewed the question of immortality, and, eventually, she has started reconsidering spirituality based on scientific explanations. She states that "In nature, particles are entangled with millions of other particles, all interacting with each other. One could speculate that entanglement of these particles could cause a kind of consciousness for the universe. This is my current concept of God" (233). She is comfortable with quantum theory as a scientific reasoning to explain the concept of God. Since the beginning of new millennium there has been an increase in papers that

linked neuroscience to quantum theory to explain brain and mind interaction, consciousness, and soul, mobilizing a transdisciplinary dialogue between neuroscientists, physicists, and philosophers (Eccles 1994; Dennis 1995; Stapp 2007; Pylkkänen 2018; Atmanspacher 2019).

Temple is interested to show how neuro-chemicals can influence our religious beliefs in her narrative.[93] She implies that her lack of belief at that time was due to biochemical alterations in her brain. In this regard, I observe that in her narrative the brain chemicals are expressed in a form of analogy to indicate Temple's spiritual 'conversion', while her writing style switches to a confessional narrative, as she states: "but it wasn't until three years ago, when I was hired to tear out a shackle hoist system, that my religious feelings were renewed" (237). Moreover, her religious beliefs are reinforced once she realizes the impact and depth of her profession as a machine designer for slaughtering cattle. She realizes that it is a moment when life and death meet, a ritual that deserves respect and should be done with a minimum of suffering: "I believe that the place where an animal dies is a sacred one. There is a need to bring ritual into the conventional slaughter plants and use it as a means to shape people's behaviour" (239). In this view, Temple is against the routinization and mechanization of the slaughtering business, and she denounces how it has been executed without ethical grounds. For her, the slaughtering moment is spiritual with an ethical implication that needs to be respected. Hence, for Temple, spirituality lies in the brain, with its reasoning and ethics.

[93] She recounts that she was once poisoned with organophosphate and the substance altered her mind while taking antidepressant drugs; she states that such combination "dampened my religious emotions. I became a kind of drudge who was capable of turning out mountains of work. […] I just cranked out the drawings as if I were a computer being turned on and off" (237).

5.3.2 Siri: "Or might the problem simply be a matter of your point of view?"

Siri is the one that explores the mind-brain interaction with the greatest breadth and depth in her narrative. Siri brings up the mind-brain problem with a rhetorical question: "how could it be argued that this wasn't an *organic, physical* phenomenon?" (14). The "organic" and "physical" she mentions are based on a materialist realm, as it should lie somewhere in the brain, making the conversion a disorder in a certain part of the brain; however, technology such as EEG does not detect conversion disorder, which then becomes an issue of the mind, as she remarks: "The idea that we are made of two stuffs, not one, that mind isn't matter, continues to be part of many people's thinking about the world" (14). Mind-body dualism is not only an interest that catches neuroscientists' eyes, but also philosophers'. Likewise, Siri as a humanist, raises further questions, such as: "Is my mind the same thing as my brain?" and "What is organic and nonorganic?" (14). To shed some light on these issues, Siri relies on vernacular cases, based on everyday fragmented stories about individuals' dearest one's mental illnesses, as for example: "The father on the radio made a point of saying, 'Schizophrenia is an organic brain disease'" (14). Once the disorder is located in the brain, it becomes physical, embodied, as Siri continues offering further examples: "My son isn't mad; he has something wrong with his brain" (15). Defining mental illness as a brain problem may minimize stigma and increase one's acceptance by society.

Siri links the concept of soul, once divided by analytical philosophers, phenomenological philosophers and natural scientists, to a current concept of consciousness, which emphasises mind-body interaction. She confesses that "Perhaps I am hopelessly tender-minded, but can logical formulations encompass *everything*?" (143); in other words, she is asking herself whether the brain can encompass everything including consciousness and the soul. To support such a

discussion, she brings Merleau-Ponty into the conversation and de Beauvoir's review of his work. She agrees with Beauvoir that "much of science (as well as much of analytical philosophy) proceeds from an anonymous third-person view of a paralyzed world, which can then be broken down into legible truths" (144). In this matter, Siri disagrees with the philosopher of mind Patricia Churchland, who affirms that "the mind is neurons" (144), while Siri remarks that when the black box is finally open, "the story will be told, completely" (145). Like the mythological Holy Grail, once it is found, the truth will be unveiled. Despite this, Siri insists on keeping the story in suspense, as she conjectures: "Maybe the mind emerges from the brain ... Or might the problem simply be a matter of your point of view?" (145).

As her story moves on, Siri delays to solve her seizure problem by refraining to admit that it is a neuronal condition that consists of a materialist or physical problem involving a certain structure in her brain. That view can be considered mechanist by putting the stress solely on the brain.[94] Siri wants to believe there is more to it that goes beyond the matter, as she suggests that some "cognitive scientists, such as Francisco Varela, and other theoreticians have drawn insights from Buddhism and various mystical practices to gain insight into a selfless reality" (145). Other scholars, as she notes, believe in a "pan-psychic oneness", and still others, "have left the idea of substance far behind them and delve into the curious regions of quantum theory" (145). She leaves it up to her readership to decide on which theory to solve the mind-brain problem; yet, she does not adhere fervently to one theory or another, but she agrees with "What is seen depends on

[94] Siri criticizes reductionism: "the scientific fetish for brain function [that treats] these processes as if they took place in an isolated, bodiless organ -- a bunch of neurons in a vat going about its business alone" (89). What she implies is that general neuroscience research is at a molecular level without interaction with the environment. In this view, she relies on William James's work to support her position while she paraphrases the psychologist: "All action is thus reaction upon the outer world" (89); she agrees with his model of subjective experience as "dynamic" and inclusive of the perceived world as she states: "We are inhabited, occupied, plural, and always live in relation to that perceived external world as corporeal beings, not just brains" (90).

the perspective of the seer" (145).[95] Siri argues that the mystical, or better, out of body experience, has been ignored in the neurosciences; according to Siri (and the neuroscientist Baruss), it should be integrated into sciences, and analysed as a phenomenon within an open scientific approach. She complements Baruss' view by understanding reality "not just as a sea of frozen material objects, already given to us, but as a puzzle of perceptions that depends on the viewer" (148). Thus, the mind-body problem addressed in Siri's neuro-autobiography offers her readership a review of such classical issue, tempting her readers to search for the Holy Grail themselves.

Her recurrent critique of the mind-body problem reveals an underlying materialism and reductionism that prevails in the scientific discourse, which she finds hard to accept as a spiritual person. She describes that she used to be a pious child who later "lost the piety but retained the fervency" (159). For this reason, she resists materialism and keeps searching for the Holy Grail in her life. She criticizes science for trying to understand the 'God spot' as if it lived in the brain. Furthermore, Siri is invested in understanding what makes a person become more fervent than another one. She believes that certain individuals, and usually the ones with epilepsy, are more vulnerable to the "oceanic feeling", a term she borrows from Freud to explain spirituality. She explains that to Freud some people experienced "a feeling of something limitless, unbounded - as it were, 'oceanic'" (160) as the psychoanalyst puts it. Both Freud and Siri talk about a cosmic attunement, as Siri states that Freud did not recognize the oceanic feeling as being necessarily "a set of religious beliefs" (161). The "oceanic feeling" may be a hint to find the Holy Grail.

[95] She continues the mind-body discussion by citing current and 18th century philosophers, for example, Berkeley, Schwindt, Beauvoir, Husserl and Merleau-Ponty for "extraordinary transcendence". She cites the Canadian philosopher, Imans Baruss, with whom she agrees with the extraordinary transcendence, as he states that "there is more to reality than meets the eye" (147).

5.3.3. Jill: "every iota of you and me […] is atomic matter and energy."

Jill's narrative explores the mind-brain problem from a New Age perspective, in which she mixes different religious traditions and she connects them to our consciousness or soul. She sometimes locates the soul/mind either in the brain or in the body; for example, she mentions the soul lies in the brain: "I believe the experience of Nirvana exists in the consciousness of the right hemisphere, and that at any moment, we can choose to hook into that part of our brain" (116). Under a New Age discourse, she equates brain to mind/soul, as she remarks: "My stroke of insight would be: *Peace is only a thought away, and all we have to do to access it is silence the voice of our dominating left mind"* (116). She seems to recognize that we are brain (brainhood), mind (consciousness, self), and spiritual (soul) beings, without placing them into a rank. Her attitude to stress the soul might be in response to her near-death experience, and for this reason, a purely materialist view of life cannot offer her sufficient answers. Since defending the existence of a soul that lives in one's body might not be what her readership expects from a neuroscientist; Jill's rhetoric becomes exaggerated, with a dramatic tone that can be misinterpreted as sensationalist.

The mind-brain problem is stressed in Jill's narrative because it has affected her identity, as Jill becomes afraid of losing her 'subjectivity' and personhood because of the stroke. This issue falls in the realm of the mind, as she states: "I was still me, but without the richness of the emotional and cognitive connections my life had known [...] How could I still be Dr. Jill Bolte Taylor, when I no longer shared her life experiences, thoughts, and emotional attachments?" (69). The fear of losing one's identity, self, and consciousness due to a brain damage could reduce an individual to a cerebral-hood with limited functioning. This may lead us to the following question: Once a person has brain damage, is the damage restricted to solely the brain or to the

person, or even both? We could argue that there is an encounter of the personhood and cerebral-hood once the brain is damaged. In other words, once you lose your brain to a stroke, for example, you lose yourself. This is a question that permeates Jill's neuro-autobiography, which reflects an old philosophical question of Cartesian tradition. In her narrative, she seems to detach herself, that is, her spirit, from a body seen as a container, which reflects the Cartesian dichotomy. As a modern neuroscientist, Jill surprisingly sides with dualism, while most neuroscientists tend to follow a monist trend nowadays. She remarks: "I felt like a genie liberated from its bottle. The energy of my spirit seemed to flow like a great whale gliding through a sea of silent euphoria" (69). She acknowledges the existence of her spirit being liberated from a body. She feels her body/brain separating from a soul when she has the stroke. This is clearly illustrated in the following statement: "It was clear that the "I" whom I had grown up to be had not survived this neurological catastrophe. I understood that Dr. Jill Bolte Taylor died that morning" (69). She raises an ontological question of who she is while narrating her brain stroke. In other words, she separates the "Dr." from this "I" whom she uses in quotations to refer to the soul, whereas "Dr. Jill" is the material form. She remarks that "From a practical perspective, considering the amount of biological damage, being her again wasn't even an option! In my mind, in my new perspective, that Dr. Jill Bolte Taylor died that morning and no longer existed" (70).

Jill's reflections are based on a philosophy of mind and phenomenology that highlight experiencing the 'new' *I*, as a result of a brain damage who left her interacting with an external world in a less rational but more intuitive way. Jill emphasizes the notion of 'being' over 'doing', meaning that the brain damage left her 'disabled' in terms of doing things, but not in terms of being, a position that supports her existence. While 'Dr. Jill' was a woman of doing, planning, and executing her life with full agency, now the new *I* is all about being under consciousness, as

she mentions: “I shifted from the doing-consciousness of my left brain to the being-consciousness of my right brain” (71). She refers to her right hemisphere as if it were the one responsible for a bohemian or ‘new age’ lifestyle in opposition to a materialist lifestyle. Moreover, the right is responsible for thinking in pictures rather than thinking verbally, which is the responsibility of the left hemisphere, as she witnessed: “I stopped thinking in language and shifted to taking new pictures of what was going on in the present moment” (71). Living the present moment has an eastern philosophical implication, in which the *I* can only experience what is present; in Jill’s case, her memory has been obliterated by the blood that spread over her left hemisphere. Moreover, she states that “I no longer perceived myself as a single, a solid, an entity with boundaries that separated me from the entities around me. I understood that at the most elementary level, I am a fluid. Of course, I'm a fluid!” (71). The idea of not being a person but an energy of atoms and molecules “vibrating in space” means that the *I* is redefined, that is, the ‘self’ once biologically constituted now it becomes energy. She continues: “My left hemisphere had been trained to perceive myself as a solid, separated from others. Now, released from that restrictive circuitry, my right hemisphere relished in its attachment to the eternal flow. I was no longer isolated and alone. My soul was as big as the universe and frolicked with glee in a boundless sea” (71). She describes the *I* poetically, to show its essence, free from the layers of social and acculturated self. The right hemisphere loses the sense of boundaries, of the differences between *I* and *You*, of becoming fluid, by losing its individuality. She further explains that “Although the ego center of our language prefers defining our *self* as individual and solid, most of us within us, and between us is made up of atoms and molecules vibrating in space”. She sees herself as bioenergy, like an ethereal self, a ‘quantum self’.

Jill equates the soul with the right hemisphere, with an understanding of the 'self' as a fluid, energy flow, and cosmic body. This is the hallmark in her neuro-autobiography, in the sense that her readership should understand the transformation she goes through: grounded in material culture within a discursive practice of shifting into matter and energy, a bioenergetic self, based on a quantum theory of the self (cf. Zohar 1990). She explains that "We exist as fluid-filled sacs in a fluid world where everything exists in motion [...] Every pixel, including every iota of you and me, and every pixel of space seemingly in between, is atomic matter and energy" (72). Her material body constitutes atomic energy that flows, blends, and leaps to bind with others: "Everything in my visual world blended together, and with every pixel radiating energy we all flowed *en masse*, together as *one*" (72). The idea of connectivity permeates her narrative, seeing organs not as solid elements, but as fluid, which she equates with the soul. Her spirituality is based on energy, not on the laws of the objects as she tells her readership: "But in this shifted perception, it was impossible for me to perceive either physical or emotional loss because I was not capable of experiencing separation of individuality. Despite my neurological trauma, an unforgettable sense of peace pervaded my entire being and I felt calm" (73). Jill explains body and energy (i.e. matter and wave) from phenomenology and quantum perspectives, as she highlights that "No longer capable of perceiving temperature, vibration, pain, or proprioception (position of your limbs), your awareness of your physical boundaries shift. The essence of your energy expands as it blends with the energy around you, and your sense that you are as big as the universe" (81).

In Jill's narrative, the 'self' or identity is understood from an ontological rather than a socio-constructive view. For example, she mentions that she loses part of her neural cells and her thinking mode is different; for this reason, she must 'reinvent herself' in regard to the

environment, but she is still the same soul: "At the essence of my soul, I was the same spirit they loved. But because of the trauma, my brain circuitry was different now, and with that came a shifted perception of the world... my brain wiring was different now, as were many of my interests, likes, and dislikes" (118). In this extract, Jill refers simultaneously to the soul, body-brain organs, and mind. In other words, the brain is the matter working with different circuitry, the mind refers to her emotions and cognitive functions, and the soul or spirit is the essence of her existence. [96]She also acknowledges that "My mind was so impaired" (118), which we may infer that she is referring to her mind as cognition, the intellectual element as she raises the question: "*Can they take away my Ph.D.? I don't remember any anatomy!*" She fears losing her identity as a neuroscientist because of the brain trauma, and for this reason, she has to reframe herself as a former neuroscientist and a post-stroke victim advocate.

Despite Jill acknowledges an interaction between mind and brain, the relationship between the two terms gets blurred in her narrative. For example, in the extract that she discusses the function of the right and left hemispheres during the healing process, she reinforces an idea that all we live is part of our brain responsibility, which goes back to the centralization of brain in a reductionist view of brain-hood: "As my left brain became stronger, it seemed natural for me to want to "blame" other people or external events for my feelings or circumstances" (127). She seems to contradict herself by asserting that "I am certainly in charge of how I choose to perceive my experience" (127), which the focus lies in the personhood with a stress on agency and decision-making for her attitudes and experiences in the world. The oscillation between brain-hood and personhood in her narrative reveals her belief in the interaction between mind-brain, and even

[96] In Jill's narrative, I can relate it to Popper's World – 1, 2 and 3 – that is, *world 1* would refer to the brain/body (i.e. organism), *World 2* to the mind (i.e. psyche/soul), and *World 3* to culture (e.g. Jill's as neuroscientist), respectively. She focuses on connecting body and emotion (mind) by stating that "One of the greatest lessons I learned was how to feel the physical component of emotion. Joy was a feeling in my body" (126).

soul. Her life story shows that a clear-cut distinction between mind and brain is not possible as she provides strong arguments based on her stroke experience that supports the belief that there are things in life out of one's control (e.g. brain stroke), however, the way one perceives, feels, and acts upon such events is up to the person themselves (e.g. mind).

5.3.4 Barbara: "Rigorous and repeated exercise paid off"

Barbara's neuro-autobiography stresses the brain-mind over the body, limiting the discussion since she attributes all power to the brain. What is unique, however, in her narrative is how she deals with her resilience as a psychological trait for being determined and strong-willed, which is driven by her neurological condition. She mentions that "Rigorous and repeated exercise paid off. Gradually I began to feel subtle variations in movement. My brain was informing my muscles about how far and where they needed to move to perform the skilled movement" (148). From this view, mind and brain become one, taking a monist position that sides with hard-core neuroscientists. The brain and mind exercise power over the body as seen in the following sentence about her kinesthetic problem: "The two sides of my body get along well now" (148). She means that the exercises she designed defeated the 'alien' element that was causing her to behave with 'klutziness'. She takes a different approach from Siri, who has come to terms with an alien (i.e. shaking woman) through self-acceptance. Yet, Barbara annihilates the alien (kinesthetic problem seen in her body) with her neuroscientific knowledge that stresses the brain holding control over the body. The mind loses strength and presence by being reduced to the brain that dominates the corporeal desires, needs, and movements. Similarly, Barbara reduces emotions to brain functions, as well as psychological transformations and changes as a work of brain plasticity. Hence, Barbara's narrative favours reductionism, brainhood under a monist

perspective, and due to it, does not offer philosophical or psychological discussions to deepen the subject.

5.3.5 Francesca: "happiness doesn't come from […] a 'normally' working mind or body"

Francesca's neuro-autobiography lacks the depth and breadth in discussing the mind-brain problem since she focuses on the political issues of disabilities and society's pressure on defining normality. The autobiographer comes from a family of atheists, which may explain her tendency to materialism in her approach to life. In a metaphorical way, her materialism can be observed in her discussion of labels such as 'brain damaged' and 'wobbly', which both focus on matter, that is, on the body. In her view, the brain is an organ responsible for cognitive and emotional functions, and once damaged, it may lead an individual to become disabled. Francesca's materialist view of life tends to reframe disabilities into social justice and community responsibility. For example, her understanding of 'happiness' or 'suffering' is not based on spirituality or a metaphysical philosophy, but on a network an individual establishes socially, as she remarks: "I've seen that happiness doesn't come from having a 'normally' working mind or body. It comes from being loved and growing up in a healthy environment. […] Finally, any 'suffering' I've endured hasn't come from being wobbly but from people not knowing how to handle difference" (267-8). In Francesca's view, it is society that shapes disability, with its political and economic interests. Therefore, an individual should not be blamed for their neurological disorder that leads to their disability; rather, it is society's fault for not providing the means or resources to help the disabled individual lead a 'normal' life. In her narrative, the reader can notice that a disability is not approached as a mind-brain problem but as a social issue that has political repercussions.

5.4 Discussion: Bridging the Gap?

Each neuro-autobiography, in its own way, has addressed issues of the two cultures that involve the divide between the soft and the hard sciences. The autobiographers' position reflects their academic background, be it in the humanities/social sciences such as Barbara, Francesca, and Siri, or natural sciences such as Jill and Temple. Their educational formation plays a role in how they perceive and interact with both cultures, as well as, how they may privilege one or the other in their narratives. For example, Francesca's neuro-autobiography shows a strong hostility towards medical science to the extent of having her writing marked by jokes and sarcasm against it. On the other extreme, we have Temple's narrative marked by admiration towards the natural sciences, with citations from the field of neurobiology to explain autism. Yet, in Barbara's narrative, neuroscience is put on a pedestal. Both Jill and Siri find some balance between the two cultures in their narratives. In Siri's neuro-autobiography, the author expresses her desire to merge neurosciences and psychoanalysis, by relying on major scholars in both fields. Whereas in Jill's narrative, the author attempts to merge neurosciences with a vernacular discourse based on New Age philosophy through the eyes of a stroke survivor rather than of a former brain scientist. Figure 6 illustrates each life narrative in its attempts to bridge the two cultures gap. The autobiographers who tend to converge (neuro)sciences with humanities in their narratives contribute to narrow the divide; whereas, the ones who tend to divergence may widen the gap. The examples below show how the narratives address the two cultures gap and how they can contribute or not to mend the division.

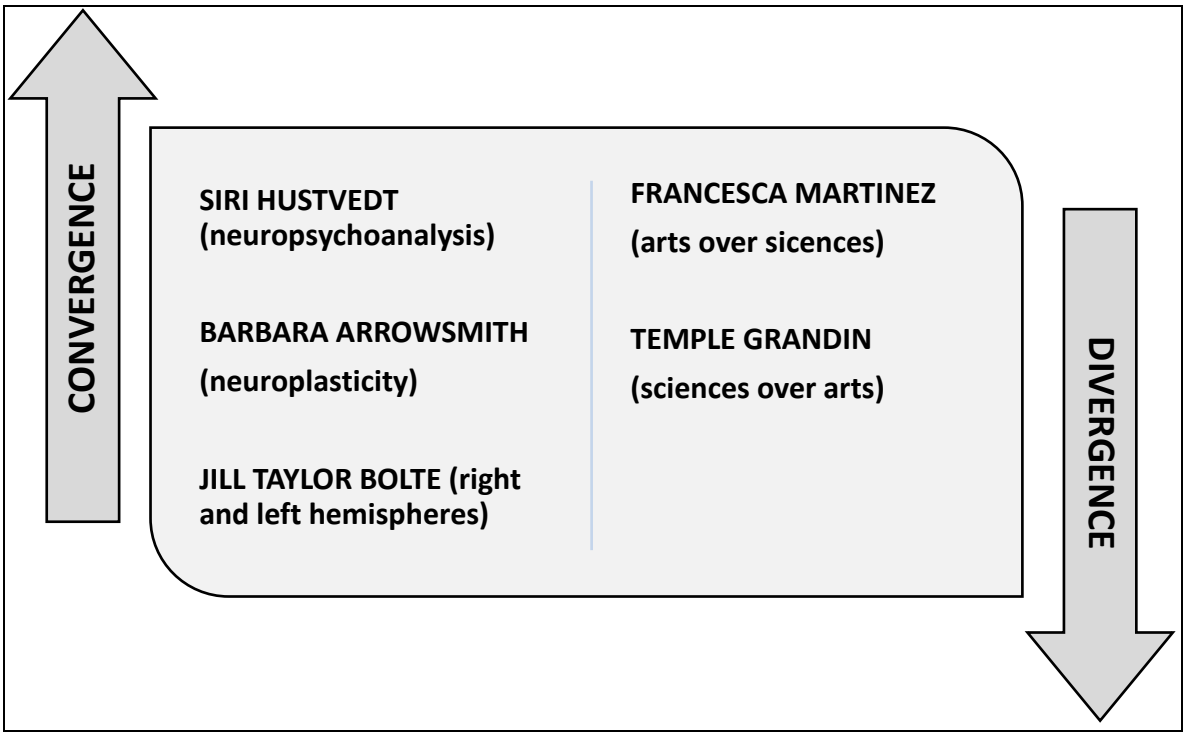

Figure 6: Points of Convergence/Divergence

5.4.1 Temple: Visual and Verbal Thinking

The question of the two cultures are manifested in Temple's life narrative with some biases since she is a famous animal scientist herself. This imbalance is seen through a distinction she makes between visual and verbal thinking, which is used as a metaphor for the sciences and humanities, respectively. For example, visual thinking is necessary for engineering, whereas verbal thinking for philosophy. Temple uses her knowledge of animal science to support her arguments in relation to visual thinking mode, which is not only found in human beings but also in animals. She sides with animal's cognitive functions as seen in this comment: "When a well-respected animal scientist told me that animals do not think, I replied that if this were true, then I would have to conclude that I was unable to think" (186).

Temple recognizes that both autistic individuals and animals with visual thinking mode have a different concept of the environment they live in. Moreover, by equalizing human beings with animal's visual abilities Temple breaks from a traditional taxonomy (i.e. Aristotle's Ladder of Nature) that ranks human beings at the top of the animal kingdom; instead, her attitude is of human beings and animals sharing some cognitive capacities. Thus, Temple states that "I have observed that the people who are most likely to deny animals thought are often highly verbal thinkers who have poor visualization skills. They excel at verbal or sequential thinking activities but are unable to read blueprints" (187). Temple's argumentation implies that 'visuals' and 'verbals' fall in opposite sides which may create an animosity, hindering dialogue to emerge between these two cognitive skills. She explains with some hostility that "I have always pictured in my mind how the animal responds to the visual images in his head. Since I have pictures in my imagination, I assume that animals have similar pictures. Difference between language-based thought and picture-based thought may explain why artists and accountants fail to understand each other" (187). By citing 'artists' and 'accountants', which can be compared with the humanities and the sciences, respectively, Temple reinforces a division between these two fields. To mitigate this old strife Temple chooses humor to conclude her thoughts: "Science is just beginning to prove what little old ladies in tennis shoes have always known: little Fifi really does think" (191); in other words, she advocates that animal's visual thinking is similar to human beings' as a cognitive skill.

As a scientist, Temple has access to specialized knowledge, which gives her agency to take decisions about her medicaments; however, this is not the case for most individuals with ASD, who have to rely on third parties (i.e. caregivers and medical staff) to make decisions on their behalf. She ends the pharmacological discussion with some advice for caregivers: "My message

for the parents is simple, and its advice that a good doctor gave my mother over forty years ago: trust your instincts about doctors, about medications, about yourself, and, most important, about your child" (142). Implicitly, Temple touches a common debate in the medical humanities community in reference to instinct versus clinical judgement. Since she is addressing caregivers, she recommends that they trust their instinct before deciding to accept any line of treatment. More importantly, she stirs a debate that is at the core of this dissertation: how to deal with the gap between the scientific knowledge and the vernacular. Instinct would side with an organic reaction, as its verification by quantitative methods are debatable; furthermore, instinct may relate also to the mind-brain problem, in the sense that a person should follow their instinct based on their intuitions rather than their cognition and the reasoning under a logical explanation. In this view, intuition and instinct are likely to align with the mind, whereas rationalization aligns with the brain.[97]

5.5.2 Siri: Neuro-Psychoanalysis

Siri's neuro-autobiography is complicated. As a fiction writer she is skillful, and as a neuro-psychoanalysis reader she is critical; she questions scientific concepts against personal experiences. She works with concepts that can get entangled such as "dream" in which she interweaves psychoanalytical definitions with her fictional world, by manipulating plot and characters' fates. Moreover, it seems that her yearning for writing and reading is a matter of survival, like the oxygen she needs to breathe to keep her body alive: "*I dream about writing and reading all the time*" (133). Then she ranks dreams higher than thinking, as the latter has been an

[97] Modern philosophy of science as in Bergson and C. P. Russell, psychology as in Jung's work and recently cognitive studies represented by Flavell and Thagard have explored concepts such as instinct, intuition, inference, and reasoning. More recently, such concepts have been discussed in terms of clinical decision-making and assessments (see Solomon 2015).

overrated cognitive skill in our culture, as she states: "It seems to me that dreaming is *another form of thinking*, more concrete, more economical, more visual, and often more emotional than the thoughts of the day, but a *thinking through* of the day, nevertheless" (136). Dreaming sides with a vernacular mode in her narrative, since Siri bases it on one's subjectivity, emotions, and experiences, which is subsequently materialized through language (i.e. verbal and non-verbal), as she states: "Dreams use the language and imagery of waking life, but their meanings are personal" (137). Her readers might have access to her dream narratives, but not to the meanings Siri attributes to them, as those are private. Nevertheless, her readership can still interpret her dreams according to linguistic cues and traces in her writing, as she shows it in a rhetorical question: "Nevertheless, there is no objective reading of a dream. Is this the character of interpretation in general?" (138). Her statement on understanding dreams has implications for the humanities (e.g. arts, music, theater, and literature), in which individuals can create multiple interpretations and meanings. Hence, I raise the following question: where should we locate dreams – in the neurosciences, in the humanities, or in both? Siri gives us a hint to answer this question, as she states: "The truth is that personality inevitably bleeds into all forms of our intellectual life. We all extrapolate from our own lives in order to understand the world. In art, this is considered an advantage; in science, a contamination" (138). She recognizes in her narrative that there is a tension between the two cultures in terms of how they employ different research methods to develop knowledge; in other words, she implies that in the humanities one can observe their own experiences to generate knowledge, whereas in sciences the observer is detached from their object of study.

Siri's narrative attempts to bridge the gap through a merge of two disciplines, neurosciences and psychoanalysis. Siri brings into her story Freud's ideas, which currently lie outside the field

of neuroscience. In other words, she attempts to de-marginalise his concepts so that a dialogue can be initiated between neurosciences and psychoanalysis. She also relates Freud to phenomenology when she states that "he did not believe that it was possible to know things-in-themselves. Our access to the world comes only through our perceptions of it, he argued" (18). Siri stresses Freud's potential collaboration with the field of neurosciences by reading his work in dialogue with current brain studies; she remarks that Freud discussed hypothetically how central nervous system could house an idea, but he was not able to prove it at the time due to the lack of brain imaging techniques: "The father of psychoanalysis then made his fateful turn toward a purely psychological explanation of the mind, although he never abandoned the idea that sometime in the future, scientists would be able to ground his ideas in actual brain functions" (18).

In addition to it, Siri criticizes medical sciences for leaving Freud behind once pharmacology took over psychiatry in the1950s and for pushing psychoanalysis to the margins. Because of it, Siri attempts to recover Freud's neurological concepts by creating a fictionalized session with an imaginary male analyst; her choice for the male gender is explained here: "[he] would be paternal creature, an echo of my father, who is the ghost somehow involved in my shaking" (20). [98] She clarifies that a methodology of storytelling (i.e. narratives) used in psychoanalysis is one of the main causes of its marginalization, since scientific and medical research methodologies are based on positivist tradition. Siri advocates Freud's method by explaining that his storytelling approach – narrative – was not of his own preference, but as he used to say: "I must console myself with the reflection that the nature of the subject is evidently responsible for this, rather

[98] Siri simulates a session in which she attempts to self-psychoanalyse the shaking woman by using concepts such as repression, transference, and countertransference as she comments "we would have a story about my pseudo seizure, and I would be cured" (21).

than my preference of my own" (in Siri 21). To Freud, a narrative method could deal with a patient's subjectivity from its first-person perspective, as it allows patients to describe their mental processes. Siri tries to justify Freud's narrative approach because he 'knew' some mental disorders such as hysteria "was an illness *without* brain lesions" (22), which could be understood from a discursive position and from a patient's observation of their own thoughts and feelings. She redefines hysteria from a psychoanalytic view that is "a systemic divide that allows a renegade part of the self to wander off unguided" (24). Her point is to check if analysing her case through the lenses of psychoanalysis would make sense to her; however, she uses other people's stories to verify it.[99] She does not want to be a solo author in her neuro-autobiography; she wants to bring other stories (probably fictional) to her narrative. In other words, Siri writes her neuro-autobiography as if she were interweaving a rug with threads of other people's neurological stories. She wants to connect her story to other characters as she makes it clear when she says: "But Irene, the fictitious Mexican, Lizzy, and I may have something in common: a grieving problem... Did I too, have a kind of double consciousness – a shuddering person and a cool one?" (27). Thus, Siri concludes that her shaking body becomes a way of grieving her father's death. In this view, she merges brain, mind, and body together through somatization.

Besides attempting to connect psychoanalysis to neurosciences, Siri's neuro-autobiography is also a critique of the scientific knowledge, since her evaluation comes from a humanities scholar's perspective; her goal is to establish a continuous dialogue with the sciences in order to

[99] She cites an example from a woman called Janet, a young lady that was unable to grieve her mother's death properly, and in turn, she became hysterical. Siri projects herself into Janet's story by stating that "I was struck by this passage. I wondered if there was a similar blankness in myself. Should I have grieved more for someone I had loved so much?" (24). Here, Siri is telling her readership that she believes she might not have grieved enough for her father's death, and for this reason, she had the seizure while delivering the eulogy. Siri gives to her readership an auto-psychoanalytical interpretation of her shaking as she believes it was caused by repressed emotions, of not allowing herself to naturally grieve her father's death.

demystify the objectivity paradigm that has been ingrained into the scientific community, for this reason, she asks what knowledge they want to produce and which knowledge 'expires', as she comments: "Knowledge does not always accumulate; it also gets lost. Valuable insights are thrown out with patently false ones" (73). She implies that knowledge production is also socially constructed, always in need of validation by scientific niches, which are often constrained by economic and political circumstances, causing some knowledge to 'expire' while new ones emerge.

Not only has Siri attempted to bridge the two culture divide through neuro-psychoanalysis, but also through a shift from a brain-centred (neuroscience) to body-centered approach (psycho-cultural), because her neurological condition becomes a 'state of being' rather than an illness, as it does not leave traces in her brain, or in her own words, a "psychological state without an organic concomitant" (119). She correlates this psychological state with the mirror neurons as neuroscientist have recently discovered them. In this case, her hypersensitivity has a scientific explanation, with more credibility by neurobiologists that "would have ignored it as a subject beyond their ken" (119). She seems to be 'forced' to reaffirm the rigorous methodology in hard science: "Without a biologically plausible hypothesis, a study is not possible" (119); otherwise, her experiential and neurological condition would lie in the realm of fiction. Hence, she points out that a robust methodology research paradigm in sciences prevails over the 'soft' methodologies to construct knowledge and truth. Nevertheless, Siri remarks that because behaviourism waned, subjective states or consciousness have gained the attention of some scholarly groups who would react to reductionism, as she comments: "There are scientists in various fields who would disagree with the reductionist formulation 'You are a vast assembly of nerve cells'" (120). She argues we should not study human beings under a monodisciplinary

perspective, but under an interdisciplinary one, and therefore, it is not only about neurobiology, but also about other disciplines such as philosophy, psychology, literature, and anthropology. It is her wishful thinking of bridging the gap between the two cultures.

Siri extends the discussion to include William James' distinction between 'tough-minded' (science-oriented or hard sciences) and 'tender-minded' (humanities-oriented or soft sciences) philosophers, by stating that James' pragmatism lies in between, with a pluralist perspective. This division is usually seen in the discussion of scientific methodology between soft and hard sciences. The rigour in methodology for hard sciences such as neuroscience is discussed in her neuro-autobiography, as she uses a metaphor to approach this matter. She creates a fictional character, Mary, a "brilliant neuroscientist" to illustrate it: [Mary] "lives in a black-and-white box and knows all there is to know about color and the brain. One day, she leaves her box and sees a red flower. Does she see anything new?" (140). For Siri, the scientist's experience dealing with the research should also be accountable for the methodology, in other words, what the scientist subjectively brings to the research.[100]

Siri follows William James's footsteps to find a balance between the tough and the tender sciences through a dialogic approach. Siri blames behaviourism for reducing psychology to stimulus-response, putting introspection aside by losing the insights from psychoanalysis, which she believes it can still be recast by blending with neurosciences. Siri denounces that John B. Watson (a psychologist that established behaviourism in North America) was "a radical and controversial advocate of behaviorism, but his ideas have had far-reaching effects on science and

[100] She aims to foster a dialogue between the humanities and the sciences, by citing philosophers interested in this question as well, such as Ned Blok who is interest in "the mysterious of neurological illness as he wrestles with a biological theory of consciousness. [...] In an interview, he speculated that philosophers who do not 'appreciate' phenomenology may, like the poet-translator I met, lack the ability to produce visual imagery, a thought that echoes my own about the engineer who refused to accept that empathy exists." (141)

the philosophy of science" (151). Moreover, she criticizes his position because it banished other schools of thought in psychology, as she affirms "Dogmas can make people blind" (151).

The traditional mind-body problem has been inherited from a Cartesian approach as Siri discusses in her neuro-autobiography, while she suggests that neuro-psychoanalysis would be the discipline in charge of bridging the gap. She criticizes scientific thinking that does not allow flexibility for its rigid methodologies forcing it to split from the humanities, as she concludes: "But when researchers are trapped in preordained frames that allow little air in or out, imaginative science is smothered" (79). Siri brings up the notion of subjectivity and how it can interact with the hard-core sciences so that creativity is allowed. She wants to clarify that subjectivity is not about an 'absolute I' that knows all the time what to do (i.e. omniscient), but at the same time it is not "a disembodied brain machine either, genetically preprogrammed to act in specified and predictable ways" (89), which she refers to the brain as a computer hard drive. She finds it odd that both scientists and philosophers have decided that "a machine is an adequate model for the human mind" (89).

She concludes the discussion on the two cultures divide by proposing a transdisciplinary dialogue among the sciences and humanities. For her, body (corporeal experience), brain (neurological) and mental (psychological) all interact with the external world, and therefore, should come together. She finds support in William James' and Merleau-Ponty's works along with the philosopher Ian Hacking who coined the expression "interactive kinds" (185) by arguing that there is still room for bringing soft and hard sciences together.

5.5.3 Jill: Left and Right Hemispheres

In a chapter titled "My stroke of insight", Jill writes a philosophical piece in which she indirectly addresses the two cultures by using the left and right hemispheres as metaphors for the sciences and the humanities, respectively. She mentions that by healing her left hemisphere, she could lose her spiritual side, "I didn't want to lose my connection to the universe. I didn't want to experience myself as a solid separate from everything [...] Frankly, I didn't want to give up Nirvana" (139). According to her, the right hemisphere has been erroneously popularly represented as 'Dr. Jerky and Mr. Hyde', "uncontrollable, potentially violent, moronic, despicable ignoramus" (140), whereas the left side has been "linguistic, sequential, methodical, rational, smart, and the seat of our consciousness" (140). Because the left hemisphere is the one usually represented as holding a sensible voice – while she remarks that "Many of us speak about how our head (left hemisphere) is telling us to do one thing while our heart (right hemisphere) is telling us to do the exact opposite" (141) – this leads us to deal with a dilemma in our lives according to Jill: the right and left dichotomies – right being the small ego, whereas the left being the capital ego. I expand the dichotomies by equating the right and left, respectively, to 'leisure mind and work mind', 'diplomat and researcher', 'feminine and masculine', 'yin and yang', 'intuitive and reasoning mind', and so on. She generalizes the dichotomies and does not offer evidence-based research to support it. She also equalizes mind to brain, not making any distinction. To support her arguments, Jill cites two neuroscientists who use brain tomography in order to show how left and right are stimulated when they are related to spiritual and mythical experiences. The example she draws upon has been carried out with monks who pray and meditate inside a machine (i.e. brain image scanning), which shows a decrease in the left hemisphere when they are meditating. There has also been a decrease in the physical boundary,

making the person more fluid when meditating, as she states: "My consciousness shifted away from feeling like a solid to a perception of myself as a fluid at one with the universe". In all, Jill's approach to the two cultures divide is through metaphors of the right and left hemispheres, in which the former aligns with a vernacular mode, whereas the latter, with hard sciences.

5.5.4 Barbara: Neuroplasticity in the Curriculum

Barbara's attempt to bridge the division between the two cultures is illustrated through her suggestion that education needs a new paradigm based on sciences such as neuroplasticity to elevate it to the next level, as she remarks: "What we urgently need now is a new paradigm in education – one that crosses the great divide between neuroscience and education. This new model will wholeheartedly embrace the life-altering concept of the changeable brain and use the principles of neuroplasticity" (11).[101] She sees herself as a pioneer towards this transdisciplinary collaboration as she mentions:

> I started Arrowsmith School in Toronto in 1980. It involved from my experience using the principles of neuroplasticity to address my own learning problems. […] The Arrowsmith Program was developed from research in neuroscience, not education. The fundamental premise of my work is that by changing the brain, the learner's capacity to learn can be modified (11).

Barbara shows some evidence that Dodge has validated her work publicly as she opens the last chapter with the following lines: "A turning point in my life's work came on May 26, when a national Canadian magazine, Saturday Night, ran a feature story, "Building a Better Brain", by

[101] Barbara cites further articles that are in tune with her proposal such as "Linking Mind, Brain, and Education to Clinical Practice: A Proposal for Transdisciplinary Collaboration" by Ronstadt and Yellin (2010).

Norman Dodge. A patient's mention of our program brought him to Arrowsmith" (215). She further states that "Published a year after our first encounter, the Saturday Night piece which ranged over neuroplasticity, Luria, Zazetsky, my childhood, and Arrowsmith – was informative and poignant" (215). She concludes in her neuro-autobiography that her vision of education is to offer students resources to change their brain in order to overcome stigma and emotional stress of bearing learning disabilities. Hence, it becomes clear that one of Barbara's goals is to provide an educational method based on the breakthroughs in neuroplasticity so that a more suitable curriculum can be designed to optimize students' learning. In her view, scientific research on neuroplasticity can provide the guidelines for education, however, she ignores the role of the soft sciences. If education is not complemented with the knowledge from the humanities and social sciences, we may end up having an education that is de-contextualized and incapable to adapt to an environment that is dynamic, complex, and interconnected.

5.5.5 Francesca: Push-Pull Forces

Like the topic on mind-brain problem, Francesca does not provide reflections on the two cultures directly either. Nonetheless, her skepticism towards medical knowledge and community can be read as a criticism against the sciences. Francesca's background in the humanities and arts, as an actor, writer, and stand-up comedian can reveal her biases against sciences, which does not help to narrow the divide between the two cultures at a popular culture level. Her critical attitude towards sciences drives her to question some medical procedures such as the termination of pregnancy when a fetus is identified with congenital malformations. She is skeptical about mainstream 'bioethics' that regulates medical procedures, which may indirectly remove women's rights over their body in sake of alleviating their 'sufferings', as Francesca mentions:

> Despite the amazing technological advancements, we've made as a society and culture, it seems we still assess someone's right to live on the basis of whether or not their bodies fit in with some arbitrary 'ideal'. Had my wobbliness been detected in the womb, my parents would probably have been advised by a softly spoken but firm doctor to have an abortion. To spare me (and them) a life of suffering! (274)

Eventual medical interventions as a result of the advances in biotechnology not only can take away human agency but also can overwrite one's life narrative. Moreover, Francesca implies that the medical community may see life of individuals with disabilities worth less than others as their bodies cannot easily meet labour market demands and "objectification" (Dickenson, 2007) to generate production. According to Francesca, a disabled individual may not be considered 'fit' enough to compete in the job market in a neo-liberal society, as she remarks: "It's now common to hear the suggestion that disabled babies should be aborted because of the financial 'burden' they'll impose on the state…" (275).

Her skepticism against the advances in biotechnology and critique of medical procedures, which can put restrictions on human agency, may convince her readership to share her ideas. Her negative attitude towards sciences does not help bridge the discursive gap between the two cultures which is reinforced by her strong political standpoint that frames the sciences as a by-product of neoliberal practices. However, Francesca adopts a performative way of dealing with the tension between the two cultures through her position as a stand-up comedian, which she takes it to a new level: her activism. She becomes a spokesperson to defend the rights of individuals with disabilities. For example, she is invited to participate in public events to raise awareness of individuals with disabilities and their daily struggles to navigate through an ableist society that hinders labour market inclusion. Nevertheless, Francesca does not offer strategies for

people with disabilities to cope with the obstacles imposed by governments' austerity plans. In this matter, her narrative becomes merely attacks against neo-liberal practices, with loose arguments and lack of evidences, which may increase the risk of having her readership discredit her assertions. Her narrative polarizes the disability issue by not offering alternative perspectives to the social problem.

To sum up, the five neuro-autobiographies analysed here address current themes in the field of the humanities and the sciences based on experiential and vernacular practices as seen in autobiographers' reflections, questions, and dialogues in order to engage with a lay audience. The two themes explored in this Chapter, neuroplasticity and mind-brain problem, are relevant for illustrating the current need to revise the two cultures divide at a vernacular level. The next Chapter offers further insights on how to possibly narrow the gap through a pedagogical approach to those neuro-autobiographies.

CHAPTER SIX: Contributions to Higher Education

6.1 The Pedagogy of Vernacular Neurosciences

Here I resume my personal account as a humanities scholar participating at my second national conference for neuroscientists at the 11th Meeting of Canadian Association for Neuroscience, held in the city of Montreal in 2017. The poster I presented under the Humanities section was on "The Pedagogy of Vernacular Neurosciences across Higher Education Curriculum: Time to Bridge the Divide?" (See figure 3). It is a project to include neuro-autobiographies into a general education curriculum for undergraduate students with the objective to foster a transdisciplinary dialogue across the humanities and life sciences. Two main questions have guided this project: 1- How to promote a neurosciences literacy that transcends a neuroscience curriculum to reach out to humanities and social sciences undergraduates? 2- What are the key concepts in the field of modern neurosciences that can be identified in those five published autobiographies written by women with brain conditions?

I was motivated to develop a project after encountering some 'core concepts' listed by the Society for Neuroscience (SFN) on their website. The core concepts in neuroscience assorted and organized by the SFN aims to promote an introduction to neuroscience to a lay audience at grade 12 high school level. The resource is available for downloading for educational purposes. The SFN core concepts 'curriculum' is organized into four major branches: a- "Controls and Responds to Functions"; b- "Genres and Environment"; c- "Foundation of the Mind"; and d- "Research Leads to Understanding". Each branch offers subsidiaries to explore key concepts in neuroscience. Nevertheless, the key concepts are neither contextualized through case studies nor through other methods, which may hinder the teaching and learning of those isolated

neuroscientific concepts. Noticing the gap, I have realized that the neuro-autobiographies could offer real case scenarios to explore neuroscientific key concepts that are embedded into those life narratives. With this in mind, I recognized that the neuro-autobiographies explored in this dissertation can cover the four branches organized by the SFN, and they can amplify the scope with transdisciplinary concepts stemming from philosophy of mind, disability studies, and memory studies among others. The following table lists and compares the SNF key concepts with the ones identified in the five neuro-autobiographies as explored in this dissertation.

SFN Neuroscience Topics and Key Concepts	**Neuro-Autobiographies**	**Neuro-Autobiography Topics and Key Concepts**
Controls and Responds to Functions	***Thinking in Pictures*** ***My Stroke of Insight*** ***The Shaking Woman*** ***The Woman who Changed her Brain***	Neural Network
Genes and Environment	***Thinking in Picture*** ***My Stroke of Insight*** ***The Shaking Woman*** ***What's the **** is Normal?*** ***The Woman who Changed her Brain***	Brain Plasticity
Foundation of the Mind	***Thinking in Picture*** ***My Stroke of Insight*** ***The Shaking Woman*** ***What's the**** is Normal?***	Consciousness Cognitive Functions
Research Leads to Understanding	***Thinking in Picture*** ***My Stroke of Insight*** ***The Shaking Woman***	Brain Scan Techniques EEG Pharmacology (e.g. Neurotransmitters)
NA	***The Shaking Woman*** ***My Stroke of Insight*** ***Thinking in Picture***	Mind-Brain Relation
NA	***My Stroke of Insight*** ***The Woman who Changed her Brain***	Brain Lateralization

NA	***What's the **** is Normal?*** ***Thinking in Picture*** ***The Shaking Woman*** ***My Stroke of Insight*** ***The Woman who Changed her Brain***	Vernacularization of Brain Terminology and Neuro-Physiology
NA	***Thinking in Picture*** ***The Shaking Woman*** ***My Stroke of Insight*** ***The Woman who Changed her Brain***	Memory
NA	***Thinking in Picture*** ***What's the **** is Normal?*** ***The Woman who Changed her Brain***	Neurodiversity

Table 3: Neurosciences Topics and Key Concepts

In the five neuro-autobiographies listed here, the neuroscientific key concepts cover notions that can transcend a biological study of the human brain (e.g. neurobiology, neurochemistry, molecular biology, neuro-anatomy, and physiology), and can offer perspectives taken from the humanities such as philosophy of mind, psychology, and disability studies. The combination of neuro-biological foundations with an integral approach to brain studies can equip scholars and instructors with tools to design a transdisciplinary curriculum to promote the teaching and learning of a neurosciences literacy through vernacular cases (e.g. neuro-autobiographies) as shown in the poster I presented at the CAN Conference in 2017.

6.2 Vernacular Neurosciences Curriculum

Intense discussions to reform and innovate sciences curriculum have been frequent across post-secondary institutions as a result of incentives for developing STEM programs in order to meet current society's demands (Kelley and Knowles, 2016; Kezar and Gehrke, 2017). While

there is also a call for curriculum innovations in the humanities, the responses may not always come immediately, as a pervading existential 'crisis' has been lurking around it for decades lowering their self-esteem, although some scholars may object to it, as the 'crisis in the humanities' might be seen as simply an enduring myth (Parker, 2007; Barnett, 2014). Whether or not the crisis is a myth, the humanities field has been despised for its low-market value, which is unable to generate capital itself when compared to STEM programs that can rely on the industry. To restore and reaffirm its importance to society, humanities programs should stress the pedagogical values that the field can offer to post-secondary students such as the development of advanced academic literacy and critical thinking that are essential skills for forming a well-rounded individual. Yet, to meet the new demands of 21st century education, alternative curriculum projects in the field of the humanities have been on the rise (Chesnokova et al., 2017) .[102] Likewise, transdisciplinary and experiential outcomes should guide the designing of an authentic curriculum in which learners are put at the core of learning and are recognized as holistic beings (Morin 15). From this view, I defend a pedagogy of Vernacular Neurosciences as part of a general education curriculum for university students. The teaching and learning of a course in the Vernacular Neurosciences can offer solid context and can embody neuroscientific key concepts that derive from the everyday. For example, the five neuro-autobiographies explored here promote a holistic view of individuals with neuro-disorders, with whom students can relate or identify.

The course project promotes a neuroscience literacy to non-life sciences majors by recognizing neuro-autobiographies as complementary resources to the curriculum of modern

[102] For example, the so-called 'Connected Curriculum' aims at "connecting students directly with researchers, encouraging students to make connections between different disciplinary perspectives, and empowering them to engage external audiences with the findings of their enquiry" (Carnell and Fung 2017).

neurosciences. With this in mind, I propose a course based on Vernacular Neurosciences to supplement textbooks usually used in introductory courses in neuroscience programs in order to promote an inclusive curriculum that can attract undergraduate students majoring outside life-health science programs. Such a course can offer a study of the human brain through a holistic view that stimulates an empathetic dialogue with the traditionally taught neuroscience. A course in Vernacular Neurosciences, as I would name it, may also foster creativity for both instructor and students, once it is designed, delivered, and learned through diverse methods without the constraints of textbooks that organize the content in a linear and fixed sequence. For instructors, it may give flexibility to organize content and design a course by adding real-world examples taken from case studies (e.g. neuro-autobiographies), material culture (e.g. technology, brain wearables), and artistic objects (e.g. paintings, installations), which deal with the human brain in socio-cultural contexts that transcend a core curriculum in a neuroscience program such as anatomy, physiology, and neuro-biology. Whereas for students, such curriculum in Vernacular Neurosciences can link content to its application and experiential learning, once students can write their own life narratives, create arts, or use technology based on neuroscientific motifs and knowledge. Moreover, a course in Vernacular Neurosciences aims to develop students' critical thinking through discussions that engage students with current neuroscientific themes and their relations to society via arts, culture, technology, and even spirituality.

Overall, a course in Vernacular Neurosciences is based on an active learning pedagogy that can provide students with diverse forms of classroom engagement through strategies of collaborative activities and shared-knowledge that align with a student-centered approach. Its curriculum is based on an open systems concept that interacts with the humanities and the sciences in a synergetic, non-hierarchical manner, rather than closed systems with their fixed and

deterministic scientific content. Hence, the teaching and learning of Vernacular Neurosciences is seen through the lens of complexity thinking due to its transdisciplinary features that can create a network of shared-knowledge and dialogue among instructors.

Because of its complexity, a course in Vernacular Neurosciences might create some challenges for instructors who have to deal with irregularities, disequilibrium, and uncertainties. In other words, designing a curriculum for a course in Vernacular Neurosciences requires from instructors an openness to transdisciplinary knowledge and approach, innovation, and creativity to handle resources that lie in the everyday environment. For example, realia material in a Vernacular Neurosciences classroom may be vulnerable to changes, accessibility, and availability since they are found outside the usual and 'safe' educational publishing environment; instead, they are taken from online resources (e.g. websites, video, v/blogs) and artifacts. Some instructors may feel uneasy for not accessing pre-established and fixed resources such as a textbook where they can anchor themselves, feeling safe in a stable position.

The uncertain and fluctuating conditions that surround the design and implementation of a curriculum for a course in Vernacular Neurosciences require from course specialists (e.g. instructors) some level of resilience to adapt into a new environment. In other words, it demands flexibility and openness to diverse pedagogical resources that deviate from regular textbooks and academic articles. For example, instructors should be able to locate reliable resources that deal with new scientific discoveries about the brain and their equivalences in a vernacular medium such as popular science magazines. To design a transdisciplinary curriculum that is dynamic and non-linear can lead to a state of chaos during its implementation and adaptation period; for this reason, it is important that instructors be able to cope with stressors that emerge out of those fluctuations by having in stock some "behavioural repertoire" (Holland 26). Hence, to mitigate

the challenges of designing a transdisciplinary curriculum for a course in Vernacular Neurosciences, instructors should seek collaborative work across the humanities and neuroscience departments. A collaborative approach can help instructors identify key concepts in the teaching and learning of Vernacular Neurosciences. The key concepts should not only represent specific knowledge that emerges from a Vernacular Neurosciences curriculum, but also that causes an impact on learners' worldviews. Based on this perspective, it should be based on a curriculum framework that enables instructors to identify and teach key concepts that can create meaningful experience for students.

The five neuro-autobiographies explored here are considered examples of Vernacular Neurosciences that can offer suitable "content" and "cultural representation" to be integrated into a non-canonical curriculum (cf. Rasco 2016,144). Here, I show that Vernacular Neurosciences are considered an example of a non-canonical curriculum by exploring some scholars' discussions on curriculum such as Rasco, who reviews Stenhouse's ideas of curriculum as culture that takes place in a "medium which holds human thinking, thus, at the same time the medium through which human minds "interact with one another in communication"" (Stenhouse 1967, p.10 qtd in Rasco 145). Rasco extends Stenhouse's work by defending the notion of curriculum as an arena for political questions (e.g. "national curriculum", "curriculum canon") and criticizes the design of curriculum as a map that takes a top-down approach that excludes students' needs and instructor's voices. Nevertheless, Rasco does not offer examples to support his arguments or solutions to design a bottom-up curriculum which takes learners' needs into account; instead, his discussion focuses on content from a semiotic perspective, that is, "curriculum as text", and not from a praxis approach that can lead to changes or transformations. Following an action-oriented approach, I advocate for a curriculum design that considers a "Threshold Concepts Framework"

(TCF) (Meyer and Land 2003; 2005; Land and Rattray 2017) in which learners can acquire content from an affective and cognitive bases that can take them to a transformative learning that promotes "identity shifts" (Cousin 2006) and changes in worldviews. Through a Threshold Concepts Framework (TCF), I explore a Vernacular Neurosciences curriculum as a complex construct, pragmatically oriented – as in Perkins's term, "proactive knowledge" (2008, 12) – , to complement Stenhouse's scholarship on curriculum, seen as a "medium through which individual human minds interact with each other in communication" (1967, 16); nevertheless, a dialogic point seems to be what Rasco has missed in his critique.

6.3 Threshold Concepts Framework

Meyer and Land first introduced threshold concepts in 2003 as part of an educational development project to enhance the teaching and learning in undergraduate courses. The authors attempted to define the term threshold concepts through metaphors such as "portal" and "conceptual gateways", as seen in their definition: "A threshold concept can be considered as akin to a portal, opening up a new and previously way of thinking about something" (Meyer and Land 2003, 1). For both authors, learning a threshold concept implies an integral response l in learners' cognitive and emotional schema, as they state: "A new way of understanding, interpreting, or viewing something may thus emerge – a transformed internal view of subject matter, subject landscape, or even world view" (2005a, 373). Therefore, a curriculum that explores threshold concepts in a classroom can provide learners with tools for transformation, or better, it can equip students with a specific language and discourse that can promote not only an epistemological but also an ontological experience.

It is important to note that Meyer and Land's threshold concepts align with notions of complexity thinking as explored in this dissertation. Threshold concepts hold features of being "transformative", "irreversible", "integrative", "bounded", and "troublesome". For transformative, the authors claim that a learner who grasps a threshold concept may have their perspectives shifted, which leads to a "transformation of personal identity, a reconstruction of subjectivity" (2003,4). Such transformation has a potential effect of a turning-point in student's life. For example, once a student comprehends and assimilates a specific set of terms or procedures in clinical nursing, they can apply it in their practicum, which will identify them as being a 'student-nurse' in their community of practice.

In the case of a course on Vernacular Neurosciences, the neuro-autobiographies can provide students with threshold concepts that have the potential to change learners' views of individuals with neurological disorders. For instance, identifying the expression 'learning disability' as a threshold concept in Barbara Arrowsmith's autobiography can have a transformative effect on learners, who will be better equipped to interact with individuals with such disorder in their everyday such as a workplace. Based on her personal accounts, students will understand that certain individuals may need extra time to perform certain tasks or they may need precise and direct instructions to succeed in certain activities. Assimilating this threshold concept can help students interact with individuals with learning disabilities without bias and discriminatory attitudes. This example shows what Meyer and Land attempt to defend in their Threshold Concepts Framework: once learners grasp threshold concepts, they change their identity through "a repositioning of the self" (2005, 374) which transcends a rote training or a set of skills to be performed mechanically. In addition to it, I defend that learning threshold concepts can be an embodied experience in which learners interact with the course content cognitively, discursively,

emotionally, and even kinaesthetically. This becomes a complex and dynamic learning experience that can lead to an "inter-relatedness of the learner's identity with thinking and language" (2005, 375). To conclude, this transformative feature has a powerful effect that can impact learners' lives as it can lead "to a transfiguration of identity and adoption of an extended discourse" (2005, 375).

Another feature that threshold concepts hold is being "irreversible". According to Meyer and Land, once the threshold concept is learnt, "it is unlikely to be forgotten" (2003, 4). Once a learner assimilates the threshold concept in its totality, that is, discursively, embodied, and pragmatically, the learner will not be able to "unlearn" (2005, 373) it. As seen in the example above based on Barbara's autobiography, once a student assimilates the concept of learning disability, they will not "unlearn" it because their worldview has been reshaped. The next feature of threshold concepts is "integrative", which enables the learner to make connections "to previously hidden interrelatedness of something" (2005, 373). In other words, the integrative feature enables learners to insights hitherto not imagined. As in the case of the course on Vernacular Neurosciences, learners shall be able to connect a threshold concept such as 'personhood' to a humanistic perspective that those neuro-autobiographies entail. This leads us to the next threshold feature, which is "bounded". For Meyer and Land, such feature is "possible often", as it constitutes a "demarcation between disciplinary areas, to define academic territories" (2003, 5). In the case of Vernacular Neurosciences, this feature of threshold concepts may oscillate between thicker and fluid borders since the teaching and learning of Vernacular Neurosciences transcend territories due to its transdisciplinary characteristic. For example, 'brainhood' can be considered a threshold concept in the curriculum of Vernacular Neurosciences with some thick borders, as its use is contextualized in the five neuro-autobiographies explored

here, although it needs an interdisciplinary understanding since it takes resources from philosophy and neuropsychology. However, some other concepts might have more fluid borders. For instance, the concept 'consciousness' can be a threshold concept that marks more than one territory such as psychology, philosophy, and neuroscience. In other words, the understanding of the concept consciousness is not exclusive to the context of the neuro-autobiographies; it shares disciplines as its meaning shifts from context to context.

The last feature of threshold concepts is "troublesome knowledge"; it is an important feature that has a direct impact on the learning experience. The acquisition of a new concept or idea can be felt as an uneasy process, marked by challenges and difficulties that learners have to cope with. They have to adapt to a new experience that requires an openness to the formation of new schema. Initially, learners have to confront with a type of knowledge that may seem "counter-intuitive, alien […], or incoherent" (2003, 5), which leads them to question their previous knowledge, beliefs, and worldview. As Cousin mentions, the acquisition of threshold concepts "can involve an uncomfortable emotional repositioning" (2006) as learners go through an internal conflict as they question their old knowledge (e.g. tacit knowledge) in relation to the new threshold concept they are exposed to. For example, the term Vernacular Neurosciences is, itself, a threshold concept that can initially generate troublesome knowledge since students would come from a position of understanding neurosciences based on their learning experience of life sciences, of scientific knowledge, and of positivist research. Yet, Vernacular Neurosciences can challenge this orthodox knowledge by allowing personal narratives and experiences of individuals with neurological conditions to complement the neuro/scientific studies. This can be considered troublesome knowledge as students would need to reposition themselves by questioning their previous knowledge (e.g. what neuroscience means) while assimilating a

vernacular knowledge (e.g. how to validate experiential and narrative approaches) of neurosciences. The table below is a sample of a curriculum on Vernacular Neurosciences through a Threshold Concept Framework based on the five neuro-autobiographies explored here:

THRESHOLD CONCEPTS	SUBJECTS/DISCIPLINES	THEMES
• Vernacular Neurosciences • Neuro-autobiography • Two Cultures • Vernacular Rhetoric	Neuroscience Autobiography Studies Science Communication	Vernacularization of the Neurosciences
• Brain imaging • Metaphors of the brain (e.g. black box, computer, muscle) • Neural Network • Connectivity	Neuroscience Cybernetics Philosophy of Science	History of Neurosciences
• Learning Disabilities • Autism Spectrum Disorder • Cerebral Palsy • Seizures • Brain Stroke	Neuroscience Psychology Neurology Disability Studies	Neurological Conditions
• Personhood • Brainhood • Cerebral Self • Mind-Brain Problem • Consciousness	Neuroscience Philosophy of Mind Psychology	Humanistic Neurosciences
• Brain Plasticity • Neurodiversity • Abled/Disabled Brain	Neuroscience Disability Studies	Neuro-Humanities

Table 4: Threshold Concepts in Vernacular Neurosciences Curriculum

The twenty-one threshold concepts can be considered the "jewels in the curriculum" for a Vernacular Neurosciences course, as using Meyer and Land's metaphor which is explained here:

> powerful transformative points when students interact with those key concepts that can serve to identify crucial points in the framework of engagement that teachers may wish to construct in order to provide opportunities for students to gain important conceptual understandings, and hence, gain richer and more complex insights into aspects of the subjects they are studying. (2005b, 57)

Thus, as seen on table 4, a curriculum based on Vernacular Neurosciences is characterized by threshold concepts that move across transdisciplinary borders in the field of sciences (e.g. neuroscience, neurology, anatomy, biology, and psychology) and the humanities (e.g. philosophy, disability studies, communication and rhetoric). It should come as no surprise that a transdisciplinary feature may challenge the teaching and learning of a threshold concept and can become "difficult or troublesome" (375) during such process.

Yet, to understand the "troublesome" nature in a threshold concept Meyer and Land compare it with a state of "liminality"; to acquire it, learners have to go through rites of passage that involves overcoming challenges and reaching the next level. The liminality refers to a period that is part of a "transitional space/time within which the rites were conducted" (375). It is expected that during a liminal stage, instructors keep providing learners with constant feedback and dialogue, in a dynamic process to secure a positive pedagogical experience. However, such liminal stage is not free from stress and tensions which learners may pay a toll for 'getting stuck' along the process as they interact with the content. In this regard, Meyer and Land state that "within educational settings it would appear that, on the part of the learner, there may be inability

to achieve the new (transformed) status, occasioning a similar form of 'mimicry' or entry into what Ellsworth (1997) calls 'stuck places'" (377). Although Meyer and Land do not clearly mention about the instructor's role in towing students from 'stuck places', that is, offering scaffolding techniques to facilitate the learning process, the authors do agree that collaborative practices are necessary during the teaching and learning of threshold concepts.

Here, I offer a brief overview of the liminal process during the acquisition of a threshold concept under a framework of complexity thought. The liminal stage is marked by oscillations and fluctuations, being at the edge of the chaos. During this process, the learner has more questions than answers, is uncertain of their knowledge, while trying to grasp the meaning of a threshold concept. Those uncertain and chaotic features are indirectly mentioned in Meyer and Land's statement on liminality: "offers less predictability and appears to be a more 'liquid' space, simultaneously transforming and being transformed by the learner as he or she moves through it" (380).

Moreover, the features of threshold concept such as "transformative", "irreversible", "integrative", "bounded", and "troublesome" (Meyer and Land, 2003;2005a) resonate with features in the complexity theory. For example, a threshold concept can be transformative because it requires a dynamic process that involves interactions between content, learner, instructor, and other agents in a pedagogical context. The integrative feature can side with network, as a newly acquired concept can be associated with a previous one. Furthermore, during the process of learning a threshold concept, a learner may face troublesome experiences that emerge out of the fluctuations between 'order-disorder' (i.e. chaos) as a result of learner's adaptation to a new context. Moreover, a threshold concept is bounded to disciplines; for example, the word 'entanglement' used in physics has a specific meaning that deviates from the

usual vernacular use, and once learners grasp it, they will not be able to 'unlearn' it, being therefore, considered an 'irreversible' process.

Once a learner completes the stages of acquisition of a threshold concept, their worldview expands, becoming stable and in a state of homeostasis, until they come across another threshold concept, and the process is re-activated, following a cycle or a non-linear movement.

Although Meyers and Land's threshold concept framework may receive some criticism such as their favoring of a content-oriented curriculum rather than a student-centred one, the authors clarify that they do not defend objectivism (which is based on content) because it would contradict some fundamental features that threshold concepts hold: they are "discursive in nature" (383). Thus, to be "discursive" implies an interactional and even a dialogic dynamics among agents (e.g. instructor, learner, content). A pedagogy of Vernacular Neurosciences through the exploration of those five neuro-autobiographies can stimulate a dialogic approach between instructors, learners and disciplines. Using neuro-autobiographies as resources in a Vernacular Neurosciences course, instructors can have access to a diversity of threshold concepts that can be negotiated. Nevertheless, the threshold concepts should be certainly "troublesome" or should hold 'stuck places' for undergraduates in the humanities and sciences alike.

A final point to be considered in this section lies in the peculiarity of exploring threshold concepts from the five neuro-autobiographies analyzed in this dissertation. In some instances, learners can identify some threshold concepts easily in those narratives such as brain plasticity and autism spectrum disorder; whereas others seem to be 'hidden' and waiting for a reader (e.g. learner) to infer as part of their reading strategies. Thus, threshold concepts such as neurodiversity and two cultures might need some scaffolding teaching to help students with their inference skills. To improve students' reading experience of digging into the threshold concepts

in those neuro-autobiographies a reading theory centered on reader's experience should be evoked. As Krasny points out, a reader response theory enables cognitive and emotional experiences to emerge during one's reading since the process is "based on the embodiment of the mind and to understanding how the arousal of images and emotions during the act of reading might contribute to complex systems of ethical behaviors" (2004, 4). Combining threshold concepts approach with a reader response theory to develop a curriculum of Vernacular Neurosciences enables us to create a context of negotiation, shared knowledge, and creativity that nurture dialogue which lies at the "logical core of complexity" (Morin, 2008,16). The dialogical driven approach is centered on action, movement, and transformation of thoughts, emotions, and behaviours. The narratives serve as a context in which an autobiographical-self is action-oriented (see table 1), rather than simply discursively marked. Similarly, a reader's work is action-oriented, capable of searching for meanings and constructing dialogues through their interactions with the text where they can infer threshold concepts that can lead to transformative outcomes.

6.4 "Security Blankets"

As the previous section focuses on the leaner and their interaction with threshold concepts that are identified as part of a Vernacular Neurosciences curriculum, this one focuses on the instructor and their interaction with a course material, in this case, the neuro-autobiographies, seen through an interdisciplinary approach that takes into account psychoanalysis, resilience theory, and complexity theory.

While discussing course material in psychoanalysis training, Britzman defines a manual as "security blankets" that can provide "assurance and protection from the haphazardness of wrong-headed turns" (62). The metaphor 'blankets' used in Britzman's work resonates with the

'blankets' in Winnicott's study to represent objects that infants and toddlers use to soothe and to offer affective support when a mother is away. The point here is not to equalize professionals' (e.g. instructors) to infants' psychological needs, but to recognize that both 'blankets' and 'course books' may function as transitional objects to temporarily shield individuals against stressors that emerge from an unfamiliar environment during one's adaptation process.

To mitigate emotional tensions derived from teaching a new course, instructors may tend to use textbooks as blankets during an adaptation period. In the case of a course in Vernacular Neurosciences, the neuro-autobiographies are recognized as complementary resources to a classroom textbook, which can be understood metaphorically as 'blankets'. In educational and family environments, instructors and infant, respectively, would grab objects (e.g. textbook, teddy bear) to soothe against common stressors that come out of an unknown environment. In the case of an educational setting, instructors subconsciously perceive the limitations of a textbook as an omnipotent agent of knowledge able to handle 'all' the content of a certain discipline. Despite its limitations, instructors grab it as a temporarily blanket when teaching a course for the first time. Their fear of losing the textbook leads instructors to strongly attach themselves to it. The 'love' (i.e. affections and emotions) that emerges from instructors' attachment to a textbook becomes a psychoanalytical objection as Britzman remarks (63), since the author takes Freud's earlier views of love to understand object relation in psychoanalysis. The love attached to the object becomes an authority in itself; for example, an instructor teaching Vernacular Neuroscience for the first time might develop strong affective relations to the object (neuro-autobiographies), in the illusionary belief it can offer them all the 'magical answers' to the content (shared knowledge) and affect-wise responses during an instructor-student interaction in a classroom. Because textbooks (e.g. published neuro-autobiographies) are themselves limited,

they cannot easily meet instructors' desires; thus, feelings of love are shifted into hate, leading to experiences of ambivalence (e.g. love-hate) towards an object. The instructor who once highly praised the textbook, now despises it by projecting their frustrations onto it for not being able to handle properly the knowledge and emotional components in their teaching practice. This could lead to maladaptation to an unfamiliar environment, which can affect instructor's emotional health for not showing "competence", (Garmezy 1999), that is, not sustaining a level of resilience to "adapt successfully to disturbances that threaten system function, viability, or development" (Masten, 2014, 10).

Thus, how can Winnicott's concept be applied to neuro-autobiographies seen as 'manuals' for a Vernacular Neurosciences course, if a transitional object is to be discarded once it is no longer needed? Should neuro-autobiographies be transient in a class? Assuming the same instructor would be responsible for a Vernacular Neurosciences course every academic year or semester, the instructor could replace the neuro-autobiographies previously studied with new life stories that deal with individuals with other neurological conditions, a task that can be considered part of their scholarship research. Moreover, instructors who adopt a learner-centred approach are guided by students' needs, curiosity, and creativity, which decenter the role of a textbook. For students themselves, once they complete the Vernacular Neurosciences course, the neuro-autobiographies studied would serve as a scaffolding tool for other neuro-life stories that students may come across in their real world; therefore, previous neuro-narratives would be replaced by new ones. This becomes a cyclical, non-linear process, and ecological, where agents (e.g. readers/learners) interact with other agents (e.g. life stories, narrators, and instructors) immersed in a dynamic environment.

Using an analogy based on Winnicott's concept of "good enough mother" to education, I coin the term the 'good enough instructor' as being the one that can gradually assist learners to become independent and to develop their own thinking. The process of learning to become separate from an object is complex and depends on time-space relations. Once a baby is able to recognize an object as a separate entity and it stays sometimes alone (from its mother/object), the baby grows emotionally. This is an important learning experience that the baby acquires in order to deal with "failure of adaptation" and to tolerate "the results of frustration" (Winnicott 13). Such experience can also help build resilience in one's personality, as Masten states that "Resilience emerges from commonplace adaptive systems for human development […] nurtured by positive interactions with the world" (8). Therefore, according to Winnicott, the transitional object allows creation of an intermediate area, that is, in-between space that enables an infant to develop its creativity and objective perception of an external world. Metaphorically speaking, the process of teaching and learning of Vernacular Neurosciences can occupy an 'in-between space' while it attempts to link the humanities to sciences, which demands from instructors a high level of creativity to maintain the dialogic relation in their pedagogical practice.

Therefore, a pedagogy of a Vernacular Neuroscience should benefit from a "theory of play" that fosters creativity as seen in Winnicott's work. The author mentions that during an act of playing, baby and object are merged with each other; the baby repudiates, re-accepts and perceives the object as 'not-me' (Winnicott 63). It turns into a dynamic activity, in which the mother or caregiver holds a significant role to ensure that the baby can experience a magical control over the object, which Winnicott calls "omnipotence" (63). This experience gives the baby confidence and security so that it can be left alone, independent and separate from the mother in later stages. The potential space created between the baby and the object becomes a

playground for experiencing omnipotence and magic. The intimacy established between the baby and the object through an act of playing is based on reliability motivated by the mother figure. For this reason, playing favours a relationship of trust that is important for the act of learning. In this view, we could articulate that a pedagogy of Vernacular Neurosciences should enable an interaction between instructor and students in which both can engage with the content/textbook/neuro-autobiographies/threshold concepts through a combination of embodied, emotional, and cognitive experiences based on 'playing' (affect). This alternative pedagogical approach based on play dynamics, which can engage various agents, supports active learning and critical thinking skills as required in higher education..

Furthermore, a combination of embodied, emotional, and cognitive experiences is dynamic, non-linear, and susceptible to the body and mind, which can promote pleasant and playful relationalities with an object. For example, the interaction between an instructor and their teaching resource creates a space that opens up for confidence building while it becomes a playground where the instructor and learner may experience omnipotence by engaging with and manipulating the object (content and threshold concepts) according to their wishes and fantasies. The instructor is liberated from certain pedagogical doctrines imposed in higher education which allows their creativity to emerge through an interaction with the course material. Thus, it creates a magical experience in which freedom can be expressed without the anxieties demanded by the profession; or better, the instructor is no longer under the authority of a manual as an object of knowledge that can castrate their creative process. As Winnicott reminds us, it is "only in playing that the child [and adult] is free to be creative" (71), and "by being creative the individual discovers the self" (73). In other words, playing with learning becomes a movement of internal liberation for both instructors and learners. This internal freedom of being oneself is exciting;

however, it might be precarious as Winnicott advises; while playing, the individual lives in a world that is neither internal nor external, neither certain nor uncertain. Thus, Winnicott's theory of play aligns with complexity thought in terms of having individuals at the edge of chaos (in a playing mode) while interacting with transitional agents in an environment, as part of an adaptive process such as teaching and learning.[103]

To support the argument that some of Winnicott's views side with complexity studies, I cite Sutherland (1980) who argues that Winnicott's late work "has moved from the classical frame of reference to an approach of a general systems theory type, for it is the self that operates as the organizing principle for all future differentiation. The critical property of the self is the creativity that takes place within it through play" (836). In this manner, complexity studies such as adaptive dynamic systems can not only offer insights to the field of education but also to psychoanalysis. Similarly, Galatzer-Levy attempts to develop a psychoanalytical model based on non-linear dynamic systems and chaos theory in which he states that "New learning occurs in adaptive systems on the edge of chaos, between the twin dangers of stagnation and disorganization. This suggests that during periods of development we would expect not to see an orderly unfolding of pre-programmed structures but, instead, periods of relative disorganization" (2004, 431). Thus, a pedagogy of Vernacular Neurosciences that explores learners' creativity may challenge their worldviews, such as their understanding of the threshold concept 'normality' explored in the neuro-autobiographies, and thus, during a process of reorganization (i.e. autopoiesis), learners may feel themselves at the edge of chaos before achieving a full understanding of such concept.

[103] Recently, there has been a growing interest in exploring psychoanalysis through complexity theories such as adaptive/dynamic systems theories, as Seligman argues that "we can consider the possibility that nonlinear dynamic systems theories provide a window toward a new metapsychology for psychoanalysis" (2005, 291).

6.5 Final Remarks: Towards Neurosciences Literacy

In this last section, I raise the following question: to where the vernacularisation of the neurosciences may lead us? To understand this question, I situate the teaching and learning of Vernacular Neurosciences and the function of neuro-narratives as open doors for neurosciences literacy.

One of the learning outcomes of a pedagogy of Vernacular Neurosciences is to promote literacy to undergraduates across disciplines in the humanities and the sciences through a variety of resources from the vernacular (e.g. neuro-autobiographies, arts, technology) in conjunction with academic and scientific texts to foster a dialogic approach that is founded in active learning, creativity, and critical thinking. The notion of creativity as seen in Winnicott's theory of play encompasses embodied experiences that are dynamic and non-linear. For critical thinking, I draw upon Paulo Freire's work on dialogic model, in particular on his concept of awareness (i.e. *conscientização* in Portuguese). Despite its usual socio-political applications in education, a literacy awareness holds a transformative process and outcome that can liberate learners from their 'internal' and 'external' oppressors, that is, learners' inner thoughts of feeling disempowered due to context constraints. To achieve this awareness, teacher-student interaction should be centered on a dialogic model that is far from a traditional 'banking system' in which the teacher 'deposits' content into students' brain. Freire denounces the banking system by stating that "The capability of banking education to minimize or annul the students' creative power and to stimulate their credulity serves the interests of the oppressors, who care neither to have the world revealed nor to see it transformed" (2000, 73). To foster dialogic relations between educational agents (instructors) and learners we need a pedagogy that promotes

'*conscientização*' based on a *praxis*, that is, "the action and reflection of men and women upon their world in order to transform it" (Freire 79). Freire's paradigm shift in education (from banking to dialogical relations) consists of 'acts of cognition' in which cognizable objects (e.g. problem solving, realia material, etc.) are 'in action' with cognitive actors or agents, that is, teacher-student interaction, in order to foster critical thinking and not information transfer.

Freire's ideas on education as liberation and freedom aligns with complexity thought in the sense that he sees education as part of an ecology, in which agents (e.g. humans and objects) relate to each other in various layers. Freire states that a pedagogy of freedom "denies that man is abstract, isolated, independent, and unattached to the world […] Authentic reflection considers neither abstract man nor the world without people, but people in relations with the world" (81). It is on this ground that a pedagogy of Vernacular Neurosciences stands: in the interconnectivity with agents across different network layers that compose an environment. In this view, instructor-student interactions tend to be based on collaborative, shared-knowledge, and experiential approach that can decentralize power dynamics which instructors have traditionally reinforced as seen in the banking model. In this view, instructors' role has become diversified, by taking positions such as facilitator, mentor, coach, teacher, collaborator, and reviewer among others.

Moreover, a pedagogy of Vernacular Neurosciences enables a collaborative model that can bridge the divide between the humanities and sciences (the latter is known for its tradition to be taught in a banking model). What contributes to such paradigm shift is a transdisciplinary curriculum of Vernacular Neurosciences supported by resources such as neuro-autobiographies to complement the teaching/learning of hard-core neuroscience (e.g. neurobiology) with approaches from anthropology, philosophy, psychology and education among others. Thus, transdisciplinary perspectives can contribute to development of neurosciences literacy among undergraduates in

the humanities and sciences alike. In this manner, a holistic pedagogy replaces a traditional atomistic model that has pervaded undergraduate programs.

This dissertation has attempted to contribute to this holistic pedagogy by supporting the project of neurosciences literacy that follows a dialogic model based on reflection, action, and transformation; these three elements can enhance critical thinking skills which combine acts of individual and collective cognition, embodiment, and affectivity. For example, the teaching and learning of those neuro-autobiographies are to be based on strategies and activities that focus on problem-solved activities (active learning and inquiry-based learning) so that students can engage with the material (threshold concepts) theoretically or applied, individually or in groups, by activating their high-cognitive abilities (c.f. Bloom's Taxonomy, 1956) and experiential perspectives (c.f. Dewey 2007).

Furthermore, one of the contributions and applications of this project to post-secondary education is to provide resources to design a curriculum that can bridge the gap between the humanities and the sciences through vernacularized modern neurosciences as defended in this dissertation. The neuro-autobiographies explored here constitute a sample of what I have defended and illustrated as part of the vernacularisation of modern neurosciences. In this view, neuro-autobiographies are to be considered part of a non-linear communication system which permits agents (e.g. writers, readers, instructors, learners) to create meanings that can be at least reflective, not to mention, transformative.

Ultimately, this dissertation acknowledges that the five neuro-autobiographies explored here, as examples of the vernacularisation of the neurosciences and as pedagogical tools for a course on Vernacular Neurosciences, are written by resilient women, who despite living under certain neurological conditions, have challenged medical practices, have denounced discriminatory behaviours, and have fought against stigma. On account of it, their voices gain space and are reverberated throughout this dissertation in the hope of being heard.

The Pedagogy of 'Vernacular Neuroscience' across Higher Education Curriculum: Time to Bridge the Divide?

Figure 7: Poster 2017 for the Canadian Association of Neurosciences held in Montreal

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INDEX

GLOSSARY

Autobiographical Self

The autobiographical self is seen as the ‘knower’ in the process of ‘knowing’, embodied in their experiences and sustained by networks which enable the autobiographical self to improvise and self-organise.

Autobiographical writing

The autobiographical writing is a dynamic exercise that involves self-reflectivity, metacognition, and self-organisation, triggered by physical and emotional experiences with oneself and with other agents in an environment.

Bifurcation

Bifurcation is a relevant concept to be explored in life narrative as it allows a reader to identify choices the autobiographical self makes based on certain conditions that can lead to positive or negative outcomes.

Complexity in Neuro-Autobiography

The complexity in neuro-autobiography is characterized by its interconnectivity and intertextuality with resources that are scientific and non-scientific which creates a dynamic interaction while a personal story is being told.

Course in Vernacular Neurosciences

A course in Vernacular Neurosciences aims to develop students’ critical thinking through discussions that engage students with current neuroscientific themes and their relations to society via arts, culture, technology, and even spiritual.

Ecologyy of Composition

An ecology of composition consists of stories being written, read, and performed through an interweave of rhetorical elements (e.g. metaphor, humor, etc.) at a micro level; of stories being connected through an interweave of different mediatised platforms (e.g. verbal, visual, audio, and moving) at a meso-level; and of stories being communicated through an interweave of other voices at a macro one.

Good enough instructor

The good enough instructor' is the one that can gradually assist learners to become independent and to develop their own thinking.

Intertextuality

Intertextuality is considered the encounter of other voices forming nodes along the text, becoming visible by not merging with each other, but interacting so that a creation of a network topology is possible.

Literacy awareness

Literacy awareness holds a transformative process and outcome that can liberate learners from their 'internal' and 'external' oppressors, that is, learners' inner thoughts of feeling disempowered due to context constraints.

Memory

Memory becomes an important rhetorical element in the neuro-autobiographies since it encapsulates resolved (positive experiences) and non-resolved (trauma) past events in the autobiographers' life. Since memories are intimate and private, they are expressed in a vernacular mode at their best.

Modern Neurosciences

Modern neurosciences as a transdisciplinary subject at the crossroad of the humanities and the sciences.

Neuro-Autobiography (I)

Neuro-autobiographies as a holistic writing practice in which experiential and discursive markers are considered to represent the narrators' views of their lived experiences with the neurological conditions.

Neuro-autobiography (II)

The term 'neuro-autobiography' to refer to life stories written by individuals with neurological disorders or conditions; hence, exemplifying it as one of the manifestations of the vernacularisation of neurosciences.

Neurofiction

'Neurofiction' is likely to be considered an evolution of a writing practice developed by a well-known neurologist, Oliver Sacks, who in the 1970s began to narrate his patients' bizarre neurological disorders in a literary fashion.

Pedagogy of Vernacular Neurosciences

Pedagogy of Vernacular Neurosciences explores learners' creativity and may challenge their worldviews such as their understanding of the threshold concept 'normality', and thus, during a process of reorganization (i.e. autopoiesis), learners may feel themselves at the edge of chaos before achieving a full understanding of such term.

Transitions

The ‘transitions’ in neuro-autobiographies can be seen as discursive markers in the narrative that indicate shifts and turning-points in one’s life as a result of the bifurcations and the choices available.

Vernacular (I)

Vernacular to refer to an everyday language used in the neuro-autobiographies in contrast to a scientific language and discourse used in the medical sciences.

Vernacular (II)

The concept of vernacular to refer to an everyday language used in the neuro-autobiographies in contrast to a scientific language and discourse used in the medical sciences.

Vernacularity

Vernacularity encapsulates human experiences and memories (e.g. traumas) in their discursive forms.

Vernacularization of Neurosciences

Vernacularization of neurosciences, a process that involves complex dynamic communication systems through the dissemination and circulation not only of everyday objective perspectives and material manifestations of neurosciences such as portable brain-wearables, but also of subjective views and discursive practices such as neuro-stories.